

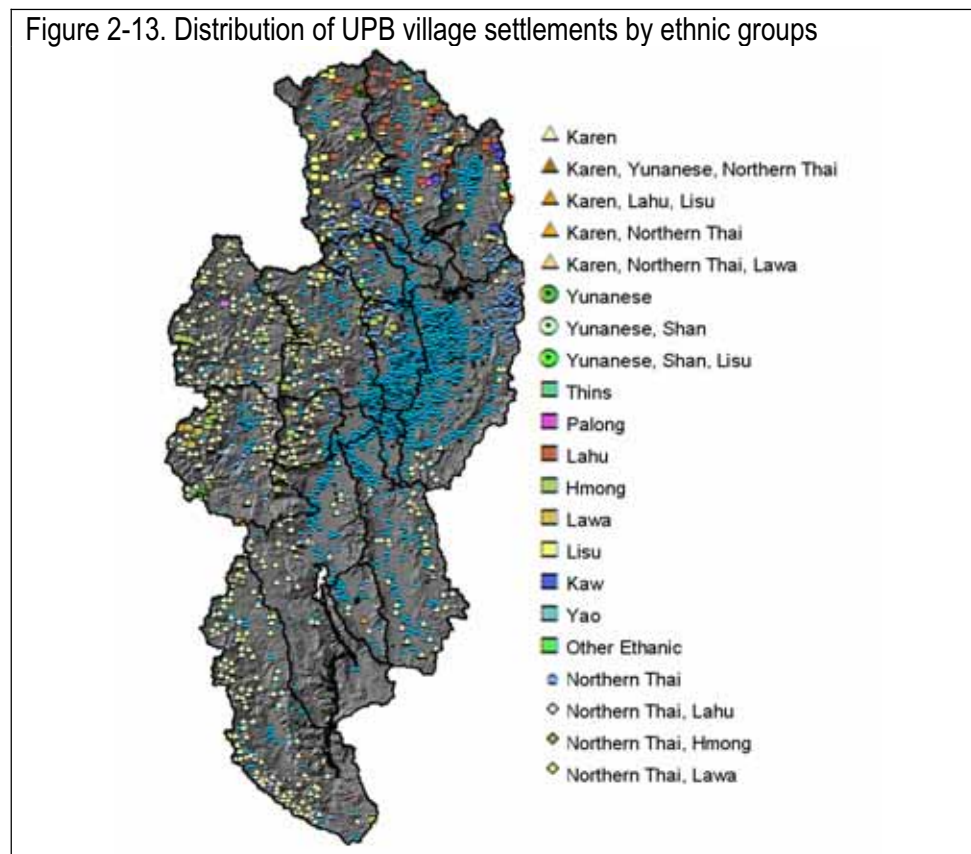
2.3 Dimensions of poverty in case study areas

This section turns from regional overview to explorations of poverty in the context of our specific case study areas in the region. In the process, we also provide some examples of diversity in the region in how people are viewing and assessing poverty and issues with which it is associated.

2.3.1 Distribution of poverty in the Upper Ping Basin, Northern Thailand

The Upper Ping Basin (UPB) is populated with diverse ethnic groups. The majority ethnic group is the Northern Thai, whose settlements occupy most of the lowlands (Figure 2-13). The second largest ethnic group and the largest ethnic minority is the Karen who live in highland areas (mostly in middle to upper montane zones) in the Upper Mae Chaem, Lower Mae Chaem, Mae Khan, Mae Klang, and Mae Tuen sub-basins. Hmong, Lisu, and Lahu minority groups occupy highland areas in Mae Taeng and Ping 1 sub-basins in the north. Other ethnic minorities are dispersed in some midlands and highland areas of UPB.

Figure 2-13. Distribution of UPB village settlements by ethnic groups



The abundance of land and water resources makes the Chiang Mai- Lamphun valley the main “food basket” for the upper North. With installation of three large-scale irrigation projects, multiple cropping has been practiced since the early 1970s. This has encouraged expansion of trade, as well as city and suburban areas. Populations are concentrated in lowland areas, and especially those in the periphery of Chiang Mai city (Figure 2-14). Thus, population density is highest in irrigated lowlands, while most of midland and highland areas have population densities of less than 50 persons per square kilometer.

In order to assess income-based poverty using village-level data, household income data from the 2003 NRD-2 survey conducted by the Community Development Department were zonally summarized as a property of small local level 4 sub-watersheds (see details on sub-watershed levels in the UPB site description section of chapter 1).

Figure 2-14. Distribution of population & population density in the UPB

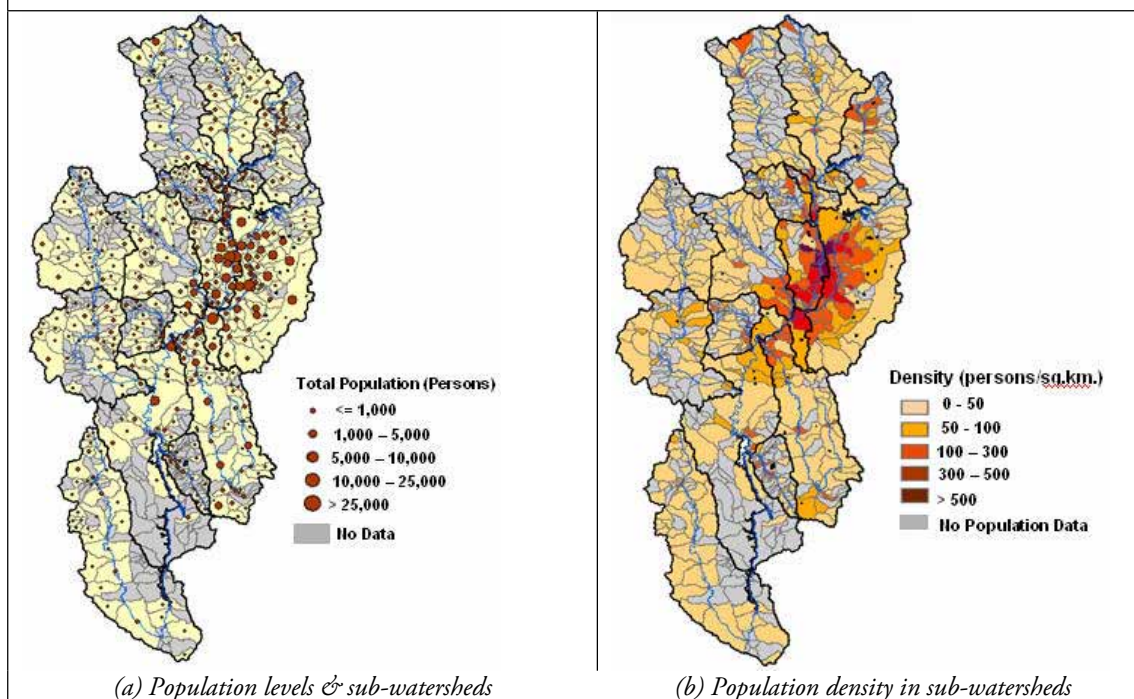
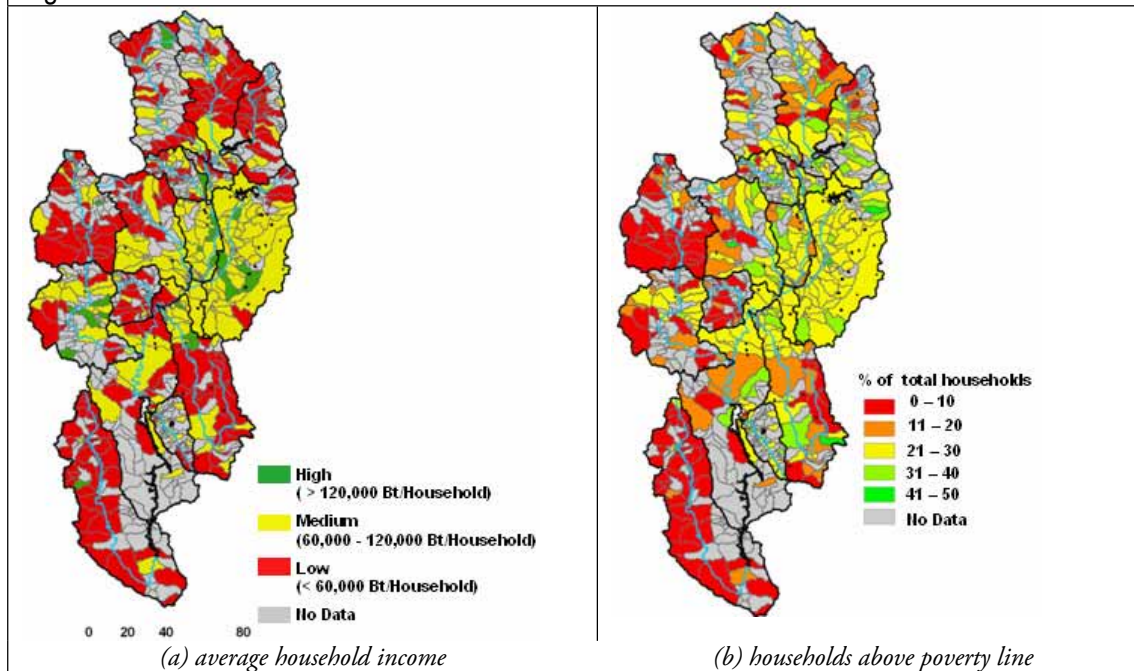


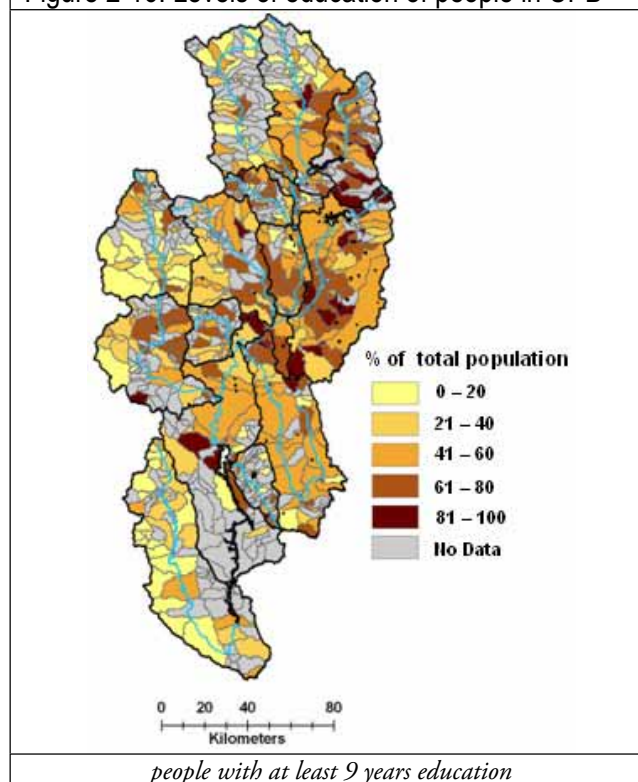
Figure 2-15. Distribution of indicators of household wealth status in UPB



Spatial distribution of wealth expressed as a thematic map (Figure 2-15(a)) indicates that communities where average household income is less than 60,000 Baht/year are mostly located in midland and highland sub-watersheds. This is confirmed by data in Figure 2-15(b) which displays the percentage of households above the poverty line within sub-watersheds. These communities are mainly ethnic Karen (Figure 2-13) and have lower levels of education in terms of the percent of total population with at least 9 years education (Figure 2-16).

Other factors that contribute to poverty in these areas are access to land, water and time of travel to district towns and provincial cities where major sources of information and markets for inputs and outputs are located. These will be discussed in later sections of this report.

Figure 2-16. Levels of education of people in UPB



2.3.2 Local heterogeneity in poverty status

In considering the poverty status of the population, a case study in Northern provinces of Thailand found that the poor were scattered in different districts of areas often considered to be relatively well-endowed areas.

A study by Benchaphun et al. [2005] surveyed 910 farm households in Chiang Mai, Chiang Rai and Lamphun provinces of North Thailand. The survey covered 490 farm households in the Chiang Mai Valley (Chiang Mai and Lamphun) and 420 farm households in Chiang Rai, located within an overall total of 115 villages. These areas are considered prime agricultural areas of the North. Yet even here, the research team found very diversified farming systems and considerable heterogeneity in study area populations.

In the lowlands of Chiang Mai, Lamphun and Chiang Rai in, the average annual household income in 2002 was around 60,000-70,000 baht, which was only slightly higher than poverty line² (Table 2-11 and Table 2-12). Well-off, medium and poor farm households were found to live side by side each other in the same areas, sub-districts and districts. Net cash

² The national poverty line was 1,032 baht per person per day in 2002. This is equivalent to \$USD 0.80 a day per person or 50,000 baht per household. Alternatively, if \$USD 1 a day per person is used to define the poverty line, this is equivalent to around 60,000 baht per household per year.

income of farmers ranged from 0 baht per household to 1.2 million baht per household, depending on crops and resources such as land and capital.

- Poor farm households defined as less than 60,000 baht per household had incomes that averaged around 35,000 baht per household.
- Medium farm households defined as those having income between 60,000-120,000 baht per household had on average income of 85,000-88,000 baht per household.
- Well-off farm households with more than 120,000 baht per household had average incomes of 180,000-260,000 baht per household.

Table 2-11. Average household income by income groups, from surveys of farmers in Chiang Mai, Lamphun and Chiang Rai provinces, 2002

	Total household income				Total
	Very poor	Poor	Medium	ell off	
	<30,000 baht	30,001-60,000 baht	60001-120,000 baht	>120,000 baht	
Chiang Mai					
Average HH income	18,707	47,804	85,602	259,789	70,690
Sample size	101	138	82	38	359
percent	28.1	38.4	22.8	10.6	100.0
Lamphun					
Average HH income	19,493	44,334	87,650	176,678	73,191
Sample size	28	49	30	24	131
percent	21.4	37.4	22.9	18.3	100.0
Chiang Rai					
Average HH income	21,149	44,134	84,345	179,049	60,985
Sample size	121	151	103	42	417
percent	29.0	36.2	24.7	10.1	100.0
Total sample size	250	338	215	104	907
percent	27.6	37.3	23.7	11.5	100.0

Source: Benchaphun et al 2005

About 65 percent of total income came from their farm, and about 35 percent from off-farm and non-farm sources. Medium income households in Chiang Mai and Chiang Rai had a higher proportion of their income from farm sources (75 percent). Well-off households in Chiang Rai had the lowest proportion of their income from farm sources (53 percent), with non-farm sources constituting nearly half of their income. Chiang Mai well-off farm households were relatively wealthier than those in Lamphun and Chiang Rai, with higher levels of both farm and non-farm income. Well-off farm households had about 5 times the income of poor farm households.

The study also found that 27.6 percent of the households surveyed had annual household incomes that placed them in the lower range of very poor (less than 30,000 baht), whereas 37.3 percent were classified as poor (30,000-60,000), 23.7 percent had medium incomes (60,000-120,000 baht), and 11.5 percent were well-of with incomes of more than 120,000

baht per household per year. In Lamphun, 18 percent of the farmers surveyed enjoyed more than 120,000 baht of annual household income, compared to 10 percent at this income level in Chiang Mai and Chiang Rai areas. This is due to the fact that Lamphun farmers grew higher-value fruit trees like longan, and that many of them had non-farm income sources. In this survey, the proportion of poor households was as high as 65 per cent because it was a survey among rural farm households where there was a high concentration of poor households. Among very poor households, their average household income ranged around 20,000 baht per household or \$USD 0.40 per person per day.

Table 2-12. Income of farmers in Chiang Mai, Lamphun and Chiang Rai, 2002-2003

		Province	Number of households	Farm income	Non-farm income	Total income
-----baht per household-----						
Poor		Chiang Mai	239	23,048	12,488	35,508
		Lamphun	77	26,603	8,805	35,301
		Chiang Rai	272	21,675	11,552	33,909
Medium		Chiang Mai	82	64,749	20,173	85,602
		Lamphun	30	64,400	23,250	87,650
		Chiang Rai	103	53,380	29,289	84,346
Well-off		Chiang Mai	38	178,871	84,205	259,789
		Lamphun	24	118,051	58,627	176,678
		Chiang Rai	42	94,910	86,490	179,048
Total			907	43,793	22,554	66,589
-----percent of households-----						
Poor		Chiang Mai	239	64.9	35.2	100
		Lamphun	77	75.4	24.9	100
		Chiang Rai	272	63.9	34.1	100
Medium		Chiang Mai	82	75.6	23.6	100
		Lamphun	30	73.5	26.5	100
		Chiang Rai	103	63.3	34.7	100
Well-off		Chiang Mai	38	68.9	32.4	100
		Lamphun	24	66.8	33.2	100
		Chiang Rai	42	53.0	48.3	100
Total			907	65.8	33.9	100

Source: Benchaphun et al 200

2.3.3 Self-defined and alternative poverty lines

Self-defined poverty lines in North Thailand

A survey conducted by Benchaphun et al. [2001] during 2000-2001 in 20 villages of four Royal Project sites (Angkang, Nong Hoi, Mae Hae and Prabat Huay Tom) in Chiang Mai and Lamphun provinces of Northern Thailand included interviews among farmers and farmers leaders about criteria of poverty.

During discussions about how they defined poverty, they included income, housing, assets and land ownership as key criteria for definition of poverty. They used a household income of 40,000 baht³ per household as the “cut-off point” between poor and non-poor, irrespective of household size. Households with incomes of more than 100,000 baht per household were considered well-off.

Using their “definitions” of poverty, Table 2-13 categorizes poor, medium and well-off households. Poor households predominated in the Prabat Huay Tom site (63 per cent of the surveyed households). The Angkang site had 34 per cent of the surveyed households being poor, but in the Nong Hoi site only 14 per cent were poor and in Mae Hae only 4 per cent of the interviewed households were viewed by the people as being poor — the rest were considered to be “medium” and “well-off”. One can see how perceived poverty varies across local contexts.

Table 2-13. Distribution of households using farmer's self-defined poverty lines in four Royal Project sites in Chiang Mai and Lamphun

Royal Project up-land highland Site	Poor (<i><40,000 baht per household</i>)	Medium (<i>40,000-100,000 baht per household</i>)	Well-off (<i>> 100,000 baht per household</i>)
% of surveyed households			
Angkang	33.9	54.2	11.9
Nong Hoi	14.1	70.3	15.6
Mae Hae	4.5	80.3	15.2
Prabat Huay Tom	62.7	34.3	3
All four sites	28.9	59.8	11.3

Self-defined poverty lines in Vietnam case study

Self-defined poverty lines were determined by tea growers in Hoang Nong commune of Dai Tu District in Thai Nguyen Province using both wealth ranking and the Stages of Progress Method (see Box 2-3). Their self-defined poverty lines compared quite well with official poverty lines defined by the MOLISA ‘poverty reduction 135 program’.

³ If the national standard is used, 11,688 baht per person per year is the poverty line. A household with 5.6 members should have more than 65,452 baht per household, while a household with 9.6 members should have more than 112,204 baht per household to be above poverty line.

Box 2-3. The Stages of Progress (SOP) Method

Village representative groups in two villages (about 30% of the total households in each village) (1) define local notions of poverty, (2) identify “stages of progress” that households in the villages might go through as they obtain more and more investment funds, and (3) characterize each household in the village according to its current and past stage.

Focus groups also characterize livelihood strategies. Two representative focus groups of tea growers in each village were selected using the following criteria:

- Wealth: rich, average and poor (following criteria of ‘poverty reduction program 135 and wealth ranking)
- Age: including the most common age of the HH head (over 40 years old) and the old group.
- Gender: 2 groups, male and female.

One-day group meetings were conducted using a semi-structured checklist and PRA tools as described below.

Research questions, tools and expected outputs:

	Research questions	Tools	Expected outputs
1	Poverty causes and poverty line according to local perception	Wealth ranking, SOP	Self-defined poverty and well-being lines are identified. Livelihood strategies of households in getting out from poverty are mapped
2	market information – poor (what, where, why, how, who)	Interview + brainstorming + ranking	Information access(social & human resource of the poor)
3	Gender along value chains	time line seasonal calendar day clock	Gender role among the poor- target groups for improving production process (social resources)
4	Institutional assessment	Institutional ranking	Opportunities & Constraints the poor have

Source: <http://www.pubpol.duke.edu/krishna/index.html>

Hoang Nong commune consists of 18 villages that include 1,145 households and a total population of 4,968 people. Their population growth rate is low, and the dominant age group belongs to the labor force. According to criteria from MOLISA, about 55 percent of the commune population belongs to the average wealth group, while 20 percent are the well-off and 25.6 percent (332 households) are poor. Income of poor households is less than 200,000 VND/month/person, while rich can earn 6 million VND/year/person (after deducting all production costs).

Indicators for poverty as measured by participating villagers are based on the following parameters: House, land areas, labor, income, but also measured price received when selling tea, loans, and furniture. The poor, as defined by the ‘stages of progress’, usually lack labor, have bad health, and do not have enough money for purchasing fertilizers for tea (Tables 2-14 and 2-15).

Table 2-14. Stages of progress with self-defined poverty and well-being lines from case study site in Vietnam

Stage	Doan Thang Village (Kinh ethnic group)		Dinh Cuong village (Dao ethnic group)
10		Expand business, having brand name of Hoang Nong	
9		Applying technology, investment, marketing, learning about product market	Savings and loan
8		Owning advanced multi media (radio, television)	Expand production activities, extent breeding facilities, build up biogas system
7	Sending children to learn at high school or vocational school to get a working skill	Savings, take care of health	From average to wealthy
6	Building many store house, saving money in a bank	From average to wealthy	Doing business, change crop to more economic species, large livestock
5	Improve housing, cleaner	Buying motorbike	Saving money for pay back debt, for children wedding
		Building houses, improve and upgrade kitchen and house furniture, bathroom	Better food, have meat for each meal, nice clothes
4	From average to wealthy	Poverty line	Poverty line
	Purchase motorcycle, more furniture, better food (2 meals/day with meat, fish)	Buying cows and buffalo	Purchase motorcycle for transport materials, TV
3	Shelter with toilet and bath room	Buying fertilizers and basic machines	Poverty line
	Poverty line	Buying additional land	Building house 'cap 4', purchase buffalo, pay back debts
2	Purchase fertilizers to replant old tea, improve health		Purchase fertilizers, piglets, sharing tea processing equipment
1	Not hardworking, sick, bad economy management, in debt, toilet made by bamboo	Little and poor land, many dependent people, do not have basic houses, sick	Not yet hard working enough, lack of equipments, no buffalo, not enough rice and tea, due to less land, in debt, simple house, sick, not good economy management

Source: PRA survey, 2007

Table 2-15. Change in household stages of progress and poverty status over time at a case study site in Vietnam <i>Note: stages 1, 2 are under poverty line, 3, 4 are average, 5, 6 are good sense of well-being</i>							
Sample Households	Important Periods & Major Events						Team observation
	82-86	1991-92	1997	2001	2005	2007	
		Land allocation; Red book issued	Sell young labor to the south	Electricity available	GTZ project started; Establishment of a 'safe tea' cooperative		
The			1			3	Children grow up, health improved, hard working (14 hours/day)
Nhi			4			3	Old parents, pay for small children go to school
Hai					2	3	Purchase more land for tea, children get bigger
Hang				2		3	Children get bigger
Thanh			2			3	Parents are less sick
Hong			1	2		4	Business service, selling equipment for tea and drying processing, selling pesticides
Lan	2			3		4	working with tea, children grow up, more labor
Lang	3	4				4	More labor, creativity, pension
Thom	3					4	good management, diversify agricultural activities
Lam					3	4	More labor
Hanh	2		4		6	5	No children at the beginning, have invalid subsidy and reduced school fee due to working in the army
Loc	1	3	4			5	healthy, no children from beginning, safe minded and hard working

Source: PRA Survey, 2007

Location: Doan Thang village, Hoang Nong commune, Thai Nguyen district, Vietnam

Self-defined poverty lines in the Lao PDR

According to the Prime Minister Instruction No. 1010 in June 2001, the Government of Laos defines poverty based on four main factors. These include availability of food, (2,100 kcl per person per day) and clothing, housing condition (permanent, temporary, etc.), access to health services and access to education. The government aims to reduce the percentage of population under poverty line to 24 percent by 2015.

One of the key challenges for poverty alleviation in Laos is its geographic (i.e. mountainous-lowland, urban-rural) and ethnic discrepancies (Chamberlain 2007). With particular regard to rural poverty, Raintree states that the "...problem of rural poverty is ultimately rooted in the failure or weariness of rural livelihood systems. Any serious effort in poverty alleviation must eventually focus on finding ways to improve and sustain rural livelihoods (Raintree 2001, p72)." He particularly stresses examining poverty in Laos not merely in terms of a household's level of consumption, but instead from the perspective of capabilities: Do households have ability to save and accumulate wealth? Can they adapt to changes and cope with adversities? Are they able to adopt technologies that enhance long-term productivity?

A team of researchers from the Faculty of Forestry of the National University of Laos conducted a case study in Sing district (Luang Namtha province) supported by the U.S. National Science Foundation. Focus group interviews were held with village elders and leaders to discuss different economic classes within seven villages. Rice sufficiency, access to land (size and numbers of plots), agricultural production, and assets (i.e. livestock) emerged as key factors that distinguished households' economic status across villages. Based on these characteristics, researchers distinguished three general economic classes of households as described in Table 2-16. This approach also parallels the NGPES approach.

Table 2-16. Self-defined poverty levels in the Lao PDR

Classes	Description
Better off	These are families that have land to meet their food needs and may have surplus production that can be sold. These families also have means to invest and diversify into commercial cash crops such as sugarcane, maize, Para-rubber, or are able to engage in small-scale agricultural trade.
Middle	These are families that have land to meet their basic food needs and may have some surplus production that can be sold. These families may also have some limited means to invest and diversify into commercial cash crops such as sugarcane, maize, Para-rubber, or to engage in small-scale agricultural trade.
Poor	These include families that do not have sufficient access to agricultural land to meet their subsistence food needs throughout the year. Families also tend to have limited household labour (i.e. young family, illness, death, etc.) and assets.

In addition to basic factors of poverty defined by the Lao government, we found that access to basic agricultural production inputs including land and labor were important conditions for households' survival and accumulation of wealth.

2.3.4 Notions of well-being

At our case study site in Vietnam, well-being is noticed by villagers as soon as one owns motorcycles or a television, has better food for better health, has savings or expands her/his agricultural activities such as using more fertilizers and more land (see Table 2-14).

In Northern Thailand, our studies have found that the poor as defined by others may not view themselves in the same light. A survey by Benchaphun during 2006 in Mae Wang and Mae Chaem of Northern Thailand asked farmers to do a self-assessment. They were asked to identify whether they considered their households' living as "experiencing hardships" (*lum-bak*) or "not sufficient" (*kud-son*); "moderate level of comfort" (*pan-klang*); or "having good level of comfort" (*sabai*). Using the poverty line definition at 60,000 baht per household, it turned out that only 42 per cent of them who had income less than 60,000 baht per household per year or in the "poor" category considered themselves *lum-bak* or experienced hardships, quite a proportion (56 per cent) considered their household as or *pan-klang* or moderately comfortable and even 2 per cent considered themselves *sabai* or a good level of comfortable.

For the medium income group, while 18 percent of households considered their household as *lum-bak* or *kud-son* or experienced hardships, the majority (82 per cent) considered their households as *pan-klang* or moderately comfortable. But 33 per cent of them reported that their income was not sufficient for living.

Among those with incomes greater than 120,000 baht per year 91 percent of these households considered themselves as *pan-klang* or moderately comfortable, while 9 per cent even reported their living experienced hardships (*lum-bak* or *kud-son*), and 18 per cent of the well-off said their living was insufficient. None of the medium or well-off households considered themselves *sabai*. This case study shows the fact that poverty is a relative concept which is not captured well by income levels per se, as many of those in "poverty" would consider themselves reasonably comfortable, while many of those not in "poverty" considered themselves insufficient in income and experienced hardships (Table 2-17).

Table 2-17. Self assessment of poor, medium and well-off households at study sites in North Thailand

Households reporting that:	Type of households		
	Poor	Medium	Well-off
% of the income group			
Income is sufficient for living	40.4	66.7	81.8
Income not sufficient for living	59.6	33.3	18.1
Experienced hardships, not sufficient (<i>lum-bak</i> or <i>kud-son</i>)	42.3	17.8	9.1
Moderate level of comfort (<i>pan-klang</i>)	55.8	82.2	90.9
Good level of comfort (<i>sabai</i>)	1.9	0	0

Source: field survey, 2006

2.3.5 Changes in household poverty over time

Land assets and household cycles in Yunnan

Access to land resources is often an important indicator of relative wealth for rural populations. In China, arable rural land is periodically redistributed based on changes in household size. During the period between allocations, the amount of land per-capita for each household gradually becomes more unequal as household size changes according to stages in household life cycles.

This process of change was assessed for natural village hamlets within two administrative villages in western Yunnan, based on data from official household land use contracts. Gini coefficients⁴ were calculated for household land assets in order to quantify the inequality of land distribution in villages. As when used with income or any other asset, a value of 0 indicates perfect equality whereas a value of 1 indicates perfect inequality. Results confirm that agricultural land in these villages was more evenly allocated in 1985 (Table 2-18).

Table 2-18. Comparison of Gini coefficients for contracted land per household in each natural village at a case study site in Yunnan, China

Baicai	1985	2002	Pingzhang	1985	2004
Baicai	0.053	0.158	Baishuihe	0.000	0.204
Baojiacun	0.014	0.164	Dazhai	0.019	0.205
Dashuigou	0.070	0.185	Lujiadi	0.018	0.285
Lipo	0.024	0.157	Shangpingzhang	0.031	0.217
Qingcai	0.048	0.192	Xiapingzhang	0.065	0.275
			Xiaohezhai	0.034	0.126
			Xinzhai	0.016	0.197
TOTAL	0.071	0.188	TOTAL	0.046	0.239
Average	0.042	0.171	Average	0.029	0.219

Every natural village had an increase in the inequality of land distribution between 1985 and 2002/2004, as depicted by the increase in the Gini coefficient over the same period. This pattern of increasing inequality in access to land is due to gradual changes in household composition as each separate household grows, divides and decays through the various stages of a household life-cycle. Households which are currently in the growth stage (marriage, reproduction) will have lower per-capita land resources than households which have lost members since the time of land allocation (due to out-migration or death). Thus, the life-cycle stage of a household functions as an important determinant of relative access to land resources due to the current system of land distribution. This is particularly relevant to poverty in a context where there are few resources other than land, and few economic options other than agriculture.

⁴ Use of the Gini Coefficient as a measure of inequality is further discussed in section 2.1.1.

Land, electricity and change in Vietnam

Since the land allocation program in 1991-1992, life of villagers has improved at our case study site in Vietnam. Since the village began receiving electricity from national grid in 2005, new opportunities for hard-working families with cash savings allowed them to “take off” and achieve the “well-being” level described earlier.

On the other hand, there is significant risk that families of tea growers may fall back into poverty, as they are only just above the poverty line today. Their farming depends much on their own labor, and if any family member gets sick they can fall back into debt. They need help with access to low interest loans in order to strengthen their tea production (see Table 2-15).

Age and gender in North Thailand

In Northern Thailand, Charal et al [1997] studied an Akha village called Mae Salaep in the highland areas of Mae Chan district in Chiang Rai province. They found that poor households were newly settled and young families, while old settlers and old families were more well-off with paddy land and more farm land. Early settlers had more access to land while young families found it difficult to have farm land of their own. If they had some land from their parents, it was usually small in size.

On the other hand, interviews with villagers in the Mae Wang watershed of Chiang Mai Province during 2006 found that many poor households were aged and landless. These old people did not have many of the wage employment opportunities which are often available to the young and strong. When they were young, they could earn income by wage employment. As they got older, they were not strong enough to do many farm jobs. Many of them had some health problems. Moreover, many of the poor were old people who had weak kinship networks, and many of them were single parents. Old men and women were equally vulnerable to poverty. As extended families are disappearing, poverty among the aged has been more apparent in rural areas of Northern Thailand.

A study by Nutchai [2003] in the Mae Hae Royal Project site in Chiang Mai province found that many poor households had aging household heads, a woman as head, insufficient labor or had more dependent members of their family. Household heads typically had low education and many did not speak good Thai language. These households had insufficient rice for consumption. They also had less access to loans, and would borrow only to a small extent for consumption purposes.

2.3.6 Ethnicity factors

Ethnicity at case study sites in North Thailand

In Northern Thailand, the poor are sometimes members of ethnic minority groups, but there is also considerable variation among ethnic groups. Benchaphun et al. [2001] found in their survey in Chiang Mai and Lamphun in 2000-2001 that household incomes of the Karen, Lahu, Palong tribal groups were low compared to those for Hmong and Chinese Yunnanese (Haw). The Hmong and Chinese Haw are often recognized to be quite entrepreneurial and commercially-oriented while the Karen, Lahu and Palong ethnic minority groups are often recognized as being self-sufficient and subsistence oriented. As for lowland Thai, they are the majority in Northern Thailand and their wealth status is mixed—some poor and some well-off.

In order to help clarify some of the patterns among ethnic groups, Table 2-19 shows income data by ethnic groups in villages surveyed during 2001. As indicated in this table, the Thai and Karen relied more on non-farm activities than the Hmong, Lahu and Palong. Although initial examination of this data suggests that the Hmong are more well-off, analysis of per capita income reveals that because of their large household size, they too are in poverty — in addition to the Karen, Lahu and Palong ethnic groups. Only the Thai and Chinese Yunnanese (Haw) were slightly above the poverty line due to their smaller household size.

Table 2-19. Household income by ethnic groups in 20 upland and highland villages in four Royal Project sites in Chiang Mai and Lamphun areas

Ethnic group	Number farm HH	HH size (persons)	Cash income farming	Cash income non-farm	Total cash income	In-kind income	Total HH income	Total income per person per year ^{1/}
			---baht/household/year					
Hmong	64	9.7	65,631	11,164	76,795	17,227	94,023	9,693
Yunnanese (Haw)	21	6.6	66,207	20,211	86,418	7,319	93,737	14,202
Thai	16	4.2	19,033	25,471	44,504	9,663	54,166	12,896
Karen	112	5.4	18,539	21,520	40,059	10,796	50,855	9,417
Lahu	17	9.6	29,143	8,509	37,652	11,033	48,685	5,071
Palong	19	5.6	22,656	4,879	27,536	5,823	33,359	5,956

^{1/} Poverty line for 2000 was 974 baht per person per month or 11,688 baht per person per year

Source: Benchaphun et.al. 2001

In a study of ethnic hill tribe and lowland Thai villages in Mae Hae, Nutch (2003) found that commercialization and development did not reach people equally. Although agriculture remained dominant in all income classes, off-farm wage employment was the main source of supplementary cash income for the poor farmers in such areas, and it was especially more prevalent among the Karen. Trading was more common among well-off households, but poor Karen and Hmong households were less able to cope with the new market-oriented economy. Wage employment, seeking more farm land, borrowing, more trading, growing more fruit trees, or changing crops were some of the measures they employed in trying to cope with poverty. Poor households were often found to be those with land, labor and information constraints. They had about 0.3-2 hectares of upland fields per household, often

with poor soil and sloping land, and this is usually insufficient to meet household needs. Most poor ethnic groups did not have irrigated land. The lowland Thai had more irrigated paddy due to their earlier arrival in this area. Kinship networks of the poor were also weak. Households had some livestock, but mostly pigs and chickens. Moreover, the health of household members was usually not very good.

The study found that incomes of poorer farmers were below the poverty line. Hmong income was lower than that for the Karen because of their larger family size. The main cause of poverty was lack of inputs, and especially land and capital. In addition, there was also some disparity among the poor farmer group. The Hmong were found to have more tendency to switch to commercial agricultural systems, and annual income from sale of products of the Hmong was 1.2 times higher than that of the Karen. However, income from the agricultural sector was not sufficient to meet livelihood needs in both of the poor ethnic groups. They were still dependent on off-farm occupations, both for consumption and investment, but the Karen earned 1.4 times more off-farm income than the Hmong.

Ethnicity at case study sites in Vietnam

At the case study site in Vietnam, the population of Hoang Nong commune belongs to six ethnic groups, including the Dao, Kinh, Tay, Muong, Hoa, and San Diu. The Dao and Kinh are the largest ethnic groups.

The Kinh group migrated to this commune around the 1960's from the Hong (Red) river delta (Thai Binh and Ha Nam provinces), as well as from neighboring upland provinces in the north (Tuyen Quang and Lang Son provinces). This was in response to a national program named 'Development of New Economic Zones'.

Each ethnic group keeps their culture and ritual. When a mixed couple, one from an ethnic minority and one from the Kinh group, gets married, their children are usually registered as belonging to the ethnic minority group. This is in order to get benefits that specifically target ethnic minority groups, such as for education or for support for improving livelihoods, including better housing, clean water and sanitation as provided under the 134 program. There is no tension between different ethnic groups, and 30 percent of the commune leaders belong to Dao and Nung ethnic minority groups, while the remaining 70 percent are Kinh.

There did not seem to be any differences between Kinh and Dao groups in defining their wealth or the "stages of progress" that households in their villages might go through as they obtain more and more investment funds (Table 2-14). This may imply some positive impacts of livelihood support to ethnic minority groups under the national '134 program'.

2.4. Identifying and locating the poor

Previous sections of this chapter have provided a brief survey of definitions and distributions of poverty at regional, national and selected local levels. Case studies have also provided insights into various factors that appear to relate to how we identify and interpret poverty and its implications. Based on this survey, we offer the following responses to the question with which this chapter began: Who and where are the poor in the Greater Mekong Region?

2.4.1 Poor areas versus numbers of poor

An initial set of issues relates to how one conceives of, defines, and measures poverty itself. If more conventional conceptualizations of material deprivation are used, based on monetized levels of income or consumption expenditures, then there are still basic issues regarding its assessment that relate to how best to establish a poverty line and whether it should focus on the proportion of a population in an area that falls below the line, or perhaps on the absolute number of people who are classified as poor, or whether it should bypass the poverty line and focus on inequality and relative poverty among the population. Each approach focuses on a legitimate set of issues, and there are no right or wrong answers.

Our regional assessment using data derived from small area estimate techniques suggests that significant questions and issues related to choice of approaches emerge where discrepancies occur between the outcome of approaches based on poor areas or numbers of poor.

- The Lao PDR is the most obvious case where poor areas also contain greatest numbers of poor people. But since this includes extensive sparsely settled areas in montane zones, and the government must allocate its very scarce resources among efforts to achieve its poverty elimination strategy (NGPES), there may still be need to consider differences between poverty rates (or depth) and poverty density in setting program priorities.
- Vietnam is the case with the largest discrepancy between assessments based on poor areas (poverty incidence, gaps or severity) and numbers of poor people (poverty density). The poorest areas are in montane, and especially remote middle to upper montane zones, whereas the greatest numbers of poor people are in far more densely settled rural areas in lowland zones. This underscores the fact that there are different types of poverty in the country, which may well have different underlying causes, and that different approaches and priorities are required to address poverty issues.
- In Thailand these types of discrepancies are mixed. In the northern region, highest poverty incidence and severity is associated with more remote, sparsely settled areas in montane zones that are largely inhabited by ethnic minority groups, resulting in discrepancies that are similar to those in Vietnam, but with lower magnitudes. In its Northeastern region, however, distributions of poverty incidence, severity, and density show similar patterns.
- Many remaining parts of Thailand and areas in Yunnan show more modest levels of both poverty incidence and poverty density, suggesting persistent poverty among certain com-

ponents of the population. We have seen evidence of heterogeneous combinations of poor and non-poor households and/or communities from the Upper Ping Basin.

- We have also seen an example of discrepancies between a measure of inequality using the Gini coefficient, and distributions of poverty incidence or density based on national poverty line standards. Vietnam has the highest levels of poverty incidence and density. Yet it also has the lowest levels of inequality, and its highest inequality levels appear to be in areas where poverty incidence is high and poverty density is low. Yunnan and Thailand both have much lower overall levels of poverty incidence and density, but inequality in Thailand is by far the highest in the region, whereas Yunnan has relatively low levels of inequality that appear to be relatively evenly distributed.

These results again underscore the diversity and complexity of poverty distributions, and provide further evidence that over-simplistic approaches to poverty alleviation are likely to be only partially effective at best. And since access to markets and resources are important factors related to poverty programs, there is a need to understand more clearly the nature and roles of constraints and impacts that occur in different contexts.

A second set of issues arises when other alternative approaches to conceptualizing and defining poverty are used. While these approaches have great promise, and are clearly capable of providing important insights into the nature and dynamics of poverty, as well as into potential impacts of different approaches to poverty alleviation, they usually require data and/or other types of information that are not currently available across large areas. Thus, it is usually difficult to apply these approaches in efforts to assess distributions of poor areas or numbers of poor people across spatial or social landscapes at national or regional levels.

Efforts to reach some middle ground include those that focus on developing indicators based on variables present in census or large sample surveys regularly conducted across broad areas. One major example includes studies of determinants of poverty that employ regression analysis to reveal relationships between poverty incidence or density with other variables in large databases. Such studies include recent work in Vietnam [Minot 2003, 2005], Laos [Andersson 2006; Engvall 2006; World Bank 2006b], Thailand [Warr 2004] and Cambodia [World Bank 2006c]. Another recent study by the World Bank [2006a] explores linkages between poverty and a range of environment-related variables. And several of these studies are also beginning to include dynamic elements to help assess change over time.

2.4.2 Multiple dimensions and causes of poverty

There is now widespread recognition that poverty has multiple dimensions and causes. Moreover, while conceptualizations of poverty based on material deprivation continue to play an important role in analyses and formulation of various policies, analytical approaches based on capabilities, livelihoods, vulnerability, and/or social exclusion are rapidly becoming more visible and influential. We can see the relevance and importance of these concepts and approaches in many of the examples from individual countries and case study sites.

The five types of capital used by the sustainable livelihoods approach [Carney 1998] can be used to help us begin organizing elements of information presented in this chapter. These notions are useful for helping classify dimensions of poverty and suggesting causal links.

- *Natural capital* includes the quantities and qualities of natural resources to which people have access, including land, water, forest and biodiversity. There are basic ecological characteristics associated with our definitions of altitude zones that set broad limitations on possibilities for natural capital within them, and some of these issues will be explored further in subsequent chapters. Within zones, we have seen frequent reference to limitations the poor face in terms of insufficient quantity or quality of land and water resources relative to their better-off counterparts, as well as how needs for natural capital can change with household life cycles or livelihood strategies as they respond to changing conditions. Roles for forest assets in rural Vietnam have also been discussed.
- *Human capital* includes the people themselves, their vision, and their ability to labor and pursue their livelihood strategies, including characteristics such as their skills, knowledge, health, and so on. Case study examples have shown how perceptions and abilities can vary, and have indicated relationships between poverty and education, skills, health, aging, etc. Work with the 'stages of progress' approach underscored additional aspects of livelihood strategies, and the importance of social and community context.
- *Financial capital* includes savings, credit supplies, remittances, etc. These play a role not only in assessing the poverty or wealth status of individuals, households or communities, but also in limiting or facilitating their access to new opportunities, both in terms of the cost of entry, and in terms of their ability to accept and manage risk, as well as their vulnerability to impacts of environmental or economic fluctuations.
- *Physical capital* includes basic infrastructure such as irrigation facilities, equipment, transport, energy, communications, and physical access to markets for inputs, outputs, wage labor, consumer good and services markets. It also includes livestock, which have multi-purpose roles including a means for accumulating wealth. Physical assets of households are frequently used as indicators of wealth and poverty status, both by outside analysts and by local people themselves. Shortage of larger-scale physical infrastructure is seen as a major factor associated with poor areas, and has been the main focus of many development programs that target poor areas. Case studies have already shown how electricity, irrigation, roads and other types of physical infrastructure are associated with change in local areas.
- *Social capital* includes relationships and membership and participation in various groups or networks, as well as access to wider institutions of society. At one level, this includes all the social groupings to which people may or may not belong at relatively local levels, including those based on kinship, production activities, political affiliations, ethnicity, culture, religion, or other types of interests. At another level it also includes relationships between people and the groups with which they are affiliated with larger society and the social, economic, political and other types of institutions at that level. Thus, for example, characteristics such as kinship, ethnicity, or political affiliation can either limit or ex-

pand access to support services, social safety nets, development assistance, etc. Moreover, group membership may facilitate access at one level, but exclude access at other levels.

Poverty, then, can result from deprivations associated with various combinations of these forms of capital that limit the capabilities of people to pursue with dignity the livelihoods and goals to which they aspire.

2.4.3 Perceptions of poverty

Perceptions of poverty are associated with both the ways in which poverty is conceptualized, and the level at which it is assessed.

Levels of material income and consumption, together with perceptions of poverty lines that reflect minimum levels that are socially acceptable in a society, are still the most widely used indicators and measures of poverty across broad populations. Additional attributes of poor populations are identified through regressions with variables found in census or broad surveys, or through more casual generalizations and popularized stereotyping.

We also see frequent use of material income as an indicator of wealth at more local levels, but it appears to be more commonly used in the context of articulating relative wealth categories or rankings. It is also more common at local levels for the placement of people, households or groups into wealth categories to be subject to modification by additional information about their characteristics.

But it is also more common at very local levels to find perceptions of poverty status to be based on some mixture of asset indicators and information about the intentions, capacities and/or trajectories of people or households. Thus, for example, poor people may be seen as either “hard working” or “lazy”, based on their individual characteristics, their family history, their ethnicity, or other factors. They may also be seen as unfortunate, such as households headed by elderly women whose children have died or moved away and are not willing or able to help to “properly” care for their parents during old age. Or they may be seen as being “temporarily” poor, as in the case of young couples with several young children who thus have high dependency levels and small labor force assets.

These types of more complex, and sometimes more intuitive perceptions of poverty reduce the relevance of efforts to define a single acceptable “standard” for defining and assessing poverty. Thus, indicators and measures of inequality may be more relevant for characterizing areas and populations, as well as for understanding local self-perceptions of relative poverty. Indeed, local self-perceptions often appear to also include factors related to levels of inequality that are seen as equitable, or at least acceptable, as indicated in areas of heterogeneous wealth status in North Thailand. Thus, they are also often more complex and may reflect values and aspirations by integrating abstract notions of satisfaction or happiness associated with quality of life. Accordingly, some people classified as poor may not perceive themselves as experiencing hardship, whereas some people classified as quite wealthy may perceive of

themselves as living with only a moderate level of comfort – presumably either because there are people who have more than them, or because it is not culturally acceptable to flaunt your wealth or status. On the other hand, some well-off elites view themselves as having superior fates or attributes that are responsible for their better fortune, so that the poor (and often other ethnic groups) can only hope to aspire to a much more meager status and position in life.

3. How have market opportunities changed?

The previous chapter explored the nature and distribution of poverty in the Greater Mekong Region. It ended with discussion of five forms of capital, and how different dimensions of poverty can be associated with deprivation related to various combinations of these forms. We now turn our focus to dynamics of change in the region and how they have affected the pool of opportunities from which people can construct and develop their livelihood strategies, depending on the mix, quantity and quality of capital assets to which they have access. The next chapter will then examine how people have responded and adapted to these changes in opportunities.

3.1 What do we mean by market opportunities?

Evolution of livelihood change and its interactions with trade and larger economies is inextricably linked with the political economy of the societies within which it occurs. Thus, this section begins with a brief review of change in the political and economic context of the region, and how it has affected the overall framework within which livelihood opportunities develop. We then present the conceptual framework that our study used to explore how people respond and adapt to livelihood opportunities, followed by a brief discussion of the often blurred distinctions between state and private sectors in the region. Following sections will focus on particular dimensions of change in factors related to market opportunities in the region, and then on case studies of change in specific local areas.

3.1.1 The “opening” of economies in the Greater Mekong Region

Mainland Southeast Asia has been witness to a long and complex history of geo-political dynamics dominated by waxing and waning empires centered primarily on lowland areas where irrigated paddy rice production could flourish. Forested montane zones often served as a buffer between lowland empires, as safe haven for those with different cultures or ideas, or as refuge for those out of favor with or displaced by growing empires.

Montane mainland Southeast Asia (MMSEA) and its mountain forests have long provided livelihoods for its inhabitants through a considerable range of agroforestry techniques that evolved through centuries of local experience enriched by information that flowed along trade routes, through kinship networks, or with evolving settlement patterns. In many parts of the MMSEA domain, ethnic groups settled into different altitude zones where their agroecosystems became adapted to local ecological characteristics and patterns of biodiversity distribution. While their livelihoods usually centered on self-reliance, diverse characteristics among their local domains also allowed them to identify products with value for trade or tribute through networks of social interaction that spanned the region. Although MMSEA began to be carved into pieces belonging to one or another lowland-dominated geographic nation state during the colonial era, the reality of such boundaries on the ground occurred more slowly.

But in association with the increasingly globalized geo-political dynamics of the 20th Century, nation states began increasing their presence in and control over portions of MMSEA within their domain. Thus, livelihoods in different parts of the region began taking on more of the flavor of the administrative, political, cultural and economic characteristics of each country as they pursued divergent paths of socio-political change.

While various forms of interaction, trade and migration had been taking place in the region for centuries, the Cold War era that began in the wake of the Second World War brought a period of dramatic change. In 1948 Myanmar gained independence from the British Commonwealth, and by 1949 political struggle in China resulted in a new communist government. The First Indochina War in Vietnam resulted in the end of French colonial control in Vietnam, Cambodia and Laos in 1953-54. Vietnam was subsequently partitioned into two zones, and the Second Indochina War that followed grew to include massive conflict in Vietnam, and civil wars erupted in Cambodia and Laos. Opposing sides were backed by the U.S., China, the Soviet Union and various allies of both sides. After the end of the Second Indochina War in 1975, the Cambodian-Vietnamese War was an effort by Vietnam to end the brutal reign of the Khmer Rouge, and this was followed by a short Third Indochina War fought between Vietnam and China in 1979. While the wars did not directly include Thailand, it felt threatened and became an ally in the U.S.-backed anti-communist coalition, providing military bases and launching intensive national security-oriented development programs.

During this period, parts of MMSEA were targets of unprecedented levels of aerial bombardment by the U.S., and assistance from mountain ethnic minority groups was sought by competing sides in the conflicts. Moreover, the importance of montane zones as buffers between lowland-based societies in conflict with each other increased as countries erected barriers to “close” trade and exchange across the region, and sought to increase their control over mountain areas. As mountain peoples became more integrated into national systems, populations grew in some areas, perhaps due to reduced endemic diseases such as malaria, but also through migration associated with political turmoil, armed conflict, and directed or enticed relocation, or with perceived opportunities first in the opium economy, and more recently in commercial production or wage labor.

Barriers to movement and exchange, together with roads, policies and projects aimed largely at increasing national security and stopping opium production, facilitated emergence of agricultural production based on MMSEA locations that were either the most ‘tropical-like’ portion of a temperate zone country (China), or the most ‘temperate-like’ portion of tropical countries (especially in Thailand and Vietnam). Programs for self-sufficiency in China included efforts to convert forested montane areas of Yunnan into grain production, while state farms were established in southern Yunnan to produce rubber. Temperate crops were promoted in upper montane zones of North Thailand as an alternative to opium production, despite the state’s refusal to officially recognize land holdings in these zones. Forests in many areas were cleared to deny cover to the enemy.

After many years and countless casualties, re-ordering of the political landscape of GMS states was basically completed in 1975, although turmoil associated with Cambodia continued for several more years. Newly reunified Vietnam and the new government in the Lao PDR turned most of their focus inward for several years as they built their new political, economic and social structures and launched efforts to begin recovering from the enormous damage inflicted by war.

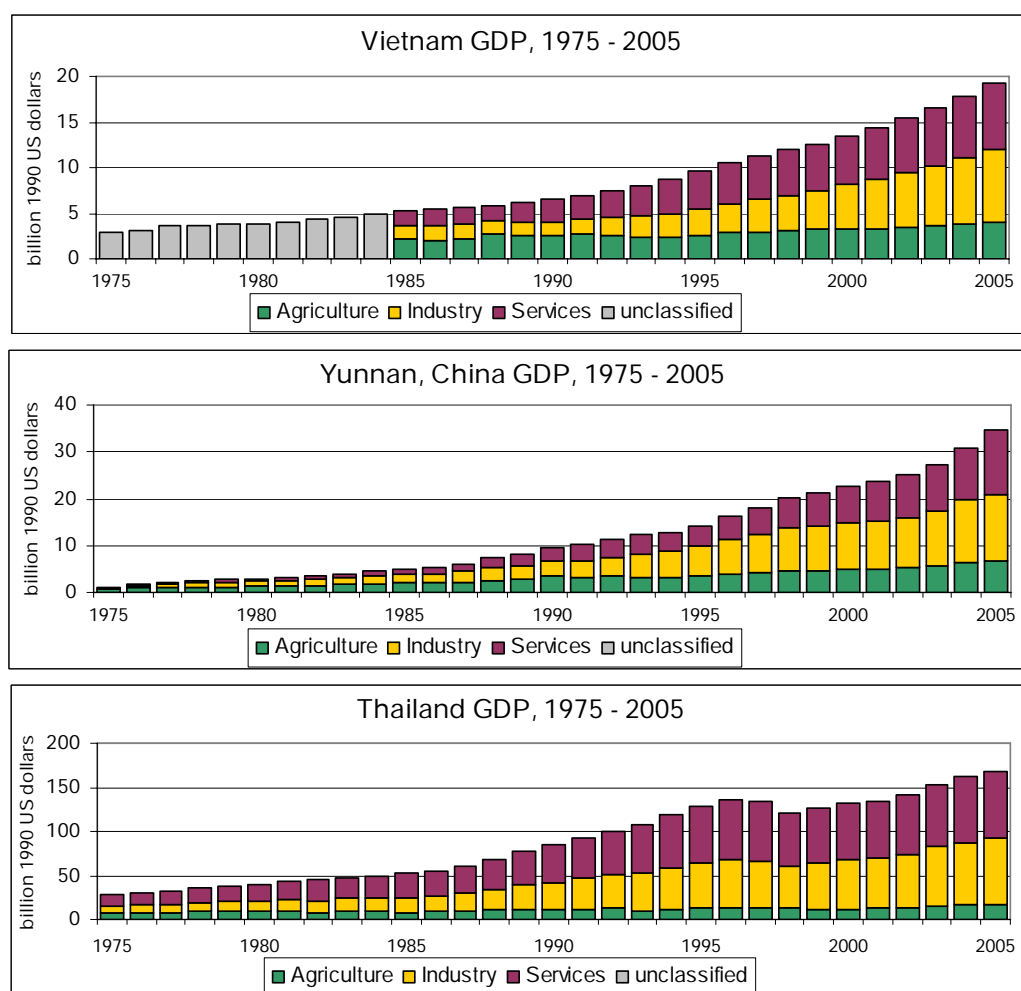
Then during the final decades of the 20th Century, political tensions among the countries began receding, and a new era of regional identity began to emerge, linked to common interests in economic development in the face of growing forces toward globalization. Beginning in the mid-1980's a wave of change in economic orientation swept through the region, and by the 1990's all countries were joining regional organizations and entering into economic agreements at regional and global levels.

Economic growth and structural change in GMS states

Examination of economic growth and change in the region since 1975 results in a quite clear grouping of GMS states into two categories according to the size and structure of their economies. Growth and basic structure of the three largest economies in the GMS, Thailand, Yunnan and Vietnam, are charted in Figure 3-1 for a 30 year period since 1975. These data from the UN Statistical Division's common database are expressed in constant 1990 US dollars, and thus reflect change in real value without distortion by inflation.

- **Thailand.** Thailand began its strong push for economic development with its first national economic development plan in 1960, while inward policies were pursuing self-sufficiency in China, and most of the region was involved with armed conflict. Perhaps largely as a result of this "head start", the size of its economy has been by far the largest among GMS states throughout this period. By 1975 the overall size of the Thai economy was already approaching the current size of the second largest economy in the region. Thailand's economic development strategy has been strongly export oriented, and at the global level Thailand was a founding member of ASEAN, and became a member of GATT in 1982, prior to establishment of the WTO. It has also emphasized diversification of the economy from a central focus on agriculture into industrial and service sectors, which has been linked with high levels of foreign investment. Thus, despite strong emphasis on commercialization of agriculture and production of export crops, the share of agriculture in the overall economy has dropped to very low levels. We can also see Thailand's 10-year period of very rapid economic growth that began during the late 1980's – as then Prime Minister Chatichai announced a policy to 'turn battlefields into marketplaces' – and ended with the Asian Economic Crisis. Despite this quite significant setback, by 2002 it managed to begin a new period of reasonably rapid growth. Most of the economy is based on a fairly even balance of contributions from increasingly complex industrial and service sectors.
- **Yunnan.** Growth in the Yunnan economy was constant, but fairly modest until it began to accelerate during the late 1980's. This corresponded to policy changes in China from 1985 that included reduced tariffs and an "open door" trade policy. The late 1990's brought a surge in growth related largely to industry. China became a key dialogue part-

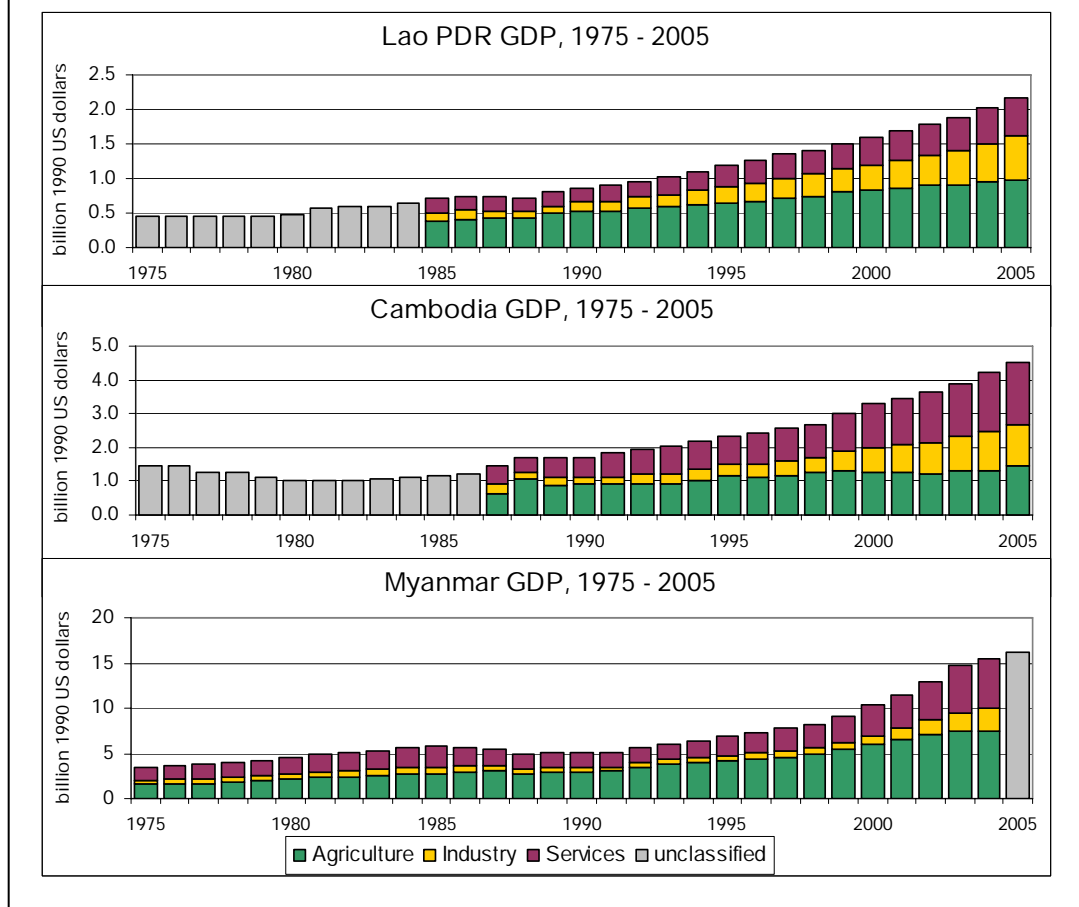
Figure 3-1. Growth of the Three Largest GMS Economies, 1975 – 2005



ner with ASEAN, joined the WTO in 2001 and began entering into trade agreements with other countries, including Thailand. Now Yunnan appears to be in period of very rapid growth related to both industry and services sectors, with tourism its proclaimed “backbone”. And while agriculture’s share in the Yunnan economy has been decreasing over time, it has also been making steady growth that appears to be continuing.

- Vietnam.** Overall economic growth in Vietnam appears to have been steady but fairly modest during the first 10 years after reunification. Major economic policy changes were introduced in 1986, however, under the banner of *Doi Moi*. Dramatic economic growth and restructuring has followed, in parallel with a very outward-looking economic policy. By 1995, Vietnam had become a full member of ASEAN, and was accepted as a member of WTO in January 2007. Although its early achievements included massive increases in production of rice, which brought it from a rice deficit to being the second largest exporter in the world, as well as in various other agricultural commodities where it has become a player at the global level, growth in agriculture is now dwarfed by growth in services, and especially industrial sectors, which are linked with high rates of foreign investment. Vietnam’s economic growth rates are now among the highest in the world.

Figure 3-2. Growth of the Three Smallest GMS Economies, 1975 - 2005



We now turn to how the smallest three economies of the region have fared in comparison with performance and change in the largest three. Thus, similar data on economic growth and general structure are presented for the Lao PDR, Cambodia, and Myanmar in Figure 3-2. Our interpretations of this data include:

- Myanmar.** Like Thailand and Yunnan, Myanmar was not directly affected by the Indo-china Wars, but in comparison to Thailand its economic policy has been less open to foreign investment. Yet it still experienced steady economic growth through the first decade of this period, until the economy began to contract and then stagnate during the late 1980's as political turmoil emerged. After declaration of an 'open door' policy in 1989 and strong reassertion of military control, the economy began growing during the 1990's, and growth became more rapid at the turn of the century. Myanmar joined the WTO in 1995, and became a member of ASEAN in 2001. Most of its economic growth has been in agriculture and service sectors, although there has been modest growth in industry during recent years. One should also note, however, that the agriculture sector includes forestry, and that timber exports to Thailand accelerated during the 1990's. Moreover, political turmoil continues in Myanmar and is resulting in increasing levels of international economic sanctions against the military regime. Perhaps as part of their response, data on the economy and conditions in Myanmar are becoming more sparse, inconsistent and difficult to obtain.

- **Cambodia.** Cambodia went through a very dark period during the 1970's, during which much of its economic and administrative infrastructure was devastated. Many people were killed and many more became refugees in Thailand and other countries. Some of the economic dimension of the difficulties it has endured is reflected in the economic contraction during the first decade of this period. By 1985, however, a reasonable level of order and functionality was restored, and Cambodia announced its market economy policy. And by the early 1990's parliamentary democracy was restored and economic growth began to increase. Cambodia joined ASEAN and became a member of the WTO in 2004. While much of its economic growth has been in the services sector, the industrial sector is now also receiving substantial foreign investment and is growing rapidly. Its overall economic growth rate is now very high.
- **Lao PDR.** The smallest economy in the region is that of the Lao PDR. As we saw in the previous chapter of this report, Laos is a mountainous country with a very dispersed population. Moreover, a large portion of the population has been composed of a diverse range of ethnic groups who have lived relatively aloof from central authorities, even under colonial rule. Thus, in many ways the new government that took power in 1975 was faced with building much of the infrastructure of a modern nation state under difficult conditions and with very scarce human and financial resources. Thus, it should not be too surprising that the overall economy was basically stagnate during the late 1970's, and made only very modest growth during the 1980's. But after adoption of their New Economic Mechanism in 1986 the situation gradually began to change, and by 1989 Laos began to experience a fairly steady rate of economic growth. In line with this policy, the Lao PDR joined ASEAN in 1997, and hopes to join the WTO during 2008. The pattern of Lao economic growth appears fairly balanced among sectors of the economy, including a large contribution from agriculture. It needs to keep in mind, however, that the industrial sector includes their sale of electricity to Thailand, while the agricultural sector includes sale of timber and forest products, and that until only recently these have been the two largest sources of foreign exchange for the country.

While countries of the region share some elements in their patterns of economic change, as well as the regional consensus on more open market-oriented economic development that emerged during the 1980's, there are still very significant differences in the size and structure of economies in the region. In order to help visualize overall patterns of economic activity and change in the GMS since the mid-1980's, Figure 3-3 aggregates GDP from member states into charts of economic change according to agricultural and non-agricultural sectors during 1985-2004.

In terms of regional agricultural GDP, we can see that while agriculture contributes only a very small percent of the total GDP in Thailand, it is still the largest agricultural economy in the region. But at the same time, distribution of contributions from agriculture to GMS regional GDP is far more balanced than for the non-agriculture sector. Yunnan and Myanmar have played particularly important roles in the growth of regional agricultural GDP, but especially in the case of Myanmar, the forestry component is likely to be quite strong, although more conclusive data are also quite difficult to obtain. Despite significant impacts that in-

creased agricultural production in Vietnam has had at the international level, its contribution to the growth in overall value of agriculture in the region has been fairly modest.

In terms of GDP from non-agriculture sources, dominance of the Thai economy is very clear throughout this period, and disaggregation into industrial and services sectors shows similar distributions for each. But it is also important to

note that growth rates in non-agricultural sectors are now higher in Vietnam, Yunnan, and recently even Cambodia, than they are in Thailand. Whether they can sustain such growth rates to the point that the size of their economies can challenge that of Thailand, however, remains to be seen.

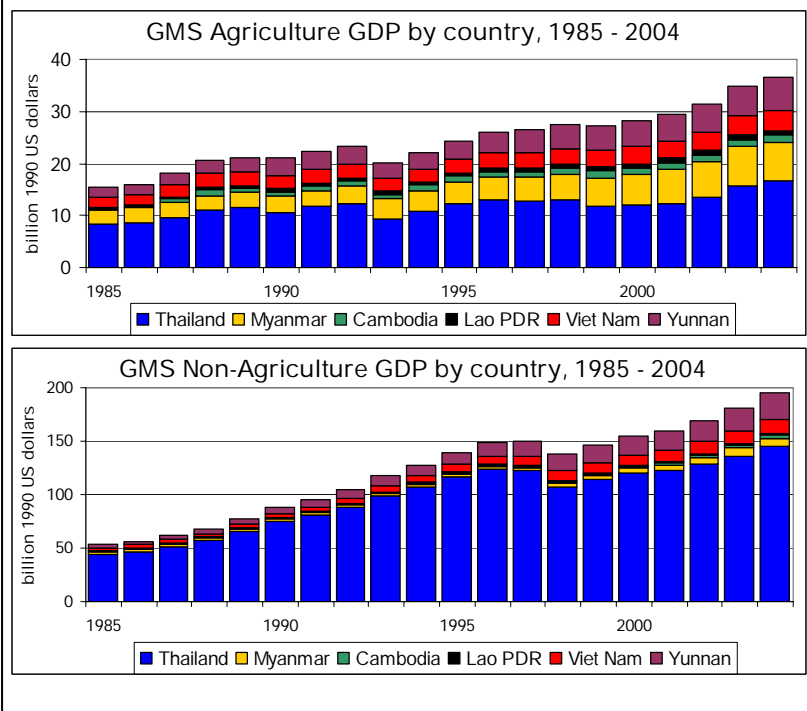
Patterns of economic growth in all countries are related to growth in exports and international trade, and growth rates are clearly highest in industrial and service sectors where imports and foreign investment are also major factors. Thus, the “opening” of regional economies in the economic sense relates to the relative degree to which their economies are engaged with and are dependent on international trade and investment. One common measure of this type of economic openness is the ratio between the total value of international trade (imports + exports) relative to the size of the economy (GDP). Values of this ratio or “index of openness” are charted in Figure 3-4 for GMS countries during 1985 – 2005.

The convergence of trajectories of Thailand, Vietnam and Cambodia toward very high degrees of economic openness is clear, while Laos is still seeking its own path after instability during the Asian Economic Crisis. Yunnan, like China at the national level, has lower levels of openness using this measure because the huge size of the domestic economy in China dilutes the relative impact of imports and exports. The demise of openness in Myanmar is linked with the state of affairs within that country.

Impacts of economic growth and change

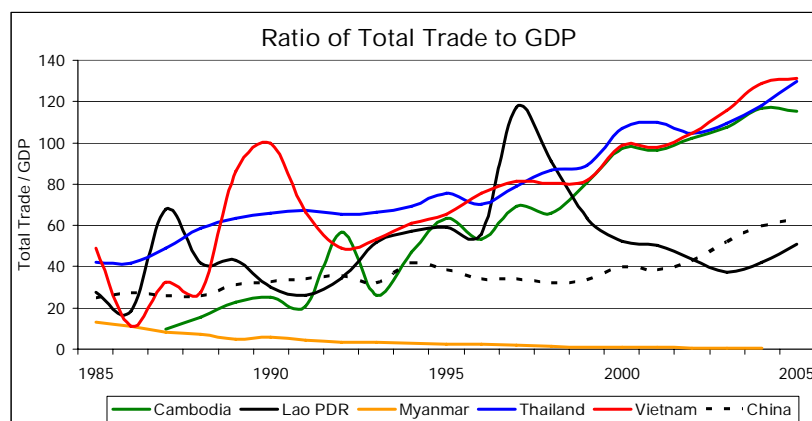
While most economies of GMS states have been growing quite rapidly, and most are undergoing quite significant structural change, the benefits and impacts of these changes are not distributed evenly. This can be further explored by addressing two questions.

Figure 3-3. GMS growth by major sectors, 1985 - 2005



The first question is how is the overall value of economic activity in the region distributed relative to distribution of the population? In order to explore this issue, Figure 3-5 charts change in GDP per capita in GMS states during 1975 – 2005. As this chart indicates,

Figure 3-4. Change in Openness Ratios, 1985 - 2005

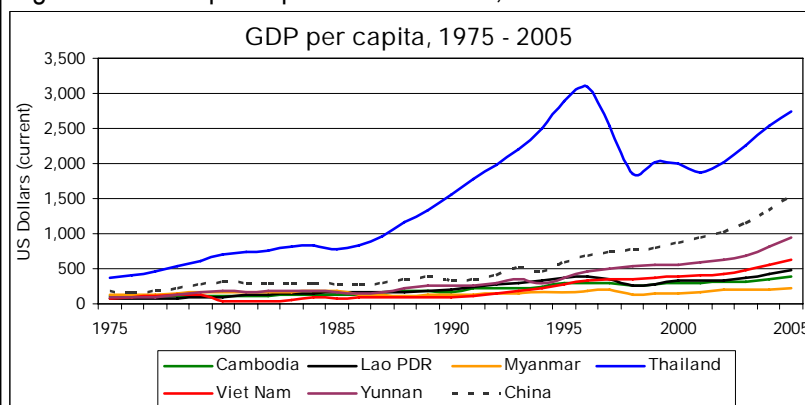


Sources: ADB Key Indicators, various years; ICRAF-China

economic value per capita has been substantially higher in Thailand than in other GMS states throughout this period. But we also see in a rather dramatic fashion how GDP per capita grew very rapidly from the mid-1980's to the mid-1990's during what has become known as Thailand's "bubble economy" period. This ended during the Asian Economic Crisis as per capita GDP lost about one-third of its value before beginning renewed growth after 2002. Although less dramatic, impacts associated with the Asian Economic Crisis are also seen in data for Laos, and to a lesser extent Myanmar and Cambodia, which were probably at least partially linked to the severe downturn in Thailand.

But beyond that, we can also see that per capita GDP began growing in the 1990's in all GMS states except Myanmar. The rates of growth, however, have been somewhat different, and appear to be resulting in increasing disparities among countries. Of particular note is the dramatic increase in per

Figure 3-5. GDP per capita in GMS states, 1975 - 2005



Source: UNSD common database, IFPRI, ICRAF-China

capita GDP of China at the national level, and given its size this is already an achievement of monumental proportions. While the trajectory of Yunnan is climbing more rapidly than GMS states other than Thailand, the gap between Yunnan and China at the national level reflects its classification as a relatively poor province of China, and the gap appears to be growing. The third largest economy in the region, Vietnam, also has the third highest level of per capita GDP. And while it appears to now be growing rapidly, its level and rate is more modest because of its relatively large and still more rapidly growing population. The three smallest economies have the lowest levels of per capita GDP, as well as the lowest rates of increase, although the Lao PDR appears to have recently improved.

The second question is how does distribution of economic value among sectors compare to distribution of actual employment among sectors in economies of the region? Agriculture was the primary focus of both production and employment in the past, and it is still the main source of employment in rural areas. We have already seen how shares of agriculture in the total GDP of GMS states are declining, but it is not yet clear what this means regarding the distribution of benefits from economic growth. Thus, Table 3-1 displays available data on sector shares of both GDP and employment in GMS countries during 1990 to 2005. Since employment data for Yunnan is not available, national data for China are used instead. Several patterns in this data are apparent:

- For larger economies in China, Thailand, and Vietnam, agriculture makes a relatively small and declining contribution to GDP. And, while the employment share of agriculture is much higher, employment is shifting out of agriculture at a fairly rapid rate.

- Among the smaller economies, the same pattern is now becoming evident in Cambodia. Change in Myanmar was in the same direction but at a slow pace during the 1990's, but employment data since then is

unavailable. Data for the Lao PDR are insufficient to say much about trends, but about 80 percent of employment is still in agriculture.

- While industry contributes more than 40 percent of GDP in larger economies, its share of employment is much smaller.
- Although there have been periods of rapid growth in industrial employment (Thailand during the early 1990's, Vietnam since 2000) growth in employment in the services sector was much more rapid during those periods.
- Overall, most decreases in agricultural employment are associated with shifts to the services sector, where the contribution to GDP is much greater than agriculture, but (except

Table 3-1. Sector shares of GDP and employment

	year	% GDP Share			% Employment Share		
		agric	industry	services	agric	industry	services
Thailand	1990	12.5	37.2	50.3	63.3	9.9	26.7
	1995	9.5	40.7	49.7	46.4	14.3	39.3
	2000	9.0	42.0	49.0	44.2	15.0	40.8
	2005	10.2	44.1	45.7	38.6	16.0	45.4
China	1990	26.9	41.3	31.8	60.1	13.3	26.6
	1995	19.8	47.2	33.1	52.2	14.4	33.4
	2000	14.8	45.9	39.3	50.0	11.2	38.8
	2003	12.5	47.5	39.9	49.1	12.0	38.9
Vietnam	1990	38.7	22.7	38.6	72.1	8.8	19.0
	1995	27.2	28.8	44.1	71.3	8.6	20.1
	2000	24.5	36.7	38.7	64.4	10.1	25.5
	2005	21.0	41.0	38.0	53.9	12.9	33.2
Myanmar	1990	57.3	10.5	32.2	66.2	8.0	25.8
	1995	60.0	9.9	30.1	64.1	9.1	26.8
	1997	58.9	10.2	30.9	62.7	9.7	27.6
Cambodia	1995	49.6	14.8	35.5	81.4	2.3	16.3
	2000	37.9	23.0	39.1	73.7	7.0	19.3
	2005	32.5	26.4	41.1	60.3	9.7	30.0
Lao PDR	2001	51.2	23.7	25.1	82.7	8.7	8.6
	2003	48.6	25.9	25.5	82.2	9.3	8.6

Data sources: ADB Key Indicators 2007 and UNSD common database

for China) is growing more slowly than industry (Cambodia), relatively stagnate (Vietnam), or slowly declining (Thailand).

These distributions begin to demonstrate how the “opening” of economies in the region is bringing new livelihood opportunities, but the nature and location of these opportunities are not evenly distributed or equally accessible for everyone.

Another way to examine this type of data is presented in Table 3-2, which displays the value added per worker in major sectors of the region’s largest and most rapidly growing economies. This type of

data allows us to see differences across sectors and among countries in value added per worker, (or worker economic productivity). If we assume that workers receive a proportionate share of this

Table 3-2. Value added per worker by sector in GMS countries

Country	Year	Share of Agricultural Employment (%)	Value Added Per Worker (constant 2000 US\$)		
			Agriculture	Industry	Services
Thailand	2004	42.6	1,028	9,163	5,407
China	2002	50.0	600	4,961	5,080
Vietnam	2004	53.9	367	2,251	1,509
Myanmar	1997	62.7	n.a.	n.a.	n.a.
Cambodia	2004	60.3	412	1,685	1,116
Lao PDR	2003	82.2	n.a.	n.a.	n.a.

Sources: ADB Key Indicators 2007, Special chapter on inequality & country tables

value added (which can be a rather heroic assumption), then at least these relative relationships should carry through to wage rates they receive.

Thus, this table can be seen as a map of:

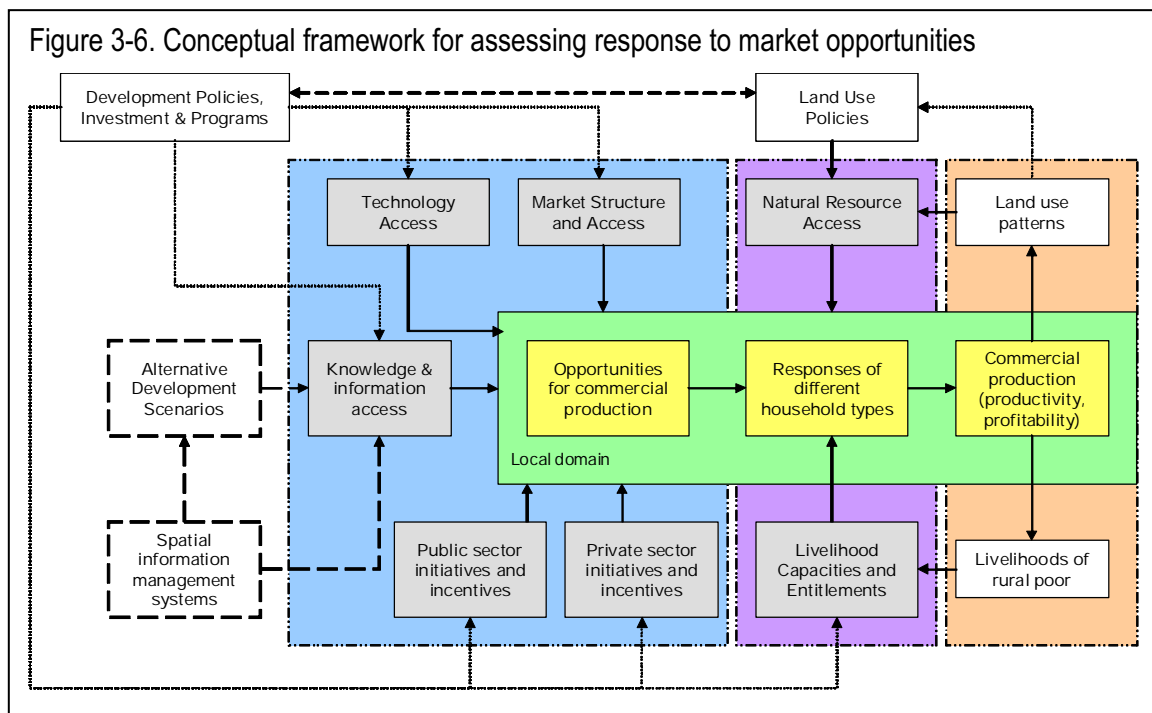
- the distribution of emerging opportunities;
- incentives for changes in livelihoods;
- incentives for movement to locations where opportunities are greater; or
- for entrepreneurs or employers, the labor costs for you and your competition.

3.1.2 Conceptual framework for assessing farmer response to opportunities

In the first chapter of this report, we articulated the physical boundaries of montane zones of mainland Southeast Asia. The second chapter explored distributions of poor populations in the region according to different definitions and measures. And the previous section of this chapter has outlined the broad context of political and economic change that has been occurring in the region. We now turn to the basic conceptual approach this study has taken in its explorations of market and resource access of the poor in upland zones of the Greater Mekong Region.

The conceptual framework of our study is summarized diagrammatically in Figure 3-6. This figure maps relationships among components of the two main researchable propositions upon which this study was developed and conducted:

- First, how local households respond to opportunities for commercial production depends on their access to markets, technologies, natural resources, and appropriate knowledge. It also depends on the capacities, skills and rights of households themselves. Private and public sector initiatives also have an important influence. All can be influenced by public policies, investments and programs directed toward both development and land use, with tension between these two policy realms often resulting in increased uncertainty.
- Second, that provision of spatially-explicit information about current and future market opportunities in forms relevant to small-scale upland farming enterprises could make a substantial contribution to alleviating poverty in these upland areas (dotted boxes and lines, Figure 3-6).



This figure also maps several domains within which particular components are located, and among which important relationships occur.

- The *local domain* (green color) within which a pool of production opportunities (commercial or not) arise, households respond, and production outcomes occur. A particular

local domain may also have its own characteristic (such as those associated with various types of communities) that help shape or filter (and thus enable or constrain) how outside components enter into the local domain and influence the local opportunity pool.

- The *wider resource domain* (purple color) upon which households depend regardless of their degree of integration into wider market systems. This domain includes the natural resources to which they have access, but also their own other attributes and capital assets, including their perceived needs, aspirations and visions of the future.
- The *wider outcome domain* (orange color) wherein cumulative responses of households result in wider patterns of livelihoods and land use.
- The *additional market factor domain* (blue color) includes additional components upon which successful responses to market opportunities depend. We should note that knowledge, and especially local or indigenous knowledge, is part of livelihood capacities in the resource domain. The knowledge and information in this domain relates to new additional forms.
- The remaining *wider policy domain* remains outside the previous four, and includes overall development policies, investments and programs, which are determined at distant locations, but which influence components in other domains. We have also placed our exploratory information system approaches in this domain.

3.1.3 Blurred lines between state and private sectors

Although our conceptual framework employs two separate boxes to depict initiatives and incentives from the public and private sectors, realities we have found across the domains of GMS states compel us to qualify this distinction.

There is a great deal of rhetoric from national governments, international development banks, development agencies, and others, that employs this same public-private distinction and touts efforts for dialogue, interaction and collaboration among the two sides. The role of the state is seen to be that of providing infrastructure, the basic institutional framework, support services, and policies that facilitate entrepreneurial initiatives in the private sector. The private sector is seen as the main engine for economic growth, and is increasingly seen as a partner in infrastructure development through mechanisms such as build-operate-transfer arrangements. But in fact, lines between public and private sectors are often quite blurred, and there are important ways in which they overlap at various levels.

Perhaps the most obvious aspect of this issue is in the “transitional” economies that are approaching development of a private sector from a past that centered on socialist ideology. Yunnan, Vietnam and Laos are all clearly in this group, as well as various major players in Cambodia. Since their independence from the British Commonwealth, Myanmar has also had its own peculiar take on socialism, which seems to now be mixed with totalitarian military control. And while Thailand is the only country among the GMS states that has consistently disavowed socialism, it also has a history associated with numerous state enterprises

that are defended with nationalistic rhetoric, as well as some rather thick relationships between private and public sectors.

Some of these issues relate to overlapping membership, where private businesses may either be state enterprises that are being “spun off” to the private sphere, or new entities led and/or staffed by people still in or very recently from the state sector, where they still maintain close relationships. In short, they may be the same players acting in a format that provides them with more flexibility, and sometimes less accountability. At the same time, of course, there is also a growing list of independent entrepreneurs with amazing “success stories” (especially in hi-tech fields), who are becoming media favorites and pop heroes of the young.

Moreover, the issue is not confined to large, high profile companies, and may be even more widespread among the small and much more local enterprises and companies that emerging across especially “transitional” states of the region. Various types of cooperatives, growers associations, or other similar forms of organization, especially when their initiation has been induced by government agencies or agents, may also fall into this grey area in between state and private sectors.

Another aspect of these issues relates to the influence that one side of this equation has on the other, which is an issue that arises to varying degrees in countries throughout the world. While virtually everywhere people are familiar with stories about business interests trying to “buy” the outcome of state decisions that affect their business interests, in this region there is also considerable initiative from the opposite direction in the form of extorted payments or favors of various sorts to avoid harassment or worse. These have come to be considered one of several types of transaction costs that are seen simply as part of the cost of doing business.

Yet another dimension of state-private sector relationships has emerged as provincial, district or local government authorities enter into contracts with large, often foreign companies, which may be either private or state enterprises. Such contracts may or may not have the endorsement of local communities, but they can have strong impacts on local communities, their natural resource base and livelihoods, and their local institutional arrangements.

At the broader policy level, where it is generally recognized that the state has an important role to play, there are also sometimes questions about impacts of state policies on private sector development. One important example has been the general area of state promotion of production of particular crops. At various times, states in the region have implemented national programs to boost production of various crops, initially for national food security or self-sufficiency, and subsequently to increase foreign exchange through exports. While such programs have been common around the world, some of these programs in the region have been fairly heavy-handed at times. Impacts of such efforts have included distortions of opportunities and incentives that have hampered diversification, as well as development of markets and private sector enterprise. They have also sometimes brought large benefits to a relatively small component of society. While membership in international trade agreements may result in pressure to reduce such programs, the terms of various trade agreements can also bring differential impacts on private sector development in various sectors and locations.

3.2 Changing context of opportunities for production

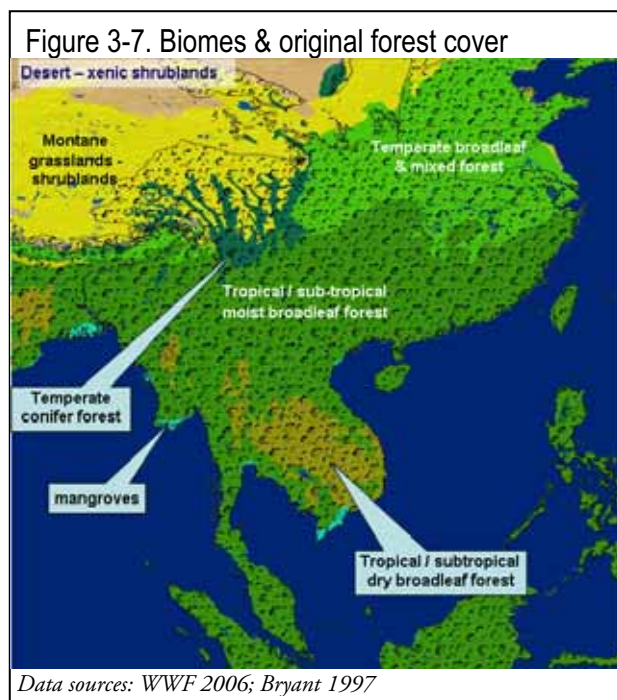
Given the “opening” of economies in the region and our conceptual framework for assessing response to market opportunities, this section provides a brief survey of the state of land resources in the region, followed by a meso-level overview of economic development and change in areas where our case study sites are located, and brief discussions of three factors that play important roles in changing opportunities: international trade, tourism, and physical infrastructure.

3.2.1 Natural resources and changing opportunities

For the vast majority of people in montane zones of mainland Southeast Asia, most major components in their local pool of livelihood opportunities have long related to land-based production options. Thus, the quantity and quality of land and water resources within the wider resource domains to which they have access is a major factor in shaping their perceptions of opportunities, as well as the viability of their responses to new market production opportunities that may arise.

At the broadest level, mainland Southeast Asia can be divided into several biomes that integrate broad variation in climate, water and soil characteristics that have shaped the distribution of basic types of natural vegetation occurring in the region. Within these biomes, which are mapped in Figure 3-7, various more localized eco-regions have also been identified [WWF 2006].

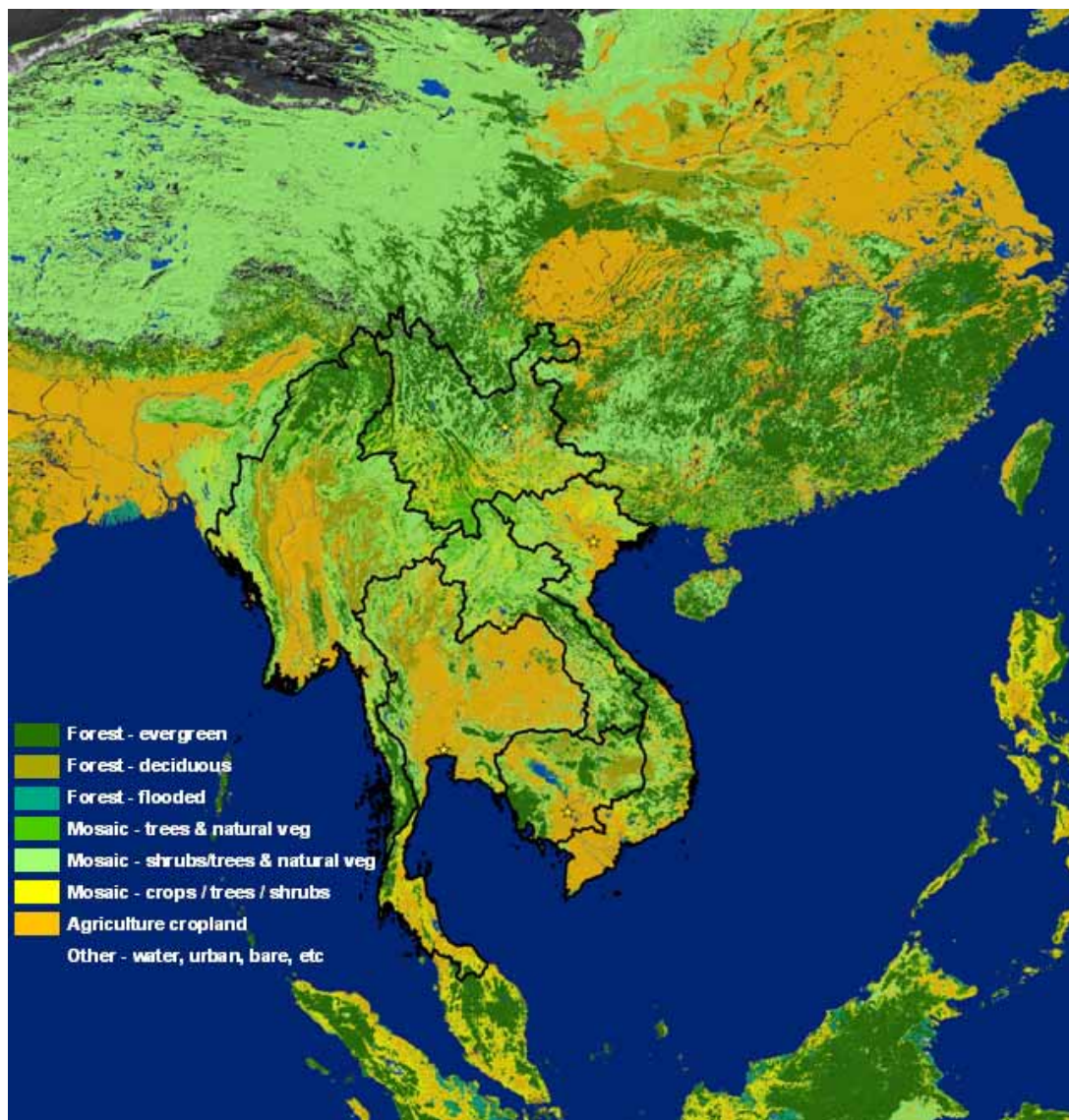
This figure also overlays forest tree texture that indicates the estimated extent of natural forest across the region about 8,000 years ago, assuming current climatic conditions [Bryant 1997].



We can see the dominance of tropical and sub-tropical moist broadleaf forest across the GMS region, except in the alpine zone of Yunnan where temperate coniferous forest occurs, and in the belt of dominantly dry broadleaf forest that stretches from southern Vietnam northwest to parts of northern Thailand and central Myanmar. The dry forest is mostly deciduous, reflecting dry season moisture limitations associated with soil and rain shadow conditions related to the strongly monsoonal climate. Together with figures in Chapter 1 that identified altitude zones and major river basins of the region, this gives a picture of broad variation in the natural resource base for human activities in the region. This variation affects the overall potential of natural resources in within specific local resource domains

After millennia of human interaction with this regional landscape, however, its current condition looks rather different. In order to help visualize how the broad landscape of the region has changed under human management, and thus provide a clearer picture of the current state of resources potentially available in different types of localities, Figure 3-8 presents a simplified classification of land use based on interpretation of remote sensing from various sources conducted under the Global Land Cover 2000 project [EC-JRC 2003]. This figure also overlays boundaries of GMS states.

Figure 3-8. Mainland Southeast Asia land cover, circa 2000



Source: reclassification of Global Land Cover 2000 [EC-JRC 2003] based on global legend

Two features in this figure are particularly striking. The first is the large portions of the region that have been converted into cultivated lands, and how these areas primarily correspond to the lowland zones identified in chapter 1 of this report. The second feature is that a very large proportion of the remaining area is classified as mosaics of shrubs/trees and natural herbaceous vegetation, or one of the two other mosaic categories. Although evergreen and

deciduous forests are still evident, they appear to cover a rather small proportion of the overall landscape.

Judging from how areas with which we are very familiar are classified in this dataset (such as the Mae Chaem sub-basin in North Thailand where we have time series Landsat and aerial photo data as well as considerable ground observations), it appears that the category of shrubs/trees and natural herbaceous mosaic includes a very substantial amount of area that most people would consider forest. Although many of these areas have been affected by human activities, and one would certainly not think of them as pristine wilderness, the tree cover component of this mosaic is often very substantial. The extent of agriculture and both evergreen and deciduous (which includes mixed deciduous) forest for these areas, however, appears fairly reasonable.

Thus, with this caveat in mind, the national sub-tables in Table 3-3 were developed by overlaying land cover in Figure 3-8 onto our set of six regional altitude zones. Numbers in each table show the percentage distribution of

Table 3-3. GMS land use by type and altitude zone, 2000

Cambodia		Lowland		Montane			Alpine	Total Area
		Coastal	Upper	Lower	Middle	Upper		
percent of total land area								
Forest	evergreen	5.8	8.0	3.2	4.1	0.6	-	22
	deciduous	10.2	6.3	0.1	0.0	-	-	17
	flooded	1.1	-	-	-	-	-	1
Mosaic	w/trees	2.4	1.5	0.2	0.2	0.0	-	4
	w/shrubs	14.6	6.6	1.0	0.4	0.0	-	23
	w/crops	3.0	2.1	0.4	0.1	-	-	6
Agricultural land		24.2	1.2	0.1	0.0	0.0	-	26
water, urban, bare, etc		2.7	0.0	0.0	-	-	-	3
		64	26	5	5	1	-	100
Lao PDR		Lowland		Montane			Alpine	Total Area
		Coastal	Upper	Lower	Middle	Upper		
percent of total land area								
Forest	evergreen	0.0	2.9	2.9	7.8	4.6	-	18
	deciduous	0.2	1.7	0.3	0.2	0.0	-	3
	flooded	-	-	-	-	-	-	-
Mosaic	w/trees	0.0	0.6	1.1	6.8	4.5	-	13
	w/shrubs	0.4	11.4	6.1	17.2	10.2	-	45
	w/crops	0.0	2.0	2.3	6.6	2.3	-	13
Agricultural land		0.3	4.6	0.7	0.6	0.2	-	6
water, urban, bare, etc		0.0	0.3	0.2	0.3	0.0	-	1
		1	24	14	40	22	-	100
Myanmar		Lowland		Montane			Alpine	Total Area
		Coastal	Upper	Lower	Middle	Upper		
percent of total land area								
Forest	evergreen	1.4	4.2	3.1	4.4	6.3	0.4	20
	deciduous	0.9	4.1	2.7	4.7	2.0	-	14
	flooded	0.3	0.0	0.0	-	-	-	0
Mosaic	w/trees	0.1	1.4	0.6	1.6	2.2	0.0	6
	w/shrubs	5.0	5.4	3.1	7.9	8.2	0.1	30
	w/crops	1.2	1.8	0.9	2.0	1.5	0.1	8
Agricultural land		10.8	8.4	1.1	0.8	0.6	0.1	22
water, urban, bare, etc		0.4	0.1	0.0	0.0	0.0	0.0	1
		20	26	12	21	21	1	100
Thailand		Lowland		Montane			Alpine	Total Area
		Coastal	Upper	Lower	Middle	Upper		
percent of total land area								
Forest	evergreen	1.0	1.5	1.7	3.2	1.2	-	9
	deciduous	0.5	3.1	3.5	2.7	0.1	-	10
	flooded	-	-	-	-	-	-	-
Mosaic	w/trees	0.2	0.2	0.2	0.6	0.4	-	2
	w/shrubs	2.7	7.0	3.7	5.8	1.4	-	21
	w/crops	4.0	1.7	0.8	1.7	0.4	-	9
Agricultural land		18.5	27.0	3.2	0.7	0.0	-	49
water, urban, bare, etc		0.5	0.5	0.0	0.0	0.0	-	1
		27	41	13	15	4	-	100
Vietnam		Lowland		Montane			Alpine	Total Area
		Coastal	Upper	Lower	Middle	Upper		
percent of total land area								
Forest	evergreen	0.7	2.2	2.7	6.5	3.7	0.0	16
	deciduous	0.3	1.0	0.2	0.2	0.0	-	2
	flooded	0.3	-	-	-	-	-	0
Mosaic	w/trees	0.6	1.2	1.0	2.1	1.1	0.0	6
	w/shrubs	3.8	5.8	4.9	8.7	3.5	-	27
	w/crops	2.3	3.8	3.3	3.6	1.2	-	14
Agricultural land		26.7	3.4	1.6	1.7	0.3	-	34
water, urban, bare, etc		1.1	0.1	0.0	0.0	0.0	-	1
		36	18	14	23	10	0	100
Yunnan		Lowland		Montane			Alpine	Total Area
		Coastal	Upper	Lower	Middle	Upper		
percent of total land area								
Forest	evergreen	0.0	0.0	0.1	0.5	28.2	5.2	34
	deciduous	-	-	-	0.0	0.0	0.0	0
	flooded	-	-	-	-	-	-	-
Mosaic	w/trees	0.0	0.0	0.1	2.8	9.0	0.0	12
	w/shrubs	0.0	0.0	0.1	1.6	26.7	2.5	31
	w/crops	0.0	0.0	0.1	1.9	9.0	0.1	11
Agricultural land		0.0	0.0	0.1	1.1	9.7	0.1	11
water, urban, bare, etc		-	0.0	0.0	0.0	0.5	0.4	1
		0.0	0.1	0.5	8	83	8	100

total national land area according to both of these dimensions for each of the GMS states.

This data helps us further assess the land cover dimension of the regional natural resource base. Basic patterns in each country include:

- **Cambodia.** Large areas of relatively intensive agriculture are located almost exclusively in the lowlands, along with the vast majority of deciduous forest and mosaic vegetation. The small proportion of land in montane zones is largely covered by evergreen forest.
- **Lao PDR.** More than three-quarters of the major cultivated areas are located in the lowlands, but they account for only 6 percent of national land area. Mosaic vegetation that includes mixture of agricultural crops is primarily distributed among montane zones, and especially the middle montane zone. But three-quarters of the total land area is covered by primarily evergreen forest, or by mosaics of basically natural vegetation that includes trees and shrubs of various size (keeping in mind our above note on the “shrubs/trees” category), and the overwhelming majority of these types of land cover are located in montane zones. This reflects the extensive areas of mountain forest lands in Laos, as well as land cover patterns associated with local agroecosystems that occur there.
- **Myanmar.** About 22 percent of total land area has been converted to major areas of agricultural cropland, the vast majority of which is located in lowland zones. More than one-third of the country is classified as intact evergreen or deciduous forest, and more than 40 percent is associated with mosaic patterns. The majority of both intact forest and mosaic land covers are found in montane zones.
- **Thailand.** The most extensive conversion to agricultural cropland has occurred in Thailand, where about half of the total land area is in major cultivation areas. About 90 percent of this area is located in lowland zones, and almost all the rest is in the lower montane zone. Another 9 percent of land area has mosaic patterns that include crops, and two-thirds of this is in lowland areas associated with orchards, rubber or other plantation tree crops. Remaining areas in montane zones are associated with tree cover in the form of evergreen or deciduous forest, or with mosaic patterns, some of which include mixtures with agricultural crops.
- **Vietnam.** Conversion of forest to agricultural cropland has also been extensive in Vietnam, where major cultivated areas occupy about one-third of the total land area, with 90 percent located in lowland zones. Intact forest is primarily evergreen and primarily located in montane zones. Land under mosaic patterns is extensive, accounting for just under half of the total land area. There is a larger proportion of mosaic areas associated with mixtures of agricultural cropping than in other GMS countries, and more than half is located in montane zones.
- **Yunnan.** More than three-quarters of the total land area of Yunnan remains under various forms of tree cover, with large areas classified as evergreen forest, and only 11 percent classified as agricultural cropland. Another 11 percent has mosaic patterns that include agricultural crops, most of which runs in an east-to-west belt across the southern half of the province, and as in parts of Thailand, this may also include areas with plantation tree crops. In areas below the upper montane zone, more than 78 percent is in mosaic pat-

terns, with 15 percent in cropland, and the remainder under evergreen forest. Most alpine zone areas are under evergreen forest, with the remainder primarily in mosaics with shrub/tree cover.

From this brief overview of the distribution of natural resource characteristics in the region, we can see that extensive areas of agricultural cropland are, indeed, primarily a phenomenon of the lowlands, where they already occupy very large areas. Montane zones, on the other hand, have substantial areas of intact forest cover, and extensive areas with mosaic patterns of cover that include varying proportions of trees, shrubs, natural herbaceous vegetation, and crops. These are the heartlands of the agroforestry mosaic landscapes which provide the natural resource base for production activities in montane zones of mainland Southeast Asia.

Major areas of agricultural cropland are generally associated with fairly clear and well recognized land use claims that usually have some form of official recognition. The same is usually true for areas classified as mosaics with crop components that are associated with orchards or plantation tree crops. These areas are also where most of the major investments have been made for developing irrigation systems and other forms of supporting infrastructure for agricultural production. For dominant lowland societies, these are the areas most suitable for agricultural production, and are the major centers of commercial agricultural production that have contributed most to agricultural GDP.

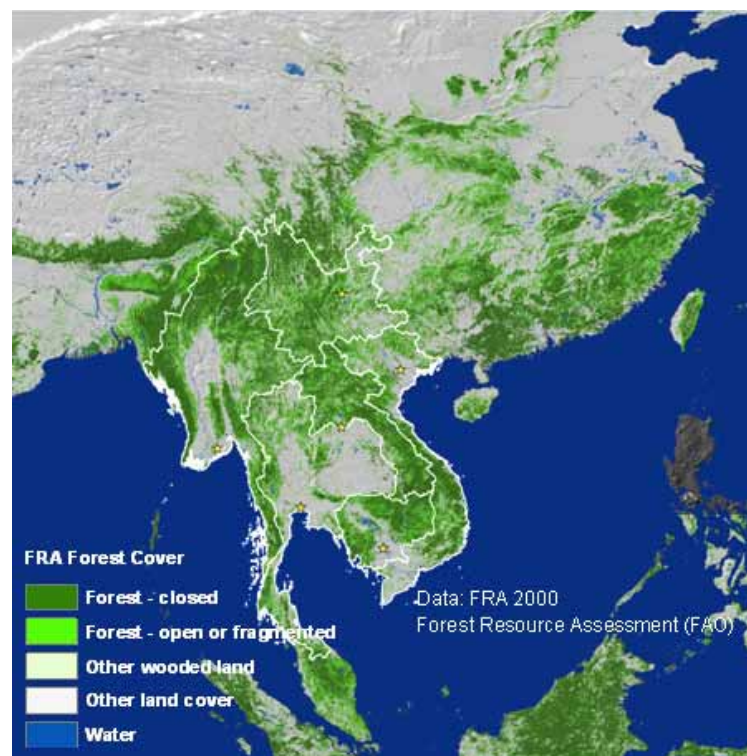
But for other areas classified as having mosaic patterns of land cover, the story is often quite different. Many of the agroecosystems that evolved in these areas have included components that maintained their agricultural productivity through management of natural vegetative regeneration processes. In other words, they used various types of shifting cultivation techniques that restored the productivity of agricultural fields during fallow periods when natural vegetation was allowed to regenerate. Thus, areas with a mixture of agricultural fields and others that are at various stages of natural regeneration are one source of the mosaic patterns found in many mountain landscapes. But their often complex patterns and lack of clear fixed field boundaries make them less “legible” and have thus not allowed them to be easily incorporated into systems for documenting and recognizing land use tenurial rights.

Moreover, expanding state forest land claims by governments and their forestry agencies often proclaim mosaic landscapes dominated by natural vegetation, and especially “unused” fallow areas to be state forest land. Thus, people who opened agricultural fields within these areas became seen as “encroachers”. To help provide a picture of how these landscapes are viewed from a forestry perspective, Figure 3-9 displays interpretations of “forest cover” from the 2000 forest resource assessment (FRA 2000) conducted under the FAO. Under this type of interpretation, mosaic landscapes become “open or fragmented” forest or “other wooded land”. While some GMS states are experimenting with approaches to recognize at least some forms of local land use rights in these areas, others have taken little substantive action.

Furthermore, for lowland societies, agroecosystem management practices that include shifting cultivation components are usually considered primitive, and inappropriate forms of land use for the sloping lands found in montane zones. Such views have been exacerbated by the

fact that many of those practicing these techniques have been members of ethnic minority groups who are marginalized by mainstream societies. And as we saw in chapter 2 of this report, despite their relatively low population densities, these areas are also where the highest rates of poverty incidence are found. And during recent years, montane zones with agroforestry mosaic patterns of land cover have also become a major target of concern by environmental interests. Many interpret these land use patterns as forms of “forest degradation” that threaten biodiversity, downstream water resources, and overall environmental sustainability.

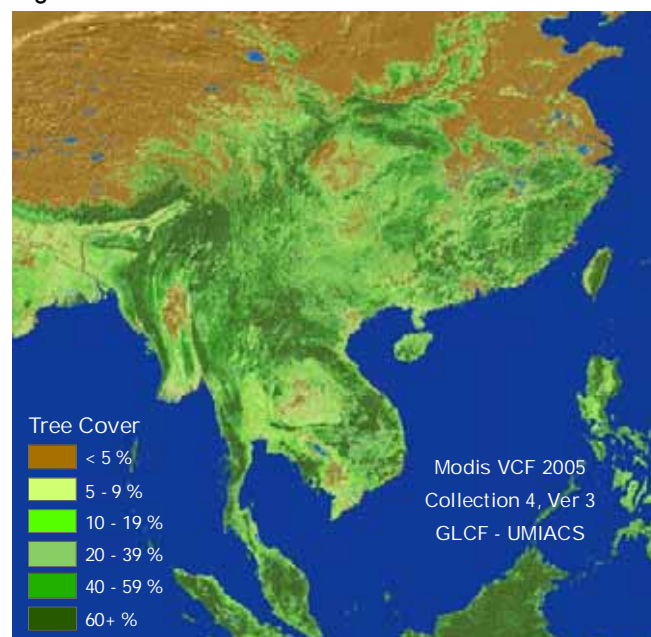
Figure 3-9. Mainland SE Asia forest cover, FRA 2000



In this regard, it is also useful to consider overall tree cover in the region, without attempting to interpret whether trees are part of forest or agricultural landscapes. Thus, Figure 3-10 displays tree cover levels for the region, based on interpretations of data from the Terra Modis satellite platform available from the Global Land Cover Facility. As this figure suggests quite clearly, there are significant to quite substantial amounts of tree cover in most agricultural areas. The current and potential roles of agroforestry landscapes are clearly important questions that need to be addressed in a more systematic and transparent manner.

Subsequent parts of this report will revisit aspects of these issues and how they relate to livelihood opportunities for commercial production in montane zones of the Greater Mekong Region.

Figure 3-10. Tree cover in mainland SE Asia



3.2.2 Meso-level manifestations of economic development and change

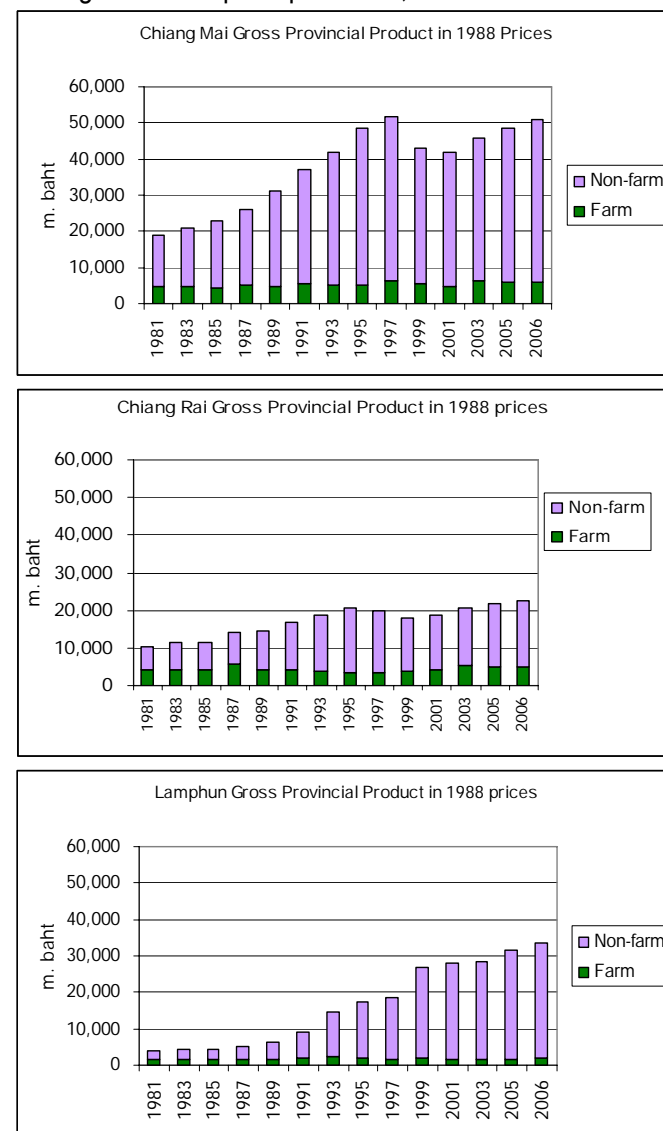
In the introduction to this chapter, we have already seen at the macro-level how economic policies, investments and programs have been bringing dramatic change to the region. And the previous section of this regional overview has painted a picture of how current land use patterns reflect the general condition of natural resources potentially available in different areas. This section continues our regional overview by looking more closely at how economic development and change has affected the meso-level context of case study areas in Northern Thailand and Northern Vietnam. Following sections complete the regional overview by looking at three dimensions of regional change that are particularly important for our study - international trade, tourism and physical infrastructure.

Changing economic context in the Upper Ping Basin of Northern Thailand

In the vicinity of our case study sites in Northern Thailand, the income of the population has generally increased continuously over the last three or four decades, as reflected in per capita gross provincial product (GPP) or gross regional product (GRP). However, as in Thailand and the region more generally, this growth in income has come mainly from the non-farm sector. As a result of two decades of implementation under four National Social and Economic Plans (1961-1981), the Thai economy had grown rapidly, but there was a widening gap between the rich and the poor.

Thus, the Fifth National Social and Economic Plan (1982-1986) turned attention to regional growth and income distribution. According to this plan, Chiang Mai was to be the Northern growth pole for economics, education and culture. However, Manat et al. [1991] found that focus in the plan was subsequently shifted from the agricultural sector to industrial and service sectors. Thus, the proportion of gross domestic product from agriculture continued its decline during im-

Figure 3-11. Gross Provincial Product in Chiang Mai, Chiang Rai & Lamphun provinces, 1981-2006



Source: NESDB

plementation of this plan. Subsequent National plans followed the same approach, and by 1997 the non-farm sector increased in relative importance to the point that it accounted for 81 percent of regional GDP, compared to 19 percent from agriculture. At the same time, natural resource quality in the North had become a major concern, whether being forest, soil or water resources.

Structural shifts from farm to non-farm production are most pronounced in Lamphun province, and to a lesser extent Chiang Mai province. Figure 3-11 shows gross provincial product in constant 1988 prices from farm and non-farm sectors during 1981-2006 in Chiang Mai, Chiang Rai and Lamphun provinces. GPP for the farm sector stayed at an approximately constant level during this period, while GPP for the non-farm sector increased continuously, but with a dip in 1998-99 due to the 1997 macro-economic crisis. As a result, the share of the farm sector in total GPP declined continuously. Specifically, Table 3-4 shows that the share of the agricultural sector in Chiang Mai decreased from 24 per cent in 1981 to 15 per cent in 1990, and remained around 12-13 per cent during 1997-2006, while the share of agriculture in Chiang Rai began at 39 percent in 1981, fell to 27 percent in 1990 and then to 18 percent in 1997, but then increased after the economic crisis 26 percent in 2003, before dropping again to 22 per cent in 2006. Lamphun is the province that has undergone the most substantial structural change during this period, with the share of the agricultural sector decreasing from 40 percent to merely 9 percent in 1997 and holding at around 5-6 percent during 2000-2006. In general, growth in agriculture has been good in Chiang Rai and Chiang Mai where there has been much agricultural development and diversification—but not in Lamphun.

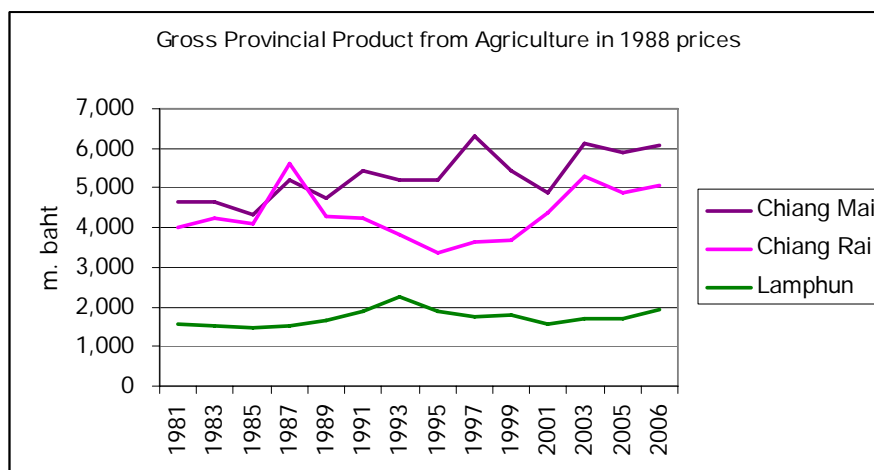
Table 3-4. Farm and non-farm sector as a percentage of gross provincial product in Chiang Mai, Chiang Rai and Lamphun, 1981-2006

Year	Sector	Share of total GPP		
		Chiang Mai	Chiang Rai	Lamphun
-----% of GPP-----				
1981	Farm	24	39	40
	Non-farm	76	61	60
	All	100	100	100
1990	Farm	15	27	24
	Non-farm	85	73	76
	All	100	100	100
1997	Farm	12	18	9
	Non-farm	88	82	91
	All	100	100	100
2000	Farm	13	23	5
	Non-farm	87	77	95
	All	100	100	100
2003	Farm	13	26	6
	Non-farm	87	74	94
	All	100	100	100
2006	Farm	12	22	6
	Non-farm	88	78	94
	All	100	100	100

Source: NESDB

Figure 3-12 shows gross provincial product for the agricultural sector measured in 1988 prices for Chiang Mai, Chiang Rai and Lamphun during 1981-2006. GPP for the agricultural sector in Chiang Mai showed reasonable improvement over time, while that for Chiang Rai declined in relative terms until 1995-1997, and then increased rapidly until 2003 and stabilizing until 2006. For Lamphun, agricultural GPP was stable throughout this period.

Figure 3-12. Gross provincial product for the agricultural sector in Chiang Mai, Chiang Rai and Lamphun, 1981-2006



Source: NESDB

Economic value has also increased on a per capita basis, as reflected in Table 3-5, which reports per capita GPP measured in constant 1988 prices for Chiang Mai, Chiang Rai and Lamphun provinces during 1981 to 2000. During this 25 year period, per capita incomes doubled in Chiang Mai, grew by 55 per cent in Chiang Rai, and multiplied eight-fold in Lamphun. This compares with a doubling of per capita incomes in the North generally. These data help demonstrate how economic growth in Northern Thailand has been more rapid in certain provinces. Average growth for the North as a whole was slower than in Chiang Mai and Lamphun. The fastest growth has been in the non-farm sector, and especially in Lamphun where the Northern Industrial Park is located. Income disparities begin to show more clearly when comparing data for Lamphun and Chiang Rai in Table 3-5, where we can see that GPP per capita in Chiang Rai has been relatively stagnant over the last 10 years compared, compared to dramatic growth in Lamphun.

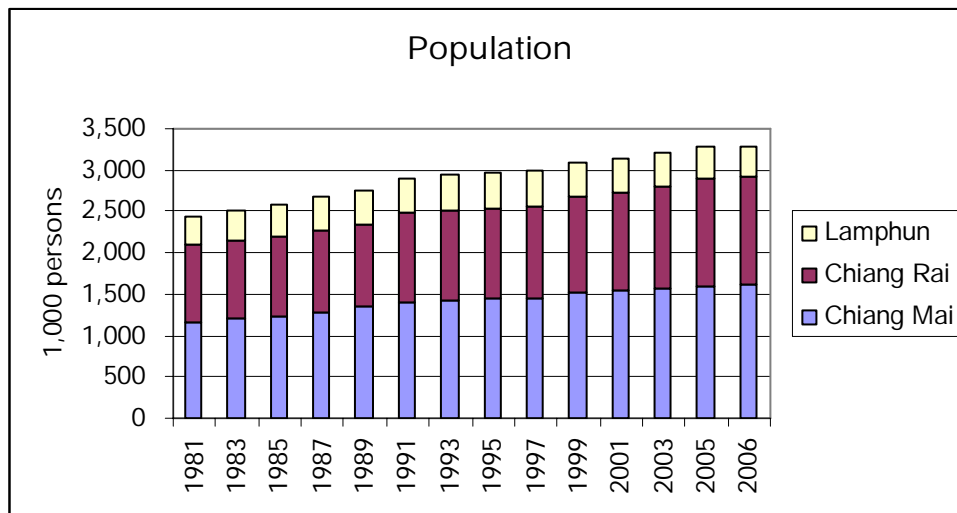
Table 3-5. Per capita gross provincial product (GPP) in Chiang Mai, Chiang Rai and Lamphun and per capital GRP for all provinces of the North, 1981-2006

	Per capital GPP/GRP (constant 1988 Baht)			
	Chiang Mai	Chiang Rai	Lamphun	North Region
	-----baht per person-----			
1981	16,414	11,207	11,364	12,402
1985	18,328	12,100	11,518	14,323
1990	25,877	14,919	16,732	18,039
1995	33,776	18,538	40,282	23,627
1997	35,839	17,830	42,692	24,304
2000	26,658	16,115	76,826	22,869
2003	29,250	16,537	73,324	26,342
2006	31,621	17,344	90,907	28,484

Source: NESDB

Figure 3-13 shows that population growth has basically stabilized since around 1990 in Chiang Mai and Lamphun provinces, whereas population growth remains somewhat higher in Chiang Rai province.

Figure 3-13. Population in Chiang Mai, Chiang Rai and Lamphun, 1981-2006



Source: NESDB

In the past four decades of development in Northern Thailand, there has been substantial development in the infrastructure supporting the Northern Thai economy. Road improvement, electricity, and irrigation facilities were expanded, and now provinces, districts and villages are well connected to each other. Telephone connections and household water supplies were also developed. Access has been improved for remote villages in the highlands and the uplands, and merchants can now get into these villages to buy and sell products. Communication and information exchange has also been much improved. An investigation of effects of highland roads in Chiang Mai, Mae Hong Son, Lampang and Phayao provinces by Sompong [1988] found that improved road access in the highlands of these provinces during the 1980s facilitated market access, job opportunities, better access to education and health facilities, better access to information and extension on new technology, and access by state services, including law and order and opium poppy enforcement measures. Highland communities on the whole appear to have better standards of living through better road access. Some of the negative effects associated with improved road access included undesired cultural changes and loss of traditional values, as well as some possible negative environmental effects, such as soil erosion and forest loss. Sompong asserts, however, that better roads have also facilitated better enforcement against forest destruction.

Since 1981, the Thai government has promoted Chiang Mai as the Northern center of economic, social and cultural activities, featuring its “*Lanna*” identity. Tourism boomed in Chiang Mai and many hotels, resorts, restaurants, golf courses, and handicraft producing villages have been developed and successfully operated. Agro- and eco- tourism are also becoming popular, and have emerged in neighboring provinces like Chiang Rai and Mae Hong Son. Tourist enterprises employ quite a number of people and many rural people have moved to towns to find jobs in such enterprises [Attachak 1991].

Especially during 1987-1992, growth in industrial and tourist sectors in the North was high, and began having impacts on the agricultural sector as substantial areas of agricultural land—both with and without land titles -- was sold to land developers for tourist resorts, hotels, housing and commercial projects.

In addition to growth in tourism in the North, there has also been good growth in both large and small industries. Kanok and Luechai [2001] reported that during 1992-1996, growth in industry in the North was the highest among all sectors. Industrial investment was concentrated in Chiang Mai and Lamphun, especially after the Northern Region Industrial Estate Authority of Thailand was established as part of national policies to decentralize industrial development into regional centers. Many government offices were set up to support this development, including offices of the Board of Investment, Northern Region Industrial Promotion, Northern Human Skill Development, Export Promotion, and the Industrial Board [Rattanaorn 2003].

Together with growth in commercialization, contract farming has been increasingly common in the North since 1987. Both foreign and domestic companies have invested in contract farming in order to assure their supply of necessary agricultural products. Commodities under contract farming in the North have included grapes, soybeans, barley, potatoes, ginger and cucumber. Processing factories run by foreign companies were also established in many areas of the North.

Typical characteristics of contract farming commodities are their need for more management and care than other crops. They often have high risks of pests and diseases. Companies which introduced the crops would normally supply materials to farmers, such as seeds, fertilizers and chemical inputs, and would guarantee a price for output at certain specified quality and time periods. Thus, quality control is usually a key aspect of such contract farming. Accordingly, although farmers do not have price and market risks, they are still subject to production risks. When there are pests, diseases, quality or management problems, farmers will need to bear such risks.

In 1994, the Northern Industrial Economics Center [1994] reported some 100 fruit and vegetable processing firms in North Thailand: 36 in Chiang Mai, 14 in Chiang Rai, 10 in Lampang, 9 in Lamphun and the rest in other Northern provinces. Products from these factories are sold both domestically and for exports. Often the products are canned, but some are frozen.

More high-value crops have also been introduced in the North since 1981. Rattanaorn [2003] and Benchaphun et al. [2005] reported that in the 2000's, agriculture in the North has become very diversified, and in addition to traditional cash crops like shallots, garlic and onion, there are now many fruits and vegetables grown in the North, including cabbages, broccoli, cauliflower, cucumber, tomato, potato, chilli, legumes and tuber crops, many of which are supported by government extension services. More fruit tree farms have been planted in the uplands to replace upland field crops, especially longan, lychee, mango and

orange. Fruit tree orchards need high investment and are usually established by farmers who have sufficient capital. Farmers also need to have some annual income from other sources in order to engage in fruit tree farming. Fruit tree farms are seen as being suitable for the land, water and climatic resources available in the North, and good progress has been made in their expansion during recent decades. Good profitability has been reported for some of these crops [Benchaphun et al. 2004].

Changing economic and international trade context of tea production in Vietnam

Before the *Doi Moi* policy began in 1986, the main agricultural objective in Vietnam was to produce enough rice. As a result, the government invested heavily in expansion of rice production area. This was accomplished either by providing more irrigation or drainage facilities, or by opening up new land for agriculture through efforts such as dike construction. The increase in area planted to rice was about 0.6 million ha during the span of 18 years from 1976 to 1994. During the first decade after the end of the war in 1975, the government's food policy was halfway in that direction, *i.e.* clearing forests for rice fields with little consideration for soil conservation aspects [Nguyen van Sanh 2005].

Since *Doi Moi* was introduced in 1986, Vietnam has made significant achievements in socio-economic development, foreign affairs and national security. GDP has more than doubled, while inflation has dropped to low single digit figures. Vietnam's poverty rate has declined from 70 percent of the population in the mid-1980s to 58 percent in 1993, 37 percent in 1998, and to 29 percent in 2002. Much of this reduction can be attributed to economic growth during the early 1990's (8-9 percent per year), and to Vietnam's strong agricultural performance since the late 1980's.

While Vietnam has placed strong emphasis on eradication of poverty, positive effects of the country's remarkable economic growth have not yet reached the entire population. A series of challenges remain to be addressed, and especially the growing levels of regional disparity. According to Vietnam's latest (2006-2010) poverty line definitions (based on per capita income) there are still 4.6 million poor households in the country (26.3 percent of the total). The percentage of the total population classified as poor reaches 10 percent in urban areas, 42 percent in rural delta areas, and 48 percent in rural mountainous areas.

After nearly 20 years of the *Doi Moi* reform process, Vietnam's agriculture and forestry sector has achieved stable development, with an average grow rate of 4.3 percent per year, and it is strongly and rapidly changing from autarkic production to a diversified commodity export-oriented form of agriculture.

The nine main exportable agricultural products of Vietnam are rice, coffee, tea, rubber, pepper, sugar, groundnut, cashew nut and pig meat (Table 3-6). Most agricultural products were taxed from the mid 1980's to the mid 1990's, but in 2001 export quotas were eliminated. Since then private companies have been able to export without any restrictions [Nguyen & Grote 2004], and now most exportable agricultural products are free of tax. Jensen and Tarp [2003] found that reduced trade taxes (especially import tariffs) affect rural areas more negatively than urban areas, and that farming households are more affected than wage-earning

and self-employed households. Moreover, export subsidies may support farmers in different ways depending on where they are located. For instance, farmers near the port may be affected positively, while farmers in regions far from the port may not benefit if domestic trade limitations hinder their products from reaching ports for export [Nguyen & Grote 2004].

Trade between the northern uplands region and both the rest of Vietnam and the rest of the world is well below national standards. Farmers in upland areas are benefiting from low production costs, but margins for marketing their products are relatively high because of inadequate transport, communication and other commercial infrastructure [Minot 2003].

Table 3-6. Development of Vietnam's export volumes of major agricultural products, 1986-2002

Product	1986	1994	2002
	----- (thousand tons) -----		
Rice	-500 (import)	2,000	3,250
Coffee	40	180	720
Tea	12	24	75
Cashew nut	6	82	63
Groundnut	44	120	108
Rubber	40	130	450
Pepper	4	16	76
Sugar	-40 (import)	-125 (import)	10
Pig meat	7	13	15

Source: Nguyen & Grote, 2004

Vietnam has now entered a new phase of reform and integration into the world economy, with aims of raising the country's economic development and reducing poverty, enhancing the life quality of the people, and laying a foundation to achieve the target of industrialization by 2020. With this vision, Vietnam started to apply for WTO accession in early 1995 and became an official member of WTO in January 2007. As a result of becoming a WTO member, there are likely to be widespread effects on the overall national economy in general, and on the agricultural sector in particular. According to Kwa [1999], MARD [2001], Nguyen Thang [2004], and Oxfam [2004, 2005], predictions are that by joining the WTO, Vietnam's agriculture will be able to expand agricultural product markets, achieve foreign investment, and create pressures to develop and enhance the competitiveness of domestic enterprises. Moreover, Vietnam's agriculture will have more opportunities to access new sources of technology, which in turn will contribute to improving productivity, quality and competitiveness of Vietnam's agricultural products including rice, coffee, tea and cashew.

WTO accession also poses certain challenges for Vietnam, however, and especially in the early years after becoming a member. By liberalizing its market, Vietnam has to eliminate trade barriers and lower tariffs. Thus, Vietnamese firms and households will face fiercer competition from foreign competitors. And in its export markets, Vietnam's agricultural products may also face strict regulations imposed by importing countries on standards for quality, hygiene, food safety, etc. Many households who depend on agricultural production, including tea producers, are likely to be negatively affected. Vietnam may thus face shocks in product and labor markets during the transition period [Do Hoai Nam 2001].

Opportunities as well as challenges that WTO accession may bring to Vietnam's agriculture are highlighted in our case study in terms of potential impacts of accession on tea farmers. Tea is a commodity that contributes considerably to agricultural product export value of Vietnam (Table 3-7).

Table 3-7. Export values of major agricultural products of Vietnam in 2005

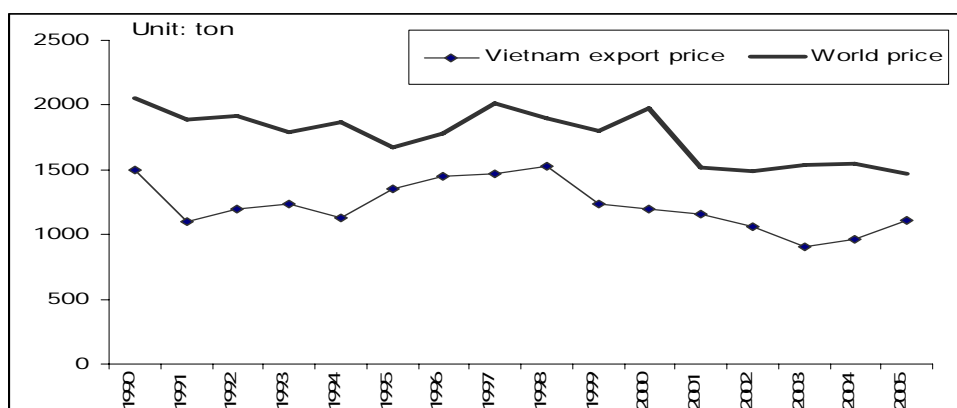
Agricultural product	Export value (million USD)	Share of value (% of total)	Relative Position
Rice	1,407.2	4.3	1
Rubber	804.1	2.5	2
Coffee	735.5	2.3	3
Cashew nut	501.5	1.5	4
Vegetable	235.5	0.7	5
Pepper	150.5	0.5	6
Tea	96.9	0.3	7
Ground nut	32.9	0.1	8
Total export value	32,441.9	100.0	

Source: Vietnam Customs Department, 2006

With production of 577,000 tons of fresh tea in 2005, tea is one of eight major export agricultural products of Vietnam. Most tea in Vietnam is produced by smallholders. There are currently 34 districts in Vietnam that grow tea, and more than 600 enterprises are involved in tea production and business. Tea has been exported to 59 countries, with 80 percent going to Iraq, Taiwan, India, Pakistan and Russia. Moreover, the Vietnamese people have a long traditional custom of drinking tea in both fresh and processed forms. The market for Vietnamese tea is one of the markets that will be affected by WTO accession. At present, on average, tea for domestic demand accounts for about 30 percent of available annual output [MARD 2005]. Vietnamese tea products that have been exported to many countries for several years include much more pre-processed tea. After processing, mixing and packaging at factories, importers have sold their products in their markets under the name of Indian or Taiwanese tea, and not Vietnamese tea. Thus, while customers have been sipping Vietnamese tea and have known its taste for a long time, the trademark of Vietnamese tea is hardly known in international tea markets.

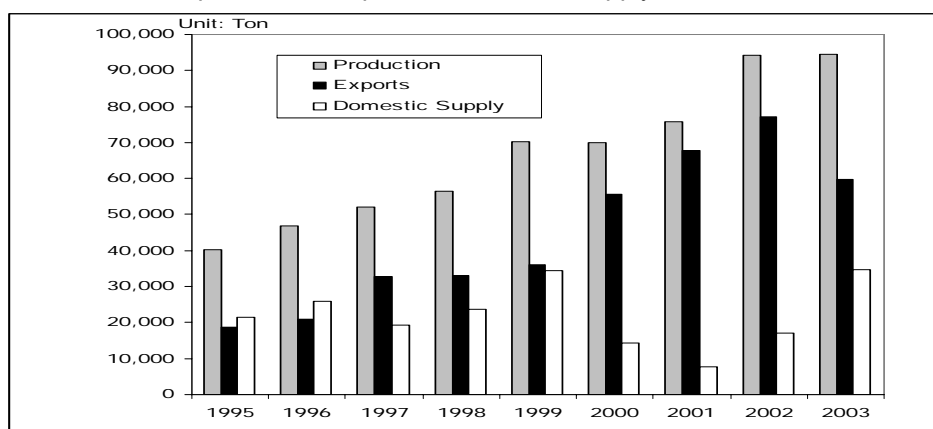
On the export side, because of poor cultivation methods and processing technology, Vietnam's tea productivity is still low, at only about 1,060 kg/ha, compared to 1,460 kg/ha for Sri Lanka, 1,700kg/ha for India and 2,100 kg/ha for Kenya [FAO 2005]. Moreover, tea varieties are mostly low-value, resulting in low quality tea (Figure 3-14) [MARD 2005]. During 2002-2003, tea production increased, but tea exports fell (Figure 3-15).

All types of tea in Vietnam have low competitiveness and may face several difficulties in world tea markets after the country joins WTO. As a result, poor households who are depending on tea as their main source of income may be negatively affected.

Figure 3-14. Vietnam tea export price and world price¹for tea, 1990-2005

Source: Vietnam General Statistical Office, Vietnam Custom Department, FAO

Figure 3-15. Vietnam tea production, export and domestic supply, 1995-2003



Source: FAOSTAT, 2005

At a seminar recently organized by VCCI (Vietnam Chamber of Commerce and Industry) in Hanoi, the Ministry of Trade pointed out that quality is the weakest aspect of Vietnamese tea products being exported to global markets. Moreover, product hygiene and safety at all stages of tea production, ranging from cultivation to treatment and processing, are two important indicators to which Vietnam should pay the most attention. But since the production cost of Vietnamese tea is still lower than its export price by 14 percent, tea still has a certain competitive advantage in price, and thus potential for participation in international trade.

¹ World tea price is Mombasa auction price

3.2.3 Regional growth and change in international trade

Processes underlying the dramatic expansion of Southeast Asian economies during the last three decades, as we have seen both at macro and more meso-levels, have been closely linked with international trade and investment. GDP of countries in the Greater Mekong Subregion (GMS) measured in constant 1990 prices were on average 3-6 times larger in 2005 than in 1976 (except 14 times for China), as indicated in Table 3-8. This growth has occurred in both agricultural and non-agricultural sectors. Changes leading these patterns of growth involve a number of features which are common, to a greater or lesser extent, to all these economies [Flatters & Santikarn Kaosa-ard 1994]:

- major shifts in economic structure—in most cases from agriculture to industry, and a continuing change in the structure of industry itself;
- high rates of technical change, based largely on importing and adapting foreign technologies;
- high levels of foreign and domestic investment; and
- rapidly growing international trade, led by increasingly competitive exports of manufactured goods and imports of necessary capital and intermediate inputs.

Table 3-8. GDP at constant US\$ market prices in GMS countries, 1976-2005

Country/ year	(Unit: billion 1990 USD)						
	1976	1980	1985	1990	1995	2000	2005
Cambodia	1.5	1.0	1.1	1.7	2.3	3.3	4.5
Lao PDR	0.5	0.5	0.7	0.9	1.2	1.6	2.2
Myanmar	3.6	4.6	5.8	5.2	6.9	10.3	16.1
Thailand	29.9	40.1	52.3	85.4	129.1	132.0	168.6
Viet Nam	3.2	3.8	5.3	6.5	9.6	13.4	19.3
China	113.0	157.6	262.3	383.0	682.9	1,032.4	1,623.6

Sources: UN Statistical Division (UNSD) Common Database, Asian Development Bank (ADB) Key Indicators, International Food Policy Research Institute (IFPRI) China Provincial Dataset (Yunnan)

Effects associated with trade liberalization in the form of the multilateral GATT trading System, emergence of new Asian regionalisms such as ASEAN+1 (China) and ASEAN+3 (China, Korea and Japan), as well as other bilateral and multilateral FTA's world-wide during recent years, pose challenges, and also offer trade opportunities for member countries.

Most GMS countries have gradually liberalized their economies, and have reaped substantial benefits from opening up to the outside world. The region has actually made great achievements in international trade and investment with other countries, and especially China. Among GMS countries, China has had the highest international trade values for two decades, followed by Thailand, Vietnam, Myanmar, Cambodia and Laos. China's import value was around 18 times larger in 2006 than in 1986, while export value was around 31 times larger in 2006 than in 1986 (Table 3-9). Among other GMS countries, Thailand has been one of the leaders in international trade for many decades, and export growth has risen since 1986. Other GMS countries have also accelerated their export growth since 1996 (Table 3-9).

Table 3-9. Import and export value in GMS countries, 1986-2006

		(Unit: million USD)				
	Country/ year	1986	1991	1996	2001	2006
Cambodia	Export	3	57	293	1,296	3,345
	Import	11	62	1,632	1,456	4,235
Lao PDR	Export	14	82	321	376	1,055
	Import	60	154	690	719	1,633
Myanmar	Export	288	527	1,183	2,625	4,361
	Import	304	1,068	2,678	2,663	3,910
Thailand	Export	8,864	28,875	56,478	65,113	130,783
	Import	9,165	37,957	74,939	62,057	128,634
Vietnam	Export	789	2,189	7,463	15,020	40,203
	Import	2,155	2,483	11,285	16,217	47,162
China	Export	31,367	71,967	151,168	266,709	969,284
	Import	43,247	63,877	138,949	243,567	791,793

Source: Asian Development Bank (ADB) Key Indicators 2003, 2007

Major export markets for GMS countries are the countries within the GMS (especially Thailand, China, and Viet Nam), other countries in Asia (especially Hong Kong, India, Indonesia, Japan, Republic of Korea, Malaysia, Philippines, Russian Federation, and Singapore), as well as Australia, Europe (especially Belgium, France, Germany, Italy, Netherlands, and United Kingdom), and North America (Canada and United States). According to Asian Development Bank statistics, since 1985 the United States and Japan have remained the biggest export market for GMS countries, except Lao. Accelerating export growth in China and Vietnam suggests that competition for international market share among GMS exporters may also be intensifying. For example, China's and Vietnam's exports to the US market in dollar terms were still growing at average rate of 30 and 56 percent respectively during 2001 to 2006, a time when Thailand's exports to this market had slowed to around 8 percent.

The major markets from which GMS countries import products are the countries within the GMS (especially Thailand, China, and Viet Nam), other countries in Asia (Hong Kong, India, Indonesia, Japan, Republic of Korea, North Korea, Malaysia, Russian Federation, Saudi Arabia, Singapore, and United Arab Emirates), as well as Australia, Europe (France and Germany), and the United States. Since 1985 Thailand, China, and Viet Nam have had highest import values in dollar terms from Japan and United States.

With exports outpacing imports, China's net trade has become positive for two decades. In 2006, the trade surplus was US\$ 177 billion (Table 3-9). China's first five export groups have been machines and transport equipment, miscellaneous manufactured goods, basic manufactures, chemicals, and food and live animals, while the first five import groups have been machines and transport equipment, basic manufactures, chemicals, crude materials excluding fuels, and miscellaneous manufactured goods (Figure 3-16). In recent years China has been by far the most dynamic and fastest growing market for exporters in the rest of East Asia. Producers in the rest of East Asia have rapidly expanded exports of parts, components and capital equipment to China, in particular for use in China's export industries (World Bank 2007). Exports of machines and transport equipment measured in US\$ were 5 times larger in 2003 than in 1996. At the same time, reflecting stronger domestic demand, machines and transport equipment import growth rose 4 times during 1996 to 2003.

Figure 3-16. China's import and export value of top five products by value, 1986-2003

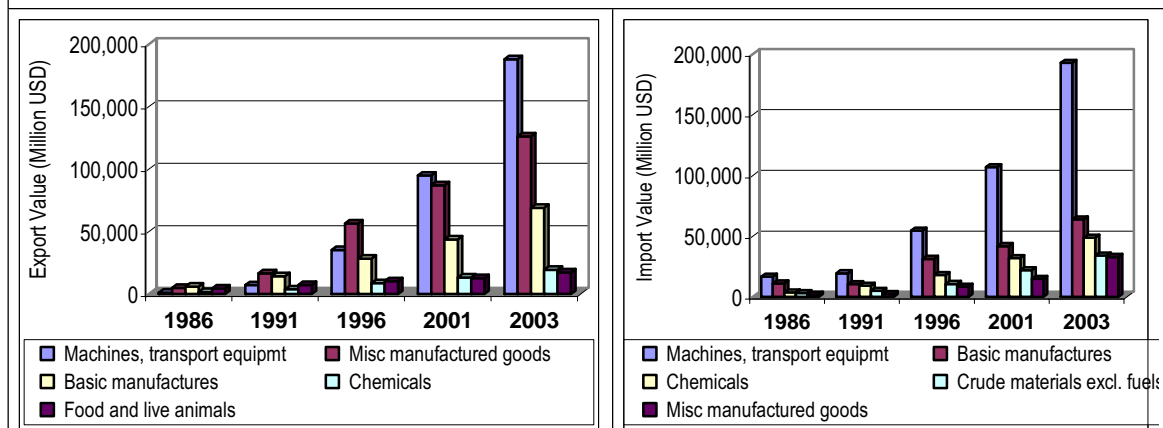
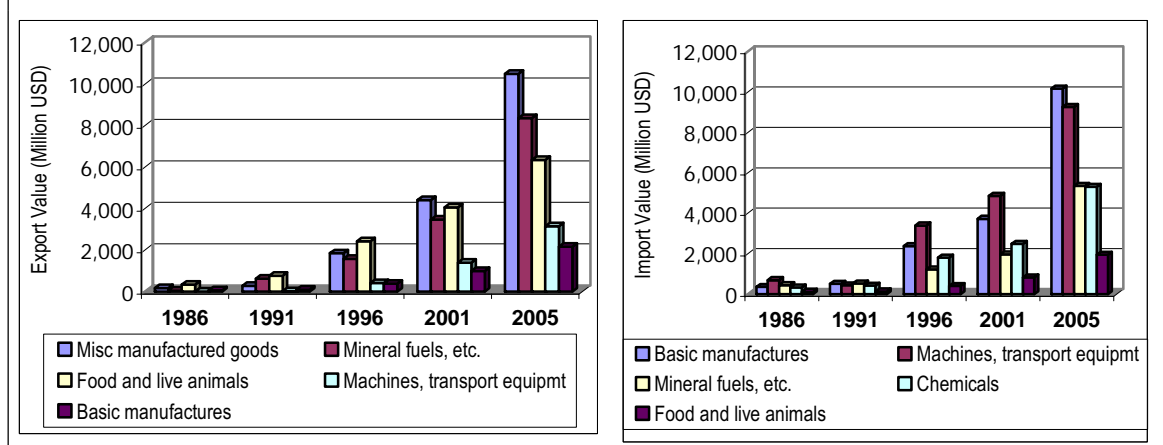


Figure 3-17. Vietnam's import & export value of top five products by value, 1986-2005



In Viet Nam, by the mid-1980s, the war-ravaged country faced famine and a failing command economy. But after the launch of its renovation process (*Doi Moi*) in 1986, it experimented with market mechanisms while trying to preserve social inclusion. An egalitarian redistribution of farmland, coupled with free trade in agricultural products and better agricultural support services at the local level, led to a boom in farm exports and a dramatic reduction in rural poverty. Accession to the World Trade Organization (WTO) in January 2007 may lead its farms and firms to open to competition and its legal system modernized [International Development Association 2007].

Vietnam exports in 2006 were 5 times larger than in 1996 while import growth was 4 times during the same period (Table 3-9). However Vietnam has run a trade deficit for two decades. Import growth picked up in 2006 largely due to capital goods, in particular machinery and equipment for the Dung Quat oil refinery and industrial zone [International Development Association 2007]. Exports of miscellaneous manufactured goods (garments and footwear), mineral fuels and food and live animals (especially seafood) were particularly strong (Figure 3-17). Imports and exports classified by product rank for Thailand and Myanmar are displayed in Figure 3-18 and Figure 3-19. Myanmar import value increased substantially after 1995 while export value increased only after 2000. Thailand export and import value increased substantially after 1996 and especially so in 2006.

Figure 3-18. Thailand's import & export value of top five products by value, 1986-2006

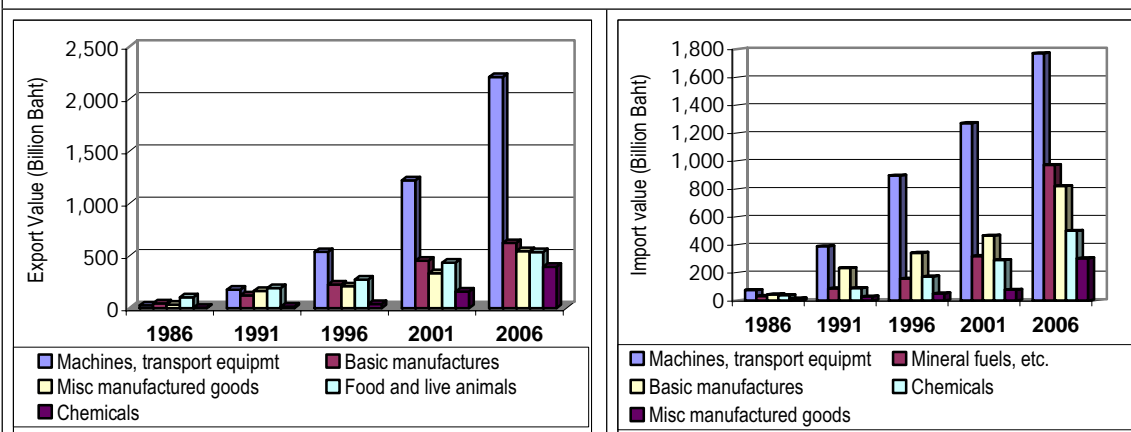
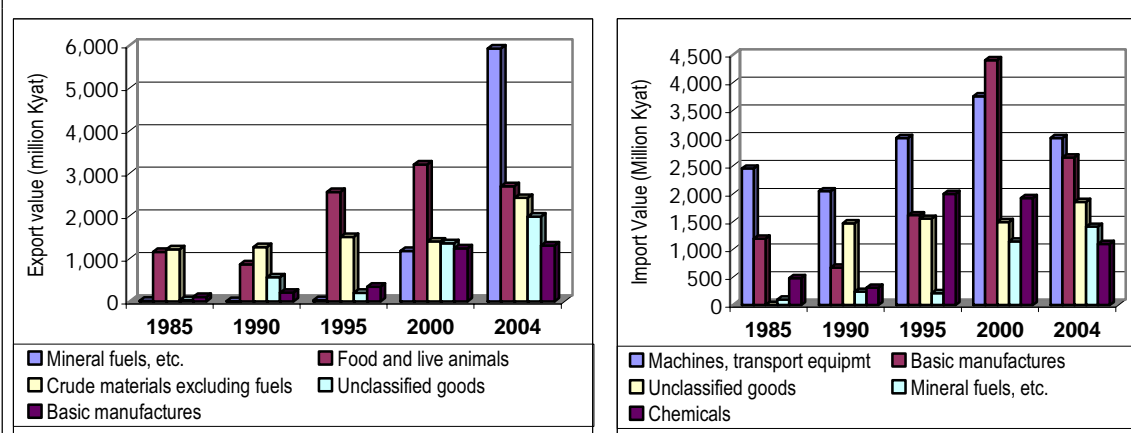


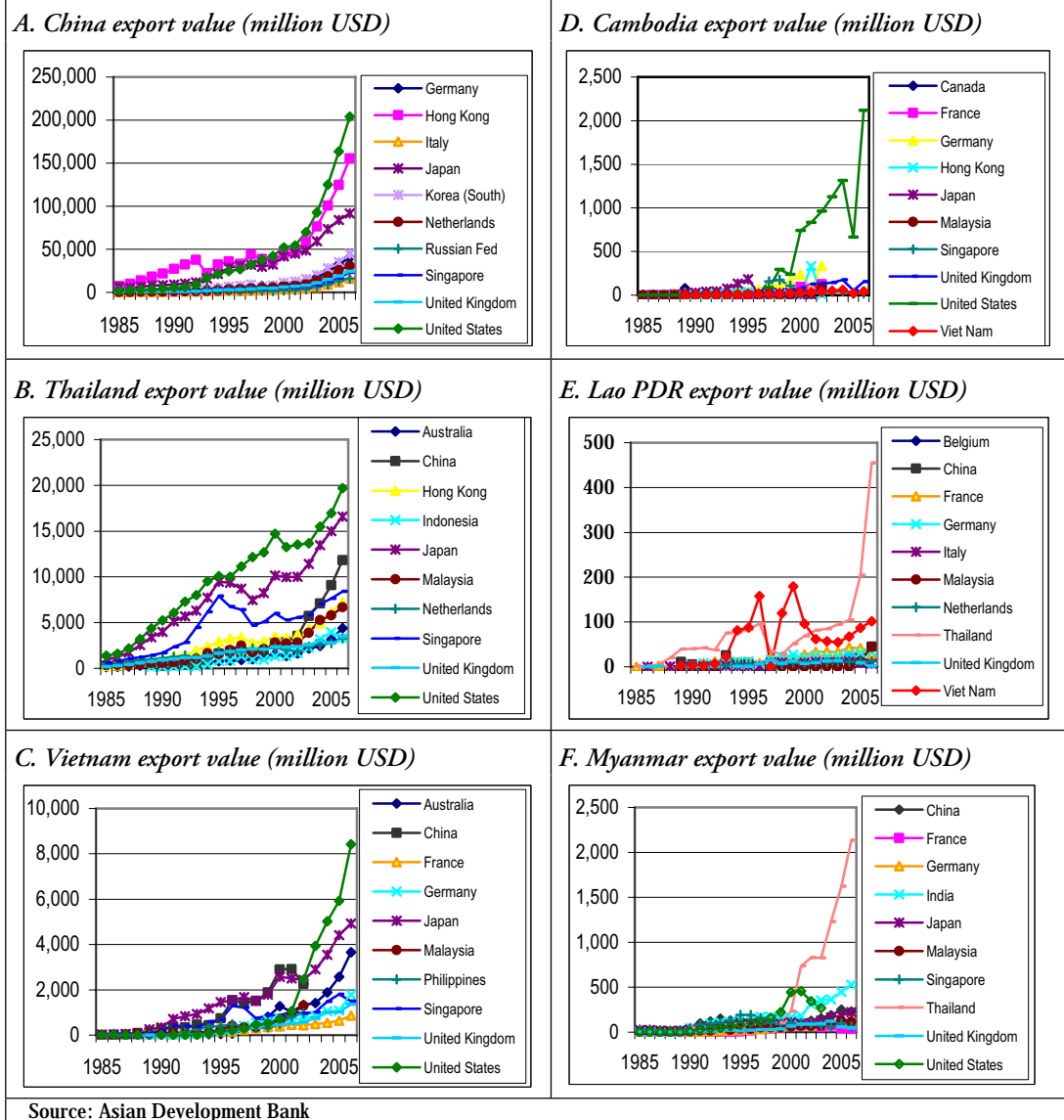
Figure 3-19. Myanmar's import & export value of top five products by value, 1985-2004



In terms of the destinations of exports from GMS countries, larger GMS economies tend to send more exports to multiple large industrialized countries, whereas smaller economies are still disproportionately dependent on a single foreign market. To help clarify these patterns, Figures 3-20 and 3-21 display exports and imports of the six GMS countries according to importing and exporting countries.

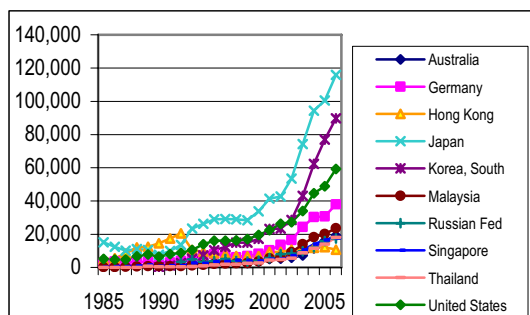
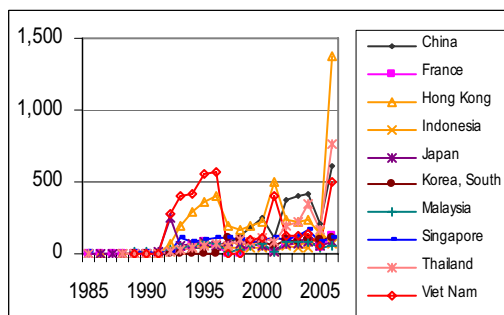
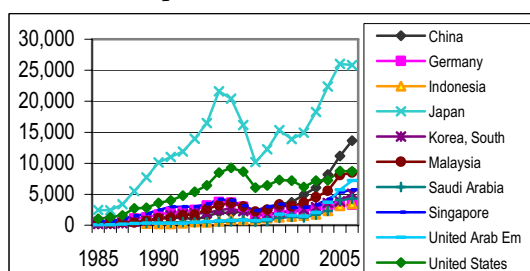
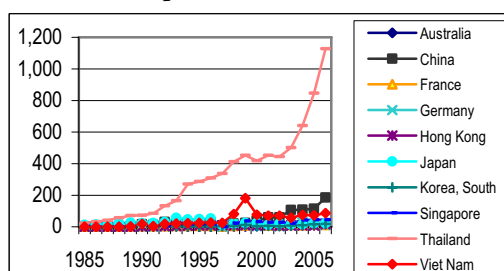
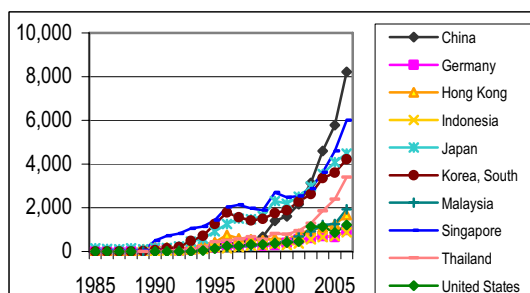
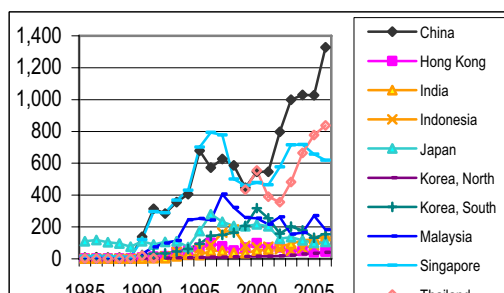
The Lao PDR and Myanmar export mainly to Thailand, and their second largest export markets are also neighboring countries – Vietnam and India, respectively. Cambodia exports predominantly to the United States. In the larger economies, Vietnam, Thailand and China all export substantially both to the United States and to Japan, in addition to various other markets. Vietnam exports more to Australia, Singapore and Europe, while China has more exports to Hong Kong than other countries. In a change from the past, Thailand now finds its exports going more to China than to Singapore, while exports to Malaysia have also grown substantially.

Figure 3-20. Export value by GMS country and destination, 1985-2005



Sources of imports show both similarities and differences among GMS countries. China's imports have been heavily weighted toward machines and transport equipment, (Figure 3-16) and its imports have been largely from Japan, Korea, the United States and Germany. Vietnam's imports include large shares of both basic manufactures and machines and transport equipment (Figure 3-17), and its major sources have been Singapore, Japan and Korea, but China now has the largest share and Thailand has been increasing its share in recent years. Imports into Thailand are led by machines and transport equipment, followed by fuels, basic manufactures and chemicals (Figure 3-18). The largest source of imports is from Japan, now followed by China, the United States, Malaysia and the United Arab Emirates. Myanmar's decreasing levels of imports are led by machinery and basic manufactures, and its main sources are China, Thailand, and Japan. Cambodia's recent surge in imports comes largely from Hong Kong, Thailand, China and Vietnam, whereas imports into the Lao PDR are largely from Thailand.

Figure 3-21. Import value by GMS country and source, 1985-2005

E. China import value (million USD)*B. Cambodia import value (million USD)**E. Thailand import value (million USD)**B. Lao PDR import value (million USD)**E. Vietnam import value (million USD)**B. Myanmar import value (million USD)*

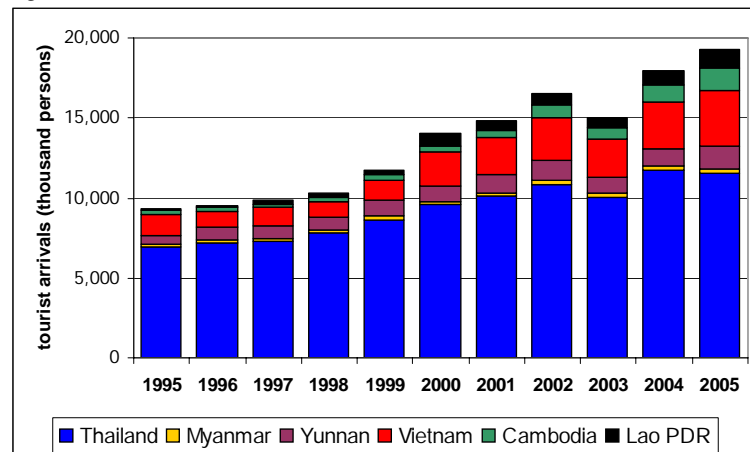
Source: Asian Development Bank

Most GMS countries have found that international trade has become an increasingly important element in their countries, and especially since 2000. Moreover, while trade among GMS countries is important, interregional trade is also flourishing and is closely tied both to major export markets and to sources of imports, especially for investment in further building economies of the region. Indeed, international trade and investment has become a major, if not the most central focus of strategies for economic development within and among GMS countries.

3.2.4 Growing regional role of tourism

In addition to international trade, tourism has become an important part of the services sectors of economies in most GMS states. From just over 9 million foreign tourist arrivals in 1995, by 2005 numbers had more than doubled. As in many other parts of the non-agricultural sectors of the regional GMS economy, Thailand's "early start" in tourism helped give it a 75 percent share of tourist arrivals in the mid-1990s. But tourism also began to boom in other states of the region at the turn of the century, and by 2005 Thailand's share had dropped to 60 percent. Recent growth is most rapid in Vietnam, Cambodia and the Lao PDR, and foreign tourist arrivals are now more than a million persons per year in all GMS states except Myanmar. In addition to the data in Figure 3-22,

Figure 3-22. Tourist arrivals in GMS states, 1995-2005



Sources: UNWTO, Qiu Xueqin 2005, China Tourism Statistics 2006

numbers of domestic tourists within GMS states are also growing, and in Yunnan where domestic tourists come from throughout China, they outnumber foreign tourists by a factor of more than ten to one [Qiu Xueqin 2005].

Especially during earlier years of tourism growth in the region, however, various shady elements with connections to tourism, and especially drugs, prostitution and human trafficking, affected its international reputation. Growing concern among many was further heightened as HIV-AIDS problems began emerging in the region.

But subsequently, very successful programs were launched in Thailand to promote other types of tourism and to expand and upgrade a wide range of tourist facilities and services. This diverted attention away from the darker side of tourism, resulted in massive growth in the tourism sector, and helped put Thailand on the global tourism map. We have already seen reference to the role of tourism in economic diversification of the Upper Ping Basin in North Thailand. And in Yunnan, tourism is seen as the "backbone industry" of the province, and major development and promotion programs have helped it become one of the top 10 destinations for Chinese domestic tourists [Qiu Xueqin 2005]. Other countries have now developed their own similar types of approaches, resulting in a large and growing array of tourist and convention options around the region, from urban centers, to scenic beach areas, hot spring spas, centers of ancient culture, and mountain areas with diverse ethnic traditions. New growth areas include homestays in town and rural areas, eco-tourism linked with protected forest areas, and even agro-ecotourism in scenic agroforestry landscapes of the region.

While the types of tourist industry development and promotion pioneered in Thailand and Yunnan have demonstrated the important economic potential of this sector, there are still a

range of concerns that are often expressed. One particular focus of these concerns centers on the distribution of benefits from expansion of tourism. While large profits have been made by large-scale investors, many are questioning how many benefits have filtered down to poorer segments of society. Moreover, poor rural communities in many areas have complained about being displaced from their already meager natural resources due to expansion of protected forest areas and development of tourist facilities backed by wealthy and well-connected interests. And while employment of local people has increased wage labor opportunities in various tourism areas, many of the jobs available to locals center on low-paying menial work with few prospects for future development. Although various interesting exceptions have emerged in the region, they do not yet play a prominent role in the overall tourism industry of the region.

It is in this context that ambitious new regional initiatives in the tourism sector are being announced by GMS states, along with pledges of major financial support from the Asian Development Bank (ADB). A glossy GMS Tourism Sector Strategy has now been published [ADB 2005], based on a consultancy report that proclaims, “the tourism sector has been recognized as a major growth engine for socio-economic development and poverty alleviation, as a promoter of the conservation of natural and cultural heritage, and as a harbinger of peace” [APPI 2005]. But the consultancy report also goes on to recognize that realization of such potential will require reinvestment of much more of the revenue generated by tourism in:

- *protecting and enhancing the value of the subregion’s outstanding cultural and natural resources;*
- *diversifying product and promoting the subregion as a single destination;*
- *promoting the development of competent tourism human resources;*
- *raising quality standards of tourist facilities, services and tour products;*
- *providing tourism-related infrastructure that spreads benefits of tourism more widely and is more pro-poor;*
- *controlling the adverse social impacts of tourism on women, children and ethnic communities (HIV-AIDS, commercial sex work, child prostitution, and trafficking) and its potential impact on the image of the subregion;*
- *encouraging more active participation of the private sector in tourism, investment, marketing and human resource development; and*
- *increasing efforts to reduce barriers that restrict the movement of tourists between and within the subregion giving special attention to cross-border facilitation.*

This program seeks to increase annual foreign tourist arrivals in the region to between 46 to 52 million by 2015, through a strategy focused on promotion of “competitive, cross-border culture, nature and adventure-based tour programs” [ADB 2005]. The growing network of World Heritage Sites (both cultural and natural) and expanding protected forest areas are seen as growth points for marketing and strategy implementation. Especially for a country like the Lao PDR, where market-based opportunities for rural communities have been very scarce, promotion of these types of tourism are being taken very seriously.

Tourism in the Lao PDR

Political stability in the region and improved transportation networks have facilitated increased importance of tourism in Laos. The number of tourists entering Laos has increased very dramatically, from 14,400 in 1990 to 737,000 in 2000 and 1,095,315 in 2005. Earnings from tourism have also been increasing steadily, from just over 70 million USD in 1997 to more than 110 million USD in 2004. Due to interest in the country’s diverse natural and

cultural attractions, culture and nature based tourism are estimated to account for more than half the total value of the Lao tourism industry [Bouttavong et al 2002].

Under its National Tourism Authority, the Lao government is supporting development of eco-tourism and cultural tourism as a strategy to reduce rural poverty [LNTA 2005]. As an important example, the Nam Ha National Protected Area (NPA) in Luang Namtha province is seen as a successful case and potential model for eco-tourism that has been supported by UNESCO since 1999 [Lyttleton & Allcock 2002]. According to Schipani [2007], more than 70 percent of tourists arriving to Luang Namtha participate in eco-tourism activities, the most popular of which include multi-day forest trekking, locally guided visits to ethnic minority villages, and guided river and cave tours. Numbers of tourists to Luang Namtha increased from 18,600 to more than 49,000 between 1994 and 2005, and the tourism industry in Luang Namtha alone generated 3.15 million USD during 2005.

One of the notable successes of Nam Ha NPA is the employment opportunities and streams of revenue generated by eco-tourism for local authorities and local people. This is particularly important to help counter various negative trends that are also linked with changes occurring in association with newly expanding roads through the area [Lyttleton et al. 2004].

3.2.5 Physical infrastructure and the GMS

We have already seen references to important roles physical infrastructure has played in economic and social transformations occurring in the GMS region, including those associated with economic growth and restructuring, international trade and tourism, and more details will emerge in subsequent sections of this report. Since expansion of roads and transportation, irrigation systems, electricity grids, and telecommunications networks has been a major factor facilitating economic and social change, it should not be too surprising that such items are very high on priority lists of both governments and international development banks.

While local communities also usually want very much to have access to these types of facilities, they are often at least initially unaware of the range of impacts that may emerge at larger scales and over longer periods of time. Moreover, their interest usually places strong emphasis on associated systems related to health care, education, markets, information and extension services that are suppose to follow in areas where basic physical infrastructure is developed, and in the past – especially in lowland areas – often have done so. And, it is a core premise of poverty alleviation programs across the region that such processes will indeed occur.

Given this recent historical context, perhaps it should also not be too surprising that there is a strong focus on basic physical infrastructure in regional strategies and programs for development under the GMS banner, which has especially strong support from the Asian Development Bank (ADB).

One of the main central themes of GMS programs is to spur development by increasing “connectivity” across the region. This is to be brought about through five “strategic devel-

opment thrusts” consisting of activities conducted under 11 “flagship” programs. The five development thrusts include:

- Strengthen infrastructure linkages through a multisectoral approach
- Facilitate cross-border trade and investment
- Enhance private sector participation in development and improve its competitiveness
- Develop human resources and skill competencies, and
- Protect the environment and promote sustainable use of shared natural resources.

Of the 11 flagship programs, the first three consist of “economic corridors” that have been the focus of most attention, and continue to expand or shift as new reports emerge:

- *The North-South Economic Corridor* initially had two branches. The first stretches from Kunming to Bangkok via two alternative routes through either Laos or Myanmar, and the second runs from Kunming through Hanoi to Haiphong. With extension of the GMS to Guangxi in 2004, a third looping branch has been added to which joins Kunming with Nanning, and then turns southwest through Lang Son to Hanoi.
- *The East-West Economic Corridor* stretches from Da Nang and Hue in Vietnam, through Thailand and Laos, to Myanmar (initially Yangon, but now stops in Myawaddy).
- *The Southern Economic Corridor* stretches from Bangkok through Cambodia to Ho Chi Minh City in Vietnam. A second branch has also been added from Cambodia to Quy Nhon, Vietnam.

A map in the draft version of the ADB mid-term review report indicated five additional corridors (Northern, Eastern, Western, Southern Coastal, Central and Northeastern), as well as an extension through southern Thailand to Malaysia, but they were not included in the final version of the report [ADB 2007b]. The roads in these additional corridors are, however, included in the map indicating the vision of the overall regional road network in 2015. The general overall pattern of transport corridors in place, under construction and envisioned in the region is indicated in Figure 3-23, along with associated urban areas, towns and underlying existing major roads. The most recent

Figure 3-23. GMS road net, cities & settlements

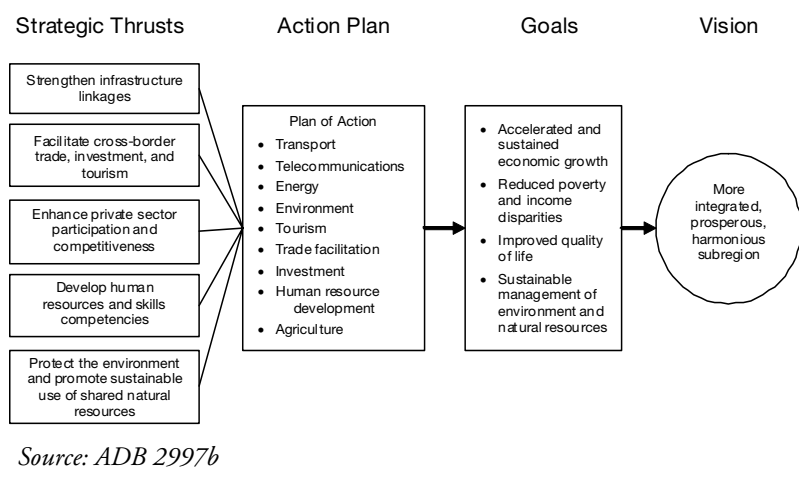


version of the ADB vision for 2015 includes a few additional corridors that are not yet on this map, but the overall pattern is indicative.

Remaining flagship programs were established to provide focus on telecommunications, energy, trade, investment, tourism, environment, water resource management, and human resources development. All of the documentation associated with GMS programs has gone to great lengths to explain that these economic corridors are seen as much more than just transportation corridors, and that together the flagship programs are pursuing the overall goals of GMS cooperation, which is "...to fulfill its vast potential, lift people from poverty and promote sustainable development for all" [ADB 207c].

Over time, however, articulation of the GMS program has changed, and the 2004 "plan of action" specified priority program implementation targets more clearly. The mid-term review by ADB notes that the focus of GMS implementation and monitoring has shifted from "flagship programs" to the sectors and areas of subregional cooperation, which are articulated with the diagram reproduced in Figure 3-24. The tourism program was added in 2004, the core environment program was adopted in 2005, and a core agricultural support program has just been adopted.

Figure 3-24. GMS Strategic Framework 2002 - 2012



While marketing of GMS programs places heavy emphasis on "software" components and "soft" sectors, with frequent references to poverty alleviation, how project resources under these programs have been allocated thus far paints a somewhat different picture, as indicated in Table 3-10.

Table 3-10. Financial resources allocated to GMS projects, 1992-2006

	first phase		second phase		overall		Funding source (%)			
	1992-1999		2000-2006		1992-2006		Govt only	Co-finance	ADB only	
	M US\$	%	M US\$	%	M US\$	%				
Transportation	2,233	85.4	2,493	60.0	4,726	69.8	44	23	33	100
Energy	383	14.6	1,578	38.0	1,961	29.0	5	81	14	100
Tourism	-	-	47	1.1	47	0.7	26	-	74	100
Health	-	-	39	0.9	39	0.6	20	2	78	100
Total	2,616	100	4,156	100	6,772	100	32	39	28	100

Source: ADB 2007b. *Mid-term Review of the GMS Strategic Framework*

Indeed, in projects funded during 1992-2006, which total to an impressive US\$ 6.8 billion, 70 percent of all financial resources have been allocated to transportation infrastructure, and

another 29 percent to energy infrastructure. A total of 1.3 percent of financial resources have been allocated to tourism and health, and apparently only technical assistance funds (not included in the table) have been allocated to other sectors. There are also additional components of these overall systems not included in these figures, that are being built apparently from national budgets and through bilateral collaborations within the region, such as fiber optic networks, etc.

The overall pattern of resource allocation under the GMS and its focus on facilitating trans-border flows of goods, people and resources has not gone unnoticed, however, and skeptics are raising a range of questions related to possible discrepancies between rhetoric and actions. As Oehlers [2006] notes, a number of shortcomings in the developmental vision underpinning the GMS programs have been raised by various studies, to which he adds his own cautions about the potential of the “regional market economy” as articulated under the GMS program to deliver on its goal of poverty reduction. Oehlers particularly questions whether increases in economic flows within the region based on cost differentials associated with current patterns of production structures and specialization will be sufficient to bring about change that is either enduring or deep enough to improve production and productivity, and thus address fundamental issues associated with poverty. He especially points to needs to address a range of issues in the institutional environment within which all this is taking place.

Recent reviews of impacts of regional integration on various forms of migration in the GMS raise another range of issues associated with increased “connectivity” in a region where there are large degrees of disparity among localities and states [Sciortino et al. 2007; World Bank 2006d]. The review by Sciortino et al. [2007] especially underscores the many dimensions and implications of migration in response to incentives and disincentives associated with disparities at multiple levels, which are illustrated by recent and current movements of people within the GMS itself, including several closely related with GMS regional projects. Rapid urbanization, feminization of poverty, and official and unofficial movement of young unskilled labor among countries, are increasing numbers of often stateless people seeking work and a better life. Under current conditions many are vulnerable to exploitation and trafficking, have little or no access to education, health or other social services, and are frequently subjected to threats, violence, extortion, fraud or deception [Sciortino 2007, World Bank 2006d]. Various of these conditions, including health threats such as HIV-AIDS can affect people within their own country where related changes are occurring, as illustrated by a study in Laos [Lyttleton et al. 2004]. Unless the related institutional environment in the region can be improved, increased “connectivity” brought about by easier travel is likely to exacerbate these problems.

The mid-term review of the GMS program by the ADB acknowledges that there are legitimate issues being raised regarding issues such as these [ADB 2007b]. But it yet again denies any singularity of focus on physical infrastructure. Rather, it argues that emphasis on removing physical barriers to connectivity among GMS countries has been a necessary initial priority, and that progress on the “hardware” components involved has been good. It also claims that reasonable progress has been made in negotiating and initiating additional programs related to “soft” aspects of regional cooperation, most of which have only begun to become op-

erational during recent years. It then goes on to identify a substantial number of “opportunities” for further emphasis that will be critical for achieving the goals and objectives of the GMS Strategic Framework. Many of these areas include those identified by outside analysts and skeptics, and are grouped into areas related to increasing competitiveness of production systems (including agriculture), to helping translate advances in physical connectivity into accelerated improvements in livelihoods and poverty reduction, and to “containing and mitigating” undesirable consequences such as transmission of communicable diseases, illegal migration of workers, and environmental degradation. Time will tell how many of these “opportunities” will be acted upon, and what will be the impact.

In any event, it is undeniable that changes in physical infrastructure have been, and will continue to be a very important factor in changing the framework within which local livelihoods throughout the region are conceived and continue to evolve.

3.3. Case studies of production change and development

Given the continuing major changes in the context in which opportunities for market production are emerging, we now turn to some specific examples of change and development in local sites in the Greater Mekong Region. We begin with a section on how changing patterns of commercial production are reflected in land use patterns in the Upper Ping Basin, where the extent and degree of commercial production is greatest among our case study sites, but where there are also areas with characteristics and some types of conditions that still resemble remote areas in other parts of the region. We then turn to brief examinations of patterns of commercialization and change in selected aspects of local economies in the UPB, as well as in case study in sites in Vietnam, Yunnan and the Lao PDR. This is followed by brief discussions of roles played by state and private sectors in examples of commercial production arrangements from our various sites in the region. The section concludes with a note on linkages between lowland and upland economies in the context of the Upper Ping Basin.

3.3.1 Commercialization of land use in the Upper Ping Basin

Land and water resources are key basic elements in resource domains of local households and communities in mountain areas of the region, including the Upper Ping Basin (UPB). And since characteristics of these basic natural resources are not distributed uniformly, local configurations of natural resources have a strong influence on how various market production opportunities are perceived, as well as on the viability of commercial production in the context of globalizing economies. Moreover, patterns of land use for commercial production will also reflect competition from other sectors of the economy and society for land, labor and capital resources that are in demand for alternative uses. Resulting tensions among competing demands can result in policies that seek to pull or push change in different directions.

This section focuses on assessments of land use in the UPB that employ the quite high resolution spatially explicit database developed by Methi Ekasingh and his colleagues at Chiang Mai University under support from the Thailand Research Fund, and its associated modules to support provincial decision-making related to agricultural policy and management issues. These assessments provide us with an overview of how changing market opportunities have interacted with distributions of natural resource characteristics, human settlement and investment patterns to shape agricultural production systems in the UPB. At the same time, the assessments demonstrate some important emerging analytical tools that can help guide future decisions about how best to respond to continually changing market conditions as regionalization and globalization bring new levels of complexity that market-based production decisions must consider.

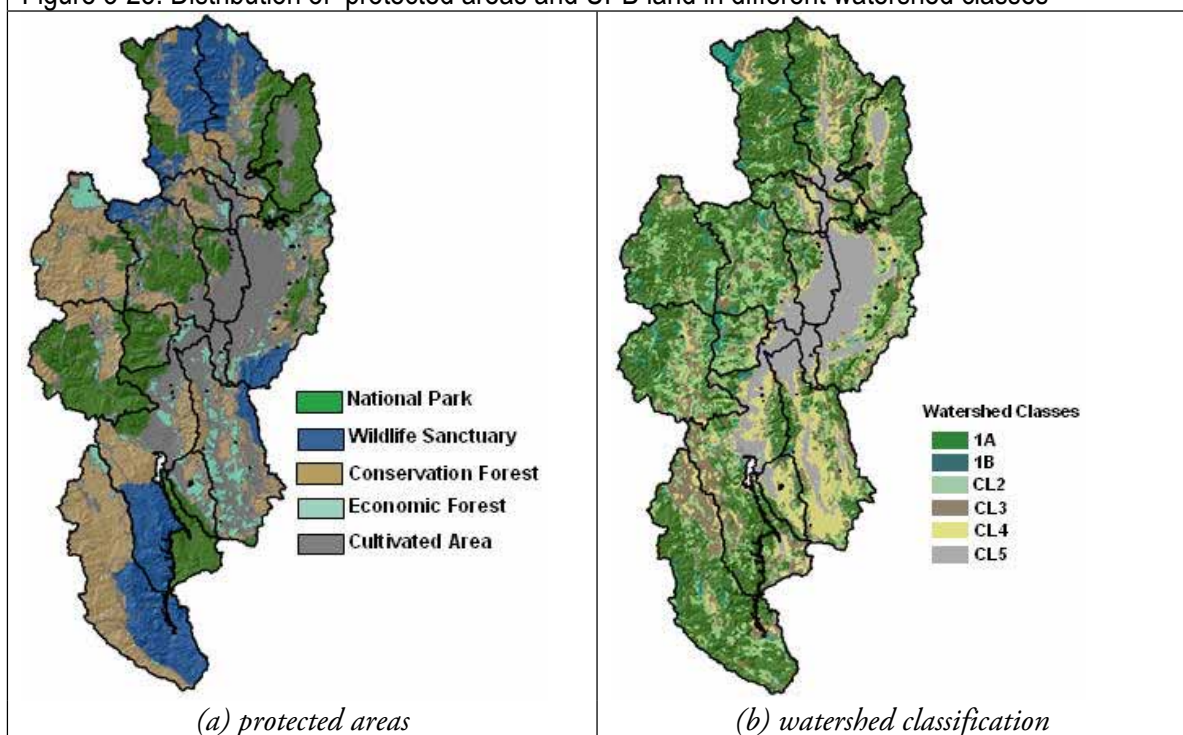
Since most of the more extensive and complex commercial agricultural production systems in the UPB have a central focus in and around the Chiang Mai-Lamphun Valley area, we conclude this section with a brief look at land use patterns in some local sub-watersheds of the Mae Chaem sub-basin. This provides an example of how forces shaping production patterns in the Chiang Mai-Lamphun Valley are also interacting with more remote areas in montane

zones of the UPB, and inducing responses that are conditioned on contexts that are more strongly affected by policy-induced constraints that have a bit different set of similarities with contexts in other montane zones in the region.

Land Use and Production Systems

Access to land resources is constrained in the Upper Ping Basin (UPB) by protected areas (national parks and wildlife sanctuary) and conservation forest (Figure 3-25a). In addition, agriculture is forbidden or highly restricted within watershed class 1 and 2 zones, but limited agricultural activities are allowed on the land that belongs to watershed class 3 and 4, and are unrestricted in watershed class 5 zone, which are mainly lowland area (Figure 3-25b). Other aspects of physical access in the UPB are further discussed in the next chapter.

Figure 3-25. Distribution of protected areas and UPB land in different watershed classes

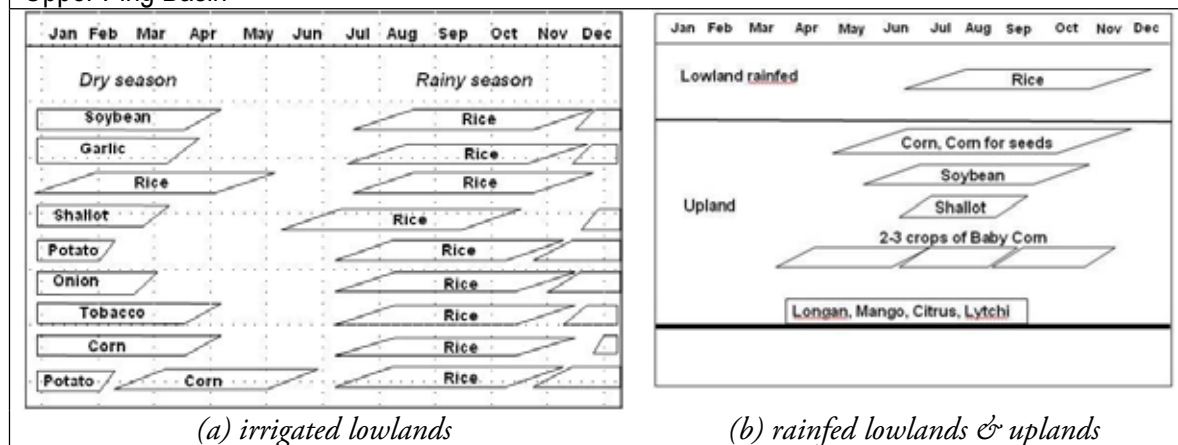


But despite these restrictions, the UPB supports one of the most diversified and productive agricultural systems in northern Thailand, including agroecosystems that range from lowland paddy to temperate fruits and vegetables in the highlands.

The most productive agriculture areas are irrigated lowlands, and rice still dominates this agricultural landscape during the rainy season (Figure 3-26a). Rice is usually grown during July to August and harvest time is between November to early December, and both glutinous and non-glutinous varieties are cultivated. In the dry season commercial crops such as garlic, shallot, onion, potato, soybean, and corn are grown, while dry season rice is preferred in areas where irrigation water is available from any of the three large scale irrigation systems. In lowland rainfed areas, rice is also the main choice of farmers, due to good surface water storage capacity of the poorly drained soils.

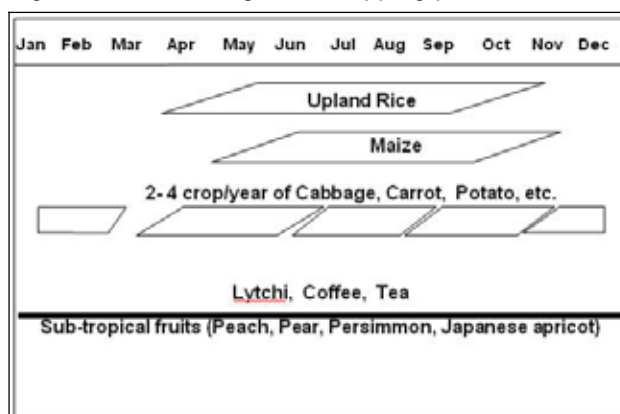
In the uplands, corn and soybean are preferred by farmers [Benchaphun et al. 2004]. As illustrated in Figure 3-26b, shallot and baby corn are short duration crops that are grown commercially in UPB uplands. Fruit trees such as longan and mango are also widely grown in upland areas, and to a lesser extent citrus and litchi.

Figure 3-26. Main cropping patterns in irrigated lowlands, and rainfed lowlands and uplands of the Upper Ping Basin



Upland rice is grown as a staple food on sloping land, while paddy rice is cultivated in flat land of small valleys of the highlands (Figure 3-27). Maize is cultivated for commercial purposes during mid May to mid September on sloping land. Climate conditions in the highlands are favorable for vegetables and sub-tropical fruit crops. Short duration cash crops such as cabbage, carrots, and other vegetables were introduced by the Royal Project Foundation, and have been well accepted in local and Bangkok markets for decades. Two to four crops of vegetables per year are possible in some areas on the highlands where water is available for low-cost sprinkler irrigation system. Peach, pear, persimmon, and Japanese apricot are examples of sub-tropical fruit trees that are currently grown. However, their products have been severely threatened by higher quality products now imported from China.

Figure 3-27. Main highland cropping patterns



During the last decade, there has been significant change in agricultural land use in UPB. In general, the planted area of the main rice crop declined by 26,875 ha (Figure 3-28a), while production areas of soybean, garlic, and dry season rice decreased by 14,106, 4,218, and 3,778 ha respectively, and growing areas of shallot increased by 2,066 ha (Figure 3-28b). Two factors are responsible for the decline in cultivated area of main season rice and soybean: (1) the expansion of city of Chiang Mai and its suburbs into irrigated areas, and (2) an increase in longan production area by 51,109 ha (Figure 3-29) in response to demand for dried longan in China together with more efficient longan dryers and marketing facilities. The growing areas of litchi, tangerine and mango were found to have increased by only 8,568, 6,444, and 1,100 ha, respectively, during this period.

Figure 3-28. Changes in cultivated areas of irrigated lowlands during 1991-2002 for main season rice and dry season crops

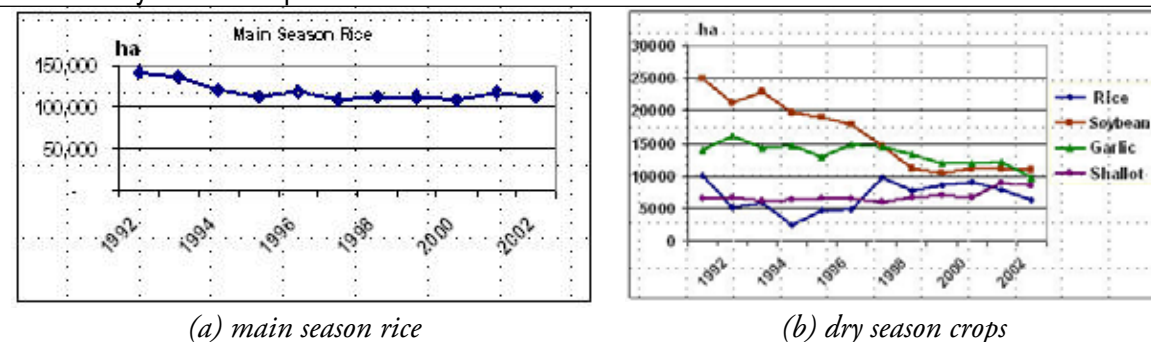


Figure 3-30 displays distribution of major cropping systems as interpreted from Landsat TM and field survey in 2000. The changes in selected land use where expansion of urban and longan production area took place during 1988-2000 are illustrated in Figure 3-31.

Figure 3-29. Change in cultivated fruit tree area 1991-2002

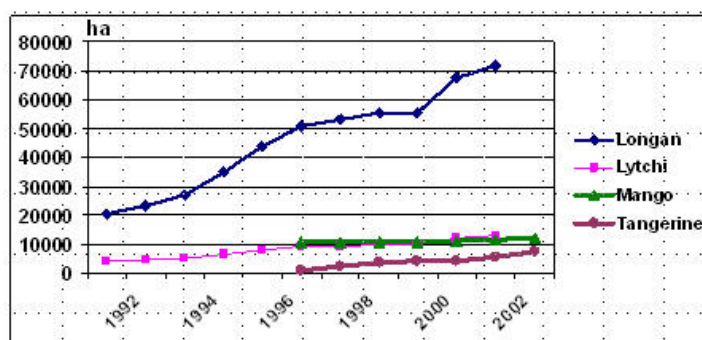
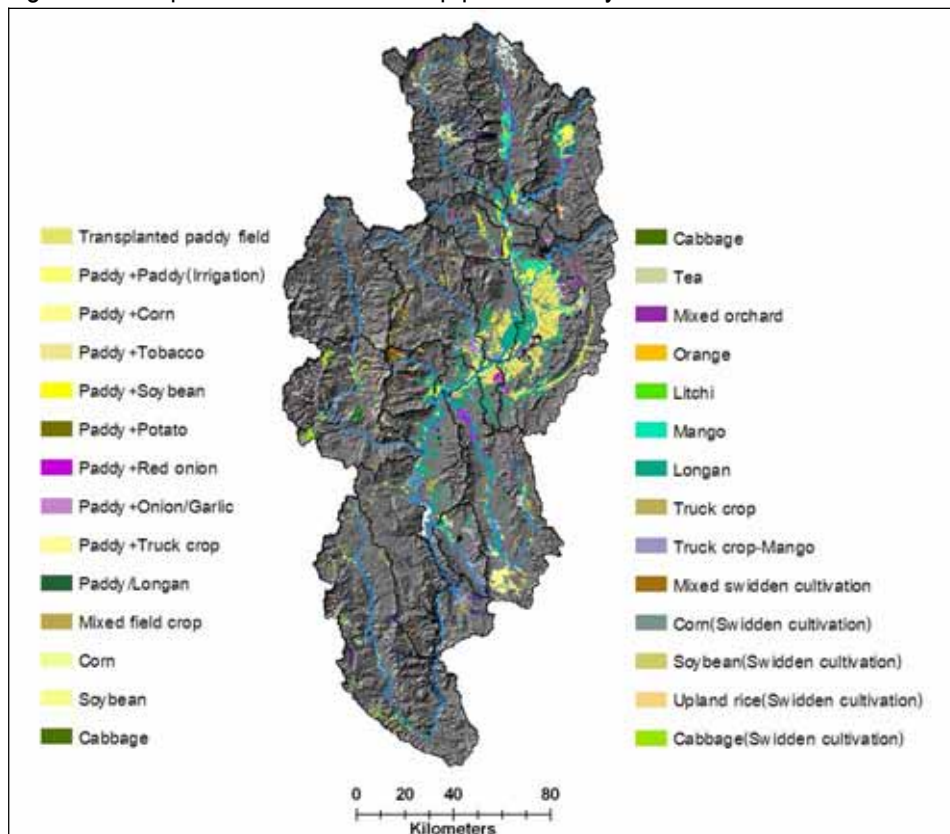


Figure 3-30. Spatial distribution of crop production systems



Source: Benchaphun, et al. 2004

Assessing potential production area

The dynamics and competitive nature of agricultural production require information on potential land use options to cope with changes in demand for food and environmental quality. Land evaluation is the process of predicting the potential use of land regarding the purpose of its use and land attributes. Modern land evaluation is based on the FAO Framework for Land Evaluation [FAO 1976]. A variety of analytical models can be used in these predictions, ranging from qualitative to quantitative, functional to mechanistic, and specific to general approaches. Fuzzy set is one technique that has been used to standardize land attributes prior to applying specific decision rules for evaluating land for its physical suitability [Ahamed et al. 2000; Baja et al. 2002; Braimoh et al. 2004; Sicat et al. 2005]. Land evaluation at the regional scale requires a geographic information system (GIS) to effectively build and store land mapping units and their attributes. A customized interface is required for interacting with a user in these processes. In this study, Multi-criteria Decision Making (MCDM) approach [Malczewski 2004] was used to evaluate LMU for specific and relative suitability (see Box 3-1).

Since available land resources can support multiple cropping in some areas, land suitability results are discussed separately for main (rainy) and dry season crops while fruits and perennial trees are discussed in terms of year-round use of land resources.

Suitability for rainy season crops

1. *Rice.* Rice requires relatively flat land and poorly drained soils to store rainfall to meet its relatively high water requirement. The soils in the lowland of UPB match this requirement. Large portions of the land with high values of CSI for rice are located in Mae Kuang and Mae Ping Section 2 sub-basins (Figure 3-32) largely due to good access to irrigation water from Mae Kuang, Mae Ngad-Mae Fak and Mae Taeng irrigation projects. Smaller parts of suitable land for rice are found in smaller valleys in various sub watersheds where small-scale irrigation systems organized by communities adequately supplement rainfall during rice growing season to meet water requirement for paddy.

Figure 3-31. Expansion of longan and urban area into paddy fields, 1988-2000

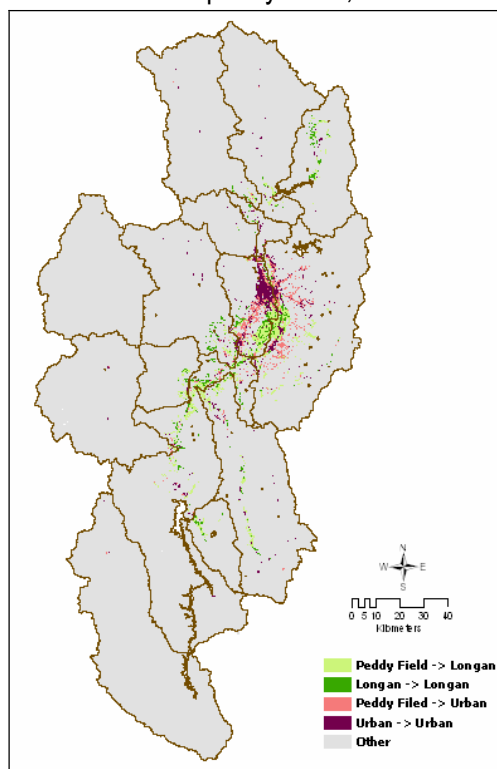
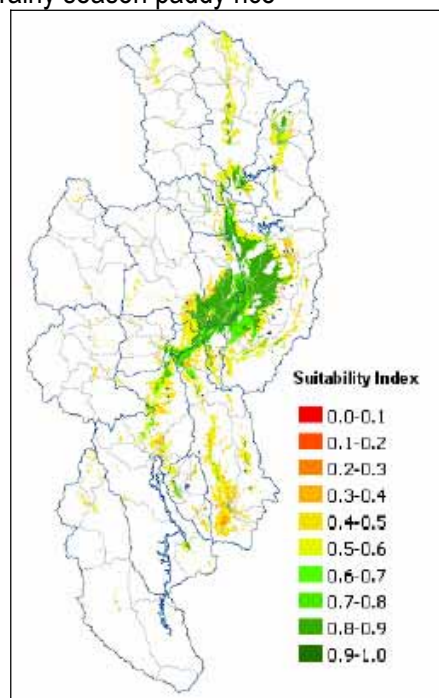


Figure 3-32. Crop suitability index for rainy season paddy rice



Box 3-1. Multicriteria Land Evaluation in GIS

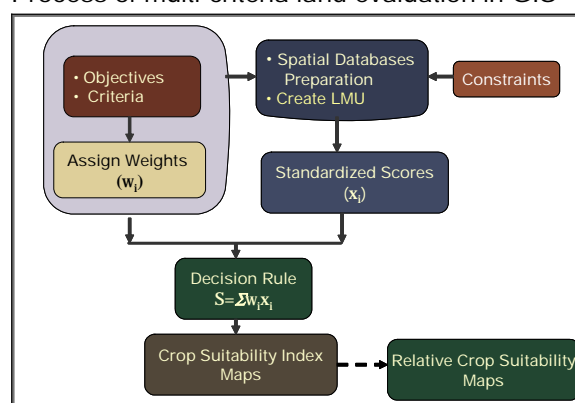
The land evaluation process in GIS starts with creation of a Land Mapping Unit (LMU), a relatively homogeneous land area with respect to key land attributes affecting long term crop production. LMU is created by overlay analysis of various map layers including soil boundary, climate zones, and irrigated area in GIS. Hence, land characteristics such as soil properties, effective rainfall, temperature and water availability are linked to each polygon of LMU, and Land Characteristics (LC) are derived. Land Quality (LQ) is then determined by comparing LC with Land Use Requirements (LUR) of Land Utilization Types (LUT). Selected LUTs were used in this study according to the extent of their cultivated areas. For the rainy season, paddy rice, field corn, and soybean were chosen, while rice, garlic, onion, soybean and corn were selected for the dry season. Longan, litchi, citrus, mango, and rubber are fruit and perennial trees used in the study. Details of LUR for each LUT were modified from those published by Department of land Development [Tansiri and Saifak, 1999]. In the DLD procedure, LUR is the assemblage of LC for each severity level of each LQ, i.e., suitable (S1), moderately suitable (S2), marginally suitable (S3) and not suitable (S3). In addition, the physical suitability assessment for LMU in the DLD method is based on a multiplication decision rule assuming equally weighted LQ. Results are expressed as suitability levels (S1, S2, S3, and N) for each LMU and LUT. Thus, it causes problems in ranking suitability of relative crops, compared to using the continuous value of crop suitability.

In this study, a Multi-criteria Decision Making (MCDM) approach [Malkowski, 2004] was used to evaluate LMU for specific and relative suitability. LQs were considered as criteria for this decision problem. Since the criterion values differ greatly in ranges and measurement units, fuzzy functions [Burrough, 1989] were used to standardize LC into a land quality index ranging from 0 to 1. These functions approximate the sufficiency of each criterion to sustain crop productivity. Once the relative weight of importance for each criterion had been assigned, weighted linear combination was then employed to derive crop suitability index (CSI) for each LMU.

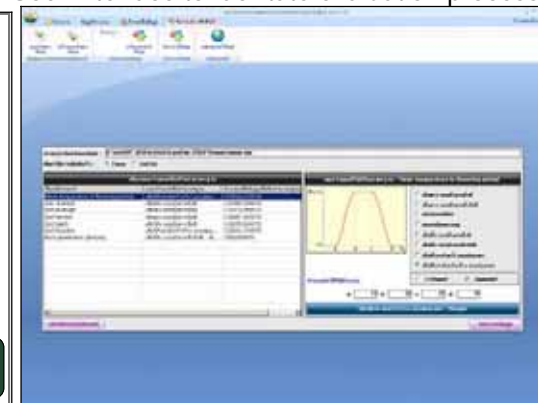
The crop suitability index is a continuous number ranging from 0 (least suitable) to 1 (the most suitable). The suitability index has certain advantage to the traditional categorial value of suitability level because it conveniently ranks relative suitability of all crops being considered for determining the most suitable crop for a given LMU. The implementation of land evaluation in GIS is a complex process (left figure, below) involving spatial data preparation to create criterion maps, standardized criterion maps and decision analysis. The results are repeatable and sensitivity analysis of criteria can be achieved.

A graphic user interface is necessary to facilitate and interact with the the users through the approved procedure. Such an interface in Thai was developed (Samranpong et al., 2007) to facilitate user to identify criteria (LQ) and their associate weights of importance prior to the analyses (right figure, below).

Process of multi-criteria land evaluation in GIS



User interface to facilitate evaluation process



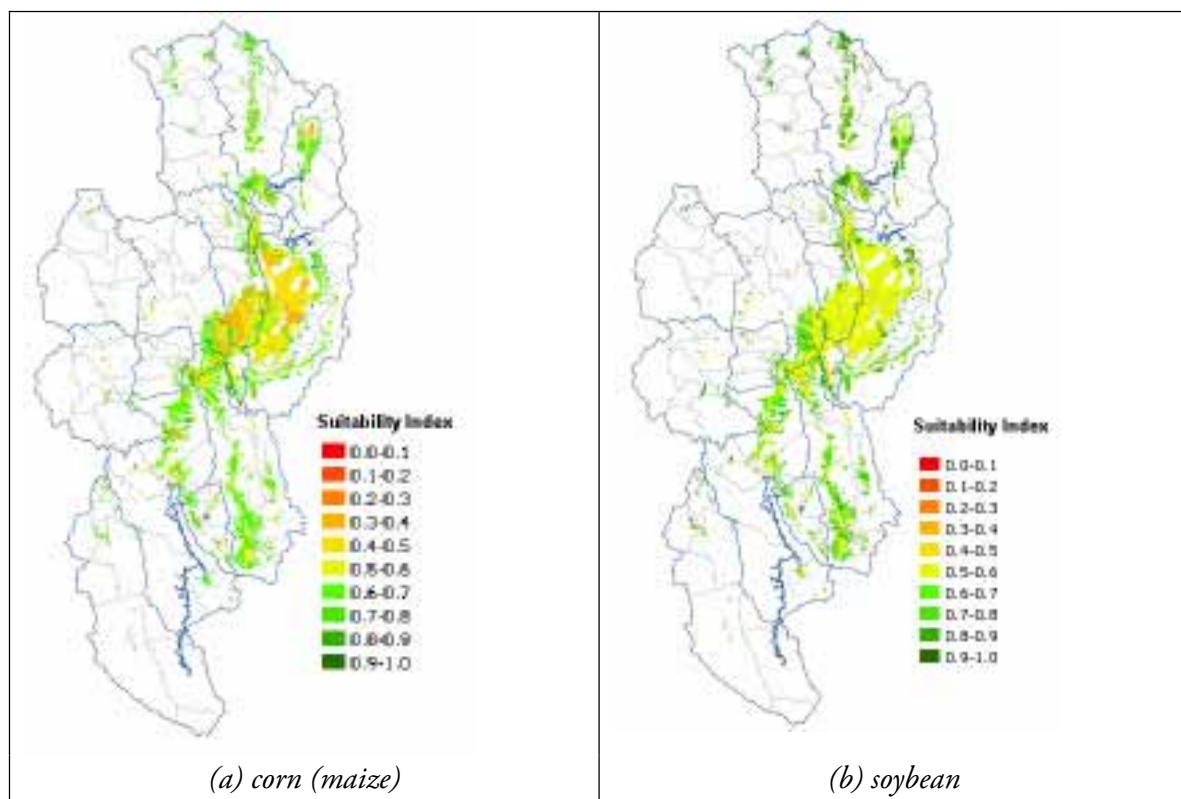
The user may select the suitable functions to generate standardized criterion maps before decision analysis; the suitability index map is displayed as a result. Since land resource is adequate to support multiple cropping in some areas, land suitability assessments were conducted separately for main (rainy) and dry season crops while fruit and perennial trees will be discussed in terms of year round basis use of land resources.

In lowland rainfed areas CSI decreases to the vicinity of 0.4-0.6, and drops further to 0.2 where slope of the land rises.

2. *Field crops*. In contrast to paddy rice, field crops require less water, better soil drainage, deeper root penetration and optimal soil acidity. Results of crop suitability assessment for corn suggest that high CSI is found in upland areas of Mae Lee, Mae Ping Section 3, Mae Ngad and Mae Ping Section 1 (Figure 3-33a). Lower CSI for corn were found in irrigated lowlands of Mae Kuang, Mae Fak-Mae Ngad, and Mae Ping Section 2 sub watersheds as the consequence of poor drainage following excessive rainfall during the rainy season.

Similar results were observed from suitability assessment for soybean. In general, uplands in Mae Lee, Mae Ping Section 3, Mae Ngad and Mae Ping Section 1 exhibit higher land quality for producing soybean than in irrigated lowlands in the rainy season (Figure 3-33b). However, soybean is slightly less sensitive to water logging and unfertile soils, so that slightly higher CSI values were detected in both lowlands and uplands for soybean compared to corn.

Figure 3-33. Crop suitability for corn and soybean in rainy season



Suitability for dry season crops

The amount of rainfall is not adequate to support annual crops during the dry season. Thus, moderately high to high values of CSI are located in areas where irrigation water is drawn from various sources.

1. Rice: In irrigated areas, CSI values range from 0.4-0.9 in service areas of Mae Kuang, Mae Ngad-Mae Fak and Mae Taeng irrigation projects (Figure 3-34). However, this assessment assumed adequate water for rice, which rarely occurs during normal years. In the rainfed lowlands, no irrigation is available during the dry season, and therefore CSI values for rice drop to 0.

2. Field Crops: Soybean and tobacco seem to be more well suited for LMUs within service areas of different irrigation projects during the dry season than are corn and potato (Figures 3-35 and 3-36). However, those LMUs have several limitations for corn and potato, including heavy soil texture and poor soil drainage, resulting in relatively low CSI values for corn and potato.

Figure 3-34. Crop suitability index of dry season paddy rice

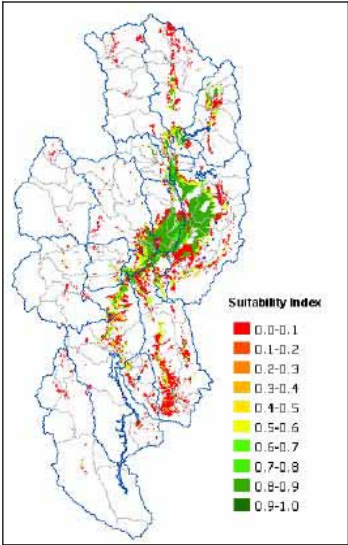


Figure 3-35. Crop suitability for corn and soybean in dry season

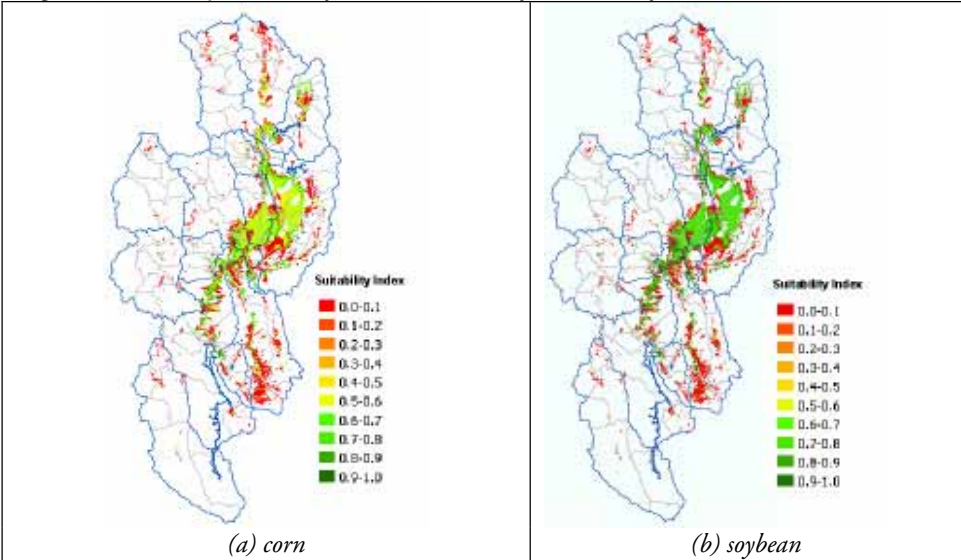
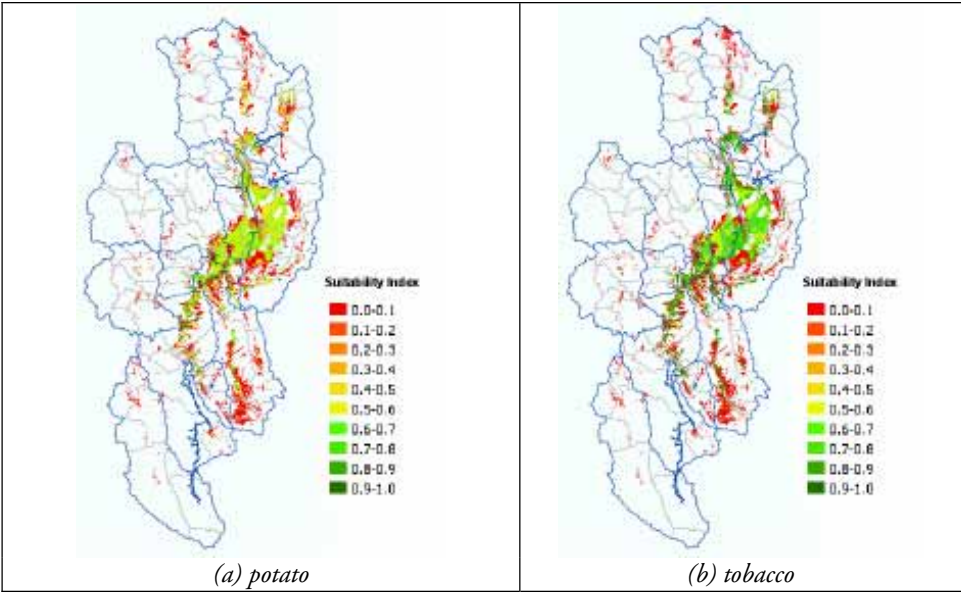


Figure 3-36. Crop suitability for potato and tobacco in dry season



3. *Vegetables.* Major vegetable crops such as garlic, onion and shallot have similar land use requirements. They prefer good drainage and light soil, and have less irrigation requirements than rice and field crops. Results of land evaluation indicate that CSI values for these crops range from 0.6-0.8 in most lowland irrigated areas while values drop to 0 in areas where irrigation water supply is unavailable during the dry season (Figure 3-37).

4. *Fruit Trees.* In this study, emphasis of land evaluation for fruit trees was on major species commonly grown in UPB i.e., longan, litchi and mango. However, tangerine was included due to its recent expansion in upper parts of the watershed.

- *Longan* Longan is the most important fruit tree in the upper north of Thailand. Production area is close to 112,000 ha, mostly in UPB. Longan requires deep soil, good access to water, good drainage and a specific range of temperature during flowering stage. Figure 3-38 shows distribution of crop suitability index for longan. Moderately high values of CSI (0.6-0.8) are associated with irrigated lowlands, with highest CSI values (>0.8) found along banks of the Ping river in Mae Ping Section 3 sub watersheds where good irrigation from EPS and well drained soils coexist. Most rainfed uplands are associated with CSI values ranging from 0.3-0.5 due to inadequate water supply for irrigation during the dry season which coincides with flowering and fruit settings.
- *Litchi and Tangerine.* Crop requirements of Litchi and Tangerine are similar to Longan except that lower temperature and slightly better drainage are required. Highland and upland areas where temperature and effective rainfall are favorable provide good land quality and hence high CSI for litchi and tangerine. These areas are located in the upper part of Mae Ping Section 1 watershed (Figure 3-39).
- *Mango.* Distribution of CSI for mango is shown in Figure 3-40a. Most lowland irrigated areas are suitable for mango cultivation particularly in well drained soil. Rainfed areas in Mae Hard and Mae Tuen sub-basins are slightly less favorable to mango due to lower water availability.
- *Rubber.* Rubber requires similar land quality to longan but higher water availability. Results of matching land quality with crop requirements reveals that moderately high CSI for rubber are scattered in many sub watersheds (Figure 3-40b). Since the temperature requirement used in this land quality assessment is for va-

Figure 3-37. Crop suitability index for garlic, onion, and shallot in dry season

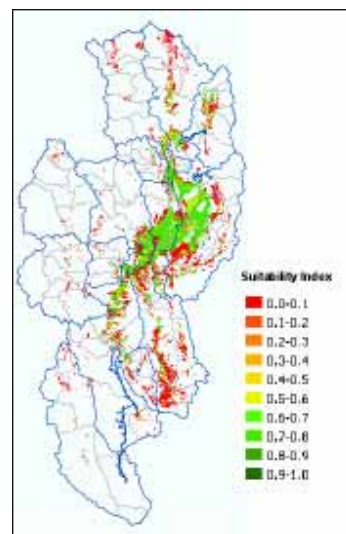
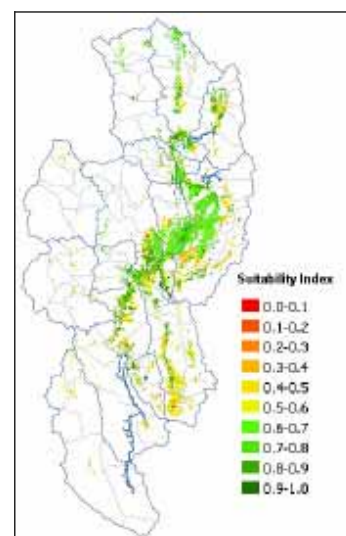


Figure 3-38. Crop suitability index for longan



rieties commonly grown in the southern part of Thailand, a new assessment should be made once data on cultivars from China become available.

Figure 3-39. Crop suitability index for litchi and tangerine

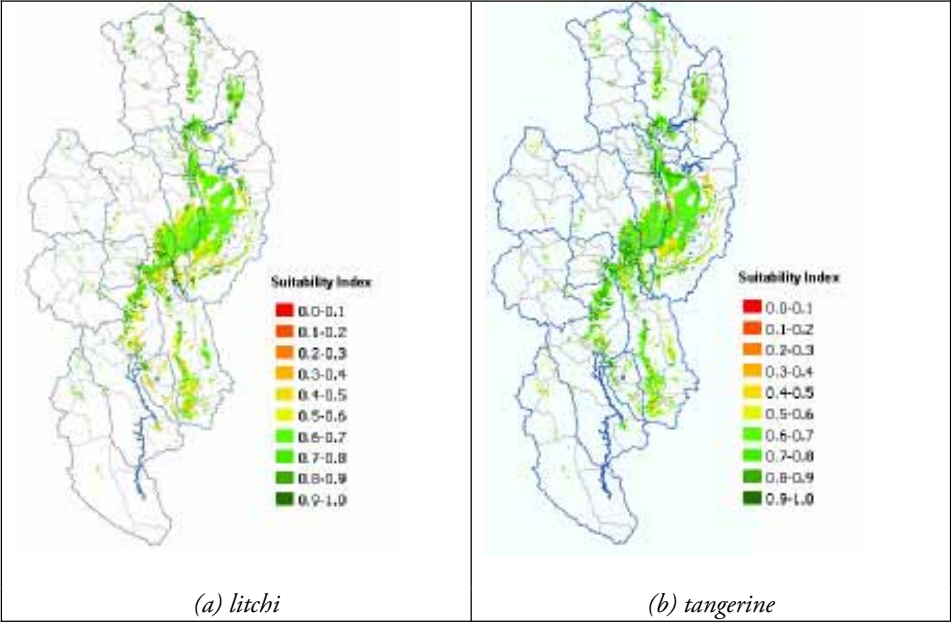
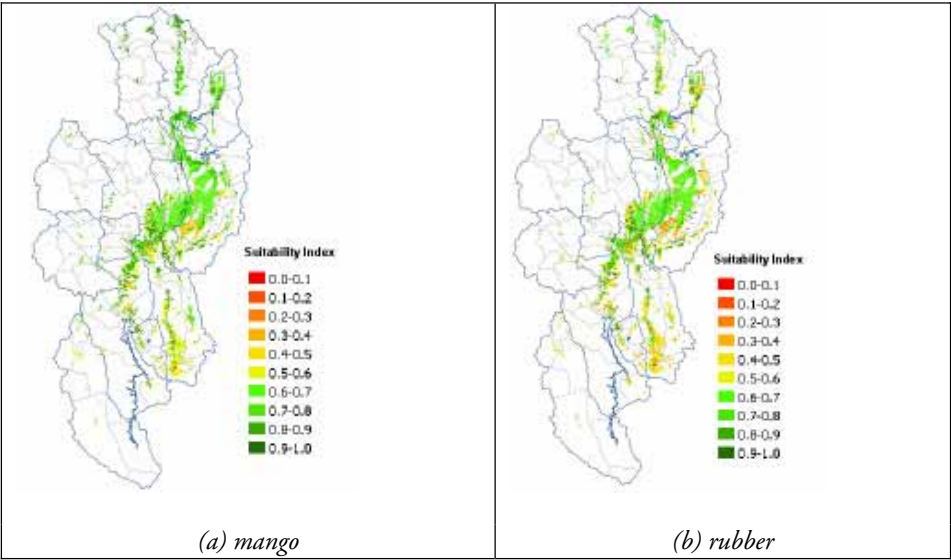


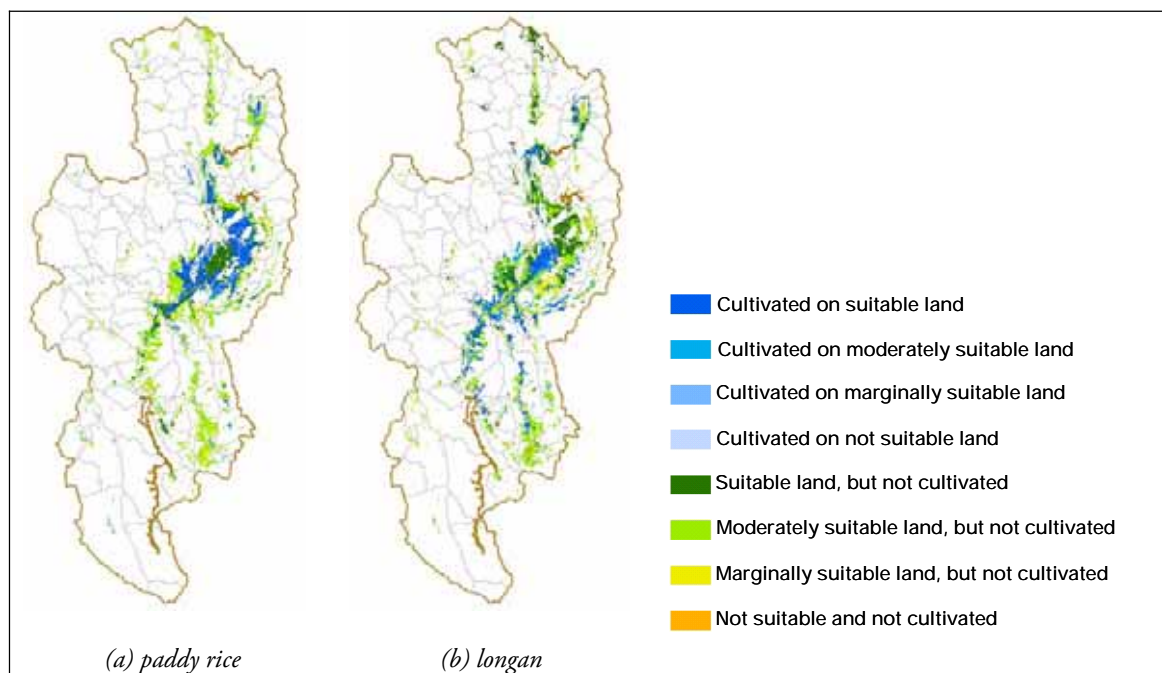
Figure 3-40. Crop suitability index for mango and rubber



Comparisons with existing land use

Spatial distribution of CSI for each crop was overlaid with existing land use in 2000 to assess the agreement between crop suitability classes and farmer's choice for land use type. CSI was grouped into four classes: suitable (0.7-1.0), moderately suitable (0.4-0.7), marginally suitable (0.2-0.4), and not suitable (0-0.2). Results of this analysis for main season rice and longan are shown in Figure 3-41. It clearly indicates that rice farmers grow rice mostly on the suitable land; some suitable lands were not used for growing rice in year 2000 mainly because farmers converted paddy fields into longan plantations through small investments to provide better soil drainage during the rainy season. Practices such as moving soil to form mounds for longan or digging drainage ditches are common among these growers. Results also reveal that there are still some suitable lands for longan available to support longan expansion if there is high market demand of this crop.

Figure 3-41. Comparing crop suitability assessment with existing land use for paddy rice in rainy season and longan

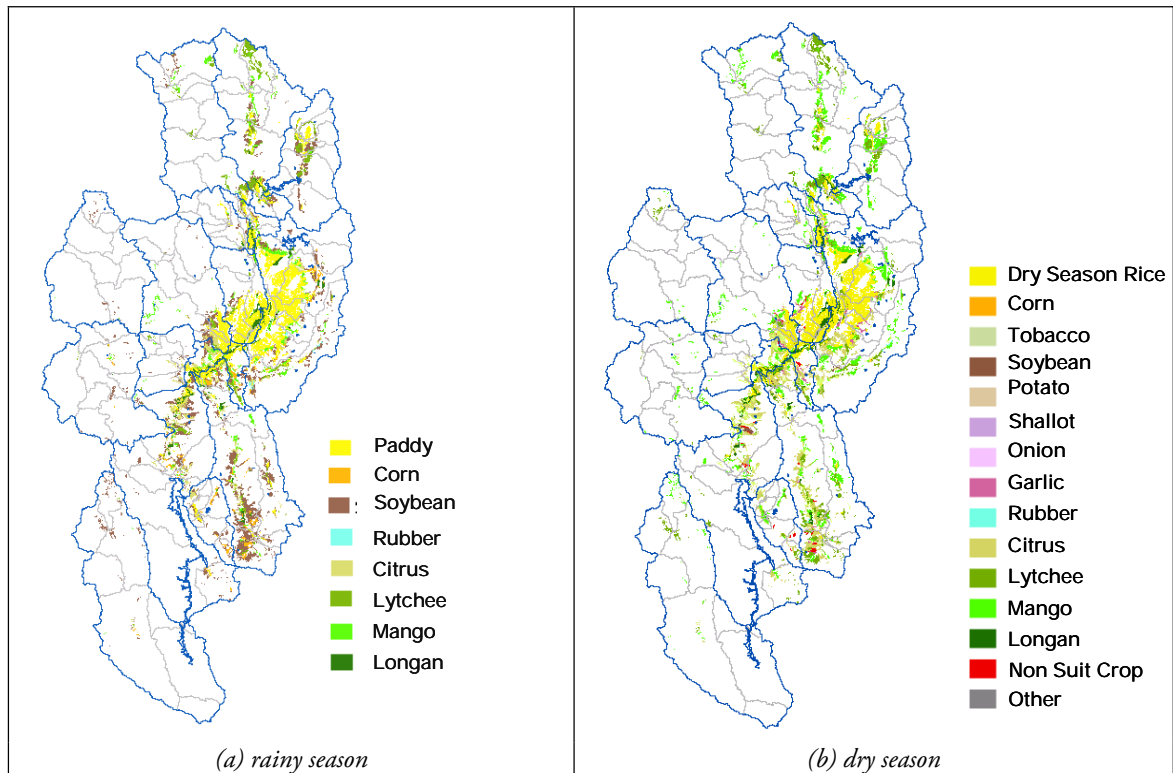


Relative suitability

The above discussion of land evaluation has focused on individual crop suitability. Although this is useful for identifying land resources for specific crop production plans, further information on which crop best suit each LMU may also be of interest. In order to help answer such questions, spatial analysis is required to compare CSI of all crops for main (rainy) and dry seasons. For each LMU, the highest CSI value and its associated crop are identified and the crop code and name is assigned to the LMU for display. For annual crops such as rice, field crops and vegetables, analyses were conducted separately for each growing season. Since fruit and perennial trees occupy land throughout the year, their CSI values were compared with other crops in the main season. Once they were assigned to a particular LMU, they

would also occupy that LMU for the dry season. Figure 3-42 illustrates relative crop suitability maps for rainy season and for dry season. In this case, free competition for the same LMU was imposed based on distribution of CSI values alone for each crop. Results indicate that paddy rice was over distributed in the irrigated lowlands both in rainy and dry seasons in comparison to existing land use. However, irrigation water supply was adequate for only part of the irrigated area in the dry season and rice was allowed to be grown only in a limited area.

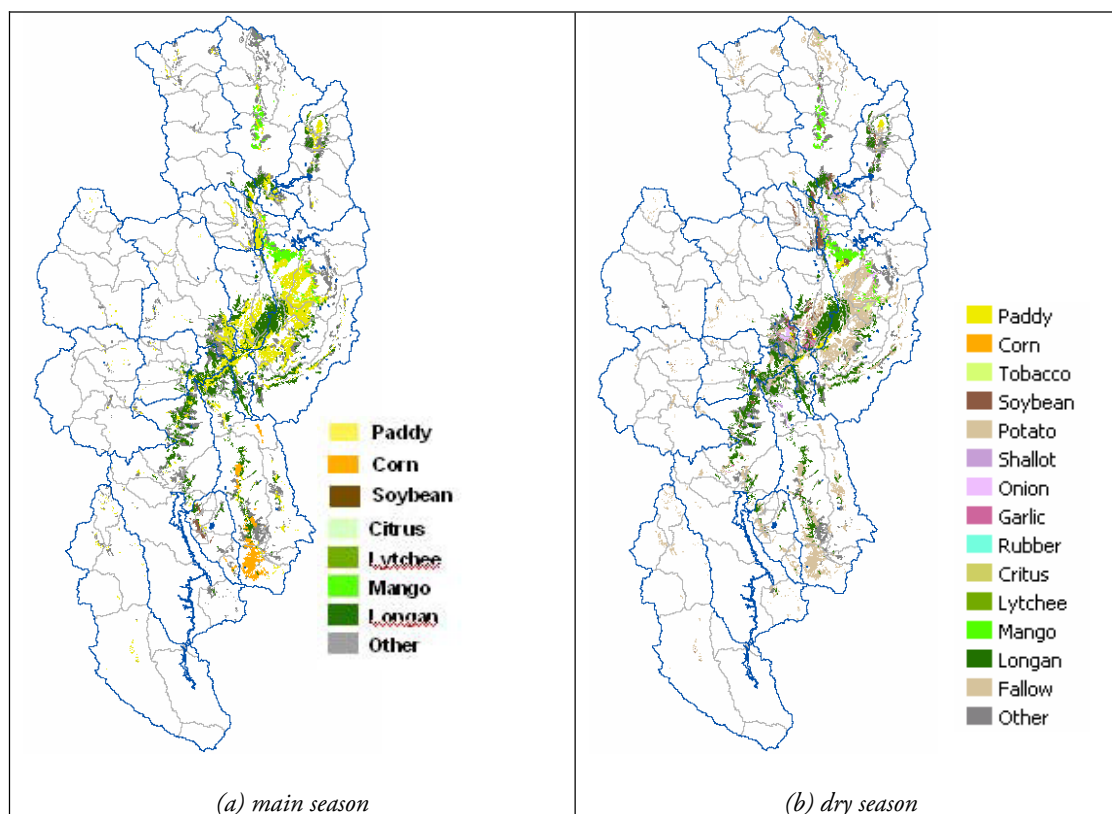
Figure 3-42. Crop relative suitability for rainy season and dry season



Production zones

Results of relative suitability analysis still have some limitation for use in crop production planning since they do not take into consideration existing land use, or relative importance of crops in relation to agricultural policy and target acreages of production to meet marketing demand, irrigation water supply, and other policies. Decision rules for relative suitability can be set so that allocation is based on existing land use, crop priority (which may be changed according to market demand, policy or economic returns), CSI values, and target area of production. These results may be considered as a crop production zone. Examples of crop production zones in UPB for rainy and dry seasons are displayed in Figure 3-43 (a) and (b).

Figure 3-43. Generated crop production zone in main season and dry season



These concepts of spatial analysis may be extended to generate most suitable areas for crop area expansion or reduction. In the case of crop expansion, crop name(s), their relative priority and new target areas were assigned through a customized interface that works with ArcGIS. This system follows decision rules to guide spatial analysis that are similar to the ones described above, and generates the resulting maps. Figure 3-44 is an example of a map resulting from plans to expand longan and rubber growing areas to meet new targets of 80,000 ha and 1,000 ha respectively. However, due to the sizes of land mapping unit, the actual areas allocated to longan and rubber were 79,984 and 9,996 ha respectively. A crop reduction strategy may also be constructed, as shown in Figure 3-45. In this case, 2,000 ha of garlic was to be reduced, and 1,000 ha each of soybean and corn were to substitute for garlic. The garlic areas that needed to be replaced were identified from LMU which have lowest values of CSI for garlic and the selected area was accumulated until the reduction target area was reached. Selected LMUs were then assigned to soybean first as indicated by its higher priority than corn (Figure 3-45), and corn was assigned to remaining LMUs until it also met the target area of replacement. This illustrates the utility of this type of tool in dynamic and strategic land use planning to cope with changes in market conditions and policy.

Figure 3-44. Crop expansion strategy for longan & rubber with the resulting production zone

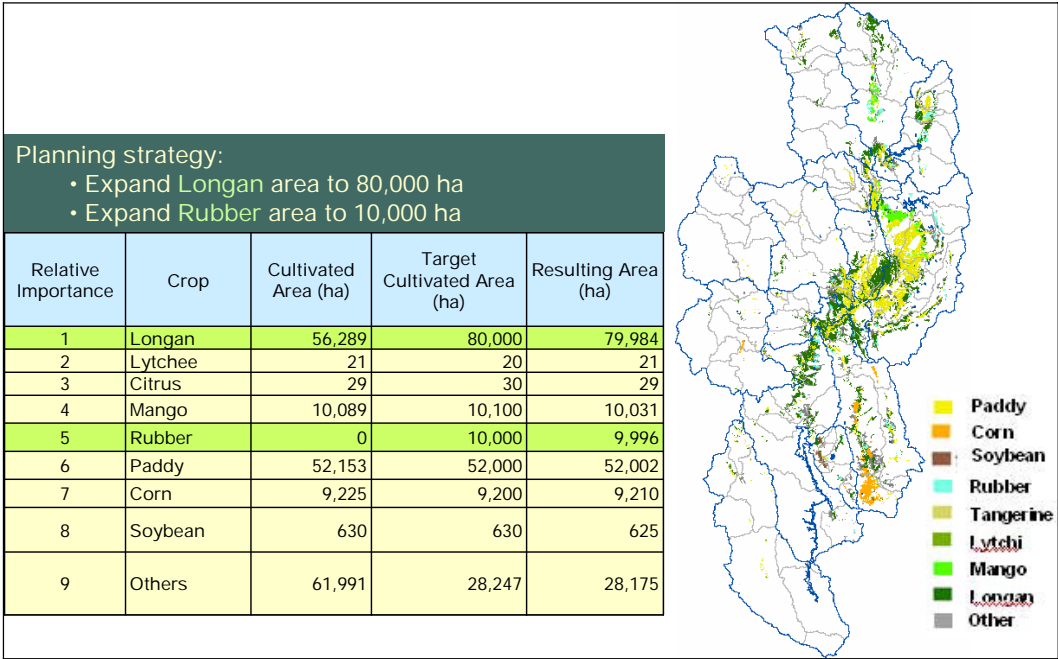
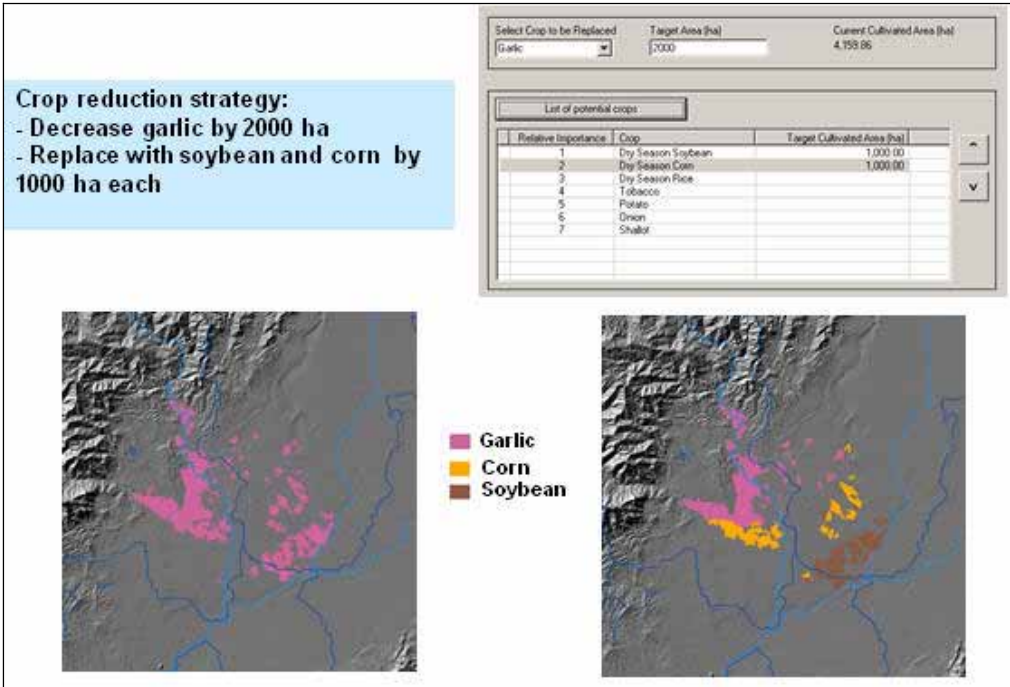


Figure 3-45. Crop reduction strategy for garlic and the resulting production zone



Remote area issues in the Mae Chaem sub-basin of UPB

The previous section demonstrates the complexities of decision-making dynamics in areas of the UPB where farmers and various levels of decision makers are faced with a multitude of changing opportunities for commercial crop production. Land use assessments clearly indicate the relative resource quality advantages of lowland and lower montane zones for production of many crops present in the UPB. To complete this overview of changing opportunities, we now turn to land use patterns in the Mae Chaem sub-basin of the UPB, where limited data on soil properties make suitability assessments difficult, and policies are mixed.

The Mae Chaem sub-basin is officially divided by an arbitrary demarcation into upper and lower Mae Chaem sub-basins, which can be seen on the western side of all the maps of the UPB in the previous section. A quick review of the maps will verify the very small amounts of area deemed suitable for major crops grown in the UPB, as well as Mae Chaem's almost insignificant share of major commercial agricultural production systems.

The section began with a brief mention of land use policy constraints on access to land resources in the UPB. Maps of protected areas and watershed classification displayed the nature and extent of these constraints (Figure 3-25). These maps clearly show how watershed restrictions and state forest lands are overwhelmingly dominant in Mae Chaem and other UPB sub-basins with land located primarily in middle and upper montane zones.

All this does not mean, however, that there is no agricultural activity in Mae Chaem. Indeed, Mae Chaem has a rich history of changing settlement patterns and land use by several ethnic groups (Figure 2-13) that pre-dates by far establishment of government zones for watershed or forest protection. The majority of people are ethnic Karen, with minorities of Lawa and Northern Thai, while Hmong and a few Lisu came to the area more recently. Except for very small lowland areas near Mae Chaem district town, traditional agroecosystems feature mosaic patterns of forest, upland fields, regenerating forest associated with rotational forest fallow shifting cultivation techniques, and small patches of paddy fields where terrain allows.

The first major impacts from commercial cropping came with establishment and growth of the opium economy. Driven and managed by powerful outside stakeholders, upper montane zones along the north-south ridges on both sides of Mae Chaem became important areas for opium production and many local residents become part of the labor force. Thus, after opium was banned and crop substitution projects were launched, upper montane zones of Mae Chaem were among their earliest targets.

Development programs aimed at opium crop substitution arrived in the 1970's and 80's, in tandem with new protected forest areas. Areas in the eastern mountains around Thailand's tallest peak (Inthanon) were declared a national park and later a second park extended protected status to the south, and forestry watershed protection units were established at strategic locations around the sub-basin. Villages in or near protected areas were the first targeted by development projects with the twin aim of substituting intensive cash crops for opium in the highland (upper montane) zone, and stopping all forms of shifting cultivation in all zones.

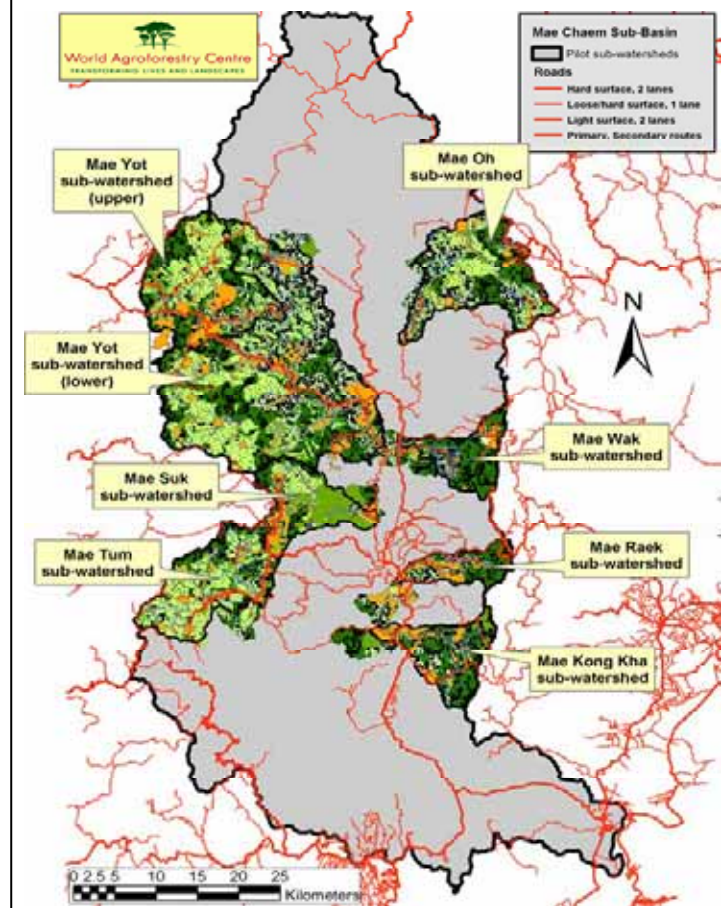
As these approaches were extended to other parts of Mae Chaem, projects built road networks in both lowland and montane zones, and encouraged lowland agricultural industries in the private sector to establish production relationships in the sub-basin. They also brought electricity, health centers, and schools. But recognition of land holdings was withheld from all but lowland zones on the pretext of their reserved or protected forest status, and after 1985 their watershed protection status. Thus, access to credit and government agricultural extension services appropriate for mountain conditions have lagged far behind mainstream lowland areas of the UPB. Lack of even recognition of their basic citizenship was a problem for most people until the 1980s and 1990s.

These sometimes contradictory government policy-led efforts to transform livelihoods and landscapes in Mae Chaem still continue, and they still continue to generate tensions between state agencies and local communities, and uncertainty about opportunities for market production. In response to this situation, most local communities have begun establishing their own informal land use zoning arrangements. These efforts have been (informally) encouraged by forestry agencies working with Royally-initiated projects, as well as NGO projects active in the sub-basin. Thus, a project was launched by the International Centre for Research in Agroforestry (ICRAF) and its partners to collaborate with local villagers in mapping a substantial sample of areas where local land use zoning had been done by villagers themselves. Support was provided by the Rockefeller Foundation under a previous grant. The seven sub-basins that were mapped are shown in Figure 3-46. More details on this work, which covered 125 settlements in 53 administrative villages and nearly 1,400 square kilometers of area, are reported by Thomas et al. [2004].

In order to help provide a broad picture of land use in these types of areas within the Upper Ping Basin, village land use maps from three sub-watersheds have been aggregated and simplified. These three sub-watersheds represent land use patterns in three different contexts that cover significant parts of the Mae Chaem sub-basin.

Mae Tum watershed (Figure 3-47) represents areas where upland rice is still produced using forest fallow rotational shifting cultivation practices that have cycle lengths of 5 to 10 years.

Figure 3-46. Sites of village land use mapping in Mae Chaem



This is verified by the area ratio of fallow fields to active cropped fields. The overall landscape also includes patches of forest that are used for subsistence purposes and others that are protected, along with some small areas of paddy land. Parts of this area were studied by Roth [2004] and Prasit [2001], and most have now been declared to be national park.

The Mae Kong Kha watershed (Figure 3-48) represents areas near a national park where forest fallow shifting cultivation has been completely transformed to a system of fixed upland fields and permanent forest. Fixed fields may involve crop rotations, but use chemical inputs rather than forest fallow to maintain productivity. This is the location of new case studies under this project reported in other sections of this report, especially in relation to hybrid maize seed production under contract farming arrangements.

The Mae Suk watershed (Figure 3-49) represents areas where the overall land use mosaic is a composite of quite different patterns associated with

Figure 3-47. Land cover under forest fallow systems

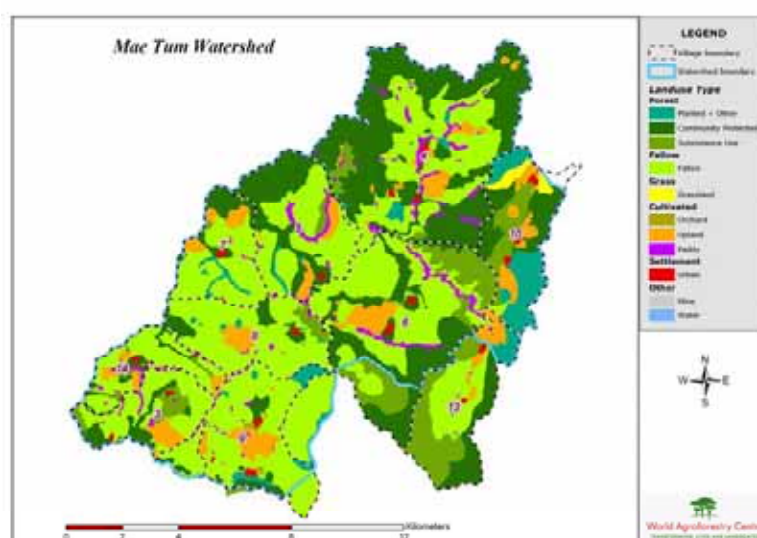


Figure 3-48. Land cover under permanent field systems

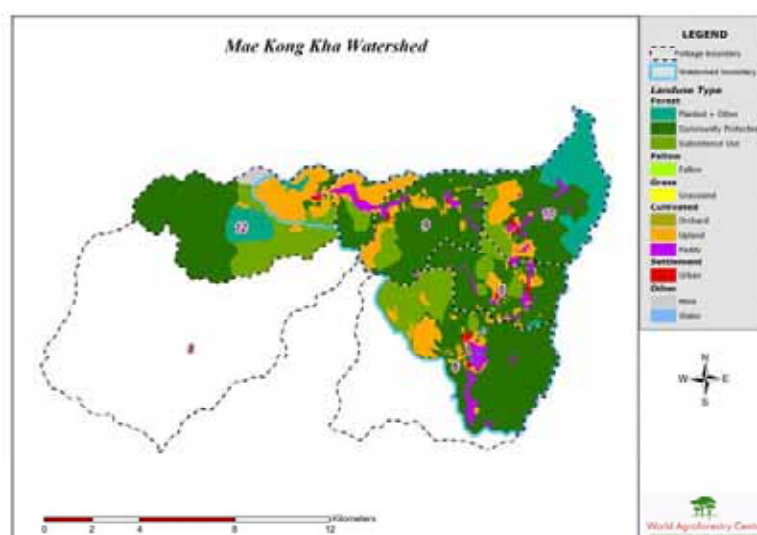
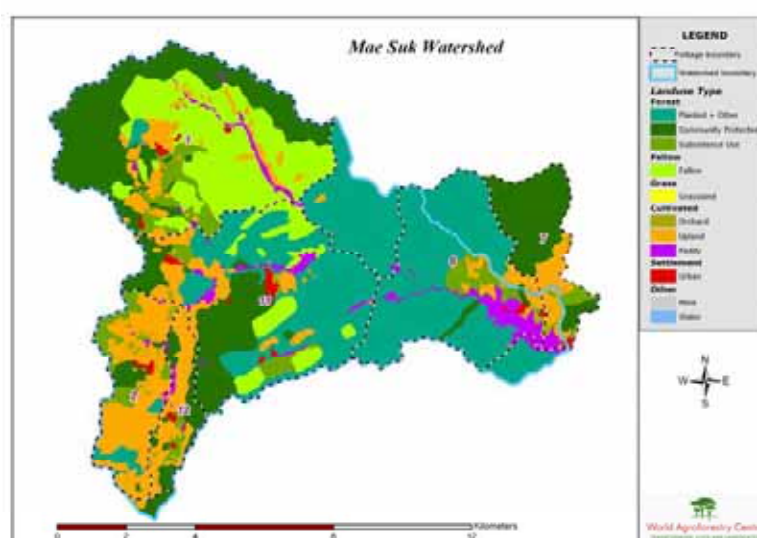


Figure 3-49. Land cover under multiple systems



villages of different ethnicity. Downstream portions of the watershed (east side) are occupied by lowland Northern Thai villages that have substantial areas of paddy fields and some permanent fields for upland crops. The northwest portion of the upper watershed is occupied by Karen communities that still rely primarily on rotational forest fallow shifting cultivation systems. Hmong communities in the southwest portion of the upper watershed were the target of opium crop substitution projects, and now they rely on relatively extensive areas of fixed fields where they conduct intensive commercial cultivation of primarily vegetables, employing technology that includes gravity-fed sprinkler irrigation using PVC pipes. Although their crops and approach have been influenced by the Royal Project, they are not part of the Royal Project Foundation network, and their production, transport and marketing systems are their own. Commercial production has been expanding into ethnic Karen villages, and Badenoch [2006] explored in considerable depth social networks and resource governance issues associated especially with water management and upstream-downstream relations.

When land use zoning maps from all seven sub-watersheds under the mapping project are aggregated, we begin to see some of the broad patterns of variation in livelihoods that have evolved in response to changing opportunities and constraints in Mae Chaem. Thus, Table 3-11 presents data on land use patterns of mapped villages aggregated first by ethnicity and then by combinations of major cropping system components: paddy rice, upland rice, field crops, and orchard. Where upland rice is produced using forest fallow systems, the ratio of fallow to upland field area is an indicator of cycle length. Data includes areas of both cultivated and uncultivated land associated with each type of system. The five administrative villages with mixed ethnicities are listed separately.

As these data indicate, variation both among and within ethnic groups is instructive. Northern Thai villages, which mostly are clustered in lowlands around the district town, have paddy lands, some fruit trees, and fixed fields for commercial production of maize. Hmong villages, which are located in upper montane locations on mountain ridges (except one area where they relocated under an early resettlement program), all have intensive fixed field commercial vegetable or fruit tree production, depending on the area. Lawa, who are locally recognized as having settled in this area before other groups, have been able to retain their mixed paddy and rotational forest fallow upland rice systems in reasonably sustainable form.

The majority ethnic Karen, however, have systems that span the full range of variation from long-cycle forest fallow to paddy with fixed field commercial maize, vegetables or fruit trees. They also have a range of intermediate medium and short cycle forest fallow systems that allow us to see the overall gradient of transformation that has been induced by pressures that continue to be applied in Mae Chaem. Government agencies and environmentalists do not believe traditional forest fallow systems can be sustainable, so areas like Mae Tum are being annexed into national parks to force people to occupy less land. The same forces refuse any official recognition of village rights to uncultivated and forest areas villages claim as part of their agroecosystems in Table 3-11. The vision underlying official policy appears to be one of small enclave village areas with a few intensive crops and non-farm income, embedded in a huge matrix of state controlled and managed protected forest land.

Table 3-11. Overall Land Use Strategies Reflected in Village Land Use Zoning Maps of Seven Sub-Watersheds in Mae Chaem by Ethnic Group, 2002

major village system components				ratio	average land resource use per household										size of examples in sample				sample share		system footprint			
paddy rice		upland rice	field crop		orchard	cultivated land				uncultivated land (ha)			villages practicing system			TOTAL Land Area (ha)	percent of sample people	sample land	persons per sq km	% of land cultiv	% forest	% perm forest		
					fallow /upland	paddy (ha)	all (ha)	paddy % (ha)	upland % (ha)	orchard % (ha)	substist forest	protect forest	all forest	forest + fallow	admin vill	natur vill	house holds	pop						
Northern Thai Villages																								
10	expanded	-	maize	<minor>	-	1.3	3.0	46	52	2	2	6	14	14	3	5	274	1,134	4	3	25	18	-	81
13	small	-	maize	<minor>	-	0.4	3.1	12	87	2	6	3	9	9	6	7	725	3,327	12	6	37	25	-	73
14	small	-	maize	fruit trees	-	0.6	5.8	11	65	24	4	2	6	6	1	4	199	882	3	2	37	49	-	50
18	<minor>	-	-	garden	-	0.1	0.1	83	0	17	-	-	-	-	1	3	114	473	2	0.02	1,970	39	-	-
Lawa Villages																								
1	small	long forest fallow	<minor>	<minor>	10.7	0.4	2.3	19	81	-	2	3	5	25	1	1	46	237	1	1	19	9	74	17
2	<minor>	medium forest fallow	<minor>	<minor>	6.2	0.1	1.6	8	92	-	0.1	2	3	13	1	1	65	375	1	1	40	11	65	22
3	expanded	medium forest fallow	<minor>	<minor>	7.8	1.5	3.7	41	59	-	5	12	17	34	2	3	116	610	2	3	14	10	45	44
Karen Villages																								
1	<minor>	long forest fallow	<minor>	<minor>	14.0	0.2	2.4	9	88	3	1	15	19	48	3	10	233	1,447	5	9	12	5	57	38
2	small	medium forest fallow	<minor>	<minor>	4.7	0.4	3.4	12	87	1	2	11	14	28	5	16	494	3,290	12	11	21	11	44	45
3	expanded	medium forest fallow	<minor>	<minor>	7.3	1.3	3.4	38	62	0.2	8	18	27	42	3	7	189	1,231	4	6	14	7	34	58
4	<minor>	short forest fallow	<minor>	<minor>	3.3	0.1	2.9	4	96	-	11	7	19	29	1	2	42	226	1	1	17	9	29	61
5	expanded	short forest fallow	<minor>	<minor>	1.7	1.8	8.3	21	75	4	35	10	47	58	3	9	259	1,605	6	12	9	12	16	71
6	expanded	short forest fallow	maize	<minor>	1.8	1.9	9.5	20	80	1	27	23	51	65	3	10	234	1,918	7	13	11	13	18	69
7	small	short forest fallow	vegetables	<minor>	1.2	0.6	2.9	22	74	4	1	5	16	19	1	4	121	539	2	2	20	13	12	73
8	small	fixed field	maize	<minor>	-	0.4	4.9	7	91	2	3	4	6	6	1	3	68	295	1	1	39	44	-	55
9	expanded	fixed field	maize	<minor>	-	1.0	3.6	28	72	0.2	3	14	19	19	4	9	339	1,648	6	6	21	16	-	84
11	expanded	-	vegetables		-	1.9	3.2	62	38	-	5	39	44	44	1	2	72	380	1	2	11	7	-	93
12	expanded	-	fruit trees			1.3	4.2	31	-	69	5	11	17	17	2	5	216	1,117	4	3	24	20	-	78
13	<minor>	-	maize	<minor>	-	0.1	9.2	1	98	1	13	26	44	44	1	1	54	235	1	2	8	17	-	81
Hmong Villages																								
15	<minor>	-	<minor>	fruit trees	-	0.1	3.6	4	2	95	1	1	3	3	1	1	25	355	1	0.1	215	55	-	43
16	<minor>	-	vegetables	fruit trees	-	0.05	11.3	0.4	55	44	2	33	35	35	1	1	44	278	1	1	14	24	-	75
17	small	-	vegetables	<minor>	0.2	0.4	11.4	4	93	3	2	10	14	17	3	6	263	3,168	12	5	42	40	9	50
Mixed Villages																								
3	expanded	medium forest fallow	<minor>	<minor>	3.7	0.8	5.4	14	86	0.1	9	14	24	41	1	3	90	790	3	3	19	11	36	52
9	expanded	fixed field	maize	<minor>	-	0.8	3.1	26	72	1	2	14	16	16	1	6	156	661	2	2	22	16	-	83
17	<minor>	-	vegetables	<minor>	0.2	0.1	5.6	2	96	2	6	10	19	20	3	6	172	1,214	4	3	27	22	3	72
Overall Study Area																								
															53	125	4,610	27,435	100	100	20	15	21	63

3.3.2 Commercialization and diversification of local economies

Upper Ping Basin in Northern Thailand

In Northern Thailand, the agricultural economy has become more diversified during recent decades, no longer relying on only a few crops or livestock, but rather a diverse range of field crops, vegetables, fruit trees, ornamental crops and livestock. Contract farming and processing of farm products is common. High-income markets are tapped with good packaging technology and marketing skills. Speedy transportation and communication via good roads, railways, airline, postal, telephone and internet services have expanded market outlets for crops and products.

A study by Benchaphun et al. [2005] found that farming systems in Chiang Mai and Lamphun are very diversified with many crops grown. While farmers still grow rice in the wet season, they have adopted diversified cash crops in the dry season, including soybean, garlic, shallot, tobacco, baby corn, potato, tomato, sweet corn, onion, cabbage, and many types of vegetables (Table 3-12). In Chiang Rai, maize is a popular cash crop both in wet and dry season.

Table 3-12. Farming in Chiang Mai, Lamphun and Chiang Rai, with net farm income per household by cropping patterns, 2002-2003

<i>Province</i>	<i>Cropping patterns</i>	<i>Average farm size (ha)</i>	<i>Net income per household (baht)^{1/}</i>
Chiang Mai	Rice-garlic (fresh)	1.02	20,518
	Glutinous rice	2.06	21,272
	Rice-tobacco (fresh)	1.09	22,372
	Double cropping of glutinous rice	1.58	26,869
	Rice-shallots (fresh)	0.56	29,726
	Rice-soybean	1.62	34,219
	Rice-tobacco (dry)	1.09	46,084
	Rice-sweet corn	2.08	49,491
	Rice-onion	0.78	59,290
	Rice-potato	0.67	121,300
	Rice-garlic (dry)	1.02	128,288
	Rice-potato-sweet corn	0.67	129,125
Lamphun	Rice-baby corn	0.48	19,515
	Rice-tobacco (fresh)	1.09	23,093
	Rice-shallots (fresh)	0.61	24,138
	Glutinous rice-non-glutinous rice	0.93	24,667
	Rice-garlic (fresh)	1.02	35,085
	Rice-tobacco (dry)	1.09	48,980
Chiang Rai	Rice-soybean	0.56	9,699
	Rice-field corn	0.70	11,955
	Glutinous rice	2.42	24,764
	Glutinous rice-non-glutinous rice	3.38	62,477

^{1/} Include in-kind income but do not yet deduct value of family labor

Source: adapted from Benchaphun et al. 2005

Highland communities are also now quite market-oriented and monetized. At the site in the Mae Kong Kha sub-watershed in Mae Chaem, for example, growing maize for seeds is popular among farmers under contract farming with a multinational company (Table 3-13). In the Mae Wang watershed, farmers have grown onion and tobacco as a cash crop since 1960. These crops need well-organized input and output markets. In the last 10 years, sweet corn is grown in the areas under contract farming with an agribusiness processing and export company. Longan, shallot, garlic, soybean and many other vegetables are grown as cash crops with very competitive input and output markets together with processing plants. Similar cash cropping takes place in other areas of the North. In Chiang Rai, for example, tea, coffee, orange, litchi and pineapple plantation are now common.

Table 3-13. Changes in cropping over time in Mae Chaem and Mae Wang sites, Chiang Mai

Time line	Mae Chaem (Mae Kong Kha)	Mae Wang
40-50 years ago	12 year forest fallow rotation upland rice, paddy rice, maize, soybean	Paddy rice, soybean, sesame, onion, green cabbage, garlic
30-40 years ago	9 year forest fallow rotation upland rice, paddy rice, maize, soybean	Paddy rice, soybean, sesame, tobacco (contract farming), onion (co-operatives), green cabbage, garlic, shallot, longan (fruit trees)
20-30 years ago	7 year forest fallow rotation upland rice, paddy rice, maize, soybean	Paddy rice, soybean, tobacco (contract farming), onion (cooperatives), green cabbage, cauli flower, garlic, shallot, longan (fruit trees)
10-20 years ago-now	3-4 year rotation upland rice, paddy rice, maize, soybean, shallot	Paddy rice, onion (cooperatives), soybean, green cabbage, tobacco (contract farming), longan (fruit trees), maize
10 years ago-now	Paddy rice, 1-2 year crop rotation of upland rice, soybean, shallot, maize, hybrid maize for seeds (contract farming), pumpkin, longan (fruit trees)	Paddy rice, longan (fruit trees), soybean, shallot, tobacco (contract farming), sweet corn (contract farming)

Source: CMU field survey, 2006

A survey of farm households in Chiang Mai, Lamphun and Chiang Rai conducted by Benchaphun et al. [2005] found that non-farm income constituted approximately one-third of the total household income. Such income came from a very diversified range of activities, including trading, handicrafts, food processing, wood carving, construction, wage labor in neighbors' farms, factories, remittances, etc. As the non-farm sector grows, employment opportunities for farmers and their household members also grow. Moreover, growth of the tourist sector in Northern Thailand has also provided many villagers with income earning opportunities, including those related to provision of guest houses, restaurants, rafting, trekking and souvenirs. In Mae Wang watershed, for example, the research team found that ecotourism services as well as handicraft production for tourists has flourished, and now provides very substantial supplementary income for villagers.

Tea production sites in Northern Vietnam

Diversification of the economy of Vietnam is reflected in Hoang Nong and Phu Xuyen communes of Dai Tu district in Thai Nguyen province, where farming system and livelihood analyses were carried out. Both the communes belong to the buffer zone of Tam Dao National Park, which is located in the Tam Dao mountain range. Findings presented here are about market and resource access of poor tea growers.

Currently, most households living in these communes obtain the majority of their income from agricultural activities, such as paddy farming, rearing cattle and tea cultivation. Among them, livestock rearing, and especially cattle rearing, yields the highest economic return for farmers (Table 3-14). Additionally, local farmers, and especially poor households, also earn their living through forestry-related activities, including hunting, wildlife trafficking, exploiting medicinal trees, growing orchids, breeding cattle, and especially acquiring firewood.

Due to the high population density in buffer zone areas (218 people per km²) together with the intensive farming and forest-related activities mentioned above, pressure on wildlife and plants in the nearby Tam Dao national park is high.

Table 3-14. The relation between wealth groups and farming system groups at Vietnam tea site

Farming System groups - based on main income source (n=200)	Wealth groups (no of hh)					Total
	Poor with tea land	Poor without tea land	Medium with tea land	Medium without tea land	Better- off with tea land	
Other crops as main income	18	2	24	-	1	45
Tea as main income	17	-	34	-	4	55
Animals as main income	8	1	59	4	6	78
Off-farm as main income	5	2	1	-	-	8
Non-farm as main income	4	-	8	1	1	14
TOTAL	52	5	126	5	12	

Source: Structured questionnaires for 200 households, 2005

Tea is considered as a crop with a 'comparative advantage' for conditions in the buffer zone of Tam Dao National Park. But during the last few years, changes in the export market have forced a price decline.

In order to earn a living, farmers in the Tam Dao National Park and its buffer zone are intensifying their tea plantations, using high chemical inputs of fertilizers and pesticides. A survey conducted in 2004-2005 [NOMAFSI 2006] showed that Thai Nguyen tea growers use about 20 different types of chemicals, 14 of which are pesticides. The high input of poisonous chemical pesticides, together with bad spray management, reportedly leaves residual poisons in tea. High inputs of Nitrogen (N), Phosphorus (P) and Potassium (K) compared with harvested crop yields, also shows inefficiency of fertilization. This has had several negative consequences, including high soil acidity (pH is less than 4) and low soil fertility (Soil Organic Matter is around 1.4%) in the area, a reduction in the number of natural pest predators, a low tea price, and a low income for tea growers. As a consequence, tea growers' have become poorer.

Vegetable production site Yunnan

Yunnan's winter climate is ideal for cool-season vegetable production, when winter prices in northern China are at their highest. In recent years, vegetable production has become increasingly important in Yunnan, and planted area and income continue to grow. In 2004, the total area in vegetable production in the province increased to 7.8 million mu (520,000 ha), up 15 percent from the previous year. The total vegetable yield in 2004 was 9.5 million tons and valued at 9.5 billion Y, equivalent to 20 percent of the market value of all crops in that year. In areas where vegetables are planted in the cool season, farmers earn an average of around 2,100 Y/mu, but can earn up to 10,000 Y/mu, particularly in areas that specialize in commercial vegetable production.

The rapid growth of vegetable production by small-scale farming households over the last few years has occurred through external introduction of a comprehensive production system. Vegetable farming typically follows the "Company + Household" pattern, with vegetable traders from outside the local area introducing the entire production system and signing purchase contracts for the harvested goods. The traders provide seeds and other inputs (fertilizers, pesticides, plastic sheeting) as well as technical support for cultivation and harvesting. In most cases, they also select the type of crop and specific variety, so that the farmer need only provide manual labor. Without this access to new techniques and inputs, farmers in the region are limited to minimal production for local markets. This system is the predominant means of introducing new market opportunities to the area, as a comprehensive package of new crops, inputs and technology. In just one step, farmers are supplied with a new crop and guaranteed market access.

NTFP's and rubber in Northern Laos

Mountain communities of Northern Laos, as in many montane areas of mainland Southeast Asia, have traditions based on diverse sets of livelihood activities. In contrast to many other parts of the region, however, opportunities for commercial production have been relatively few. But due to an evolving sequence of government policies related to regional economic integration and land use in upland areas [Fujita 2006], rural livelihoods are becoming increasingly integrated into the market economy [Thongmanivong & Fujita 2006]. Commercial crop production has been expanding most rapidly in areas near larger towns and near borders with neighbouring countries where companies seek to expand production into Laos.

Various non-timber forest products (NTFPs) have long had significant value for rural households in Laos, providing sources of both food and income [Foppes & Ketpanh 1997; Clendon 2001]. Access to NTFPs is very important for the rural poor as a buffer against food shortage, and Raintree [2001] claims revenue from NTFPs accounts for up to 80 percent of cash income of the rural poor, who have very limited alternative market opportunities. With increasing commercial sale of NTFPs such as bitter bamboo others to traders from China, studies began indicating that sustainable commercial production of NTFPs has great promise for meeting needs of rural livelihoods while also promoting natural resource conservation [Morris & Ketphanh 2002]. Recent efforts to support local efforts have included wider local organization and market analysis [Foppes & Phommasane 2006].

During recent years, however, restrictions on shifting cultivation practices in the uplands, coupled with recent rapid expansion of commercial agricultural production are reducing areas of fallow forest where NTFPs are collected. Village relocation programs are redistributing settlements to lower areas near roads, while land use allocation programs are defining new local land use boundaries. Commercial production of crops such as sugarcane and watermelon has primarily affected border areas, whereas the reach of crops like maize and a variety of more minor crops such as Job's tears, paper mulberry, etc., has been deeper into mountainous rural areas [Thongmanivong & Fujita 2006].

But the recent boom in rubber production is driving rapid conversion of agricultural and forest areas to rubber plantations as it sweeps south from the Chinese border. Studies are now pointing out dangers associated with over-concentration on mono-cropping of rubber as a replacement for diverse traditional livelihoods in the region [Alton et al. 2005]. Potential negative impacts are expected to be particularly strong on poor households in rural areas that depend on NTFPs as an important source of food and income.

3.3.3 State and private sector roles in commercial production

Initiatives by both state and private sectors can have important impacts on emergence of new market opportunities. Thus, this section summarizes findings associated with our study sites in the region.

Contract farming arrangements

Since contract farming arrangements are commonly seen as an appropriate model for helping rural households and communities engage in production for commercial markets, we have examined examples of contract farming operations in both Northern Thailand and Yunnan.

Contract farming and agribusiness the Upper Ping Basin

Our case study in Mae Wang and Mae Chaem watersheds in Northern Thailand shows the importance of private sector initiatives through contract farming and agribusiness. In Mae Wang, an agribusiness company dealing with sweet corn processing and exporting was established in the watershed. They worked not only with farmers in the local area, but also in many areas of other Northern districts and provinces, providing seeds, fertilizers and technical knowledge to farmers. Once production begins, they provide a market for farmers at a guaranteed price. The sweet corn is then processed into canned or frozen products for domestic and export markets. In this case, the popularity of this sweet corn contract farming among farmers was at an average level, and the company complained that it could not expand to more farmers. The main reason is that sweet corn production competes with rice farming in paddy areas, and forced to choose, most farmers prefer rice farming to sweet corn cultivation.

At the more remote site in Mae Chaem, farmers grow hybrid maize for seeds using contract farming. The maize seed company comes to provide seeds, fertilizers, technical know-how and a market for output at a guaranteed price. Production of hybrid maize for seeds needs

quite a bit of experience, but farmers could learn how to do it in return for a better price for their product. Such contract farming arrived within the last 10 years (1995 onwards). Farmers reported that they like this arrangement because they do not have price risks. The guaranteed price for the seed was 8 baht per kg as against 3.5 baht for normal maize output, but output is lower for hybrid seed compared to maize for feed. An important obligation for contract farmers is to sell the output only to the contracting company. If this is not the case, the contract is breached and the company will blacklist the farmers and discontinued dealing with them. Unlike the sweet corn case in Mae Wang, Mae Chaem farmers grow their maize in the uplands and it has seemed to be the best commercial crop for farmers for many years.

Both of these cases demonstrate innovations in maize seed technology, cultural practices, marketing, and logistics. Such innovations have taken place through intensive research and extension by the private sector, with various types of support from the public sector. Thai government agencies have supported the role of the private sector through various means, including seed subsidies, provision of credit, quota allocations, etc.

Contract farming of vegetables in Yunnan

Although the state no longer directly controls agricultural production in Yunnan, it still plays a central role in the agricultural economy through taxes, macro-economic policies, and the selective promotion of particular crops. There is a growing tension in western Yunnan between state planning for land use and crop production on one hand, and the interests of private companies and rural households on the other. Government bodies at all levels continue to draft 5-year plans for agriculture, including the total area to be planted to different crops and expected yields and income. However, as market information becomes more readily available, and private companies directly approach farmers to promote commercial crops under a so-called 'Company + Household' model, government officials face the choice of either supporting private sector initiatives or attempting to thwart them by providing economic incentives for their preferred crops, or sometimes even through intimidation. Examples from our case study site are summarized in Table 3-15.

In lowland valleys of western Yunnan, local government officials typically promote tobacco and sugarcane. Tobacco is the only agricultural product that is currently taxed, so government has strong incentives to maintain production levels. Sugarcane is promoted because local government usually owns shares in nearby sugar factories, and also receives benefits from company investment in roads and irrigation.

Tobacco planting is managed by local stations of the state-owned tobacco company, which sets annual targets for planting area in each township. The company promotes the crop, often offering incentives or subsidies to farmers, and provides all necessary inputs and technical assistance. At the beginning of the winter season, there is competition between the tobacco company and vegetable traders to sign production contracts with households. Local government officials often cooperate with tobacco company representatives to meet their annual goals, with methods ranging from cash payments to more coercive techniques. In one village, for example, vegetable seedlings were uprooted, and the tobacco company then offered to pay compensation for damage to farmers who would agree to plant tobacco in the ruined fields.

Other incentives are offered at village scale, with the tobacco company offering to repair irrigation systems or local roads in exchange for meeting a specified quota of tobacco cultivation.

Table 3-15. Role of government at vegetable production case study sites in Yunnan, China

Government role in vegetable production	Case study details
Government support for market	Vegetable production was boosted through a project by the district agriculture bureau to establish a centralized vegetable purchasing market from 1999 to 2004. This attracted vegetable traders from other areas, who contributed additional information on varieties, inputs, and market conditions.
Government introduces vegetable production and seeks private investor	The township government established a unique 'stock cooperative enterprise' (gufen hezuo qiye) in 1999 to promote vegetable production and act as a purchasing agent. The vice-director of the township was made manager, and it was staffed by government employees. Official poverty alleviation funds were used to start up operations and demonstration sites were planted to improve technical knowledge and promote crops. Now, the private sector has entered the market, and around 60% of vegetable traders are from other areas. The township cooperative welcomes the influx of private traders, and has now shifted its emphasis to other economic activities such as value-added processing. The role of the cooperative is to facilitate economic development, rather than to earn a profit.
Government cooperative co-exists with private traders	A cooperative was established with support from the district government. It operates on a contract basis, providing seeds, chemicals and technology to farmers who sign a sales agreement. As the local market is relatively saturated, the cooperative is expanding into other villages with no previous experience in vegetable production. The main difference between this vegetable cooperative and other traders is that the cooperative has access to government capital.
Government attempts to compete with private traders	The local government tried to enter the vegetable market in 2006 by establishing its own cooperative to purchase vegetables. The head of the organization was the former local Party secretary. When farmers continued selling to the established private trader, the government forced him out of business. The first day that he closed down, the cooperative offered only a very low price to farmers, which caused extensive protests and eventually required police intervention. The cooperative was shut down and the private trader requested to resume operations.
Government concerned over revenue threat from vegetable production	Although the local village director professes to fully support vegetable production as a way to increase household income, other officials are clearly not in favor of the transition. At the township level, they are concerned that a reduction of sugar cane and tobacco production will severely limit their revenue, with a loss of the special agricultural product tax on tobacco, and a loss of sales tax from the sugar factory if cane production drops to the point that the factory decides to relocate.
Government actively opposes vegetable production	An outside cooperative set up business, with around 190 mu under contract to plant beans. This was seen as a threat to the tobacco company, and bean seedlings were destroyed in over 100 mu. The tobacco company then promised to compensate households 500 Y/mu if they switched to cultivating tobacco in the ruined fields. Several months later, compensation had still not been received. This action was apparently taken with the implicit support or even cooperation of the local government.

Sugarcane is widespread in lowland river valleys, and is a popular choice because it is a 'lazy crop' (*i.e.* low labor requirements) with a guaranteed buyer in the nearby sugar factories. However, it is gradually being pushed out by more profitable crops such as cool-season vegetables. In villages with more commercial crop options, sugarcane is planted only in upland areas with no access to irrigation. Long-season sugarcane in particular is declining as farmers switch to a two season rice/vegetable production system. To maintain sufficient yields, the sugar company is often forced to offer additional incentives to farmers. In one village, the

company promised to complete road repairs in exchange for a 3-year commitment to plant 75 percent of the village area to sugarcane. This type of arrangement is made in cooperation with local government officials.

Sugarcane production is most prominent in villages adjacent to the factories, due to both the convenience of transportation and sales, and to the typically close relationship with local governments. There are several sugar mills in the region that were owned by the national government until just a few years ago. In 2003 and 2004 sugar mills in the case study areas were re-organized under local management. The township governments are now closely linked to these enterprises, and usually own shares in the company.

Although the state no longer explicitly controls agricultural production at the household level, the continuing influence of local government on crop selection should not be underestimated. The government is usually either directly or indirectly involved in the introduction or promotion of any new economic crops – whether through establishment of a market or marketing association, joint cooperation with businesses, subsidies for ‘dragon-head’ enterprises (such as tax breaks or cheap land rental), or simply by allowing farmers to deviate from the official economic plans for commercial crop production.

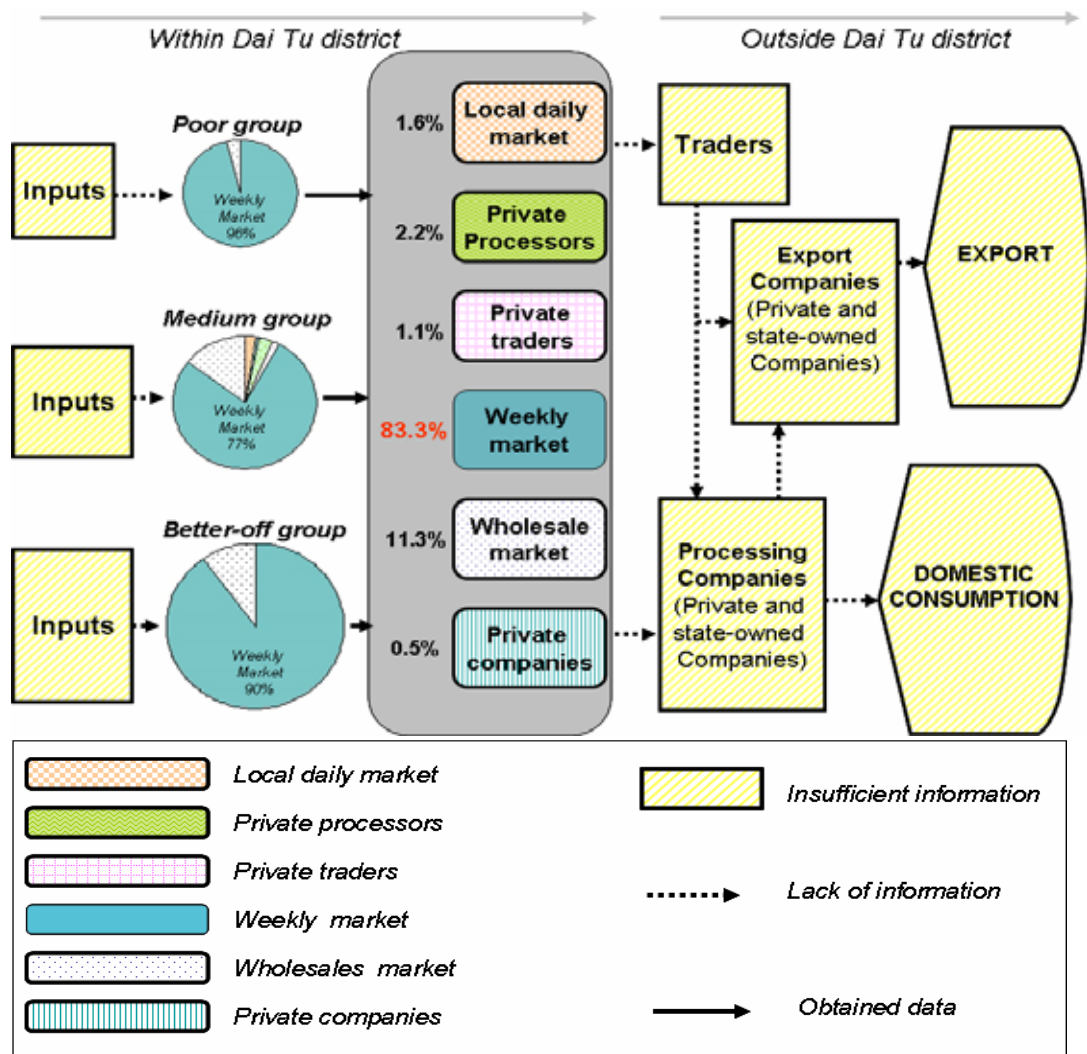
Conflict arises between the goals of increasing local incomes and of maintaining government revenues, and government officials are often influenced by their close involvement with various state-owned or private sector companies. In one site, the tobacco company hired the village secretary to work full-time as a tobacco technician to oversee local tobacco cultivation. In another village, the decision to support the former Party secretary in the establishment of a vegetable cooperative proved disastrous, and was eventually abandoned. Even in the village which established a government-funded produce cooperative to support development of the private sector, the village committee has included a scheme for dramatic expansion of tobacco area in their latest 5-year economic plan (2006-2010). Meeting those objectives will compete directly with vegetable production, and likely require some sort of subsidy or coercion.

Stakeholders in the tea market chain in Vietnam

Effects of trade reform by the state on livelihoods and food security will, to a large extent, depend on the structure of the economy, and the assets and vulnerability of the poor. Imber et al. [2003] suggest that analysis of the impact in any specific country should start with the identification of the poor, their assets and vulnerability to change, and the current trade realities. The poor at our tea production site and their assets were presented in Chapter 2. The current trade realities are analyzed through the tea market chain. The market within Dai Tu district seems to be influenced by the private sector, while the market outside Dai Tu is decided by both private and state-own companies (Figure 3-50).

In group discussions, farmers shared their understanding of the stakeholders involved in the local tea markets, how the local market acts and how their voices are heard in the market. After processing, they usually bring tea to local markets to sell. The weekly market is the most dominant market for all kinds of tea among all surveyed households (Table 3-16). The second most prominent market was the wholesale market at Dai Tu town.

Figure 3-50. Tea chain in Dai Tu district, Thai Nguyen province, Vietnam



Source: Field survey in Dai Tu district, Nguyen Le Hoa, 2005)

While most farmers usually bring their processed tea to the local market to sell, through observation it was found that some households with better quality tea have middlemen or private traders who come to their houses to buy the tea. Results from all focus group discussions showed that, normally, farmers receive a total income from tea of around 10-20 million VND per year. The cost of tea production accounts for 40-50 percent of total income. As a whole, most of them are satisfied with the current price for tea, which is approximately 25-50 thousand VND per kg of dry tea. The price depends on quality and kind of tea. Normally, they often have to accept the price that private traders or middlemen fix because they don't know much about national or global market prices.

The price of tea is very unstable, and farmers especially mentioned the price decrease in 2003 which greatly affected their tea production. Tea is a very perishable commodity both before and after processing. Green tea leaf cannot be stored for longer than six hours without damaging its quality, and it is recommended that there should be a maximum three hour interval between plucking and processing for good quality tea. Processed tea has a shelf life of only a

year before experiencing a serious drop in quality [Oxfam 2002]. Moreover, farmers need money for their lives, so they sometimes have little choice in whom to sell their tea to, and in such cases they are forced to sell their tea in accordance with prices offered by middlemen.

Table 3-16. Places for selling tea of households in different groups by type of tea

Type of tea & location	Poor with tea land (n=52)		Medium with tea land (n=126)		Better-off with tea land (n=12)	
	No	% of total	No	% of total	No	% of total
Grafted Tea						
Weekly market	2	3.8	6	4.8		
Low-mountainous produced tea						
Local daily market			2	1.6		
Private company			1	0.8		
Private processors			4	3.2		
Private traders			1	0.8		
Weekly market	11	21.2	49	39.5	4	40.0
Wholesales market	2	3.8	18	14.5	1	10.0
Seeded tea						
Local daily market			1	0.8		
Private traders			1	0.8		
Weekly market	37	71.2	41	33.1	5	50.0
TOTAL	52	100	124	100	10	100

Source: Structured questionnaires for 200 households, 2005

Rubber production in MMSEA

Although production of para rubber and State Rubber Farms were introduced in the Yunnan province of China more than 50 years ago, most of the world's rubber production has been located in more equatorial zones of Southeast Asia. Recent changes in markets, policies and technology, however, are resulting in considerable new growth in rubber production in portions of montane mainland Southeast Asia (MMSEA) zones, and both state and private sectors are playing active, closely related, and sometimes overlapping roles in its development.

Expansion of rubber production in the Lao PDR

Recent rapid expansion of para rubber plantations in the Lao PDR has become the focus of considerable attention. Global demand for rubber has increased since the early 1990's, driven largely by booming economies in China and India, with Asia now accounting for more than 50 percent of global consumption [Vongkhamor et al. 2007]. In Northern Laos, the increasing demand for natural rubber in China and the spreading of the "success story" of rubber planting in Had Nyao village in Luang Namtha province has led many farmers to invest in rubber planting. A recent study of the economics of smallholder rubber production in Luang Namtha based on production data from Had Nyao village confirms that rubber production can be profitable under current market conditions and with subsidized low-interest credit for investment [Manivong & Cramb 2007]. The provincial government in Luang Namtha explicitly supports rubber as a means to stabilize shifting cultivation and alleviate poverty [Weiyi Shi 2008].

While some farmers are planting rubber on their own (especially in Luang Namtha), the primary vehicles for current large-scale expansion of rubber is land use concession and contract farming agreement contracts that are being signed between Chinese companies and Lao government authorities at provincial and district level. Concession agreements specify the total amount of land area that a company can develop, but do not specify where those areas will be located. Often, consideration of land suitability for rubber plantations is not part of the process, local communities are not consulted, and local land allocation zoning is not considered. Discrepancies between legislation on foreign investment and land management provide further room for reinterpretation by local authorities. Farmers mention that forest areas are being cleared for rubber plantations, which is decreasing communal areas available for NTFP production and affecting water supply to paddy fields [Vongkhamor et al. 2007].

At a study site in Namo district of Oudomxay province [Vongkhamor et al. 2007] found that the contract between the company and the District Governor stipulated that the company will provide seedlings and technical support, and that it will purchase the latex when tapping begins. This is in line with the “2+3 scheme” advocated by the Ministry of Agriculture and Forestry, wherein farmers supply land and labor, and companies provide technology, markets and investment. The contract indicates farmers will receive a 60 percent share of profits from production, while 40 percent will go to the company. Profits include those both from latex production and from the sale of timber once plantations become over-mature. The price for rubber will be the current market price, but with a floor guarantee of 750 USD per ton. The contract is valid for 30 years, with an option to extend for an unspecified period.

This study also found that most farmers expressed dissatisfaction with the profit sharing arrangements, arguing that a 70-30 arrangement would be more fair when considering that farmers are to be the main source of labor throughout the life of the plantation. Thus, many farmers are hesitating to enter into agreements with the company, and specific household contracts have not yet been developed. The head of the district agricultural extension office argues that the 60-40 arrangement allows the company to recover initial investment costs, including development of a processing factory and feeder roads to the plantations that would potentially provide benefits for others in the district [Vongkhamor et al. 2007]. While the provincial government in Luang Namtha supports 70-30 contract farming arrangements, a recent study there found the ‘2+3’ scheme has often become a ‘1+4’ scheme, wherein farmers provide only land and may (if they choose) work as hired labor. Thus, contract farming can end up very similar to a simple plantation concession [Weiyi Shi 2008].

Emerging rubber in Northern Thailand

Growth of rubber production is also becoming an issue in northern Thailand. In 1991 Thailand emerged as the world market leader in natural rubber production. By 2005 natural rubber production was worth 205 thousand million baht (US\$ 5.1 billion) [RRIT 2007]. Between 1997 and 2006 area planted still increased by 20 percent to 2.3 million hectares [OAE 2006]. Average yields (kg ha^{-1}) in Thailand (1,369) are higher than most other leading producers including Vietnam (969), Malaysia (881), China (713), and Indonesia (694), but not India (1,331) [OAE 2005].

Between 2004 - 2006 the Thai government promoted para rubber plantings in new regions outside peninsular southern Thailand, including the North and Northeast regions, with fast track project areas targeting expansion by another 160,000 hectares. Total areas planted to rubber in 2006 in the North reached around 32 thousand hectares (about 1.4% of Thailand's total area under rubber), while the Northeast had just over 246 thousand hectares (11% of total) [OAE 2006]. Areas considered to have potential for reasonable rubber productivity total at least 330,000 hectares in the northern region, and 768,000 hectares in the northeast.²

Smallholder expansion of crops and plantations in upland areas of Thailand's northern region has been long constrained by land use classifications and policies. But there are indications that the attractiveness of rubber may test and challenge these policies. In March 2007 at least 3 farmers living at the foot of a hill area in Chiang Rai province were arrested, and others living in 3 villages were warned by the Chiang Rai regional forestry office not to use land in forest reserve areas for rubber plantations.³ Ethnic Lahu villagers were reported as saying they wanted to use the land to grow rubber trees like the others, but they couldn't because of the protected area status.⁴

Conflicts over use of reserved and protected forest areas for para rubber plantations occur in several regions of Thailand, but the outcomes differ. In Southern and the Eastern regions, the government is more likely to compromise on economic grounds -- there are already almost 70 thousand hectares of rubber within national forest reserve lands [DLD 2005].

Expansion of para rubber plantations in northern Thailand could be beneficial to livelihoods in some areas, but given current land policies would likely trigger major land-use conflicts among groups promoting narrow conservation objectives everywhere, other groups concerned more with securing resource access and benefits for minorities and other disadvantaged groups, and wealthier, influential, investors focused more on commercial opportunities that would be opened up by new ways to access land.

Highland crops in North Thailand

The Royal Project

The Royal Project in Northern Thailand has been another form of organization that is difficult to categorize in terms of state vs private sector, since it has various attributes of both. In case studies of four Royal Project sites, however, one sees the importance of the Royal Project in providing new opportunities to farmers. The Royal Project Foundation (RPF) has altogether 36 development sites in Thailand's Upper North Region.

The Royal Project began in 1969 with promotion of new crops to replace opium poppy. In the early days, it solicited wide cooperation from many government and non-governmental

² Official Department of Agriculture tables and maps of areas with potential for rubber production available at: <http://www.doa.go.th/rubber/index.html>

³ *Naew Na* newspaper: 25 June 2007.

⁴ *Manager* newspaper: 18 September 2005.

agencies including foreign donors and technical assistance agencies. Through these partnerships it conducted much on-farm research in new, alternative crops suitable to highland conditions of Northern Thailand. Most of the crops introduced in Project sites were temperate, high-value, capital intensive crops, such as vegetables (lettuce, strawberry, Japanese pumpkin, zucchini, bell pepper, carrot), flowers (such as statice, gypsophylla, carnation), and fruits (such as avocado, peach, pear, apricot, apple).

Later, it became necessary for the RPF to launch marketing strategies, including creation of Royal Project outlets, shops and a brand name (Doi Kham). Technical assistance has been contributed by a range of professionals with experience in the private sector. Resulting new lines of products have been very successful in tapping well-off urban segments of the market. Packaging and processing of agricultural products has been improved continuously.

After more nearly 40 years of operations, RPF has been quite successful in establishing many new crops and products from the highlands. Operated as a foundation, it is neither a private company, nor an NGO, nor a government agency, but combines characteristics found in all of them. It is an organization producing many innovations and success stories. While its organizational structure, its personnel and access to technical assistance, and its privileged status are not replicable, its lessons learnt and approaches can be useful for others.

Re-emergence of coffee in Om Koi

As described in chapter 1, Omkoi is a remote district of Chiang Mai province where livelihoods of the primarily ethnic Karen population combine traditional forest fallow agriculture with modest amounts of cash cropping. In contrast to cabbages and tomatoes, which are cash crops developed in Omkoi by the private sector, coffee was developed in the public sector and has now been transferred to the private sector. While coffee is not yet a major crop in Omkoi, recent growth in domestic demand for fresh-brewed coffee and substantial new investments to expand production suggest it may become much more important.

In the public sector, Arabica coffee (*Coffea arabica* L.) was officially introduced in 1957 when the Thai Agriculture Department obtained four cultivars from Brazil that were planted at crop experiment stations in North Thailand. Since no substantial research was being conducted on coffee, seeds from imported cultivars were planted at government stations and distributed among upland farmers in the vicinity. But progeny of these imports did not survive an epidemic of leaf rust disease (*Hemileia vastatrix*). Research on Arabica coffee finally began under the highland Royal Project in 1974 because its fit with the upland climate and environment made it one of the crops on trial as potential substitutes for opium under opium eradication schemes. With assistance from USDA, improved leaf rust resistant cultivars were brought from a Portuguese coffee research institute, and further study of leaf rust resistance was conducted by the plant pathology unit of the Department of Agriculture, including trials at research stations of the Royal Project. Despite promotion as an opium replacement crop, however, low quality output and a poor market in Thailand resulted in little expansion.

But since the 1990's, shops in Thailand serving freshly-brewed coffee have been strongly promoted, and during 2002-3 this sub-sector grew by 10.2 percent (Euro-monitor 2005). With coffee becoming a good business, private companies began picking up where develop-

ment projects left off years ago. Furthermore, with high market margins for processing and pressure to ensure supply from environmentally sustainable sources, along with related strategic moves by multinational corporations, local companies now have strong incentives to roast their own coffee beans. While coffee markets in areas such as Chiang Rai are now well established, more remote areas like Omkoi have lagged behind. Five years ago, however, this began to change when the private company VPP Progressive Ltd, who conducts its coffee business under the consumer brand label “*Café D’Oro*”, began building a regional coffee production center in Omkoi. The goal of VPP is to produce 20 tons of shade grown roasted coffee daily with most of the raw material from Omkoi.

While the private company (VPP) is now taking the lead, it is building on various earlier public sector efforts. Indeed, the new project was encouraged by a former Minister of Agriculture who knows the CEO of VPP personally. Its design and operations draw on research and extension experience of a Royal Project retiree considered one of the most knowledgeable coffee experts in Thailand, and it has recruited staff for their experience working as officials in highland agricultural extension projects. It also uses sixth generation leaf rust resistant cultivars developed under the government coffee breeding program.

New links with the public sector are also part of this process. Since, as in Mae Chaem, most land in Omkoi has been declared protected forest, protected watershed zones, and reserved forest, land security for local communities has been a longstanding and often bitter issue. Thus, the project requires government, private sector, and local Karen communities to work together with science providing the right coffee hybrid, and shade coffee being accepted as a sustainable development alternative. Moreover, suitable land must be made available for coffee plantation by negotiating rights for villagers to use land made available through a government “land reform” scheme. Accordingly, VPP began building a partnership with a project in Omkoi under the Office of Agricultural Land Reform (Sor Por Kor), which enables some areas of “degraded forest” to be used for agriculture. But the process of land allocation, as well as development of associated road and irrigation infrastructure by additional agencies, have proved difficult, and after 10 years are not yet completed.

In order to help facilitate the process, VPP rented some land from the land reform office (SPK) to build its production facility. It also launched a credit scheme for farmers already occupying the land reform area who wish to join the program. Farmers received a 15,000 baht loan from which they were required to use 10 percent to purchase enough coffee seedlings to plant about 0.5 hectare; farmers decided themselves on how to use the remainder of the loan. VPP also guaranteed to purchase all coffee produced at a minimum price of eight baht per kilograms. Most of the coffee planted, however, did not survive the dry season. While a company extension agent believed this was because farmers did not invest enough in taking care of their coffee trees, their coffee expert identified the problem as a result of not properly selecting and managing litter to cover the ground between trees, a practice that is very rare in the area.

Under a parallel second strategy, VPP is also working with the parastatal Bank for Agriculture and Agricultural Cooperatives (BAAC) under another coffee financing scheme. Here

the company provides coffee seedlings at 5 baht each, and guarantees to purchase coffee in cherry form at 8 baht per kilogram. The loan from BAAC is based on group repayment guarantee, so it requires a group with a production plan that is credible to the bank officer. While this approach is more flexible about where coffee can be planted, upland farmers seldom have experience with such types of arrangements, and business partnerships beyond household level are quite rare in Karen communities. Moreover, coffee financing linked with SPK or BAAC must compete with contracts for short season vegetable production, wherein the produce output can be used as collateral for loans provided in the form of production inputs.

Currently VPP buys most of their coffee in Omkoi from remaining plantations initially promoted by UN development projects, in addition to looking for sources as far as 200 kilometers away. But company extension officers are searching for potential areas to promote coffee cultivation and expect to create more nearby suppliers. They are also working through village headman and seeking to convince local governments (TAO) to buy seedlings for local demonstration and experimental plots. Slowly, VPP is seeing coffee plantation area grow.

Since most coffee plantations in the past died, many Karen farmers remain skeptical. But remaining remnant coffee trees left from UN experimental plots also offer hope that coffee could be successful in the area. Farmers suspect that coffee requires much more care than what company extension officers told them in the past. They also know it takes three years after investment before beginning to reap benefits, whereas tomatoes and cabbages let them see the results of their labor (success or failure) in a short growing cycle. Agricultural area is also limited – primarily by the amount of effort required for fencing to keep cattle out of their fields. Whereas vegetables require enclosures only during very short crop cycles, coffee requires fencing that must be maintained for years. Moreover, farmers must allocate land and labor to continue swidden agriculture for food security, at least in the near term, while forestry departments are always trying to further restrict total agricultural areas.

Thus, many villagers ask VPP if coffee plantation will be considered as agricultural land or land protected by the forestry department. But the answer is not yet clear. Although forest departments have warmed somewhat to the idea that people and forest could co-exist, they are strongly opposed to mono-cropping or swidden agriculture within boundaries of “their” forests. And while some forms of agroforestry appear promising, it is still unclear what types of agroforestry solutions may be possible and acceptable. Whereas protection of biodiversity is an important issue for forestry agencies, maintenance of native flora has not been a strong value in the agricultural research community. The agroforestry vision in VPP came largely from India, where both coffee and shade trees are exotic species. Thus, VPP is now working to find local species that can be used for shade trees. One option they are exploring is Sator (*Parkia speciosa*), which is native to South Thailand. But it is not yet clear whether this would be considered as native in Omkoi.

If it is to be successful, Arabica coffee needs to find ecological, legal and economic contexts that enable it to be a superior alternative to current agricultural practices. And in order for Karen communities in Omkoi to embrace coffee production, returns and risks must clearly be superior to currently competing investments in cattle, vegetables and upland rice practices.

“I am a business man and my vision is to make Omkoi the coffee capital of northern Thailand” said the CEO of VPP as he looked over land where the processing facility will be built with machinery imported from Brazil. *“The challenge is difficult but I know it is possible to be done.”* His science advisor, who has been associated with the Royal Project for 40 years, agreed to help because he believes that successful implementation of the VPP program will improve living conditions of the people as well as improve the condition of the forest. *“I have served and been supported by money from Thai citizens”* he said, and noted that even in retirement he is still burdened by the responsibility to do good for the country.

3.3.4 Linkages between lowland and upland economies in the UPB

Our review and studies of development in the Upper Ping Basin point out different types of linkages between montane and lowland zones that have strongly affected directions in which market-oriented production has developed and continues to evolve in montane areas.

Case studies of Royal Project sites and the integrated production and marketing systems developed under the Royal Project Foundation allow us to see quite clearly the importance of linkages between production opportunities in montane zones and the lowland economy. High-value cash crops are marketed in the lowlands, and affluent urban consumers provide the main market for these crops. Thus, collection, post-harvest handling, storage, sorting, grading, packaging, shipping, and transportation services for agricultural products from mid-land and highland sources to lowland markets must be speedy and of sufficient quality to ensure that agricultural produce will be fresh and marketable. The Royal Project Foundation has invested in refrigerated trucks to transport some products from its highland collection and grading operations to its lowland assembly and distribution facilities. Agricultural produce is shipped daily to Chiang Mai and Bangkok by trucks or sometimes by air freight. Fresh produce and processed products are on display at supermarkets in Chiang Mai and Bangkok, as well as at airports in both cities.

Transportation infrastructure is clearly a very important element in developing such systems, and transportation networks within Chiang Mai, Lamphun and Chiang Rai provinces, and from these areas to Bangkok are generally good with all-season roads and highways. The research team has also encountered other farmers in the uplands of Chiang Rai who ship their vegetables via air freight to Bangkok on a daily basis. In Bangkok, some restaurants have now specialized in upland vegetables. Moreover, improved roads have also enabled both domestic and foreign tourists to gain access to mountain areas and ethnic minority cultures, resulting in additional markets for agricultural products, as well as local handicrafts and services.

The Mae Wang watershed is located in mountains that form the western ridge of the Chiang Mai-Lamphun Valley, which allows them to market their agricultural produce in the lowlands quite easily. And since their proximity to Chiang Mai City is close enough that tourists can visit Mae Wang and return to the city in a single day, ecotourism “day trip” activities have been emerging, including rafting, trekking, sight-seeing, elephant riding, handicraft sell-

ing, etc., as well as homestays for those who want to stay on a little longer. These lines of activities provide another growing set of jobs and income opportunities for uplanders.

At more remote sites in the Mae Chaem watershed, hybrid seeds produced by Mae Chaem farmers are sent to the Maize Seed Company situated in the lowlands, from which seeds are then marketed nationwide. Production of maize for animal feed elsewhere in Mae Chaem is also linked with lowland agribusiness operations that have expanded into mountainous areas during recent decades. Vegetables produced by Mae Chaem farmers, including soybean, cabbages, shallot, garlic, corn and others, are assembled and shipped to Chiang Mai city. And while promotion of commercial agricultural production in the highlands originally focused on products such as temperate vegetables and fruits that would not be in direct competition with lowlands, highland production now includes some of the same crops produced in the lowlands, but takes advantage of climatic differences that allow them to be grown during the off-season for the lowlands, when usually higher prices can offset transport costs.

These situations have all become possible because of improved road and marketing networks in the areas and within the Northern economy in general. As infrastructure and economic systems are further integrated across the Greater Mekong Region, similar opportunities are emerging, as well as challenges related to competition from areas further away that is sometimes reducing the importance of more local relative differences between upland and lowland areas that have provided the basis for economic specialization in the past.

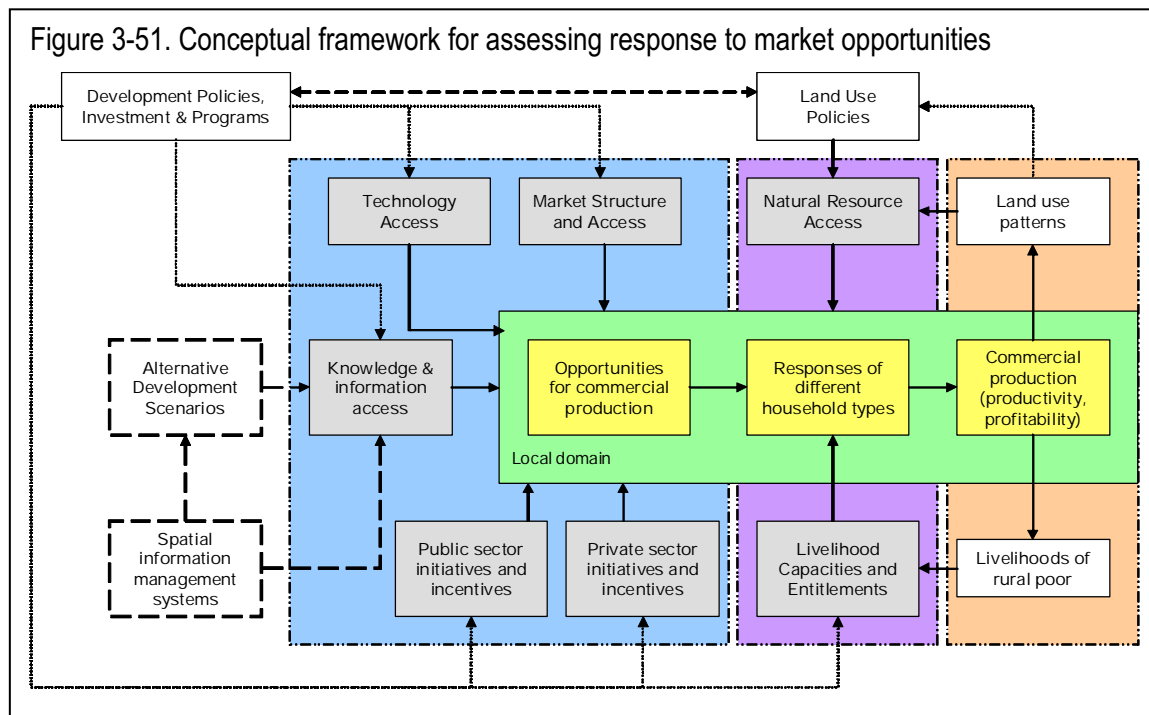
Yet another side of linkages between lowlands and uplands in the UPB relates to changing perceptions and values in lowland urban centers. On one hand, these can provide incentives for further improvement of upland production. One example is growing urban concerns about consumer safety that result in higher price differentials for agricultural products that are grown with little or no use of chemical pesticides. This provides incentives for producers to overcome the technical challenges involved in order to maintain or improve their profits, while at the same time reducing the environmental impact of their operations. Another example is growing demand in Thailand for shade grown Arabica coffee, which may provide incentives to overcome technical and tenurial problems faced by potential small-scale producers in mountain areas.

On the other hand, growing environmental concern in affluent lowland urban centers is also increasing support for efforts to close midland and highland zones to agricultural production. These interests have lobbied strongly against efforts to provide long-overdue recognition of land use claims in montane zones of Thailand, and some are pushing for all montane areas to be incorporated into national parks and wildlife sanctuaries. Their arguments are usually based on urban beliefs that this is the only way to maintain biodiversity, watershed functions, and environmental sustainability in general. And their influence on land policy is very strong.

Thus, increased linkages between lowland and montane areas can have various types of impacts on livelihood opportunities in upland areas. While they can open new realms of possibilities for market production and economic integration, they can also increase exclusion.

3.4 Changing market opportunities and constraints

How have market opportunities changed? As we have seen, economic systems in the region have changed in many ways at various levels during recent decades, and clearly this has brought new market opportunities for many people. But to help facilitate a more specific answer to this question, Figure 3-51 reproduces our conceptual framework for assessing response to market opportunities that was introduced earlier as Figure 3-6.



In the context of this framework, we can see that development policies, investment and programs have undergone radical change as countries of the region “opened” their economies, beginning in the early 1960’s in Thailand and expanding to include all countries by the mid-1980’s. Key elements have involved emphasis on commercialization and export production in agriculture, economic restructuring that shifts more emphasis to industrial and services sectors, rapid technical change based largely on importing and adapting foreign technologies, strong emphasis on international trade, and rapid growth in domestic and foreign investment in production enterprises, as well as in the infrastructure and support services required to enable economic systems to function and grow. As a result, growth everywhere in the region except Myanmar has ranged from very promising to highly impressive.

The impacts of this growth in economic activity, however, have not been uniform. We can see substantial and growing disparities both among countries and among sub-national regions and sectors within each country. Thus, the answer to our question in the context of poor upland areas in the Greater Mekong Region requires a bit more focus, which the following sections seek to provide.

3.4.1 Expansion of market opportunities for mountain areas

As we saw in Chapters 1 and 2, mountainous areas of the region are primarily relatively remote, rural and poor areas inhabited by people who are often ethnic minorities in the context of their larger societies. Moreover, their traditional livelihoods are often diverse, but subsistence-centered and based in agroecosystem management practices that result in mosaic landscapes that are looked upon with disdain by lowland-dominated larger societies. Not surprisingly, then, governmental efforts to integrate these areas into rapidly changing national societies are frequently in the context of welfare-oriented programs to help ‘backward’ poor people become more ‘modern’ or ‘civilized’. Nevertheless, substantive change in the market opportunities available in mountainous areas has been taking place.

Especially in China, Vietnam, and Lao PDR, countries had passed through a socialist period of collectivization, so that processes of economic “opening” have also been associated with allocation of responsibility for assets, and especially land, back to individual households and local communities. This has shifted the nature of market opportunities by enabling households and local groups to formulate and implement their own entrepreneurial initiatives. Along with relaxation of monopolies operated by state enterprises, this has also allowed emergence of a new generation of “private” merchants, industries and associated players in production, processing and marketing chains linked with national and international markets. Thus, an expanded range of initiatives and incentives from new mixtures of private and public sector sources are influencing market opportunities available in local domains. We have seen examples of these processes at work in relation to tea production in Vietnam, to vegetable production in Yunnan, and to commercialization of NTFP production and expansion of rubber in Laos.

Since Thailand did not pass through a similar period of socialist reorganization and began its process of economic “opening” earlier, economic restructuring and development of private sector entrepreneurial activity is at this point more extensive and complex than in other states of the region. Although state enterprises and public sector initiatives have also influenced various parts of the economy, there has been little serious attention to reallocation of basic assets or even recognition of land holdings in midland and highland areas, and the main focus of government investment has been in infrastructure to support primarily private sector-led development of the market economy. As we have seen in the Upper Ping Basin, most state investments in irrigation and other types of physical infrastructure in mountain areas has been concentrated in lowland zones of major valleys, where increasingly complex and dynamic intensive cropping systems and production zones have emerged. The first important exception was investment in road networks in montane zones, initially motivated primarily by national security and opium crop substitution programs. Thus, market production opportunities in mountain areas have come primarily from two directions: up from the lowlands, in the form of linkages with agro-industrial companies such as those associated with hybrid seeds and sweet corn processing in examples from Mae Chaem and Mae Wang; and down from the highlands in the form of intensive commercial production of vegetables and fruits that began with opium crop substitution programs, and are now epitomized by the Royal Project. Further growth and development of these opportunities has been facilitated by

emergence of district and more local marketplaces, as well as by development and elaboration of electricity and communications networks, along with gradual improvement of other types of infrastructure and support services. The new round of promotion of highland shade grown coffee production being led by private companies may reflect new types of private initiative.

Moreover, expansion of market opportunities in montane zones around the region have not been limited to agricultural crop production, as we have seen in the roles of livestock and non-farm income in several case study sites. Wage employment in expanding labor markets is now a source of opportunities in many areas, as are various non-farm production activities associated with expanding tourism and other parts of services sectors. Improved transportation and communications systems widen the domains within which people can seek wage labor and non-farm opportunities, and more distant employment opportunities are providing incentives for people to migrate out of montane zones on a temporary, seasonal, or permanent basis.

Another important dimension of the expansion of market opportunities in the region is the increasingly dynamic nature of market incentives as economic systems become more regionalized and globalized. Thus, new market opportunities can arise and fade. One example is when differences in local resource characteristics provide a basis for profitable specialization in the context of local or national markets that disappear when market integration brings competition from more distant locations with even more favorable resource characteristics. We have seen examples of this in the Upper Ping Basin. And, product quality and marketing strategies that were adequate in the past may no longer be sufficient under more globalized conditions, as we have seen in the case of tea in Vietnam. Moreover, entrance of new opportunities can threaten or displace others, as may be the case with NTFPs and rubber in Laos. But globalization also stimulates demand for more environmentally friendly products such as shade grown coffee, medicinals or NTFPs, which may result in important new opportunities if policies, practices and livelihoods can be appropriately adapted.

3.4.2 Role of technical innovation

Virtually all of the changes we have seen in market opportunities are associated with technical change. In some cases, such as commercial NTFP production in Laos, for example, change is primarily based on adaptations of local or indigenous technical knowledge that is already part of livelihood capacities within local resource domains. But even there, new knowledge from the additional market factor domain is required for effective organization and marketing. Similarly, our case study of tea in Vietnam shows the important role of technical adaptation and change, even in crops that have been commercially produced for some time.

In other cases, such as with commercial vegetable production in Yunnan or hybrid maize seed production in Mae Chaem, technologies required for effective production require entire “packages” of new technology, including seeds, inputs, cultivation practices, post-harvest handling, quality control, etc. While much of this technology is not “new” in the sense of technical invention, it is new to households and communities in mountain areas where these

opportunities are emerging for the first time. Moreover, there are always aspects of adaptation and “localization” of technologies requiring innovation by local producers.

Many of these new technologies also require production inputs, equipment and tools that must be purchased through emerging or expanding input markets. This requires access to capital and to input markets themselves, as well as sufficient knowledge to make the most appropriate purchases, and knowledge of how to employ these inputs in an efficient and effective manner. Thus, various gaps in the availability of capital and knowledge need to be filled if opportunities are to be translated into effective commercial production realities.

Sources of technical knowledge can be from various channels. Many outsiders think of government extension agencies and promotion campaigns as the primary providers of new technical knowledge. While they can play an important role, they are far from the only source of knowledge, and often not the most effective one. We have seen examples of contract farming where usually private companies provide technical knowledge, as well as examples of knowledge coming from non-governmental or international projects, or from friends or relatives through social networks. As engagement in commercial production activities continues to evolve over time, continuing technical change and innovation are more likely to come from local farmers and farmer groups themselves, as we can see in the Upper Ping Basin, but also among some of the more innovative tea growers at our case study site in Vietnam and elsewhere. Thus, the combination of experience, access to information and communications, and educational advances will be of great importance over the longer term.

One very important aspect of technical change and innovation that is important across the region, including all of our case study sites, centers on change in production efficiencies and product forms, quality, processing, packaging and marketing that will allow producers to effectively compete in globalizing markets where demand and price fluctuations and trends are affected by a myriad of factors beyond the control of local producers. Indeed, perhaps the most important challenge is how to facilitate development of entrepreneurship and associated capacities to rapidly adapt production resource mixes, practices, tools and facilities to effectively cope with a constantly changing market environment.

3.4.3 Role of the state in expansion of opportunities

At the macro-level it has clearly been changes in state policies that have opened the door for emergence of market production opportunities in states of the region. An important central theme in these processes has been that the state apparatus should “back off” from strict central planning and state enterprise monopolies, and allow emergence of private sector initiatives to shape and manage production for commercial markets. At the same time, however, there are needs for states to coordinate policies and support aspects such as research and development, in order to provide an environment where private initiative can flourish and provide opportunities in which poor mountain communities can effectively participate.

While there is no doubt that there has been much change in this direction in the region, we have also seen that, especially for countries undergoing “transition” processes, what and who

is “state” and what and who is “private” often requires operational definition within local contexts. Roles of state bureaucracies and organizations, including military and political components, are still strong in all states of the region, and there are frequent links where both agencies and individuals play active and important roles in both spheres.

That being said, we have also seen examples of emerging tensions between state and private sectors, such as in the vegetable production case study in Yunnan, which indicate that differences are emerging and competing for engagement by local farmers and communities. There are also many efforts to either privatize or at least transform state enterprises to operate in a manner that more closely resembles a private enterprise. And there are efforts to transfer leadership of some programs initiated in the public sector to more entrepreneurial private sector actors. These types of change, however, appear to be quite difficult, and likely to require changes in thinking in both public and private sectors that may require generational change.

We have seen examples of how state organizations at various levels sometimes seek to effectively “tax” emerging local, domestic or foreign enterprise by imposing requirements for improving infrastructure or facilities, contributing funds, or assisting state-promoted programs, that are well beyond the operating domain of the enterprise. State “leverage” in negotiating such agreements can include contracts with agencies or local governments that are required for enterprise to operate in their areas of jurisdiction, or even threats of harassment or intimidation. Results include various combinations of lower prices for local producers or lower enterprise profitability, and can sometimes lead to inability of the enterprise to compete with other producers. While these types of approaches are sometimes advertised as “showing social responsibility” or “returning benefits to society”, there is a limit to how much a private enterprise can contribute to such activities and still survive. Beyond issues of transparency and accountability, there are also some serious questions about impacts such approaches can have on prices received by poor farmers where they are the producers and government policies also include poverty alleviation.

Where there is most widespread agreement on a strong role for the state is in provision of physical infrastructure and at least basic services. Expansion and upgrading of road networks in the region have been a critical factor for enabling emergence of opportunities for market production, and especially when they are accompanied by electricity and telecommunications. While these types of physical infrastructure appear to have been necessary for emergence of most of the opportunities we have seen in both lowland and upland contexts, they are sufficient only for those who are otherwise already prepared to effectively participate in market production. Especially in the context of montane zones, such people are quite rare.

Basic services where state leadership is also seen as extremely important include at least basic levels of health care and education, as well as research and credit services in areas where there are insufficient incentives for private sector initiatives. While most states have made very substantial progress in the reach and quality of these services, most still have considerable disparities in distribution between urban and rural areas, as well as between lowlands and uplands, and among different social strata of society. There are also often special issues and considerations where major components of local populations have different ethnic, linguistic or

cultural characteristics, as is commonly the case in montane zones. Of course, the same is true in most parts of the world, but that does not change the degree to which it affects disparities in economic opportunities among these different components of the population.

Additional services are also often provided by government agencies or their parastatal offspring, including, for example, provision of subsidized agricultural inputs such as seed, planting materials, fertilizers, or chemicals, production quotas under state monopolies, or information through extension materials in various types and formats. They also often use various incentives and/or disincentives to induce formation of different sorts of groups to engage in activities they promote, and sometimes provide credit or direct subsidies to them. Such services are frequently associated with national campaigns to promote one or another commodity or product and are often aimed at meeting politically determined production targets.

Various state agencies and programs have sought to move further beyond infrastructure, service and subsidy roles into direct operational involvement in enterprise development and management. While roles of state enterprise monopolies are generally being de-emphasized, they are still associated with many new “private” enterprises that are being “spun-off” from their operations, and many state military, administrative and political officials are involved to some degree in many new “private” ventures. These factors can and do affect the range and nature of market opportunities available in local areas, and especially in more remote areas where the range of livelihood options is usually more limited.

3.4.4 Constraints on opportunities

While the range of opportunities for market production in montane zones has clearly been expanding, efforts by people living in these areas to incorporate these opportunities into their livelihood strategies still face several types of important constraints.

Despite advances that have been and are currently being made in physical infrastructure, physical access is still an important constraint in many montane areas. And even when basic physical infrastructure and services are in place, the terrain and relative remoteness of many areas in montane zones still impose higher costs in time and transport on the inputs they require and the products they produce. This makes it difficult for these areas to compete directly with areas that have a locational advantage, unless other factors such as seasonality or product characteristics or quality can offset such constraints.

Limited information, knowledge and expertise impose further constraints on opportunities, and these constraints are usually more severe in montane zones. In addition to more difficulties in physical access, low non-poor densities in montane zones are indicative of the general scarcity of successful entrepreneurs and sources of knowledge and expertise. Generally lower levels of education and literacy are also indicative of the broader set of issues, which can be further complicated by language and cultural issues associated with ethnic minority populations. Moreover, there can be disparities in access to many programs and services that relate to ethnicity or affiliation with groups that are marginalized by society. We have also seen in Vietnam, however, that there are some newer government support programs where the tables

have been turned so that ethnic minority status can be an advantage in accessing support. While it is still an open question how much such programs will be able to affect the overall balance of constraints faced by ethnic minority groups, at least it appears to be a good start. We have also seen in Yunnan, where ethnic diversity is part of the provincial identity featured in marketing in its “backbone” tourism industry, that ethnicity seems to have little relationship with poverty status.

Critical gaps in production, processing and marketing chains are often very important constraints that are again more difficult to fill in montane zones. We have seen how vertical integration that incorporates contract farming mechanisms appears to be a promising approach, yet results and acceptance by farmers appears to be mixed. And where systems have been put into place largely through initiatives from lowland agro-industry companies, resulting areas of intensive production in mountain regions, sometimes based on only one or a few commodities, are coming under increasing criticism and restrictions related to their perceived environmental impacts.

If maintenance of diversity is to be one of the priorities for mountainous areas, then the example of chains that have been developed by the Royal Project Foundation in northern Thailand may be indicative of the types of systems that need to be put into place in order to have well-functioning mechanisms for capturing value added and effectively marketing products into high value urban niche markets. The fact that there appears to be so few examples where this has been accomplished and the unusual characteristics of the RPF are indicative of the difficulties involved. One of the least discussed, but perhaps one of the most important aspects of what the RPF has been able to accomplish is establishment of systems and operations that are generic enough that the same facilities and systems can be used for product lines that include a relatively diverse and evolving set of products, rather than the single commodity or narrowly focused chains that are more common in the region. At this point, there are still very few examples of private or public sector initiatives that have been able to effectively develop such “backbone” systems capable of supporting diverse product lines that play on the relative advantage of complex ecological conditions found in mountainous areas.

But perhaps the single most important set of constraints for people living in montane zones in many parts of the region relates to access to land resources. In some cases, especially in parts of Vietnam, this is associated with increasing population density resulting from high rates of population growth. But in many more areas it is not so much population growth that underlies land resource access issues and problems, but rather various combinations of lack of recognition and security in local claims to land resources, redistribution of settlement patterns associated with induced resettlement and land allocation programs, and increasing exclusion from access to land resulting from state land use policies. Many of the underlying issues here are associated with the nature of traditional agroecosystem management practices, which have been difficult to integrate into the conceptual framework of mainstream land tenure schemes, and which include practices that mainstream societies find extravagant in terms of the areas they occupy, and unacceptable in terms of their perceived environmental impacts. Additional aspects of these issues will be discussed further in subsequent chapters.

4. What strategies have been used to respond and adapt to changes in opportunities?

Previous chapters identified where montane zones of the Greater Mekong Region are located, the distribution of poor areas and people according to different definitions and measures, and how opportunities for market production have changed during recent decades. This chapter shifts to a finer scale of resolution in seeking to examine the strategies that different households and communities have taken in responding or otherwise adapting to the changing sets of opportunities that have emerged within their local domains. This is intended to help provide insight into differences associated with responses to market opportunities that also relate to poverty and inequality in the region.

4.1 Access of the poor to markets opportunities

We saw in the first chapter that poverty is associated with deprivations that prevent people from being able to pursue with dignity livelihoods that can enable them to achieve their aspirations. These deprivations can be associated with five types of capital assets: natural capital, human capital, financial capital, physical capital, and social capital. When some people are able to assemble appropriate mixes of these types of capital assets while others are not, inequality and poverty are likely results.

A recent review of inequality in Asia [ADB 2007] emphasizes distinctions among three aspects of inequality: Inequality in outcomes is what can generally be measured using tools such as Gini coefficients or quintile ratios. Inequality in effort reflects the different degrees of striving, ambition, and diligence, as well as different aspirations among people in a population. Inequality in opportunity reflects underlying issues, structures and processes in society that deprive some portions of the population from having the capacity and a chance to pursue their aspirations with dignity. Indicators of inequality based on income are either already fairly high (Thailand) or appear to be growing in all states of the region. Such indicators are considered to be measures of inequality in outcomes. And as we have already seen, distributions of this type of inequality are not necessarily similar to distributions of poverty incidence, depth or densities.

Most measures of poverty are based on comparisons with national or international poverty line standards, and efforts to establish poverty lines seek to differentiate what is sufficient to provide basic opportunities for people. One major problem with most conventional approaches, however, is that they focus primarily on income or consumption expenditure-based outcome measures. Although these measures can then be correlated with indicators of other characteristics of poor and non-poor populations to try to identify “determinants” of poverty, there are often still important difficulties in distinguishing between correlation and causation.

One line of alternative approaches centers on participatory poverty assessments, such as the one employed in the Lao PDR that seeks “...to define, in a manner that is representative of

the country as a whole, what poverty means to the poor themselves, what they experience in their own words, what causes they identify for poverty, and what their recommendations are for the alleviation of poverty” [Chamberlain 2007]. Participatory poverty assessments have also been conducted in Vietnam [World Bank 1999] and Thailand [Srawooth 1999], as well as many other countries [Narayan et al. 2000], as part of efforts to develop a global report on poverty [World Bank 2001].

One of the major global products of this work identified ten dimensions of the deprivations and disadvantages endured by the poor [Narayan et al. 2000]:

- Livelihoods and assets of the poor are precarious, seasonal, inadequate
- Places where the poor live tend to be isolated, risky, unserved and stigmatized
- The bodies of the poor tend to be hungry, exhausted, sick and in poor appearance
- Gender relations are often troubled and unequal
- Social relations with the poor are often discriminating and isolating
- Security of the poor is often characterized by lack of protection and peace of mind
- Behaviors toward the poor reflect disregard and abuse by those more powerful
- Institutions often treat the poor in ways that are disempowering and excluding
- Organizations of the poor themselves tend to be weak and disconnected
- Capabilities of poor are limited by lack of information, education, skills, and confidence

Moreover, these dimensions are often tightly interlocked, making it difficult for poor people to better their lives. One aspect of particular overall concern is the “...seemingly insurmountable problems of accessing market opportunities, government services and civil society resources.” [Narayan et al. 2000]

The focus of assessments under our study is on market and resource access of the poor in upland zones of the Greater Mekong Region. While it is beyond the scope of our work to attempt to provide in-depth coverage of all the above aspects of deprivations associated with poverty, it is also clear that we need to consider carefully what we mean by access.

Access

The most common, and perhaps the most basic way in which access is perceived is in terms of physical access. Especially in largely rural areas such as those found in most montane zones, one of the most basic limits on access to resources is the type and characteristics of natural resources present within a local area. As we have seen, land, water, plant and wildlife resources in mountain areas tend to be very diverse, and thus the amount or extent of any particular type of resource tends to be limited. Different types of resources have different productivities for yielding different types of products in return to investments of different types of capital assets. Who can gain physical access to do what kinds of things with which particular types of natural resources is mediated by institutions in human social systems that are nested from very local to national and international levels. Terms of access can vary widely with regard to exclusive versus joint access, timing (e.g. seasonal, temporary, permanent), or types of use allowed (e.g. gathering, hunting, timber, grazing, cropping, etc.). Moreover, rules under institutions at different levels may conflict with each other, and all are subject to change over time.

Physical access also has its basic costs. Perhaps the most basic of these is the cost in human time and energy associated with travel to and from a site where a particular type of resource use is possible. Costs can also increase depending on the types of tools and inputs needed to transform the natural resource into a useful product or service, and to relocate products to where they will be used, consumed, or traded for something else. There are also various costs in terms of social or other types of capital assets associated with obtaining and maintaining physical access under social institutions that regulate access to and use of natural resources.

Social groups and organizations at different levels can mobilize and invest various types of resources in development of physical capital assets in the form of infrastructure that can decrease costs of physical access (e.g. trails, bridges, roads) or increase productivity of natural assets (e.g. irrigation, drainage). The distribution of costs and benefits associated with building, maintaining and operating such infrastructure is again mediated by social institutions.

All of these types of processes have been occurring for centuries at many locations across the Greater Mekong Region. Many would agree with Jodha [2005], however, that in the past the gradual rate of change in mountain regions and their relatively high costs associated with great distances resulted in evolution of livelihood strategies that were diverse and closely linked with natural resource characteristics of upland mountain environments, including consideration of risks and sustainability.

From this point of view, what is happening as a result of the relatively recent changes occurring across the region discussed in the previous chapter is not really a change in these basic principles. Rather, it is that changes in institutions and investments at higher levels are bringing rapid change that is often imposed on upland mountain areas without consideration of the context and constraints these areas face. As a result, institutions, infrastructure, production arrangements, and other factors associated with 'modernization' and market integration are both pushing and pulling people in mountain regions in directions that degrade fragile natural resources, marginalize and exclude mountain people, and increase their risks and vulnerabilities. High poverty levels are seen to be one result of these processes.

Others argue, however, that problems in upland mountain areas are associated with insufficient access and integration with globalizing economic systems. From this point of view, what is needed is more extensive and efficient infrastructure for transportation, communications and energy (the focus of GMS infrastructure programs), together with more access to markets and financial capital (credit), as well as education, public health and social service programs to build human capital. From this point of view, local economies and livelihoods will then be able to restructure themselves around products or services for which they can find a niche in the globalizing economy, or relocate to another location or economic sector.

While we see that high poverty incidence in the region is often associated with relatively remote montane areas, it is also clear that poverty is not limited to such areas. As the survey of poverty in chapter 2 indicates, there are both poor and non-poor components of populations everywhere in the region. Moreover, in areas of high population density the number of poor

people can be even greater than in areas with high poverty incidence but low population density. And inequality can be high in areas where poverty is considered to be quite low.

This raises at least two important issues for our examination of resource and market access. The first issue is what elements of access are associated with particular types of locations or areas? This issue appears especially relevant for areas where poverty incidence is high and non-poor density is low, which suggests that location-based constraints may be very important. The second issue is what are the underlying access-related issues associated with poverty in areas where relatively large proportions of the population are able to maintain livelihoods that keep them above the poverty line? These situations suggest location-based constraints on access may be of less importance than other types of constraints. And in either case, it may be important to try to distinguish differences in access between components of the population that may be temporary or transient poor, versus others that may be chronically poor [Hulme & McKay 2005], and how these are changing over time.

Research approach

Our approach to investigating these issues has been to examine the types of livelihood strategies found in case study research areas, and to group them into classes that reflect degrees and types of response to and engagement with market opportunities that have emerged in recent years. We have then explored the characteristics of households who adopt these different types of strategies, with particular attention to the composition of their portfolio of livelihood assets. Additional information includes views they have expressed themselves about their choice of strategy, directions in which they want to progress, constraints they face, and how they are seeking to address those constraints, as well as data and information from studies of how strategies have changed over time. Analysis of this data provides the basis for our overall assessment of differences in strategies, response capacities and institutional influences, as well as our perceptions of directions in which inequality appears to be changing in these areas.

4.2 Access constraints and efforts to reduce them

This section explores three dimensions of access constraints and efforts to reduce them at different sites and levels in the region. First, the distribution of various factors that physically constrain access to land, water, and markets are surveyed in the context of the Upper Ping Basin using spatial information technology. The second dimension turns to government programs in Vietnam specifically that specifically target reduction of constraints to access to natural resources, markets, and services for poorest communities in remote and mountainous areas. The third dimension brings us back to North Thailand to explore ways in which poor people obtain and use assets and entitlements that support each other in order to gain access to additional livelihood options as they further build their capacity to achieve a better life, resulting in patterns of livelihood change that can be seen as climbing an asset-entitlement ladder. Together, these three examples of access constraints and approaches to overcoming them set the stage for our explorations of various household strategies for responding to new market opportunities section 4.3.

4.2.1 Physical access to resources and markets in the UPB

Our Upper Ping Basin case study site in northern Thailand is sufficiently large and diverse for us to begin with an examination of differences in physical access to natural resources and markets among locations in different parts of the basin. We begin with a brief discussion of land access issues that were already introduced in the previous chapter, followed by a spatial assessment of access to various types of water resource infrastructure that have been developed through investments in the basin. We then turn to a spatial assessment of differences in access to economic and social infrastructure associated with different locations and investments in transportation infrastructure in the basin.

Access to natural resources: Land

The introduction to discussion of land use production systems in the UPB in the previous chapter was divided into two parts. The first part demonstrated the spatial distribution of complex and dynamic agricultural production systems that continue to evolve in response to globalizing market conditions. It is clear that the overwhelming focus of this system is in lowland and lower montane areas of the Chiang Mai-Lamphun valley, where assessments indicate land and locations are suitable for a substantial range of commercial crops, and land use tenurial rights are primarily fully recognized under the national system of land titling. Access to land in these areas is mainly limited by one's ability to inherit or purchase land at increasingly expensive market prices that rise with close physical proximity to major urban centers that are expanding into surrounding agricultural lands.

We also saw in Figure 3-25, however, that large areas of the UPB located outside the Chiang Mai-Lamphun Valley have been declared protected forest areas, or have land use constraints associated with the national watershed classification system. Most all forms of land use by local communities is legally excluded from protected forest areas and class 1 watershed lands, and restricted to various degrees by other watershed classes in montane zones. The overall impact of these constraints is that there are very few areas where local communities have any form of official recognition of their land use rights. Yet we saw examples from the Mae Chaem sub-basin of the various types of agroecosystem management practices that exist in most of these areas, and how they are being increasingly excluded from expanding protected areas and pressured to transform their traditional mosaic landscape management practices into small areas of intensive commercial crops supplemented by non-farm wage employment.

Thus, in the UPB we do, indeed, see very great overall differences in access to land resources between lowland and upland areas. In both cases, however, the poor face increasing access constraints – by exclusion in the uplands, and by land prices in the lowlands.

Access to natural resources: Water

Irrigation systems of different types and capacity have been developed in UPB. The service area of a large-scale irrigation project is at least 12,800 ha, while medium and small scale projects are categorized by service areas of from 480 to 12,800 ha, and less than 480 ha. The number of projects and service areas of different types of systems are shown in Table 4-1.

Table 4-1. Irrigation projects and service areas in Chiang Mai and Lamphun provinces

Province	Large-scale		Medium-scale		Small-scale	
	Number	Service area (ha)	Number	Service area (ha)	Number	Service area (ha)
Chiang Mai	3	71,878	15	15,671	428	72,833
Lamphun	0	0	9	17,200	127	23,434
Total	4	71,878	24	32,871	555	96,267

Large and medium irrigation schemes are operated by the Royal Irrigation Department (RID), and are located mainly in lowland areas where large volumes of water can be diverted or stored before allocation to farmlands through extensive canal networks and structures. The four large scale projects are Mae Taeng, Mae Fak-Mae Ngad, Mae Kuang and Mae Ping Kao.

Service areas of large-scale irrigation projects total 71,878 ha, and cultivated areas for main season and dry season crops in each system are shown in Table 4-2. During the rainy season, cultivated areas receiving irrigation water from these systems range from 60 percent in the Mae Taeng Project to 83 percent in the Mae Kuang Project. Crops are mainly paddy rice. During the dry season, however, only 22, 40, and 66 percent of service areas in Mae Kuang, Mae Taeng and Mae Ngad Projects are under cultivation. The low proportion of cultivated area in the Mae Taeng Project is the consequence of expansion of housing development areas during the past twenty years. Main crops vary in different irrigation systems; soybean, paddy and onion are major dry season crops in the Mae Taeng Project, while paddy and tobacco are predominant in the Mae Kuang Project. Significant amounts of irrigation water are also used for water supply to the city.

Table 4-2 Irrigable and cultivated areas in large-scale irrigation projects, 2001

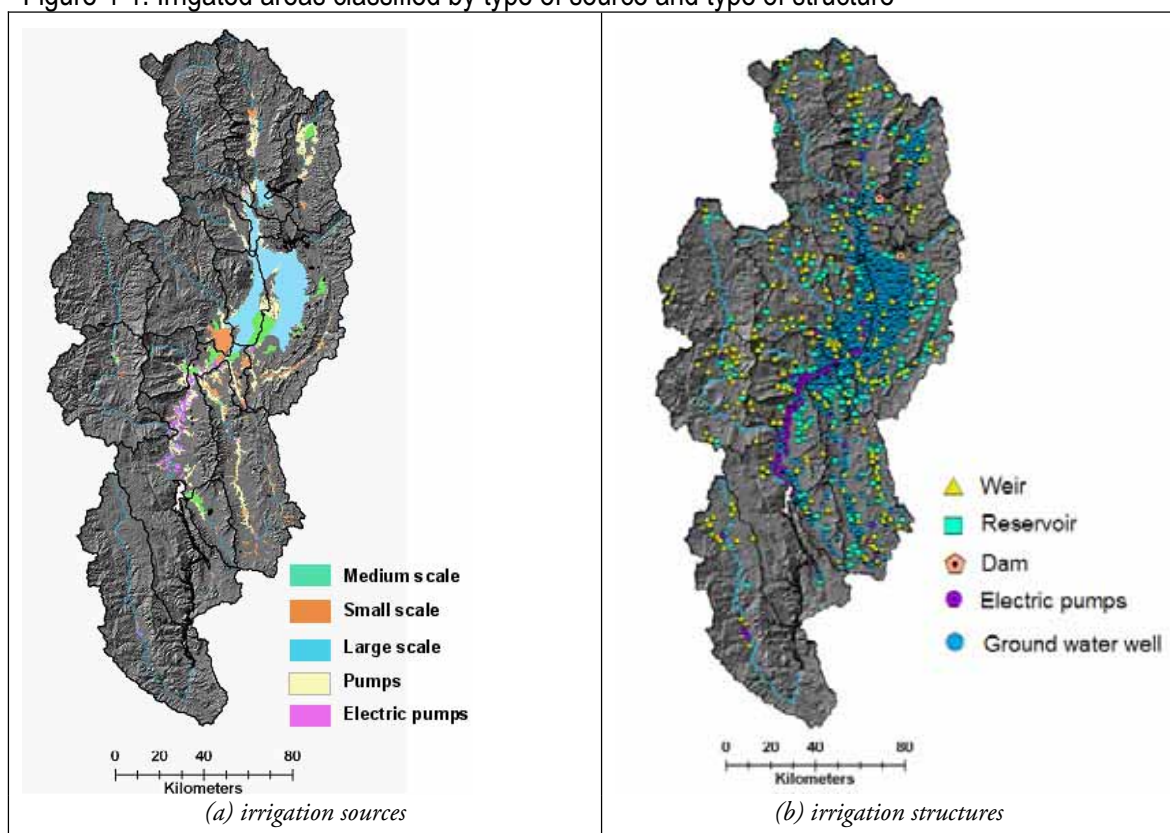
Irrigation Project	Service area (ha)	Cultivated area (ha)		Proportion	
		Main season	Dry season	Main season	Dry season
Mae Kuang	28,000	23,131	6,286	0.83	0.22
Mae Taeng	27,878	16,603	11,233	0.60	0.40
Mae Fak- Mae Ngad	16,000	12,510	10,636	0.78	0.66
Total	71,878	52,244	28,155	0.77	0.29

There are about 20 medium-scale irrigation projects in the UPB, with service areas of about 56,000 ha. These systems can support paddy areas during the rainy season that total about 85 percent of their total service area. But during the dry season, only 35 percent of their service area can be used for paddy and soybean cultivation. Some longan production areas are also under irrigation from these medium-scale irrigation systems.

Small scale irrigation systems are mainly diversion weirs managed by farmers in local communities. Some of these systems have been in service for over 1,000 years [Vanpen 1986]. They are mainly diversion weirs originally constructed with wood and rocks, but recently replaced by concrete to reduce annual maintenance requirements associate with wooden materials. Water is diverted to farmlands by earth canal and field ditches through communal efforts. Unlike larger irrigation structures, networks of small irrigation weirs are extensive in lowland, upland and highland zones (Figure 4-1b). Some small irrigation systems also have reservoirs constructed under rural development projects initiated by the government.

Another source of irrigation water is from electric pumping station projects (EPS) initiated by the former Ministry of Science Technology and Environment, but later transferred to be under the administration of RID. The main objective of EPS is to provide irrigation water for dry season crops by pumping water from rivers and perennial streams. Water is pumped at the rate of 0.5 m³/s to storage ponds, and allocated to service areas (80-800 ha) by gravity through a network of main canals (usually paved for 3 kilometers) and laterals up to 6 kilometers in length. There are at least 77 EPS scattered in Chiang Mai and Lamphun provinces, most of them in the Mae Ping Part 3 sub-watershed (Figure 4-1a). Major crops that benefit from EPS are paddy during the rainy season and longan in the dry season. Local management of water distribution is conducted by local sub-district governments (TAO).

Figure 4-1. Irrigated areas classified by type of source and type of structure



Ground water is also an important source of irrigation water, particularly outside irrigation project areas. Figure 4-1b shows the distribution of tube wells in UPB, and clearly indicates that farmers living in lowland areas have more access to ground water for irrigation than those who live in the uplands and highlands. The depth of ground water in the highlands and uplands prohibits small farmers from investing in deep wells for cultivation.

Overall physical accessibility to water for irrigation may be assessed as the proportion of irrigated area in local level 4 sub-watersheds, as displayed in Figure 4-2. Highest values appear to be concentrated in sub-watersheds that are located in the lowlands, where investments in large and medium scale irrigation systems have been made by the government during the last forty years. But highland and midland zones have higher annual rainfall, and water is diverted from smaller streams by farmers for irrigation in small local valleys. Thus, although

smaller proportions of irrigated area are found in montane zones, significant access is provided through local small scale weir diversion systems. With increasing exclusion from areas for upland fields, most of these are now being expanded to the limits imposed by terrain and water supply. But investment costs for irrigation from groundwater are too high for small farmers in these zones to further expand their irrigated areas.

Access to economic and social infrastructure: Transportation

Physical access to markets, information, and services depends to a large extent on the quality and density of road networks, and can be assessed by estimated travel time from sources to destination. Important locations for sources of market information and services are commonly district towns and provincial cities, while destinations are villages, or in an aggregated local sense, the centroid of each local (level 4) sub-watershed.

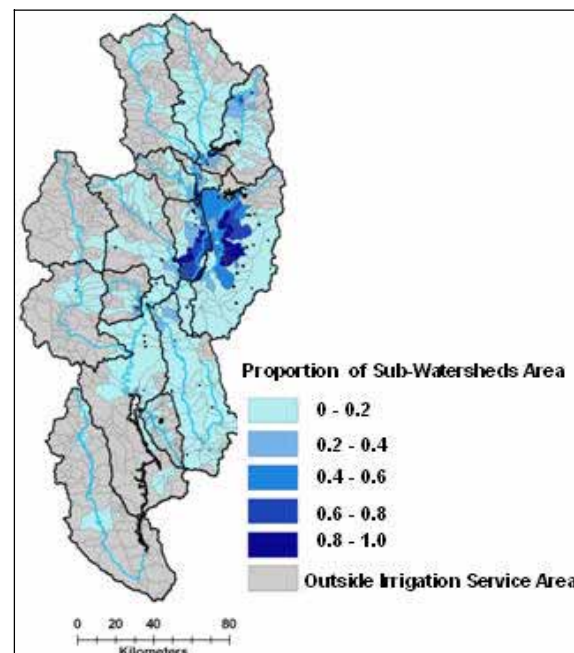
Estimates of travel time from villages and sub-watersheds to districts and provincial cities were constructed using the “Network Analyst” extension in ArcGIS software [ESRI 2002]. Minimum geo-databases for this analysis are location of villages, sub-watersheds, districts and provincial city, and road networks. Local sub-watershed and district boundaries created as polygon features were converted to point locations using the “centroid function”.

In order to estimate travel time, the road network of UPB (Figure 4-3a) was connected to origins (villages and sub-watersheds) and destinations (districts and province). Since road length (m) and traveling speed (km/hr) for each road section are required to calculate travel time, they were estimated by classifying roads into 3 types (local street, major road and highway), and assigning a travel speed to each road type. Average speed of travel for highways was assigned as 60 km/hr., while major road and local street types have average speeds of 40 km/hr. and 20 km/hr) respectively.

Once origin and destination (OD) maps were prepared from the road network map layer, the OD cost matrix function in Network Analyst was used to estimate travel time (minutes) from each original location to each destination. The output of this analysis was a matrix of shortest paths between each origin and destination pair. This information was then joined to villages and sub-watersheds as attributes of those features that may be displayed as maps.

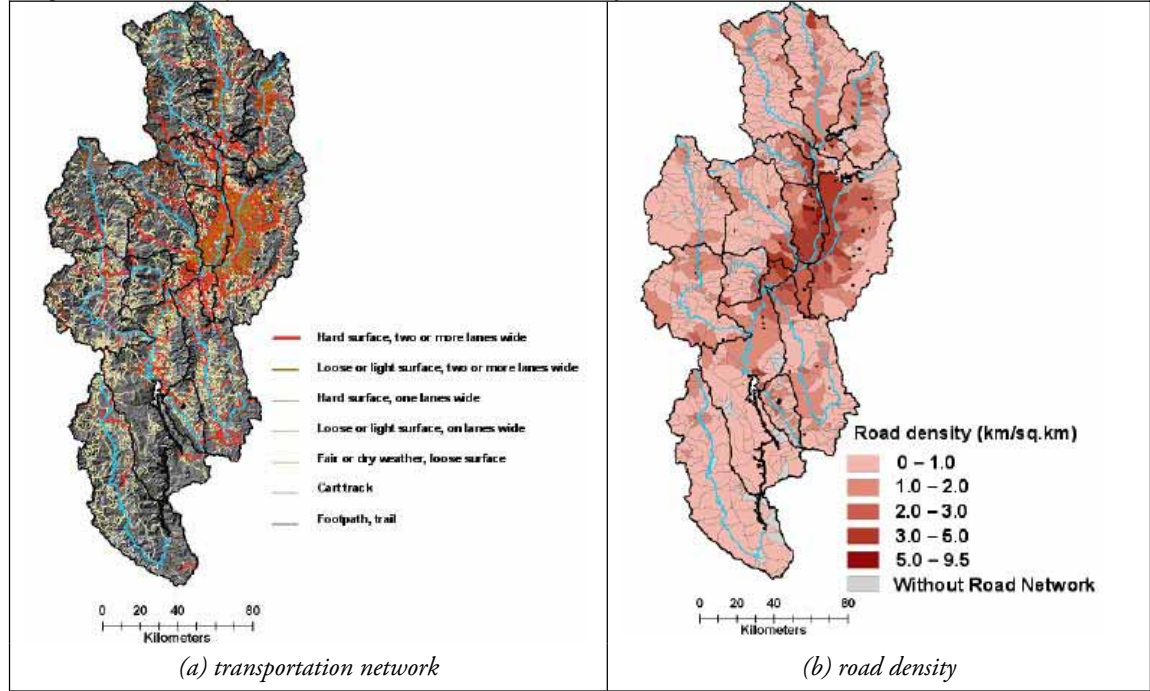
Transportation networks and road density in UPB are displayed in Figure 4-3. The most dense road network is clearly seen in lowland irrigated areas around the city of Chiang Mai,

Figure 4-2. Access to irrigation expressed as percent of irrigated area in level 4 sub-watersheds



where values as high as 9.5 km/sq. km. are found. As expected, lowest road density values coincide with highland areas in Mae Chaem and Mae Tuen sub-basins.

Figure 4-3. Transportation network and road density in UPB



Physical access to agricultural services from district towns may be expressed as travel time from the centroid of each sub level 4 watershed (Figure 4-4a) and from villages (Figure 4-4b).

Figure 4-4. Travel time (hours) from local sub watersheds and from villages to district town

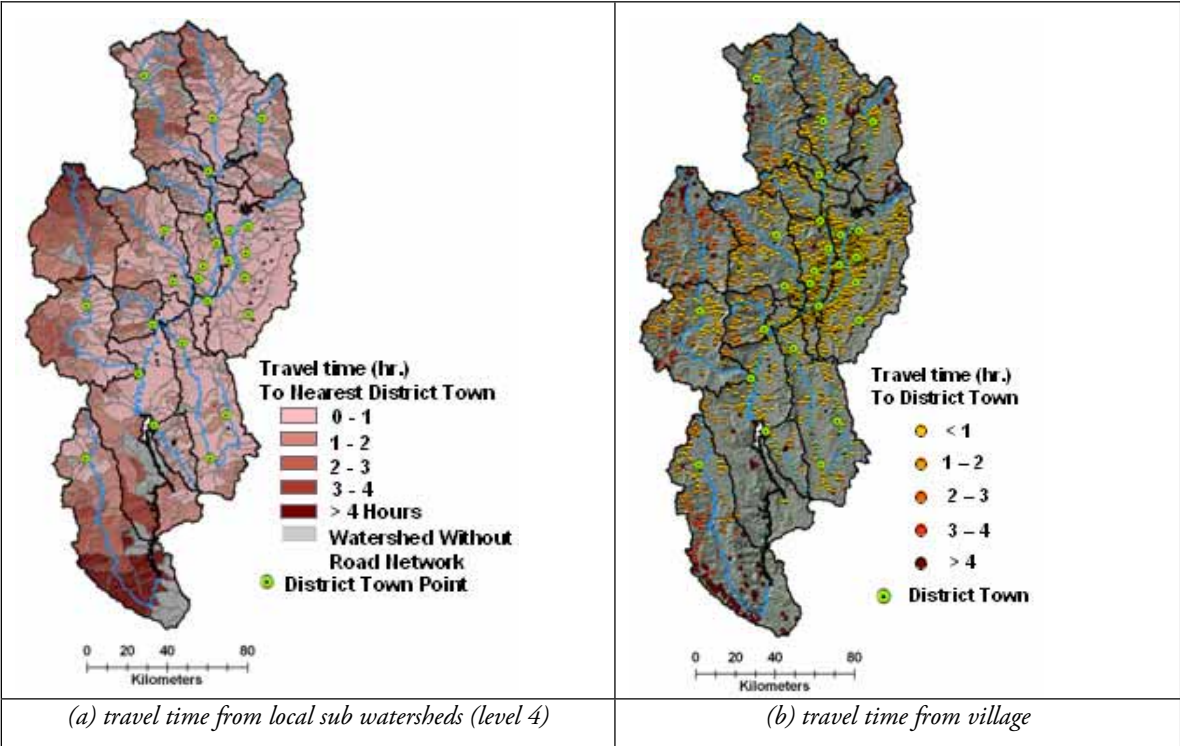
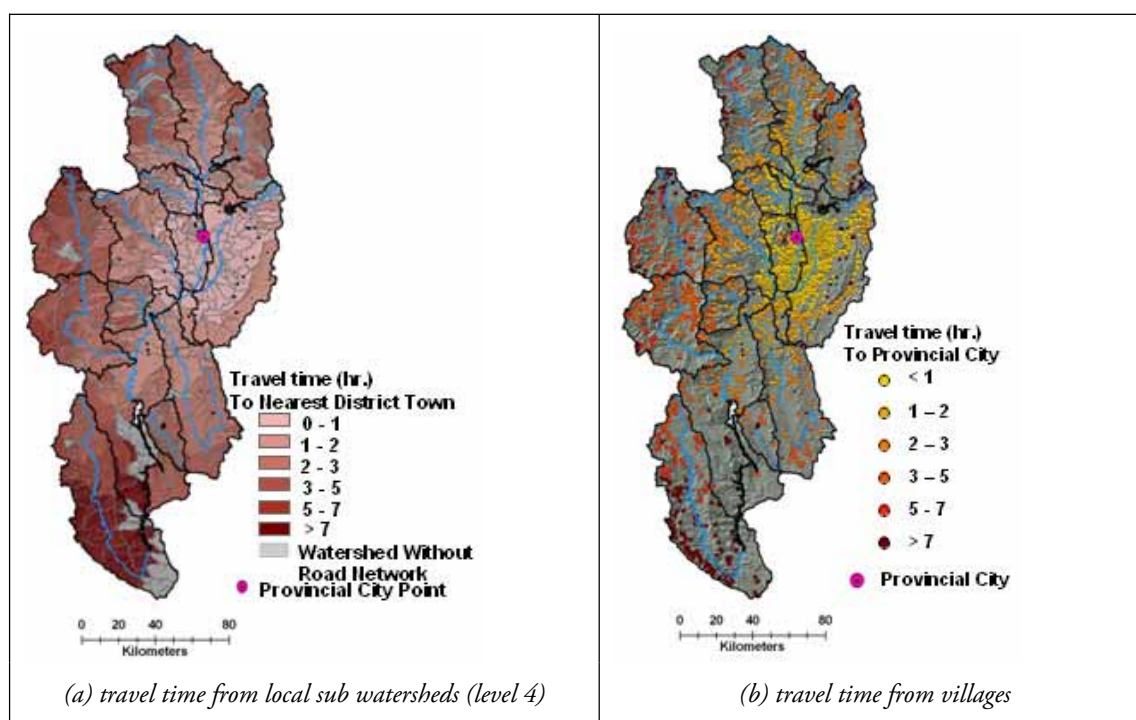


Figure 4-5. Travel time (hours) from local sub watersheds and from villages to City of Chiang Mai



These results clearly differentiate physical accessibility to markets among farm communities in different parts of the UPB. It would take a household in the highlands a much longer time to access agricultural inputs, outputs and information from district towns in general, and from the provincial city in particular (Figure 4-5). Accordingly, significantly higher transportation costs will increase costs of purchased inputs and decrease net revenues from sale of products. Sites of agri-chemical stores and local markets for trading products (Figure 4-6) also favor lowland irrigated farming areas, where more profitable commercial farming enterprises are located.

Figure 4-6. Distribution of agri-chemical stores and local markets

