

Migration and the Variability of Rice Production in a Northeast Thai Village

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Introduction

The condition of the land in Northeast Thailand for rice growing is so marginal that little surplus production is possible. Furthermore, the production of rice is extremely variable, due mainly to frequent droughts. This paper is based on in-depth research by an interdisciplinary team from 1981 to 1984 in a single village in Khon Kaen province, here called "DD."¹

The village was founded by farmers who migrated spontaneously in the latter half of the 19th century. Until the 1920s, it remained a frontier village, continuing to receive immigrants. By the 1930s, all the village lowlands best suited to rice had been reclaimed, and immigration ceased. After a brief equilibrium period, groups of emigrants formed and began to leave the village in search of more frontier lands.

Such a migration pattern may suggest the applicability of the carrying capacity paradigm in the case of DD. However, the long-term average level of rice production in the village was more than that required for self-sufficiency throughout the period. By simply comparing the long-term average production of rice with the migration pattern, it is difficult to see any relation between the two. But if we adopt a yardstick for the rice balance that takes into account the annual variability in production (the "stock depletion probability," or SDP), a relationship is clearly demonstrated. This suggests the significance of the safety-first principle in a subsistence economy.

When the superior rice lands were exhausted in the 1930s, those who remained in the village expanded their rice acreage into inferior land. Thus, even though the average production increased, the stability of production decreased. More people were accommodated in the village, but they had to tolerate a greater SDP. Income from cash crops after the 1940s helped villagers to cope with this situation.

When a community's ability to sustain itself becomes less dependent on resources within the community, the size of population becomes increasingly independent of the carrying capacity. After the 1970s, the village economy in DD underwent a drastic change, and, as a result, the share of agriculture, particularly rice growing, became only a fraction of the total village revenue. Yet the resident population did not exceed an SDP of 17/100 set by the rice balance until the 1980s. This was primarily because of the unreliability of income from off-farm employment, at least in the eyes of the villagers. Here, too, we can recognize the continuation of a safety-first principle.

Since the 1980s, DD has experienced suburbanization: non-farming households have appeared in the village, and more people commute to the towns. At the same time,

¹ An intensive study of DD village was carried out by an interdisciplinary team from 1981 through 1984. The agroecological aspects are reported in Fukui (1993).

parents have become more enthusiastic about their children's education. After completing their education and obtaining good jobs in the towns, the children are expected to contribute to the core households in the village. Children's education is seen as an alternative means of securing a livelihood. Here, too, we may be able to see the safety-first principle at work.

In this paper, I analyze the operation of the safety-first principle in relation to migration. This does not mean, however, that peasants lack the ability to take risks. Finding land in the frontier areas is a risky venture and yet it is still "traditional" among the Thai-Lao peasantry in the northeast of Thailand. In any venture, both risk-taking and risk-avoiding can be observed. As far as the resident population of DD village is concerned, the safety-first principle has been prominent from the time of the subsistence economy till the present.

1. The Marginality of Northeast Thailand for Rice-Growing

Rice dominates agriculture in the southeastern part of the Eurasian continent, the landform of which is characterized by the combination of high mountains and alluvial valleys. Though alluvial plains occupy a small portion of the total land area, they are endowed with fertile soils and plentiful water, and thus offer ideal conditions for lowland rice. Northeast Thailand, however, is an exception because it consists of the Khorat Plateau, not an alluvial valley. Like plateaux elsewhere, its catchment, and thus its water resources, are limited, resulting in the dominance of rain-fed rice. The annual rainfall ranges from 1,200 to 2,200 mm over the region, but it is near the lower limit at DD village. In years of average rainfall, only 80 days of moisture sufficient for rice are expected there.

2. Village Population

DD village is said to have been founded by a few small groups of farmers in the second half of the 19th century. In the Northeast, farmers move spontaneously "in search of good paddy land" (*ha na di*). The founding fathers of DD were also farmers migrating for *ha na di*.

The village population, the rates of mortality and fertility, and migration have been estimated for five periods from 1900 to 1983 (Table 1). During the period before the Second World War, the rate of potential or natural population increase calculated from mortality and fertility stood at around two percent per annum. During the first two decades of the century, however, the village population increased faster than that, suggesting migration into DD. This migration continued between 1920 and 1935, but some villagers also emigrated, resulting in a rate of net migration close to zero.

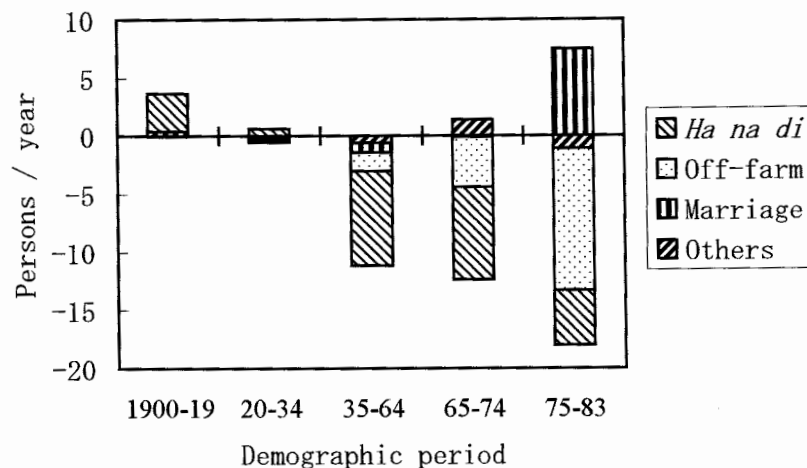
Mortality started declining in the 1930s, while fertility remained at a high level until the introduction of contraceptives in the late 1960s. The result was a rate of natural population increase of over three percent for this period. At the same time, however, rapid emigration started with more than ten people leaving every year, and the village population actually increased at a rate of less than two percent per annum. In the 1970s, the rate of natural increase declined to about two percent, mainly due to the decline of fertility, while emigration continued at the same high rate as in the preceding period. As a result, the village population increased at a rate of less than one percent. In the 1980s, DD experienced a nearly static population due to a further decline in fertility.

Table 1. The Demographic History of DD by Period, 1900-1983

Year	Population (persons)	Rate of increase (%/year)		Migration (persons/year)
		actual	potential	
1900	152	(1900-20) 3.78	(1900-20) 2.21	(1900-20) +3.60
1920	320	(1920-35) 2.67	(1920-35) 2.21	(1920-35) +0.10
1935	475	(1935-65) 1.80	(1935-65) 3.20	(1935-65) △11.20
1965	810	(1965-75) 0.95	(1965-83) 2.20	(1965-83) △10.80
1975	890	(1975-83) 0.32		
1983	916			

Notes: Mortality and fertility were estimated based on interviews with 232 mothers residing in the village in 1983, who had given birth to a total of 876 children. Migration was estimated by the family history survey with help of genealogical charts.

Figure 1. Reasons for Net Migration



Notes: 'Marriage' includes *Ook-hien*,² adoption, fosterage, divorce and death of spouse. "Others" includes military service in a monastery, schooling, and unknown reasons.

The reasons for migration are shown in Figure 1. Immigration into DD in the early decades of the century was for *ha na di*. The main reason for emigration from DD, which started as early as the 1930s, was similarly for *ha na di*. The *ha na di* emigration continued well into the 1970s, and it was only from the latter half of the 1970s that the destination shifted to urban areas.

² Newly married husbands commonly live with their wives' families for periods ranging from several months to several years. *Ook-hien* means that the couple sets up a home independently.

3. Rice Production

All the paddy fields belonging to DD are rain-fed. They lie in the floodplain of the Chi River, where floods recur once in a decade on average and destroy virtually the whole rice crop. The floodplain has a varied micro-relief. The village paddy lands occupy about twenty shallow, saucer-shaped depressions, locally called *nong*. Early settlers started reclamation from the bottom of a *nong* by draining it. The land at the bottom of a *nong* is hydrologically superior and the soils contain more clay and are more fertile. By the mid-1930s, all the *nong* bottom land had been reclaimed. The land around a *nong* slopes, and the soils are sandy and poor in plant nutrients. These parts were also reclaimed for paddy growing in the 1940s. Since the early 1950s, there has been no change in the acreage of paddy fields in DD.

Nineteen percent of total arable land of DD was planted with upland field crops, mainly cassava, in the 1980s. The uplands were once covered with forest before the first commercial crop, cotton, was introduced in the 1940s. Kenaf, a fiber crop for export, replaced cotton in the 1960s. From the 1970s, cassava became dominant, being a major export item to Europe. Six percent of DD's arable land consists of vegetable gardens. The commercialization of vegetable growing started in the 1970s.

There is extreme fluctuation in paddy yields, as shown in Table 2. It is no exaggeration in DD to say that the yield is poor in "normal" years, and a bumper crop is expected only in "exceptional" years.

Table 2. Yields and their Variability

Year	Total production (ton)	Yield (paddy kg/ha)	Reasons for poor yield
1960		1,120	
1961	123	612	
1962	44	223	
1963	46	228	
1964	8	41	
1978	30		Flood
1979	53	440	Drought
1980	34		Flood
1981	257	1,180	Drought
1982	90	600	Drought
1983	473	2,190	

In matching the village population and the rice supply, it is essential to assess the average yield or the yield in normal years. The average for a period of five or six years, however, cannot be taken as the long-term average, because the annual variability is so great. In order to estimate the long-term average, a simulation model was constructed.

The primary inputs into the model were the rainfall records. The soil moisture regime and the cropping calendar were first simulated. Next, the adverse effects of water stress at different stages of the crop growth on the yield were simulated and expressed as the reduction of the yield due to drought. Finally, the effects of flooding were incorporated. The model was validated by the observations over five year periods.

The model indicates that the long-term (100 years) average yield was 1.1 tons of paddy per hectare of total village paddy land under the conditions of the 1980s, and 1.4 tons for the conditions of the 1930s.

4. The Balance between Rice and Population

Combining the results of the demographic and agronomic studies, we are now ready to compare levels of population and rice production (Table 3).

Table 3. A Preliminary Comparison of Population and Rice Production

	1930s	1980s
Population	500	900
Paddy area (ha)		
total	196	360
per capita	0.39	0.40
Paddy yield (ton/ha, long-term average)	1.4	1.1
Per capita paddy (kg)	520	446

The rice acreage/person ratio remained surprisingly stable throughout the period under discussion. Since only better quality lands were used in the 1930s, the long-term average yield was higher than for the 1980s, and this resulted in greater per capita paddy production. But even the per capita paddy production of 446 kg in the 1980s appeared to be more than enough for self-sufficiency in rice, if not for a significant surplus. Disregarding the year-to-year variability of production, we concluded that DD had been self-sufficient in rice throughout the whole period.

Whatever conclusions might be drawn from the simulation model, it is certain that the shortage of rice has been, and still is, of great concern to the villagers. The rice balance must be expressed in the way that it is perceived by them. To do this, we have to incorporate the annual variability in one way or another in calculating the rice balance.

Rice has seldom been sold in DD. This does not mean, however, that the whole village economy is one of subsistence, since cassava is grown solely for sale, and vegetables are carried to the market in Khon Kaen every day. As we will see later, moreover, off-farm employment accounts more than one half of the total income. Yet, rice is seldom sold.

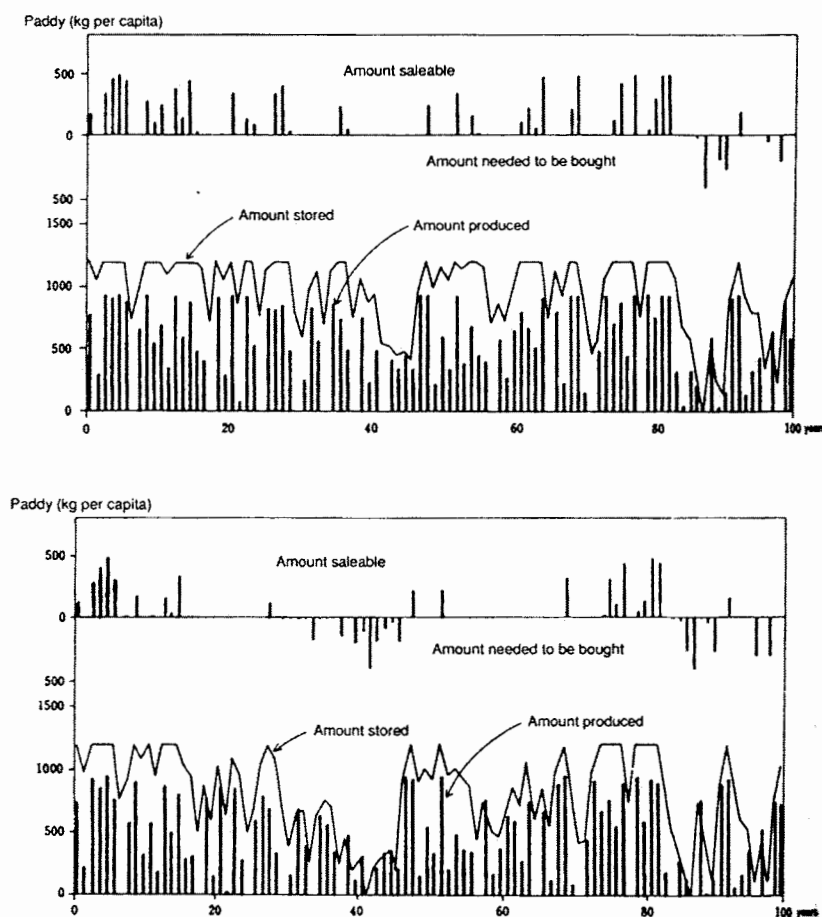
The total capacity of rice granaries in the village amounts to three years of rice consumption. All the harvest is stored in them as paddy (unhusked). The villagers' concern is how much paddy is left in the granaries, not necessarily the harvest each year. There is a saying in DD that one bumper crop can sustain three years of consumption.

The variability of the rice stock for the 1930s and the 1980s was estimated using the simulation model mentioned above, with the following assumptions:³

- (a) all the production factors remain have unchanged for 100 years,
- (b) rice is sold only when stock surpasses the capacity of the granaries,
- (c) 400 kg of paddy per person per year is consumed as food,
- (d) 50 kg per ha of paddy is needed as seed, and
- (e) the loss in stock is five percent per annum (Figure 2).

Since the balance for the 1960s is essentially the same as that for the 1980s, we can conclude that the stock depletion probability (SDP) deteriorated from 6/100 in the 1930s to 17/100 within over a period of 30 years and remained constant from then until the 1980s. An SDP of 6/100 means that stocks will be exhausted two or three times in a lifetime while one of 17/100 means that this will happen every five or six years. This reflects the reality of the villagers' experience.

Figure 2. The Rice Balance in the 1930s (above) and 1980s (below)



³ This is not an attempt to estimate the rice balance for any specific year or period, but simply one method of expressing the balance for the decades.

5. Migration and the Rice Balance before the 1960s

As a frontier village in the first few decades of the 20th century, DD attracted immigrants from elsewhere. By the end of the 1930s, all the better quality lands had been reclaimed. After a decade-long period of equilibrium, rapid emigration started taking place. This observation suggests the applicability of the carrying capacity paradigm to the DD case, in so far as the period prior to the 1960s is concerned. As stated previously, however, the relationship between the village population and the long-term average production of rice is not at all clear from a simple comparison of the two, since the average production was more than enough for self-sufficiency throughout the period examined. Only by taking into account the variability of production can it be shown that the change in the rice balance over time corresponds with the pattern of migration. This implies that the safety-first principle affects the decision to migrate, and that what matters is survival in the worst years rather than average production in normal years.

As for the period after the 1970s, however, there is a serious objection to the application of the carrying capacity paradigm to DD. As a population approaches the carrying capacity of the land, the resources available per person should stabilize or decrease, but this has not been the case in DD since the 1970s. Village elders agree unanimously that life was really hard in the old days, and, as will be shown later, it is undeniable that the standard of living has improved significantly, and that the structure of the village economy has changed drastically since the 1970s. Therefore it is also necessary to take the wider economy into account in the argument about population and food in DD.

6. The Village Economy

Until the commercial cultivation of cotton in the 1940s, the village economy was largely one of subsistence. Cotton was replaced by kenaf in the 1960s. When DD was studied by a Japanese anthropologist, the late Mizuno Koichi, in 1964-1965, kenaf was widely cultivated. A comparison of his farm economic survey and ours demonstrates the growth and change in the village economy during the interval (Table 4).

Table 4. Changes in the Village Economy between the 1960s and 1980s

Net income from	Share in the 1960s (%)	Share in the 1980s (%)	Real average annual increase (%)	
			Village	Per capita
Farm	78.7	42.2	-0.06	-0.69
Off-farm	21.3	57.8	9.94	9.26
Total	100	100	3.67	3.02
Rice-growing (% farm)	48.8	40.1		
(% total)	38.4	16.9		

The village economy grew at the rate of 3.67 percent annum, and this growth was mostly due to the nearly 10 percent annual growth of the off-farm sector. The share of the farm sector shrank from 78.7 to 42.2 percent of the total revenue. In particular, the decline in the importance of rice-growing is notable, declining from 38.4 percent in the 1960s to 16.9 percent in the 1980s.

7. Population, Rice, and the Economy after the 1960s

The changes in demographic features, the rice balance, and the village economic structure are summarized in Figure 3.

Figure 3. Changes in the Relation between Population, Rice, and the Economy

year	1900	10	20	30	40	50	60	70	80
Demographic Period	I		II		IIIa			IIIb	IIIc
Village population (person)	150	320		500			810		900
Rate of increase (% per year)	3.8		2.7		1.8			1.0	0.3
Natural rate of increase (% per year)	2.2(?)		2.2		3.2			2.2	
Migration (person/year) (for <i>ha na di</i>)	+3.6 (\pm)		+0.1 (\pm)		-11.0 (-8)			-10.8 (-8) (-4)	
Relative desirability of life in village	+		\pm		-			-	
Paddy area	potential				Middle, high fields (2,260 <i>rai</i>)				
	Low fields (1,220 <i>rai</i>)								
Probability of stock depletion	$\leq 6/100$			6/100			17/100 \rightarrow		
Village economic structure	Subsistence				Cash crops				
	Off-farm crops								

The relevant questions to be asked are: (a) how villagers coped with the deteriorating rice balance (from an SDP of 6/100 to one of 17/100) from the 1940s to the 1960s, and (b) why the rice balance remained constant from the 1960s to the 1980s, a significant improvement in living standards notwithstanding.

Villagers reacted to the deteriorating rice balance by (1) *ha na di* emigration, (2) the reclamation of inferior lands, and (3) the cultivation of cash crops. The reclamation of paddy lands within individual households proceeded from the superior lower-lying lands to the poorer lands on the *nong* slopes. Planting on the better land not only results in a greater yield, but also a more stable harvest. There is no household which cultivates only inferior land. This suggests that rice cultivation on inferior lands is viable only when combined with cultivation of better low-lying land by household members. As such, rice production from the poorer lands supplemented that from the better lands, and this allowed an increase in the resident population, from less than 500 in the 1930s to over 800 in the 1960s.

The increased population, however, had to tolerate the deteriorating rice balance

from 6/100 in the 1930s to 17/100 in the 1960s, which was possible thanks to the income from cash crops. As the switch from cotton to kenaf and cassava suggests, the market in cash crops is highly unstable, and the villagers know this well. There is nobody in the village who specializes in cash crop cultivation alone. Thus, the income from cash crops is also supplementary. However, the need to purchase rice does not recur every year, but only once in a while. As long as there is rice in the granaries, cash earned can be used for other purposes. Thus, "one buys rice in poor years but a shirt in bumper years."

There are three reasons for the constant SDP (17/100) after the 1970s. The first is ever-declining fertility. The second is the continuing trend of emigration, with the destination shifted from frontier land to urban areas. The third is the absence from the village of wage earners who have completely abandoned rice farming.

Supplemented by the income from cash crops, it appears that an SDP of 17/100 is considered by villagers to be the minimum for self-sufficiency in rice, and unless self-sufficiency in rice is assured, there seems to be no reason to stay on in the village. Moving to towns offers more chances for employment and these are good enough to compensate for the loss incurred by not growing rice. This may be the basic reason for the continuing emigration to towns.

After the 1970s, cash incomes increased dramatically, first from vegetable growing and second (and more importantly), from off-farm employment. Since DD is within commuting distance of Khon Kaen City, one of the boom towns of the Northeast, many villagers commute there. Though some villagers are lucky enough to find jobs that bring about dependable incomes, the majority are not. The absence of non-farming households in the village indicates that the income from off-farm employment is similarly supplementary to rice-farming, or at least in the villagers' perceptions. Here, too, we can see the same safety-first principle operating in the migratory behavior of villagers. To be a part-time farmer self-sufficient in rice guarantees the basic minimum, especially when one gets old or sick. To be a landed farmer is viewed by villagers as being a highly desirable goal.

Rice cultivation under rain-fed conditions requires a high labour input in a short period because planting is possible only after heavy rainfall and must be finished before the fields dry up. Planters must stand-by because nobody knows when the fields will be ready for planting, although the actual working time is rather short. Thus, it would be quite easy to continue growing rice while also commuting to town for an off-farm job.

8. The Future

Some of off-farm jobs with government agencies and large Bangkok-based companies are quite stable. With an increasing number of villagers obtaining a reliable income from off-farm employment, more of them will abandon rice farming completely. In fact, follow-up surveys carried out after 1984 suggest further deterioration of the SDP, and the emergence of several households in which nobody is engaged in rice farming. An evening market has opened in the village, and several motorcycle-taxis carry commuters between the village and the nearest bus stop. DD is now becoming a suburban village, and the size of the population is no longer determined by the rice balance.

This does not necessarily mean that the safety-first principle has been renounced, however. Parents have become enthusiastic about their children's education, expecting a return for the household in future, especially from daughters. Responsible

parents have shifted their survival strategy from the purchase of land in frontier areas to investment in children's education.

9. Conclusions

By simply comparing the long-term average production of rice and the migration pattern, it is difficult to recognize a relationship between the two, but by taking into account the annual variability of production, the relationship is clearly demonstrated. A similar phenomenon is reported for the case of sifting cultivators in northern Sulawesi, where the actual population density is substantially lower than the estimated carrying capacity. This is explained by the year-to-year variability of production (Henley 2003). This suggests the significance of the safety-first principle in subsistence economies, as was emphasized by Scott in his seminal work (Scott 1976).

When the superior rice lands were exhausted in the 1930s, some people left the village for *ha na di* elsewhere, while those who remained expanded rice acreage using inferior land. Production there is so unstable that the use of inferior sloping land was combined with the use of superior *nong* bottom lands within individual households. Thus, the average production increased, but the stability of production decreased. More people were accommodated in the village, but they had to tolerate a greater SDP. Income from cash crops after the 1940s helped villagers to cope with this. Although this income originated from resources in the village, the rice balance at this stage did not exactly reflect the balance between population and resources: taking into account the rice purchased, the food/population balance should have been better than an SDP of 17/100 suggests.

When a community's livelihood becomes less dependent on resources within the community, the population is supposed to become independent from the carrying capacity of the land. In DD after the 1970s, the village economy underwent a drastic change, and, as a result, the share of agriculture, particularly of rice-growing, became only a fraction of total village revenue. Yet, the resident population never exceeded a limit set by the rice balance of SDP 17/100, at least not until the 1980s. This is primarily because of the unreliability, at least in the villagers' perception, of income from off-farm employment. Like the rice harvest from poorer sloping land since the 1940s, and the income from cash crops since the 1950s, off-farm jobs from the 1970s to the 1980s were also supplementary to the more dependable rice harvest from the better lower-lying land. The village population has been primarily determined by the latter, while the tolerable limit of the SDP has been determined by the former.

From the 1980s, DD has experienced suburbanization, some village households are not farming, and more people commute to towns. At the same time, parents have become concerned about education, because children who are educated and have good jobs in town are expected to contribute to the income of their households in the village. Children's education is an alternative means of securing a livelihood. Here, too, we may be able to notice the safety-first principle at work.

In this paper, I have analyzed the safety-first principle operating in relation to migration. This, however, does not mean that the peasants lack the ability to take risks. Searching for land in frontier areas is a risky venture, even though it is traditional among the Thai-Lao peasantry in northeastern Thailand. The developing demography of DD village demonstrates well the interplay of taking and avoiding risks.

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