

# Balance and Imbalances in Village Economy: Access to Water and Livelihoods in Three Villages of Central Thailand<sup>1</sup>

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## *Summary*

Village economies in Asia are undergoing a growing process of integration to the national and wider cultural and economic spheres. Factor endowments, transportation facilities and other socioeconomic and human factors account for differentiated responses. In the Chao Phraya Delta, Thailand, access to water is a crucial factor governing agricultural diversification and intensification. This paper compares the household structure, the land resources, the means of livelihood, sources of income and their distribution among households in three villages with contrasting levels of water control. It is shown that while there is a huge gap in land productivity among the three villages, economic diversification, both agricultural and nonagricultural, operates a rebalancing of household incomes, without however totally bridging the gap. The implications for planning of water resource development are discussed.

*Keywords:* Thailand, rural livelihoods, diversification, agrarian change, water management, water policy

## **1 Introduction**

Agricultural development is critically contingent upon the availability of and access to production factors. Access to irrigation water, in particular, generally allows the stabilization of farm production by reducing the uncertainty of water supply, as well as allowing the extension of cultivation during the driest periods of the year. Cropping intensity, which measures how many crops are grown per year on average, often reflects the degree of intensification permitted by better water control. The development of irrigation is often undertaken to increase national food security and to improve rural livelihoods, but it may also appear as a great generator of inter-regional inequalities. By materializing the comparative advantages of those areas that can be more conveniently irrigated, irrigation accentuates natural differences in production potential and the income disparities that result from

them. Within irrigated areas, too, processes of agrarian differentiation may result from differential access to production factors, in particular water, from which the infamous head-end/tail-end problem is one familiar manifestation. Such differences may result from the malfunctioning of irrigation systems but may also stem from variations in ecological conditions or allocation priorities. Limited water resources (especially in the dry season) are often allocated preferentially to those areas endowed with better conditions for production. Planners as well as managers are therefore frequently faced with the dilemma to maximize both the return of public interventions and social development or, in other words, with the familiar tradeoff between macro-economic efficiency and equity.

Faced with water constraints, farmers often try to develop conjunctive use, notably through the use of pumps and the digging of wells (Shah, 2001; Barker and Molle, 2002). More generally, farmers' response to constraints on agricultural production span a wide range of options. These include agricultural strategies (expand land, intensify production, use factor saving technology, etc) but also economic diversification, both at the individual and household level. While rural development has long been seen as an essentially agricultural issue, it has become clear in the past decade that the traditional frontier between the urban and rural spheres was increasingly blurred. Rural households derive income from a diversified portfolio of activities that cut across economic sectors (on-farm, off-farm) and spatial boundaries (permanent, seasonal or periodic migration to cities or foreign countries). In Africa and South-Asia, studies commonly find percentages of non-farm income as high as 40 and 60% respectively (Ellis, 1998), whereas Rigg's (2001) review on Southeast Asia arrives at shares of between 40 and 70%.

Many studies have addressed the impact of irrigation on income and income distribution (e.g. Easter and Martin, 1977; Sampath, 1984; Dhaman, 1988; Ahmed and Sampath, 1992), or on the impact of uneven access water distribution in poorly managed irrigation schemes (Wade, 19xx; Hussain *et al.*, 2003). This paper compares situations with different water control. While the pattern of diversification of livelihoods is the outcome of a complex process of adaptation where structures, the access to production factors, the availability of social capital, and human agency play a significant

role (Scoones, 2000; IDS, 2002), the working hypothesis of this paper is that in irrigated areas the degree of control over water can be expected to be an overriding factor in shaping individual strategies and local development. Thus the effective impact of differentiated levels of water control on livelihoods, income distribution and poverty alleviation needs to be investigated. While access to water is recognized as an important dimension of rural poverty reduction, such study must shed light on the dialectic between local processes and transformations of the wider economy, and determine whether possible socio-economic imbalances need to be redressed by changes in water allocation, further land development, or other policies targeting non-farm sectors.

To document the effective impact of access to water on the productivity of farming systems and the livelihoods strategies of farmers, a field survey has been undertaken in three villages of the Chao Phraya Delta, Thailand. The Chao Phraya Delta presents varied ecological conditions (Kasetsart University and IRD, 1996; Molle and Dao The Tuan, 2001) and the three villages have been selected as being representative of three contrasting environments with varied levels of access to and control of water, resulting in contrasting cropping intensities<sup>1</sup>. In each village, all households were listed and analyzed in terms of family structure, land endowment and occupation, out of which approximately 70 households were surveyed in more detail.<sup>2</sup> The survey included questions about the family (last three generations), migration, occupation, agriculture, assets, indebtedness, income, and covered the actual situation, the history of the farm and its strategy regarding the future. Data were analyzed comparatively and interpreted with special attention given to the degree of agricultural intensification allowed by a given access to water.

The first village (Ban Nong Mon, Don Phut district, Saraburi province) was settled by ethnic *Lao Phuan* and is typical of the floating rice area of the delta (see figure 1). Uncertainty in production has been decreased in the mid-1970s by the construction of dikes and the gating of the drainage system. It has only recently started to grow some field crops (corn, chili, etc) in the dry season. The second village (Laat Salee, Tha Wung district, Lop Buri province) receives a limited water supply during the dry season. The upper parts grow high-yield varieties (HYVs) while the lower part of the sub-district

is cropped with deep-water/floating rice and has only recently been engaged in dry-season cropping. The third village (Mot Deng, Sri Prachan district, Suphan Buri province) is located in one of the finest areas in the delta, commonly grows two or three crops of HYVs of rice and cultivates water chestnut, a labor-intensive cash crop. It is well served by irrigation canals, with additional water pumped from the nearby Suphan Buri river or tube wells, and has long been well connected to main transportation ways.

All these villages are located in the command area of the Greater Chao Phraya Irrigation Project, which was constructed in the 1950s. In the late 1960s, the benefits of irrigation were still relatively undifferentiated, since the 1.2 million ha of land under paddy cultivation were farmed with one crop of traditional rice varieties a year, during the rainy season. It is only in the 1970s that the green revolution and double-cropping, boosted by the increase in water supply subsequent to the construction of the Sirikit dam (1972), started to spread. Depending on ecological conditions and other factors, the sub-areas within the delta intensified production in varied degrees, thus setting themselves on diverging trajectories. Ayutthaya, Lop Buri and Suphan Buri villages<sup>3</sup>, in that order, exemplify water control conditions ranging from poor to very good, with cropping intensity ranging from 1 to 3 approximately. Based on survey data, this paper first investigates how the three villages have evolved in the last four decades and how diverging these evolution trajectories have been (section 2). It proceeds with the analysis of the causes and consequences of this differentiation (section 3). Section 4 examines the rationale for investments in water control and discusses linkages with the basin level and with agrarian pressure, while section 5 offers a few conclusions.

## 2 Historical transformations and actual situation of the three villages

### 2.1 *Household Structure and Labor Force*

The very definition of what a household is and the identification of its head were problematic from the outset. There were, for example, a wide variety of situations in which the house was officially registered in the name of a person who was away or not economically active. Although an effort was made to identify the head of the household (in terms of economic decisions), this introduced a certain bias in the categorization of households. Table 1 shows the distribution of the whole population of the three villages by main age class. The most striking difference is the much lower percentage of children under 15 in V1. This can be attributed to a higher rate of emigration of families with young children and to a lower fertility. This last point is supported by data given in Table 2, which shows a dramatic decline of fertility across generations. While parents over 60 have more children in V1 (at that time, children were an asset against poverty), the situation for younger generations is the opposite<sup>4</sup> (factory work and migration to cities do not favor rearing of children). Studies by Foster (1977) and Lauro (1979) carried out in the 1970s in the Chao Phraya Delta show that households with grimmer economic perspectives tended to curtail their fertility.

The composition of households regarding generations was rather surprising: only one-third of these households were composed of parents and their children. However, if we compute the percentage of 3 (or 4) generation households, we obtain 38 percent on average, a rate quite commonly encountered (see Molle and Thippawal, 1999). Noteworthy is the lower percentage of three-generation households in V1. The greater rate of emigration tends to dislocate families and raises the share of one- and two-generation households. For example, there are five cases of households composed of grandparents (or a grandmother alone) who take care of grandchildren, while their parents are away working in factories. Single third-generation elderly households (or couples) amount to rather high

values, 10 percent and 12 percent in V3 and V1 respectively (with half of them still economically active).

These different factors translate in varied average sizes of households and also affect the available labor force. V1 has significantly smaller households (only 3.5 members against 2.7 in the two other villages) and the available labor force<sup>5</sup> is also much more reduced (1.8 against 2.3). This number can be compared with the average membership of 5.2 per household found by Amyot (1976) in 1969 in three villages located close to V1. This shows both the impact of the decline in migration and fertility and the differences between the three environments in terms of labor absorption capacity.

The current residence of both the household family members and the siblings of the household heads is also instructive (figure 2, sample data). Most of the family members (corresponding to children in 31% of cases), reside in the house. Between 10 percent and 15 percent of the family reside in Bangkok and over 10 percent in other provinces. This rate is significantly higher for V1 (25%), which shows that permanent emigration to other provinces (often upland areas of the central region) or even to other regions is nowadays still quite common (this also includes, as a cause or consequence, males marrying females from other provinces).

The siblings of the heads of households form a quasi-exclusively adult population that is more homogeneous. It was found that these siblings were settled in Bangkok (10%) and more commonly in other provinces (“other”), especially for V1 village (32%). Around 55 percent of the population that reached adulthood in the last three or four decades in V3 and V2 remained in the village, against only 35 percent in V1. If we look at these data by the class of age (of the household head), we can observe that the rate of settlement in the village for the siblings of the generation under 40 is 15 percent lower than the value for the older generations. For V1, the rate relative to household heads under 40 is now as low as 30 percent but data show that the situation was similar for the previous generation. The increased mobility is shown by the shift in the destination of migration, from the province and Bangkok in earlier times to other provinces at present.<sup>6</sup>

In the 1950s and early 1960s, the delta experienced an agrarian crisis, when the increasing population density was not matched by an increase in crop productivity or by the supply of other job opportunities. The ‘upland boom’ (the development of rainfed agriculture in upland areas during the 1960s and early 1970s), was extremely timely. Table 3 shows that the current heads of households (and to a lesser extent their parents and their children) have been involved in the migration flows between the delta and the uplands: on the whole, 55 percent of families in V2 and V1 had members concerned with a temporary or permanent move to the uplands, against 34 percent in V3. Although the whole delta was affected by these migrations, to the extent that its farming population decreased in absolute terms between 1960 and 1970 (Molle and Thippawal, 1999), V3 was provided with better farming conditions and could more easily accommodate its growing population than the flood-prone area.

These discrepancies in land productivity are also reflected in the much lower percentage (22%) of V3 households with at least a member working, or having worked, in a factory (Table 3). In V1, this percentage is as high as 46 percent. The fact that such jobs rarely last beyond the age of 40 (Neullang, 1992; Kitahara, 2003) is probably responsible for the higher rate of members having worked in factories in the past than at present. It is noteworthy that only 21 percent of the total factory jobs reported were in Bangkok, the others being found in the province itself (or the neighboring ones).

## *2.2 Occupations*

The classification of households according to their main activities was an arduous task since households with only one economic activity were exceptional. In fact, households members often engage in several economic activities (one son repairs motorcycles, another catches fish, the wife dries chili for the Women’s Group, grows home vegetables and raises poultry, joins groups for harvesting and receives occasional remittances, etc) and in many cases it was difficult to identify which was the main activity (or, if both the husband and the wife had a full-time job, which one was

to be chosen). The number of people contributing to the household income was also a source of confusion. Some people work mainly in Bangkok but still have their main residence in the village, where another member of the family (wife, son) may still take care of the rice fields. Some older people may lease most of their land but still have one of the children cultivating a few *rai*<sup>7</sup> for them. Other households are composed of two or three single adult siblings with different activities. In other words, the difficulty of defining households mentioned earlier, together with the composite nature of the household economy (both in terms of contributing members and diversity of activities) appeared as critical features, deserving emphasis rather than being treated as disturbing factors affecting (oversimplified) classificatory attempts.

However, a first classification, limited to the main occupation of the household heads, was done according to the list of households provided by the Sub-district Administration Organization and checked with the village headmen (figure 3). The “wage labor” category includes *khon rap jang*, who look for daily wages from a diversity of short-term tasks (harvesting, spraying crops, construction, etc.), employees such as truck or tractor drivers, guards or factory employees, while “nonagri” occupations refers to own-account workers (blacksmiths, electricians, etc) or officers (teachers, nurses, etc). The “lease” category refers to (often old) farmers who rent out all of their land and who either receive remittances or have other activities (e.g. teachers). The first striking point is that only 40 percent of the households in V3 can be classified as farmers, while this rate is close to 60 percent in each of the other two villages. The large “nonagri” category in V3 can be attributed to the diversity of economic activities allowed by capital accumulation: they include transportation, construction and commercial activities, and also official positions allowed by better educational levels (investments in education). The percentage of waged laborers is around 20 percent but it is only 15 percent in V1. Full tenants are prominent in V1, as will be seen later.

Subsamples were taken from these sets of households in order to focus on the activities and income of the population predominantly engaged in agriculture. This was motivated by the chief objective of

investigating the impact of the access to water on livelihoods and, therefore, a first sample of farmers was chosen, with caution to cover the whole range of tenure type and farm size. Households from the landless category were then added, as it was felt that this would bring a better understand of their position in the village.<sup>8</sup>

Table 4 shows the distribution of occupations of the heads of holdings and of all their siblings (regardless of their place of residence). The distribution in the three villages is similar, with relatively few waged laborers (around 15–20%) and a dominant population of farmers (50–60%), while other occupations are more or less evenly distributed in the remaining categories. The table also presents the distribution relative to all the children of the household heads, therefore to a sample on average one generation younger than the former one. Younger children still studying at school or at the university make up 31 percent of the total population but they have been excluded from the figure so that the percentages relate only to active individuals, who may be young but also middle-aged, if the household is ‘old’ (grandparents or generation 3). The first striking difference is that the ratio of children engaged in farming in V3 and V2 is as low as 30%, but reaches 11 percent in V1! The percentage of individuals working in companies, on own-account or as civil servants is higher in V3 (while those working in factories account for only 7%), which suggests again that better economic conditions have allowed capitalization in the form of education for children. In contrast, factory work and daily wage labor are both higher than 25 percent in V1.

Daily commuting or temporary migration entails a division of labor between grandparents and parents, where the former take care of children while the latter work out of the village. This was clear in V1, where twenty-nine percent of households had *single* grandmothers taking care of grandchildren (*faw laan*).

Further investigations into the diversity of the household occupations were carried out in order to see whether patterns of pluriactivity differed between the villages. The surveys recorded up to five activities for each of the household heads (head and spouse) and for two additional active household

members (if any). All activities were divided into seven main categories: 1) farming; 2) agricultural waged labor; 3) nonagricultural wage labor or employee; 4) commercial (own-account); 5) civil servant (officer); 6) self-employed (craftsmen, drivers, etc); and 7) factory employee.

The average number of activities was 2.7 for a couple (or single) under 40 years of age but this number decreased by one unit for household heads over 40. The comparison between farms with less or more land than the village average did not show significant differences. Considering the total number of economic activities of (up to) four household members, averages were over 3.4 in V1, 3.8 in V3 and significantly higher in V2, especially for younger households (5.3). The index of activity diversity (different economic activities in one given household are counted only once) was found to vary between 2.2 and 2.9, with slightly higher values for younger farms or farms with less land. This takes us quite far from the picture of rice-growing villages typical of the delta. The number of activities and their diversity index is very high for owners and owner/tenants in V3 as well as for full tenants in V1, which suggests that pluri-activities are highest at both extremities of the range of economic performance.

### *2.3 Main Farm Activities and Resources*

Rice is the dominant crop in the three villages. In V3 and the higher parts of V2 (or in the dry season in all locations), HYVs are grown. On the lower land of V2 (66% of total land) and in V1, deep-water (DW) and floating rice (FL) are sown under dry conditions (dry broadcasting). V2 and V1 are rice-based villages (over two-thirds of rice-only growers) while V3 has more diversified farms, mainly due to the cultivation of water chestnut, a popular complementary cash crop. Other field crops are not very common. In V1, farmers adopted corn and chili 5 years ago. Corn can be grown without much investment or risk but its return is very low. Chili can fetch high prices but requires costly input and its price is subject to high fluctuations. All villages have some orchards but in limited proportions. In V1 and V2, they are limited by the flood-prone conditions (they can be found in the

upper part of the villages), but have expanded in V2 since 1990, with the improvement of marketing channels.

Apart from cropping activities, animal husbandry is also important, especially in V2. This includes chicken, chicken-fish, ducks, geese and pigs. Starting in 1990, contract farming of chicken-fish husbandry has been a source of wealth for the village, which could diversify its income. There are now ten food-processing factories in the region that buy the production directly on the farms.

The type of farming equipment owned by the households is, of course, related to their ecological environment. Four-wheeled tractors are more common in V1 and in V2, where they are used to plough the land under dry conditions (dry broadcasting), while two-wheeled tractors are widespread in V3 (each of 79% of the households has one). The number of sprayers and pumping devices is impressive. Households with at least one pump set amount to 62 percent, 87 percent, and 95 percent, in V1, V2 and V3, respectively.

Many farmers hire labor for the main operations in rice cropping. This is due to several reasons, including the lack of physical capacity (older villagers), lack of equipment (tractors), aversion to drudgery or physical absence (landowners settled temporarily outside the village). Full owners hire such services in 66 percent, full tenants in 81 percent and owners/tenants in 37 percent of such cases. This means that rice farmers in V1, who are predominantly old, tenants or absentee, and rent tractors for land preparation, face higher labor costs.

Land tenure is also revealing of differences between the villages (Table 5). V1 has a high level of tenancy, which results from a large part of the land being sold to outsiders, but also from land released by local people who have migrated while still retaining their land rights (Molle and Thippawal, 1999). In contrast, the percentage of full and mixed owners is high in V2, where fewer full tenants can be found.<sup>10</sup> Similarly, while in V2 only 30% of the cultivated land is rented, V1 has two-thirds of its land cultivated by tenants. While 18 percent of the land is leased by local farmers,

another 47 percent belongs to owners living outside the village. This latter percentage is only 17 and 22 percent for V3 and V2, respectively.

Table 6 provides more details on the respective average areas owned and cultivated in each village. There is a clear ranking that dovetails with the productivity of the land itself. This illustrates how the possibility to develop intensive agriculture influences how land resources can be divided at inheritance. For a given technological level, ecological and water conditions define a kind of “bearing capacity”, that is a minimum land size under which farming is not sustainable and/or attractive. There is reluctance from farmers to divide their land and pass it to several of their heirs when it gets close to these limits (Mehl, 1981; Molle and Thippawal, 1999). This translates into average farm sizes of 45, 39, and 22 *rai* for V1, V2 and V3, respectively. The table also shows that full tenants only succeed in cultivating roughly one half of the area cultivated by land owners.

Because landowner/tenant relationships are an important characteristic of agrarian systems, the surveys investigated the origin, place of residence and occupation of landowners. It was apparent that most of them (over two-thirds) in V3 and V2 were local residents, whereas for V1 many were residing in the province capital or in Bangkok (Table 7). Kinship links between the tenant and the landowner are extremely frequent: 50 percent in V1 and 70 percent in each of the other two villages. This means that even Bangkok residents may be relatives who have inherited land and rent it out to relatives who have stayed in the village. This redistribution of land from nonfarming children to their siblings still engaged in agriculture, combined with the sharp decrease in fertility, have been main contributing factors to the relief of the land system (Molle and Thippawal, 1999). This smoothens the common association between absentee landlords and urban capitalists. Interestingly, such landowners used to be farmers in the past in roughly half of the cases for V1, but much less in case of the other two villages (Table 7).

Access to and use of credit also may yield telling differences between villages. Data on membership of credit institutions show that most farmers in V2 and V1 are members of these institutions<sup>11</sup>, while

farmers in V3 do not in 67 percent of the cases. Pending short-term credit is very limited in V3, as most farmers seem to have the financial capacity to fund their running costs, including the purchase of fertilizers, but it is also rather limited in the two other villages, as only one-third of the households resort to this kind of credit.<sup>12</sup> Mid-term credit (1 to 3 years) is also limited (under 10%), but long-term credit (>3 years) is rather common and even concerns 19 percent of households in V1, with typical amounts of several hundreds of thousands of baht<sup>13</sup>. Data on indebtedness are difficult to interpret because credit may be taken for productive use or investment (which then appears as positive), or because of economic failure (which then appears as negative) or other reasons, notably gambling and social ceremonies.<sup>14</sup> Very few loans are contracted to pay back old debts. Data suggest that farmers rarely fall into debt with traditional crops, including rice but, rather, that it is more often the failure of some risky undertaking which makes farmers incur non-repayable debts. Similarly, selling land is far from being predominantly the result of economic distress and is also the consequence of farmers making investments thanks to the high price fetched by their land, or of their retiring from agricultural activities. Overall, V3 farmers showed a higher self-sufficiency for both short-term and long-term credit.

## *2.4 Return from Main Crops*

Rice cropping in these three different environments, of course, shows contrasting production costs and value added.<sup>15</sup> The first reason is the cropping intensity per se. Over the last 10 years, the average cropping intensity (number of crops per year) was 1.02, 1.45 and 2.9 in V1, V2, and V3 respectively<sup>16</sup>. The second reason is the yield of each type of rice cultivation, predominantly floating rice in V1 (367 kg/rai), together with deep-water rice (421 kg/rai), deep-water rice (460 kg/rai) and HYVs (748 kg/rai) in V2, and HYVs (849 kg/rai) in V3. The third reason is that production costs are higher for HYVs than for traditional varieties. The net income amounts to almost 60 percent of the value added in V3 and V2 but to only 43 percent in V1. The resulting net incomes from rice cultivation are 7,195 baht/rai, 2,560 baht/rai and 822 baht/rai, respectively.

However, this sheer discrepancy in land productivity must be taken with caution. Figure 4 provides a view of a significant rebalancing of this initial stark contrast. Because the average farm size is correlated to the ecological conditions (farms in V1 have remained twice as large as those in V3), the gap is significantly reduced when seen in terms of crop income per household (all crops included). Furthermore, because of the lower average number of people in a household in V1 the gap is further reduced, albeit obviously not bridged, when expressed in terms of crop income per capita (household member).

## 2.5 *Household Income*

As is apparent from the multiplicity of occupations observed earlier, the household income is also very composite. Moreover, it was not always possible to determine the real income derived from wage labor, fishing, etc. The incomes from all the specific activities other than agriculture were investigated in a direct way. Those which could not be assessed were divided into two classes: *Main wage* is the main income of a waged laborer and it has been set tentatively at a yearly total of 30,000 baht. *Secondary wage* is, often, earned by spouses or children and consists of occasional jobs (spraying, harvesting, construction, etc). This was evaluated at 5,000 baht/year. With all the costs and benefits of economic activities quantitatively assessed, it was possible to estimate the income of different categories of households.

Considering all sources of income alters the overall comparison of the three villages. The first factor is the magnitude of non-crop agricultural income in V2. Animal husbandry, most prominently chicken, chicken/fish, ducks and swine, has grown dramatically in the last decade and now almost equals the crop-based income of the farm sample. Figure 5 shows the respective shares of crop (agri), non-crop (agri), and nonagricultural net incomes for households with own-account farming activities and for the whole sample. As for the former group, it appears that agricultural activities make up 80 percent of the household income except in V1, where the level of 52 percent is reached. If we consider the whole sample, the share of agricultural income varies widely, from a low 41 percent in

V1 to 74 percent in V2, while in V3 it is 60 percent. Since the sample does not represent adequately the full population of the village, these figures are only indicative of the fact that the income from crop production in the three villages is unlikely to be much over 50% in V3 and V2 and one third of the total net income in V1.

Figure 6 gives a view of both the differences between villages and the contribution of the different sources of income, for the households engaged in own-account farming activities only (farms). From an initial ratio of overall land productivity between V1 and V3 of almost 4 (or 8 if we limit ourselves to rice), we see that the imbalance is reduced for V2 when the whole agricultural income is considered, and that the ratio in total farm income decreased down to 2.5. When farm income per head is considered, the ratio is eventually brought down to 1.8 only! These successive readjustments engender a fascinating re-balancing of the initial disparities in ecological settings but without, however, fully bridging the gap.

Average farmers' income in V1, V2 and V3 were computed at values close to 100,000, 200,000 and 250,000 baht/year respectively<sup>17</sup> (Table 8). V2 fares a higher average net income than expected, thanks to animal husbandry. This value is an average value and fails to indicate that only a portion of farmers are benefited with animal farming, which reduces the economic impact of this activity in terms of distribution<sup>18</sup>. On the contrary it signals that profitable economic alternatives require capital and are likely to be captured by the village upper strata. V3 displays a higher share of waged and off-farm income than V2, in part because of the high labor demand in rice triple-cropping and water chestnut.

This analysis can be specified by distinguishing the average income<sup>19</sup> of different categories of households. Farmers who are full owners have an income close to the village average, mostly coming from their own farming activities, with some additional nonagricultural income, and remittances in V1. Owner/tenants fare much higher and appear as the most productive category of households engaged in farming, with an income of over 350,000 baht/year in V3. The full tenants' average income is close to that of full owners but a much higher share is drawn from wage labor and

nonagricultural salaries. Households wholly dedicated to farming (which include many owner/tenant holdings) also have rather high incomes except for V1 where, on the contrary, they correspond to older people hiring labor for most operations.

These average values obscure the inter-household variations in income. Gini coefficients of farming household income distribution show that V1 exhibits the lowest inequality (0.24), while V2 and V3 are at 0.36 and 0.32 respectively. This higher value for V2 is due to the particular return of poultry farming. Nine households of V1 had a per capita income of less than 10,000 baht, against only one in V2 and none in V3. On the other hand households with an extremely high income correspond to households with successful capital-intensive agricultural activities.<sup>20</sup> These farmers have either orchards (e.g., 15 *rai*) or their own large rice fields (70 *rai* or more in V1 or over 40 *rai* in V3) and offer tractor services, or have successful fish and/or poultry farming activities.

### **3 Processes at Work**

The quantitative data presented in the preceding sections have gradually revealed a host of socio-economic differences between the three villages, as well as context-specific historical trajectories. This section provides an interpretation and a synthesis of these results, emphasizing a few important dimensions of agrarian change in the three villages.

#### *3.1 Agrarian pressure and migrations*

Population growth and agrarian saturation probably started sometimes after WWII in the three villages, primarily in Ayutthaya (Piker, 1975), where land could not be divided as in the other villages because of its lower productivity and of the constraints to intensification. The number of landless families increased and remained in the village in proportions closely related to the local availability of wage labor and nonagricultural work opportunities (Ramsay, 1985; Molle and Thippawal, 2003), while emigration provided another alternative. A common interpretation of such

agrarian transformations is that the risks inherent in farming and the lack of capital (hence money lending at high interest rates and subsequent indebtedness) or access to land lead small farms to economic failure and oblige them to sell their land. Indebtedness, local wage labor, landlessness, and migration are seen as interrelated aspects of the same eviction process (Turton et al., 1978; Wittayakorn, 1983; Douglass, 1984). The evidence surfaced by the study points to a more qualified picture, where migration, land tenure and economic failure have several complementary facets.

As mentioned earlier, the late 1950s and 1960s were characterized by a situation of agrarian saturation, combining high population growth, stagnating rice yields and prices, limited job opportunities outside agriculture, a shift in the terms of trade between landowners and tenants to the detriment of the latter, and a dependency of farmers on local moneylenders (Molle and Thippawal, 1999). The “upland boom” acted as an “escape valve” and all our three districts, as well as the whole Chao Phraya delta<sup>21</sup>, experienced a net decline in agricultural population in the 1960s. The intensification of rice cultivation in the 1970s (HYVs, mechanization, double-cropping) allowed a steep increase in agricultural population in V3 during that decade, while V2 stagnated and V1 continued its decline. In addition to rice intensification, several factors relieved the situation in the late 1970s (transient betterment of rice prices, supply of agricultural credit, shifting of landlords to cities, industrialization, effect of the demographic transition, etc), and the delta underwent profound transformation from 1985 onward, in line with changes in the national economy (Molle and Thippawal, 2003).

While the migration process may have been predominantly push-driven in the 1950s and 1960s it became more complex in the last 25 years. It is now clear that the persons who quit agriculture come from all socioeconomic strata of the village society, including children of both landless households and rich families, who have studied and are eager to find occupations in the city, with no desire whatsoever to engage in farming. This finding is consonant with the literature on migration that distinguishes between ‘pull’ and ‘push’ factors, where migration may be motivated by livelihood collapse but also by attractive income differentials (Ellis, 1999: 16), and a wide range of other

reasons (lack of interest in farming, attraction of the urban way of life, low prestige of farming, rite de passage, etc). This decision is also governed by several factors, such as the age (factory work for a person over 40 is very unlikely; youths are attracted by the city life), personal networks (people generally move only if they have some relative or friend to stay with first), etc. As in most of Southeast Asia, education has now become the principal form of capitalization of the households (Rigg, 1997). Lung Chua, the “pilot farmer” of V2, and also the most successful (and industrious), has five children who have all studied and found urban jobs.<sup>22</sup>

The higher, and earlier, rates of out-migration in V1 (up to 70% for the siblings of household heads under 40 years old), together with the differences in average farmland, are clearly indicative of how ecological conditions govern the degree of land division possible at a given technological level. In V3 it is possible to make one's living in the village with much less land than in V1 or V2, and, therefore, it is possible to accommodate a higher population density by dividing the land further; emigration to the upland or factories was thus much more limited. The degree of absorption of labor and people outside agriculture, locally or outside the region, determines the level of agrarian pressure, particularly on land and water resources.

This was very sensible during the crisis time of the early 1970s, which were marked by critical tension between landowners and tenants<sup>23</sup>. This tension was later diffused by the relief factors mentioned above but also by the fact that most of the landlords who had accumulated capital shifted to cities where they found better opportunities for investments and return to their capital. They thus lost both part of their bargaining power and of their interest in extracting rents from tenants, as the ratio of the value of land relatively to annual rents rocketed up. In addition, data show that tenancy has remained rather stable along the last five decades and that a majority of contracts remain between relatives (Molle, 2002), a point confirmed by this survey. It is in V1 that absentee landlords and investors have been able to acquire larger tracts of land. This is partly due to the proximity to Bangkok, the lower price of agricultural land in that area, the possibility to buy larger areas (as average farmland is higher) and to a higher owners willingness to sell. Whether this willingness was

forced by economic failure or pulled by attractive prices is debatable and varies from one household to the other, but the survey clearly shows that the sale of land was, more often than not, motivated by the will to invest in other undertakings, or by a decision to retire (old farmer with no children to take over the farm), and was often viewed as an unexpected bonanza rather than a curse.

### *3.2 Livelihood diversification*

The survey revealed a continuing trend towards pluriactivity and economic diversification at all levels. Although there are indications from earlier village studies that this phenomenon is not new (Kaufman, 1960; Molle, 2003), the growing integration of the economy, improved transportations and communications, have markedly accentuated the options offered. These results are hardly surprising, as this trend has long been observed in Thailand (Tongroj and Yongyuth, 1983; Narongchai et al., 1983), and also represents a far-reaching aspect of the evolution of agrarian systems in Southeast Asia (White, 1989; Preston, 1989; Rigg, 2001) and elsewhere (Ellis, 1998).

The Central Plain, however, always appeared in earlier studies as the region where this trend was less accentuated, on account of the better production facilities offered in irrigated areas. This is reflected in the survey which showed that still around 80% of the income of farming families was generated by agriculture in V3 and V2, against 50% in V1, which was compelled to find other sources of revenue (in particular in local factories and through emigration).<sup>24</sup>

Income-generating activities are diverse. They include the underground lottery, fortune telling, the hairdressing, dressmaking, fighting cocks breeding (a good cock can be sold for 10,000 baht), people operating noodle stands, making fish sauce, hats, artificial flowers, nets, knives, wooden furniture, helping in construction work, harvesting in nearby areas that have different calendars, traveling to upland areas to de-tassel or harvest corn, etc. All these activities are not equivalent in terms of drudgery, risk, economic return and accessibility. For example, the spraying of agro-chemicals (which reached 200 baht/rai in chili crops<sup>25</sup>) was reported to have made several people so ill that they

had to go to the hospital. Work in factories is often a *sine qua non* of the household sustainability but it is generally reserved for people under 40 (and more often for those under 30). In some cases, daily commuting can also entail long distances. Depending on the type of industry, the health conditions are also often inadequate. Neulla-ong (1992), for example, found that the majority of workers of the factories in Sena (Ayutthaya Province) were single, aged between 20 and 27 years and stay with their parents, and that if their income and their responsibility towards the family had increased, their health had also been affected.

Labor is certainly characterized by its high mobility, flexibility and responsiveness to opportunities. As observed by Preston (1988) in Java, “the major advantage of a diversified household strategy is the ease with which the relative importance of different components can change in order to maximize welfare and to respond to changing opportunities”. This is also taken advantage of by factories, which can modulate their activity according to demand. The Sukhothai Cement Factory, for example (close to V1 village), employs between 50 and 140 persons and has adapted relatively smoothly to the post-1997 crisis conditions. Kinship contacts are very important regarding the decision to work in factories in the Bangkok Metropolitan Area. They work in both directions. A youth willing to leave the village will ask friends or relatives who are already settled to find a job for him or he will spend a few days in their homes to look for work. Factories also use these contacts to recruit relatives from workers who have given them satisfaction.

The survey showed that pluri-activity was particularly notable in younger households and in the poorest ones that endeavor to build a decent income on the basis of any wage labor they can find. Richer families, however, also tend to have varied sources of income because of the investment of their capital in different ventures and the better access to non-agricultural jobs allowed by higher education. Just as for migration, pluri-activity occurs through a combination of pull and push factors and concerns the whole socio-economic spectrum of the village population, most particularly the lower and upper strata.

If the shift from subsistence to commercial agricultural systems is not a new phenomenon in a region which development has long been driven by rice exports, the “collapse” of subsistence systems is accelerated by the competing demand for farmers’ time (Pingali, 1997). Data from the annual Labor Force Surveys show that 1988 was a watershed for the Central region: from this date onwards, the total labor force engaged in agriculture started to decline sharply, losing one million workers out of 3.5 million in the ensuing decade. This is consistent with the hike in real wages and shows that since the late 80’s at least labor is getting scarcer in agriculture (Molle and Thippawal, 1999). While this trend may continue and lead to a decrease in cropping intensity (like in China: Pingali, 1997), or in planted area (like in Malaysia: Rigg, 2001, or Indonesia: Preston, 1989), it may also level off or even be reversed if the growth of the non-agricultural sectors is discontinued, as occurred after the 1997 crisis.

### *3.3 Structure and agency*

The particular life trajectories of individuals and households revealed by the survey allow some insight on the differentiation process at work. While structuralist or Marxian interpretations of agrarian change see the access to production factors and the structure of social systems as the driving forces of the generation of inequalities, other strands of thinking place emphasis on human agency. Several scholars have analyzed agrarian change in the Chao Phraya Delta through the former lens and have come up with an image of peasant eviction associated with thriving landlordism and land concentration (Naruemeon, 1987; Wittayakorn, 1983; Douglass, 1984). A review of village studies (Molle, 2003a) and the analysis of the land system in the delta (Molle and Thippawal, 2003), however, point to a more balanced viewpoint which distinguishes between sub-areas<sup>26</sup> and periods of history, and evidences that peasants have not been only passive or submissive but have responded in many ways to factor scarcity and agrarian pressure.

Just as there are many factors governing the choice of migrating or of engaging in off-farm work, there are also varied reasons for economic failure. Obviously, the endowment in land and capital at

the beginning of the family cycle is paramount but it does not tell the full story. It must be noted that economic failure can occur for those who are engaged in own-account farming almost exclusively, and mostly for those who have their own land. Full tenants may experience poor harvests (and/or low prices) but generally have no large debts because they have no collateral to offer and are usually reluctant to borrow money because they are not sure they can safely repay it. Wage labor, in average terms, provides lower incomes than farming but also has little risk (at least inherent in the activity, while, on the other hand, there may be more exposure to health hazards).

We have noted earlier that the reasons for incurring undesired debts (taken here as an indicator of “economic failure”) are seldom the direct result of farming per se. More frequently, they stem from failed investments in more capital-intensive ventures, for example fish breeding in V1. As a rule, the most profitable activities are also the most risky (see Szuster et al., 2003, regarding the case of shrimp farming in the delta). Other typical reasons for economic failure are health hazards, expenditures for ceremonies (notably cremations<sup>27</sup> and ordinations), drinking, addiction to alcohol and drugs (notably amphetamines, present in all villages) and gambling (recurrently cited in the literature; see Prince Dilock, 1908 for an early reference). Another reason can be linked to consumerism and to the resulting psychological pressure on people to buy expensive items (CD players, karaoke theaters, motorcycles, pick-ups, etc.) for prestige or otherwise. The increased ease in getting credit from the banks (even at the price of lying about the planned use of the money) has also favored that trend.

When surveying villagers one could not avoid being struck by the diversity in determination, energy, interest and entrepreneurship that the different individuals put into their activities and decisions. When one correlates these obviously subjective impressions with the life trajectories outlined in the interviews it is hard to downplay the importance of human agency in the paths followed by the different individuals and households. It is striking, in particular, to observe that some individuals who inherited a similar area of land at the time they started working on their own account have sometimes prospered and sometimes declined and contracted debts. Such a mundane remark may be

stating the obvious (some people are more *kayaan* [hard-working] than others and may enjoy greater human or social capital) but the relevance of the agency factor is generally given limited weight in the literature, which tends to see economic activities as predetermined by the resources on hand, by the constraints of the environments and by (lopsided) social or market relationships. Several authors, such as Visser (1980) and Amyot (1976), who asserts that “in the last analysis it is the quality of the human resource that makes for success or for failure,” have also emphasized the importance of agency. This does not allow the researcher to easily draw classifications (such as those based on land and family size, equipment and other sizeable variables) but the survey strongly suggests that the human factor cannot be relegated as marginal and eventually ignored.<sup>28</sup> Job opportunities in the wider economy, together with the increased mobility found earlier, tend to open new avenues to people and families who, otherwise, would have had little future in the village economy. This is not to overstate the degree of social mobility but to indicate that the presence of resourceless households sustained by successful individuals, as well as well-endowed ones with severe debts, must also be accounted for.

### *3.4 Water Control and intensification*

The productivity of land is a direct consequence of the degree of control and access to water, which governs much of the contrast between the three villages. In the flood-prone areas of V2 and V1, significant improvements in water control have also been made in order to regulate the flood depth and duration. The resulting stabilization of the yield was clear enough to make some villagers return from the uplands. Clearly, this shows the relationship between a given degree of technological development (which allows a certain degree of intensification) and population density.

In V3, despite the area not being included in the “consolidation area”<sup>29</sup> located a few kilometers further north, mechanization and the development of double-cropping have encouraged farmers to develop on-farm level facilities (ditches, plot leveling) resulting in the improvement of water control. The decisive step was the dissemination of axial pumps powered by two-wheeled tractors, which

allowed the control of flows between the plots and adjacent ditches and drains. This area, as well as most of the western part of the delta, has been favored with regard to water allocation because of its higher potential but also of its stronger political clout.

Also crucial were the changes that occurred in V2. The inability of the government to expand on-farm facilities and water control in the (mildly) flooded part of the delta early disqualified this area for intensification, ‘customizing’ an unequal pattern of allocation. Recently, technical change (relatively cheap mechanized land leveling, spread of individual pumps), decrease in the flood regime, and growing pressure on resources, generated an unexpected response from the farmers who were granted with occasional water deliveries in the dry-season: these farmers gradually expanded the ditch system and leveled their plots, making them candidates for growing HYVs in the dry season. This was most spectacularly observed in the 1996–1998 period when generous water supply aimed at compensating for flood damage and high prices of rice triggered a spectacular expansion of dry-season rice in areas formerly unfit for it.

#### **4 Policy issues**

Paradoxically, the comparison of our three villages can give way to two opposite points of view. Evidence of balancing mechanisms that counter disparities in ecological settings and in initial investment can lead to the conclusion that one should not care too much about inequities created by interventions or by nature, since they will tend to be evened out as time goes by, in particular by the division of assets. Consequently, it is also reasonable to concentrate investments in regions that enjoy better ecological conditions and may provide a better return. Of course, the case presented is confined to a particular situation –that of irrigated agriculture in a delta- and such a conclusion cannot be generalized. It is often argued, for example, that rainfed agriculture is being discriminated against and receives fewer investments, in research or development, than irrigated agriculture does. Differences in the yield of rainfed and irrigated crop tend to prove that the non-irrigated sector is facing a precarious situation and because of this is disregarded. Extrapolating from the present study,

one may caution against rapid conclusions which are not based on a careful examination of how average farm and household sizes, as well as economic diversification may also differ.

Yet, statistics show that rainfed agricultural areas tend to be poorer than irrigated ones and, as was eventually the case with our three villages, that “rebalancing” mechanisms are not sufficient to bridge the gap between extremes, especially when regions with poor soils and water conditions are concerned. The conclusion could then be that state investments, or the water resources it controls, should be allocated to disadvantaged areas, in order to bring more equity, even if this comes at some cost in terms of economic efficiency.

In the present case, for example, should more equitable water allocation be sought, since this would increase the cropping intensity of V2 and contribute to further bridging the gap in land productivity between V2 and areas like V3? Likewise, should the situation of agricultural demise in V1 warrant more state investments to compensate for an unfavorable ecological setting? The first question takes us to a short digression on water allocation at the basin level; the second one to a comment on how policy-making is shaped by agrarian pressure.

A first possible re-allocation would be to reduce supply to, say, V3 and increase it to V2. This goes against well established –although informally- patterns of allocation based on custom, in that case the earlier decision to favor areas with good water control, justified by efficiency (and strengthened by the political clout of the region concerned). Doing so, however, might disrupt the man/resource equilibrium of V3 environment, since farming systems have adjusted to a particular endowment in water.

Water allocation in the Chao Phraya delta is also contingent upon water use in the upstream parts of the basin. Because of the development of irrigation facilities in the middle-basin (upstream of the delta) during the last 15 years, the demand for irrigation water in this area has increased and gradually ‘absorbed’ part of the water stocks controlled by Bhumipol and Sirikit dams originally allocated to the delta. Although this trend has been compensated for by improvements in dam

management and the development of conjunctive use, this, in the absence of formal water rights, amounted to an untold re-allocation of implicit ‘rights’, at least if we confer upon early investments (the feasibility of which is based on a certain amount of availability water) a kind of prior appropriation right. This re-ordering of water allocation, left to the discretion of water managers, is not always apparent to users because of its macro-scale nature and the high year-to-year variability in water availability that occults these changes. The consequence for the delta is that growing scarcity (as compounded by expanding demand) now makes it difficult to sustain or boost double-cropping in areas like V2, which remains with an unrealized potential for double-cropping.

What is of interest for our present discussion is how equity-driven decisions in the water sector, because of the interaction of users and regions through the hydrologic cycle, have resulted in increased –yet shared- water scarcity. The irrigation facilities which have been developed in the middle-basin in the early 80s were justified technically by the necessity to stabilize rice cultivation in the rainy season and, politically, by the demand of the province concerned to also benefit from the water stored upstream. Local claims, noted Ingram (1971) are supported by the strong sentiment that water is always locally thought of as “our” water. Equity and/or political considerations thus commonly override economic soundness and lead to over-commitment of water resources and ‘overbuilt’ systems (Schoengold and Zilberman, 2002; Berkoff, 2002). ‘Overbuilt’ systems are systems that have expanded beyond what the available resource dictate, thus creating scarcity and raising tension on allocation. The crucial question is whether these re-allocations that lead to better “shared scarcity” can be responded by users by adjustments in productivity without threatening their economic sustainability. Or more precisely, what will be the share of the population which is likely to be in such situation?

The second question is to what level should the state<sup>30</sup> invest in water resource development in poorer regions with lower potential and return, as opposed to fostering/betting on the development of non-agricultural activities and on the redistribution of the labor force through migration? Was the decision to limit investments in V1 right, since the substantial economic rebalancing evidenced in

this paper partly compensated for the shortfall, or should the fact that the average income in V1 amounts to only 56% that of V3 warrant more investments? For example, would have it been sound, although costly, to invest in the flood plain area in order to allow rice intensification in V1? Indeed, it would be possible, at the cost of more diking of the river system, to equip the drainage units of the flood-prone area with pumps aimed at draining out water. This system has been adopted in the Red river delta, in Vietnam, for example.

The comparison between the Red river, Mekong, and Chao Phraya deltas may shed some light on how decision-makers may be partly responding to agrarian pressure (see Molle and Dao The Tuan, 2001). Agrarian pressure, defined as the pressure on land and water resources relatively to livelihood opportunities offered in the local or wider economy, determines in the first chief how the urgency of public investment is felt by decision-makers and pressed by politicians. The Red River delta is characterized by an extremely high population density, few job alternatives, limited emigration options, and continuing high investments in water control and intensification. Population pressure has made it necessary to improve cropping conditions as much as technologically possible and warranted investments regardless of their cost-effectiveness. The Mekong delta has medium population density, massive past and on-going investments in land reclamation, dyking and dredging, but a degree of economic diversification, in part spurred by Ho Chi Minh City, which keeps agrarian pressure at levels below that of the Red River delta.

In contrast, the Chao Phraya delta distinguishes itself by a higher degree of opportunities outside agriculture, less agrarian pressure and, therefore, a lower drive for intensification and water control state investments. The study identified a first phase of agrarian saturation partly diffused by emigration to the upland frontier, a subsequent crisis, *circa* 1970, dampened by a classical Boserupian scenario of intensification, and a later process of deagrarianization and high provision of economic opportunities outside agriculture. Should not have these different 'escape valves' been available, it is likely that agrarian pressure, as manifested by growing poverty and social unrest, would have led to considering more structural development. Ayutthaya area, despite its symbolical

and emotional linkage to Thai traditional rice-farming and way of life (Rigg and Ritchie, 2002), was not granted the investments required to sustain agricultural intensification. Rather, Ayutthaya was left to rely increasingly on manufactures and migration<sup>31</sup>. This shift from an agrarian society to an urbanized/industrialized society is seen as “forced” by Suriya and Amara (2001) but the nature and costs of alternatives are not analyzed. The observed trade-off between equity and economic rationality resulted from a limited degree of agrarian pressure, a low level of concern for food security, and a related emphasis on industrial development.

In general terms, the level of agrarian pressure (with its bearing upon how prominently food-security features in policy agenda), and the overall status of the economy (which determines whether sectoral shifts and growth are driven by pull or push factors) define a framework where consideration of economic growth and efficiency, poverty alleviation, regional politics and inter-regional imbalances, seen through the lens of a particular political economy, determine the pressure for more investments in water resource development. Ecological conditions, in turn, dictate what technical options are available and at which cost. All these factors eventually govern the spatial distribution of investments and the resulting water supply/demand pattern.

## **5 Conclusions**

This study, aimed at comparing three villages with contrasting levels of access to water and ecological environments, evidenced dramatic differences in productivity, village life and farmers’ strategies. Despite some earlier trend towards agrarian pressure in V1, around 1970 the three villages were predominantly growing only crop of traditional rice varieties and were by and large on a similar footing. The study yielded a striking picture of how village economies in varied ecological settings respond to different water endowments, either capitalizing on high land productivity, diversifying agricultural activities to cash crops or animal breeding, engaging in local off-farm activities, or migrating to Bangkok or other provinces. It showed that much of how village economies in the delta evolve is linked to their access to water (in the dry season) and to the level of water control (flood-

prone/non-flood prone environments, in the wet season). While the expected dramatic discrepancies in land productivity, as a result of the contrasting levels of access to water, were confirmed, the surprise came from the way differences in farm and family size, non-cropping activities, and off-farm work significantly worked to bridging the income gap between the farming populations of the three villages and to dampening inequities generated by differences in water control. This was only partially achieved, as the income per head in V3 still remains 1.8 that of V1, but this dramatically differs from the initial ratio in the yearly land productivity for rice cultivation, which is close to 8!

The agrarian evolutions of these three villages, distant from one another by only a few tens of kilometers, show the diversity of development paths and trajectories. The even higher diversity found at the household level showed that the different individual strategies and trajectories could not be satisfactorily understood on the sole basis of factor endowment. Much of the common wisdom on land sale, indebtedness and migration, for example, did not fully accord with our empirical data, which showed a wide range of situations, motivations and responses where agency cannot be overlooked. If the symptoms of deagrarianization are here (Rigg, 2001; Rigg and Nattapoolwat, 2001; Bryceson, 1996), the multiplicity of individual trajectories makes it hard to generalize. However, specialization seems to be rare (at least in this part of the delta) and pluriactivity features in all economic strata. Activities allowing “vertical growth”, like contract poultry breeding, chili cultivation, or fish farming, illustrate how profitable alternatives of diversification require capital or skill and incur higher risk. They tend, thus, to be captured by well-off farms and do not benefit poorer households. Investments in education, linked to the little prestige and return of agricultural activities, appeared a prominent strategy of households. The frontier between the urban and rural spheres is clearly getting blurred and this calls for a reassessment of frameworks on agrarian transformations (Rigg and Nattapoolwat, 2001; Bryceson, 1996) and policy-making criteria (Koppel and Zurick, 1988).

The paper showed that economic imbalances generated by different levels of public investments in water control might be partly rebalanced by adjustments in farming systems and livelihoods, but that

such outcome critically depends on the 'escape valves' and alternatives available in the wider economy. It was suggested that political and equity-based investments to counterbalance inter-regional imbalances may result in the overbuilding of river basin and in generating growing pressure over water resources and scarcity. More generally, economic rationality appeared to be subsumed in a much wider political-economic framework whereby the options at hand and the decisions eventually taken were strongly shaped by the characteristics of the ecological setting as well as by the level of agrarian pressure.

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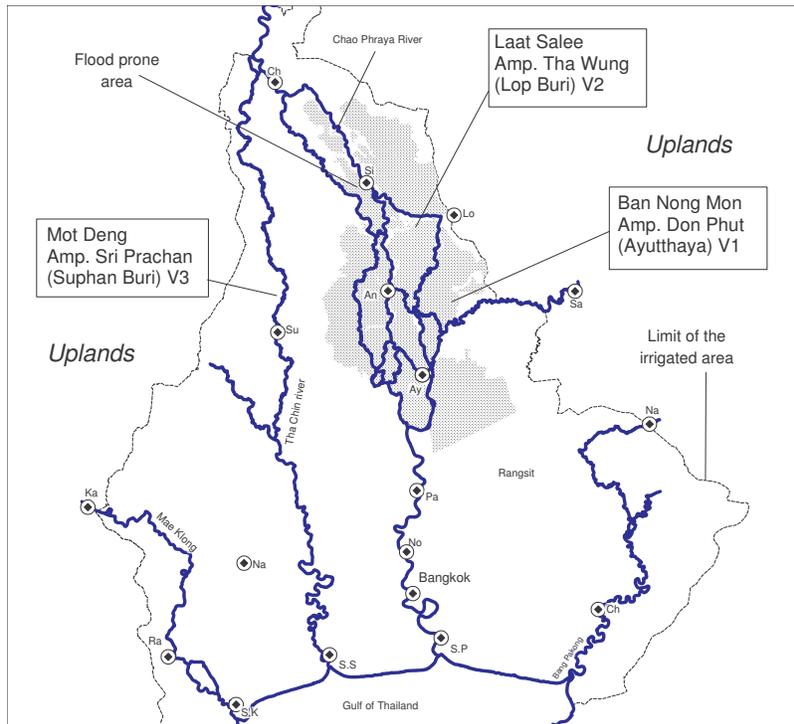
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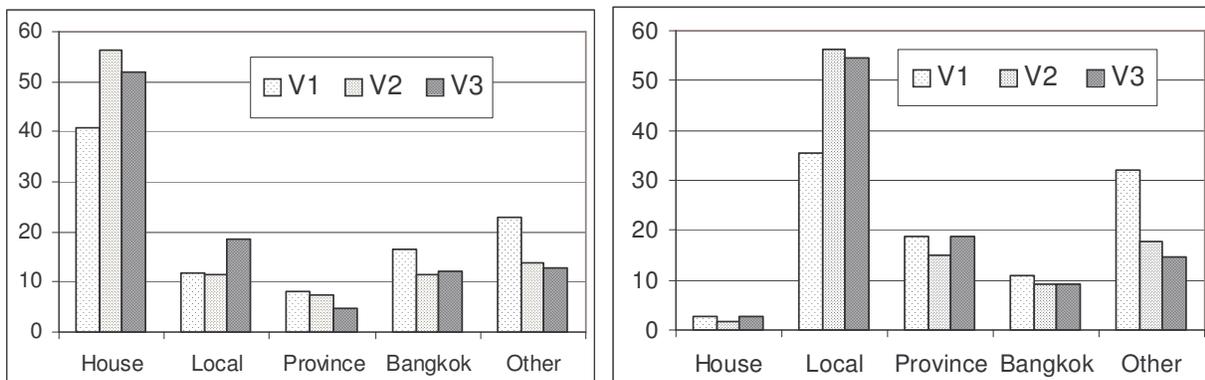
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**Figure 1. Location of the three villages surveyed.**

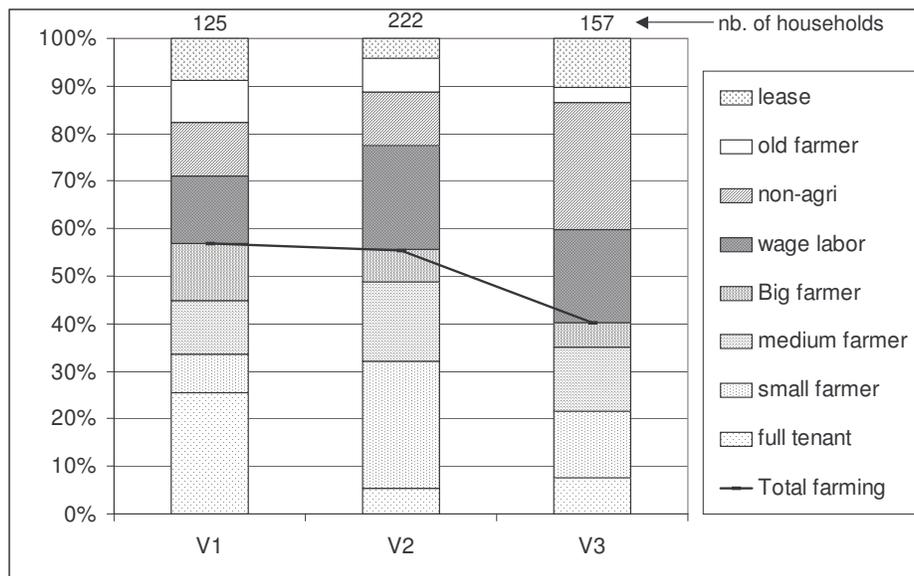


From north to south: **Ch**: Chai Nat; **Si**: Sing Buri; **Lo**: Lop Buri; **An**: Ang Thong; **Sa**: Saraburi; **Su**: Suphan Buri; **Ay**: Ayutthaya; **Na**: Nakhon Nayok; **Pa**: Pathum Thani; **No**: Nonthaburi; **Ka**: Kanchanaburi; **Na**: Nakhon Pathom; **Ba**: Bangkok; **Ch**: Chachoengsao; **Ra**: Ratchaburi; **S.P**: Samut Prakan; **S.S**: Samut Sakorn; **S.K**: Samut Songkram.

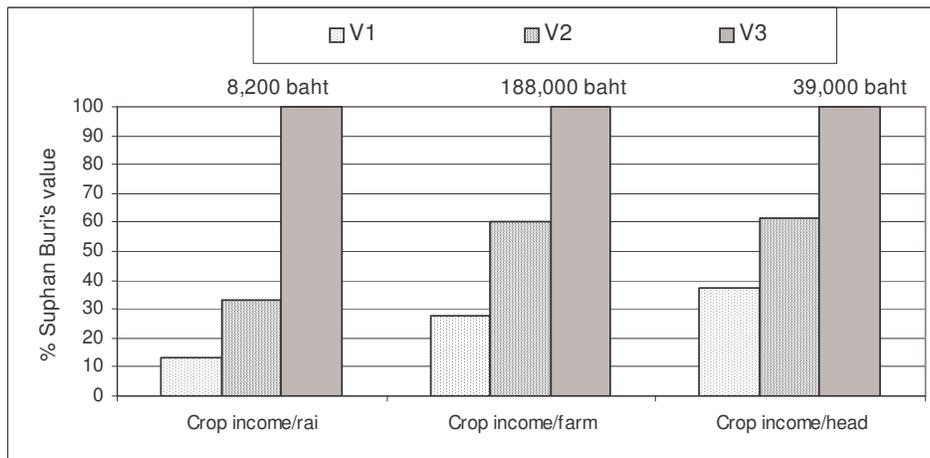
**Figure 2. Place of residence of family members and siblings of parents (in %).**



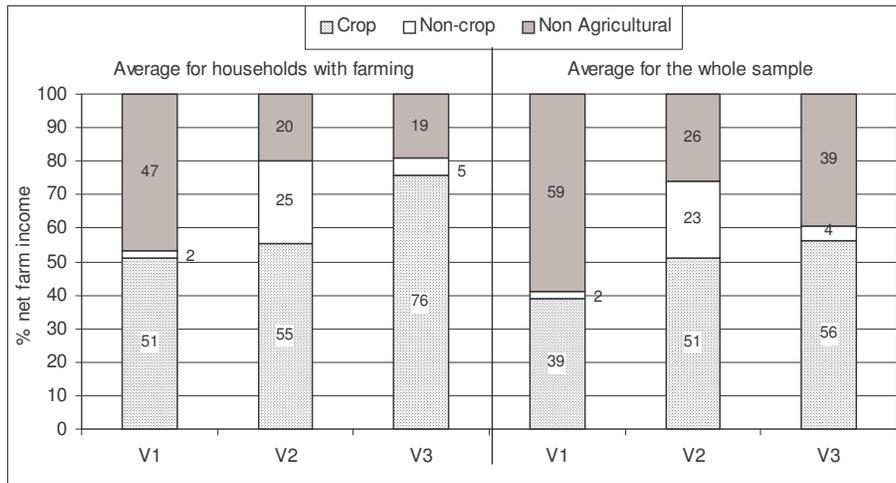
**Figure 3. Distribution of main activities in the three villages (sub districts records).**



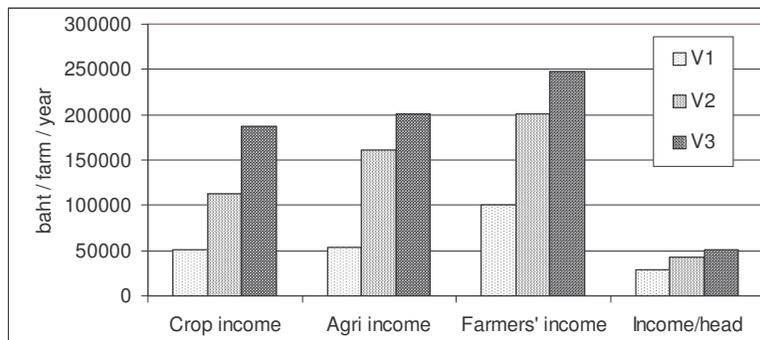
**Figure 4. Comparison of net annual incomes.**



**Figure 5. Crop/non-crop income shares.**



**Figure 6. Early average incomes of own-account farming households.**



**Table 1. Distribution of population by age class (in %).**

Village	Age class		
	<15	15-60	> 60
V1	<u>18</u>	63	20
V2	29	49	22
V3	27	48	24

**Table 2. Average number of children.**

Village	Age class of parents			
	under 40	40 to 50	50 to 60	over 60
V1	<u>1.00</u>	2.17	2.39	5.13
V2	1.85	2.41	3.31	4.14
V3	1.69	2.53	2.46	3.55

**Table 3. Percentage of families with upland migration and factory labor.**

Village	Migration to upland					Factory work		
	Parents	Farmer and spouse	Sibling/ children	Total with migrants	No migrants	Before	Now	Total
V1	4	44	10	58	42	29	17	46
V2	8	29	18	55	45	23	16	39
V3	9	16	9	34	66	15	7	22

**Table 4. Distribution of occupations (%).**

	Farmer	Daily wage	Factory	Company	Commercial	Civil servant	Own account	Other*
For household heads and their siblings								
V1	53	22	5	3	5	7	3	3
V2	57	18	4	2	7	9	2	2
V3	60	17	1	3	10	5	3	2
All	56	19	3	3	7	7	2	2
For household members (students excluded)								
V1	11	33	26	7	6	11	3	4
V2	33	16	19	8	10	11	1	1
V3	27	23	7	12	8	17	4	4
All	24	24	18	9	8	13	3	3

\* "Other" includes nuns, monks, soldiers, and prisoners

**Table 5. Types of agricultural holdings, according to land tenure (in %).**

Tenure type	V1	V2	V3
Owner+lease	0	13	13
Owner	17	33	21
Owner/tenant	38	40	39
Tenant	44	14	26
Leasing	8	0	11

**Table 6. Average land endowment and cultivated per farm (rai).**

	Land owned <sup>a</sup>	Cultivated by land owner <sup>b</sup>	Cultivated by full tenant	All farming households		
				Cultivated	Part owned	Part rented
V1	27	61	25	<b>45</b>	14	31
V2	33	41	27	<b>39</b>	30	9
V3	19	25	13	<b>22</b>	13	9

<sup>a</sup>Average land owned by all farmers owning some land. <sup>b</sup> Average land cultivated by all cultivators owning some land

**Table 7. Origin and place of residence of landlords (%).**

	Place of residence of landlords			Landlords' activity and past		
	Local/village	Province	Bangkok	Farmer	Not farmer	Used to be farmer
V1	33	41	26	3	51	46
V2	68	18	15	34	31	34
V3	79	13	8	17	63	21

**Table 8. Average composition of farming household yearly income (baht/year).**

	Total	Agri. Income	Remittances	Leasing land	Wage & agri. salary	Non-agri salary	Non-agri wage
V1	100,821	53,570	7,100	1,005	9,098	5,607	24,442
(%)	100	53	7	1	9	6	24
V2	201,540	161,123	1,242	1,788	6,639	20,888	9,860
(%)	100	80	1	1	3	10	5
V3	248,166	200,701	5,676	3,099	7,642	18,622	12,427
(%)	100	81	2	1	3	8	5

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<sup>1</sup> Of course it is impossible to ensure that all other factors are equal, but the three villages are located at roughly the same distance (10 to 15 km) to their respective provincial centers, which are comparable in size. Road access is good in all three cases.

<sup>2</sup> V2 village was surveyed in 1998 and 1999 (see Latham, 1999) and the other two villages in 1999 and 2000.

<sup>3</sup> To make reading easier we will, in what follows, refer to these three villages by V1, V2, and V3, where the number is roughly indicative of the cropping intensity or intensification in the village.

<sup>4</sup> The figures do not account for the possibility that some of the parents (notably under 40) will have more children in the future but make comparisons possible.

<sup>5</sup> The work done by children or grandparents helping occasionally (on week ends) has been considered as 0.25 units of labor. The work of adults has been attributed a factor of 0, 0.50 or 1.0, depending on their level of involvement in farming.

<sup>6</sup> The greater mobility of the younger people in V1, who often commute to industries located in other districts (Maharat, Muang, etc), is also shown by their tendency to marry individuals from the province (23%) while youth in V3 find their spouse predominantly in nearby villages and adjacent sub-districts (48%) and those from V2 in the village (65%).

<sup>7</sup> one *rai* = 0.16 ha

<sup>8</sup> The subsamples were completed by questionnaires directed at landless households. A limited number eventually appeared to correspond to villagers not involved in farming but they were nevertheless kept in the subsample. They included landowners leasing all their lands, some landless families with no agricultural income (either waged or fixed salary), and inactive people (in general, senior persons taking care of grandchildren and supported by remittances).

<sup>9</sup> This was done *a posteriori*, based on the economic data collected.

<sup>10</sup> The percentage of wage laborers (above the 100% line) is due to sample constitution and is not indicative of their relative importance in the village (which is indicated in figure 4).

<sup>11</sup> Cooperative membership is dominant in V2, while the Bank of Agriculture and Agricultural Co-operatives (BAAC) is the most common credit provider in V1.

<sup>12</sup> This may underscore reality as it is possible that some farmers were interviewed at a time (or a season) when they had not taken credit yet. Sometimes, it is reluctantly that questions on indebtedness are answered.

<sup>13</sup> 1 \$ US = 40-50 baht

<sup>14</sup> A monk's ordination (in V1 village) is reported to cost a minimum of 100,000 baht and reaches four to five times this amount for richer families. A cremation is even more important and usually costs 150,000 to 200,000 baht.

<sup>15</sup> Because some surveys were conducted in V2 in 1999, while the other villages were surveyed in 2000, the prices of rice have been homogenized and taken as 5,000 baht/ton in the basic calculation (roughly the deflated average over the last 10 years and close to the price of the year 2000, i.e. 5,300 baht/ton).

<sup>16</sup> If we consider only the last 5 years, these values are raised to 1.03, 2.65 and 2.9, respectively.

<sup>17</sup> To test the sensitivity of the village income (sample) to the variation of the main wage and secondary wage, these parameters have been reduced by 30 and 50 percent from their 30,000 baht and 5,000 baht/year values. This reduction only gives a decrease of 2-5 percent of the village per capita income (but, of course, some households are more affected than others). A decrease of the rice price by 1 percent impacts on the per capita income by 0.5 percent in V1, 0.6 percent in V3 and 0.7 percent in V2. A low price for rice, for example 4,000 baht/ton instead of the 5,000 baht/ton considered, entails a drop of 10-15 percent in the per capita income, with a higher sensitivity for V2.

<sup>18</sup> In addition, these values were obtained with the attractive prices of poultry observed during the survey, but these have collapsed in recent times (Bangkok Postxx).

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<sup>19</sup> This analysis provides some insight on yearly incomes in the three villages but did not evaluate auto-consumption of backyard products (chicken, ducks, eggs, vegetables, fruit, fish, etc). It is evident that their contribution to the daily diet is far from being negligible and it should also be considered when assessing food supply or poverty lines. Visser (1980), for example, conducted a 1-year village study that led him to estimate auto-consumption to as many as 200 days/yr. Our calculations were made considering net incomes from different activities. The indebtedness of the household has been considered with regard to financial costs but not to the principal. For short-term credit, this is justified because the price of agricultural input is already computed at its nominal real value. Medium- and long-term credit was not considered because they corresponded either to investments (asset depreciation computed) or to specific investments (for ceremonies, health hazard, land buying, etc) that, strictly speaking at least, are most often disconnected from production.

<sup>20</sup> This is also due to the distortion caused by cases in which the number of household members is low (2 or 3), while the income is high. If we considered total household incomes, we would have the opposite problem with those households with high income but high membership. Another distortion may result from not distinguishing between adults and children within the households (the cost of living of the latter being, perhaps, lower).

<sup>21</sup> Census data show that while the total population of the rural delta (Bangkok and its vicinity excluded) increased by 13% between 1960 and 1970, the agricultural population declined by 13%.

<sup>22</sup> One of them is a doctor from Chulalongkorn University.

<sup>23</sup> The problem, however, was much more acute in the north than in the delta (on this issue see Molle, 2002).

<sup>24</sup> By way of illustration, the percentage of non-farm income found by Amyot (1976) in Ayutthaya in 1969 was 15%

<sup>25</sup> However, the normal rate for spraying one *rai* of rice is 30 baht.

<sup>26</sup> It is shown in particular that the extensive treatment by historians of the Rangsit area, the stage of enduring exploitation of peasants emancipated from serfdom by urban-based landlords, has distorted the picture of a more complex and multifarious expansion of the land frontier (Molle and Thippawal, 2003)

<sup>27</sup> This prompted one woman, married to a Muslim from Nakhon Luang, to state that “all the religions are good but Islam is better because there is no expense for cremation.”

<sup>28</sup> Although it will probably continue to be so because it cannot be captured in conventional surveys, is too prone to subjectivity and does not fit conventional deterministic theories.

<sup>29</sup> Areas with full development of on-farm facilities.

<sup>30</sup> We do not ignore here the complex and political nature of public interventions, the vicissitudes of cost-benefit analysis, and more generally the interplay of vested interests that span from politicians, to bureaucracies, and from consultants to lending agencies, but the present discussion is not addressing this issue (see for example Ingram, 1971; Howe, 1987; Bauman and Haimes, 1987; Porter, 1995; Howe and Dixon, 1993; Berkoff, 2002).

<sup>31</sup> More generally, Turton (1989) emphasizes the lasting weak support of the state to the rice sector.