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Rice Cultivation in the Mekong Delta

——Present Situation and Potentials for Increased Production——

by

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I Introduction

Cho Moi is a small village on the other side of Long Xuyen across the Bassac river. For years, it was famous in this province of floating rice for its vegetable produces. But in 1973 several farmers started a new venture: growing high yielding rice (HYV) with irrigation water supplied by a private small irrigation scheme operator. They were so excited because that was the first time they saw plenty of water running into their paddies during the dry months, and also because that was their very first HYV crop. Their delight gradually disappeared, for after 4 months many of them harvested a poor crop, so poor that they could hardly pay for the water fees. The pump operator almost dismantled his set-up. The case of Cho Moi is just one of many examples of the net results from innovations introduced into a traditional environment where development planners only think of a separate component of a new package of practices but never of local people's readiness to make full use of such innovations. In almost every discussion on planning to develop the Mekong Delta, especially for increased rice production, experts usually talk about irrigation and drainage. Of course, irrigation is the most important input for the rice crop in the delta. To the Taiwanese or Japanese farmers, irrigation means more opportunity for higher rice yields. But to the Vietnamese farmers, it might just be a luxurious item which may bring more debt than profit to them. At the present time, Vietnamese rice farmers level of modern crop management would be about 10 years behind their counterparts in Japan. At least during the last 5 years, the Green Revolution has been changing the appearance of the Mekong Delta in southern Vietnam, bringing in new hopes for the country but at the same time creating new problems for farmers. Anyone who visited the delta during the wet season would soon realize that farmers used virtually half of the areas of asphalted national roads as drying ground for their newly harvested HYV rice. Nowadays one can see rice in all stages of growth at any time of the year. Actually the introduction of new HYV rice has upset the Vietnamese traditional rice cultivation pattern at a rate faster than farmer's ability to manage the new situation. Thus despite all the big campaigns for increased production, Vietnam has had to import rice during the last

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several years until 1973. Perhaps the security situation would have affected the general rice production output, but its effect, if any, must have been minimal, because cultivated areas devoted to rice is expanding (see Table 1). And yet the increase in production did not meet the demand of the 3 percent annual population growth. We are convinced that there must be other factors causing low production of rice in the delta. In order to provide delta development planners with more insight on rice production in the Mekong Delta, I shall deviate from a purely academic and agronomic point of view, to look in the entirely of the situation within an agro-economic context.

Table 1 Cultivated area and production of local and high yielding rices in Vietnam form 1968 to 1973

Year	Local Varieties			High Yielding Varieties		
	Area (ha)	Production (M. tons)	Yield (T/ha)	Area (ha)	Production (M. tons)	Yield (T/ha)
1968	2, 352, 800	4, 202, 400	1. 79	41, 000	163, 350	3. 98
1969	2, 226, 000	4, 178, 600	1. 88	204, 000	936, 400	4. 66
1970	2, 058, 600	3, 721, 300	1. 81	452, 100	1, 994, 200	4. 41
1971	1, 951, 300	3, 659, 500	1. 87	674, 000	2, 664, 700	3. 95
1972	1, 865, 000	3, 250, 400	1. 74	835, 000	3, 097, 800	3. 71
1973	1, 939, 700	3, 834, 900	1. 98	890, 400	3, 190, 200	3. 58

Source: Ministry of Agriculture, Directorate of Agricultural Economics. *Agricultural statistics 1960–1973*. 1974.

II A Glance at the Natural Environment of the Mekong Delta

1. *Soils and water*

Vietnamese Mekong Delta farmers are blessed by nature for their beloved untapped land and water treasure. Generations after generations they have learned how to maximize the values of their resources. The delta is placed in the direct influence of the Mekong river and its branches pouring into the South China sea. The downstream discharge of the Mekong river and the upstream tidal flows interplaying with heavy monsoon rains and high evaporation in a physiographically heterogenous surrounding result in an environment exclusive to the delta. The Netherlands Delta Development Team (1974) divided the whole delta into 8 main land units namely (1) coastal plain, (2) estuarine floodplain, (3) river floodplain, (4) broad-depressions, (5) peat, (6) terrace, (7) piedmont, and (8) hills. In another study, however, Takaya, Kaida, and Fukui (1974) partitioned the delta into 6 physiographic units, namely, (1) floodplain, (2) active delta apex, (3) coastal high plains, (4) broad depression, (5) Trans-Bassac plate, and (6) western coastal swamp. Each of these units is characterized most noticeably by its hydro-topographic conditions. To farmers inhabiting the provinces along the Mekong river, "upstream" farmers are distinguished from the

"downstream" farmers. The upstream region fits in very well to the floodplain, and the downstream region to the active delta apex as described by Takaya *et al.* (1974). Although the whole delta configuration appears flat as the result of alluvial deposits over the centuries, undulated land surfaces occur in many parts, particularly in the active delta apex. Erosions and deposits are continuous processes along water courses: new islets formed while some parts of river bank taken away. Based on traditional rice cultivation patterns, the Mekong Delta may be grouped into 3 main regions (see Fig. 1):

(a) The floating rice region, low-lying subjected to annual flooding from 1 to 5 meters;

(b) The double transplanted rice region, moderately depressed subjected to intermediate flooding from 0.3 to 1 meter late in the wet season; and

(c) The single transplanted rice region, non flooded by river water but subjected to rain inundation, including the coastal high plains, plain of reeds, western depression, and backswamps.

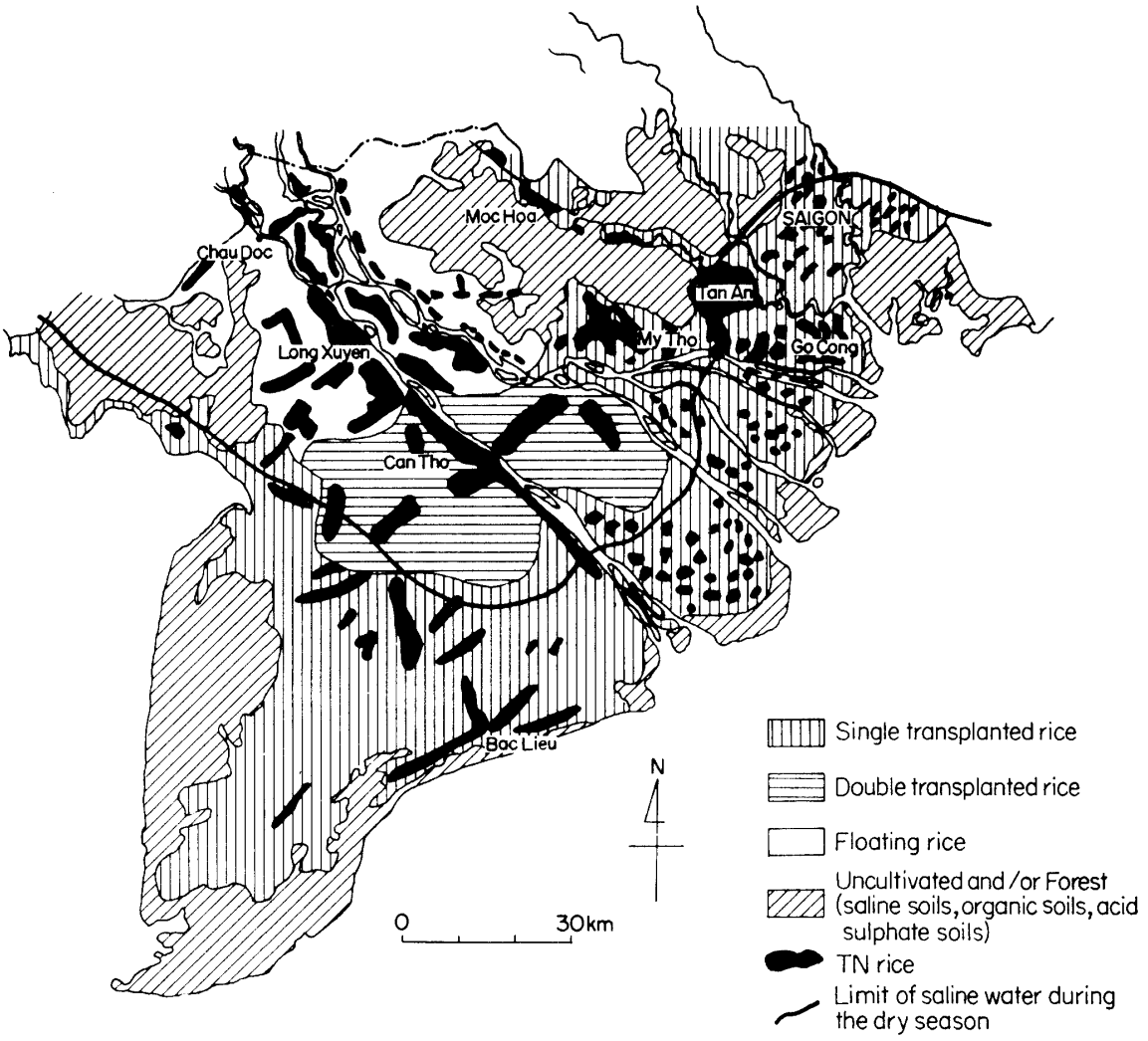

Fig. 1 The different rice growing area in the Mekong Delta

Generally the soils in the Mekong Delta are acidic to very acidic with an exception of part of the river floodplain in Chau Doc. This general acidic condition is the result of redistribution of acidic water by river flooding after acidic substances had been washed off from very acidic areas by early rains. On the other hand, the coastal plain is partly affected by salt water intrusion both from the river and from underground. In the dry season salt affected areas are estimated to occupy about one third of the whole delta. The soils are mostly heavy clays except those on levees of river, and on the sand bars along the coastal plain. Except in most of the floating rice region, the heavy clay soils in most other areas are usually puddled for transplanting rice, rendering the soils almost unsuitable for growing any upland crop.

2. *Climate*

The Mekong Delta climate is governed by the hot monsoon. There are two distinct dry and wet seasons. Wet season starts from the middle of April through middle of November; dry season from December through March. The southwest monsoon brings most heavy rains from May through October (see Fig. 2), giving additive effects on Mekong high flows, thus causing floods at various depths in scattered areas. Average annual rainfalls in the delta range from less than 1500 mm in northern region to more than 2000 mm in the western coast. As shown in Figure 2, usually a dry spell in June (in the floating rice area, i.e. Chau Doc and Long Xuyen), and in July or August (in other areas, i.e. Vinh Long) may cause much harm to the rice crops. During the main crop season, or the wet season, sunshine period is only about 6 hr/day, thus limiting potential crop yield.

3. *Hydrology*

River water reaching the Vietnamese part of the Mekong Delta is derived from discharge at Phnom-Penh and distributed through the Mekong and Bassac rivers, its branches, and numerous man made navigation canals. In normal year, discharge at Phnom-Penh increases rapidly from June and reaches its maxima in September (see Fig. 2). Consequently, the water level observed in the delta starts rising in June, becomes highest in September, then begins to recede. In Figure 2, if field water level is taken 0 meter at a discharge of 10,000 cu.m./sec, the lines representing monthly discharges may be the average values representing monthly water levels in Long Xuyen. Tidal flows were not taken into account in this figure due to insufficient data. Empirically, the effects of tidal flows is least pronounced during extremely dry or high flood months in places far from the sea such as the floating rice region. However, in areas closer to the mouths of the rivers, such as the double transplanted rice region towards the coastal plain, two diurnal fluctuations of tidal flows would affect crop growth substantially, especially during the low flow (dry season) period. During this time, more sea water flows in the Mekong system causing salinity problems to crops and soils.

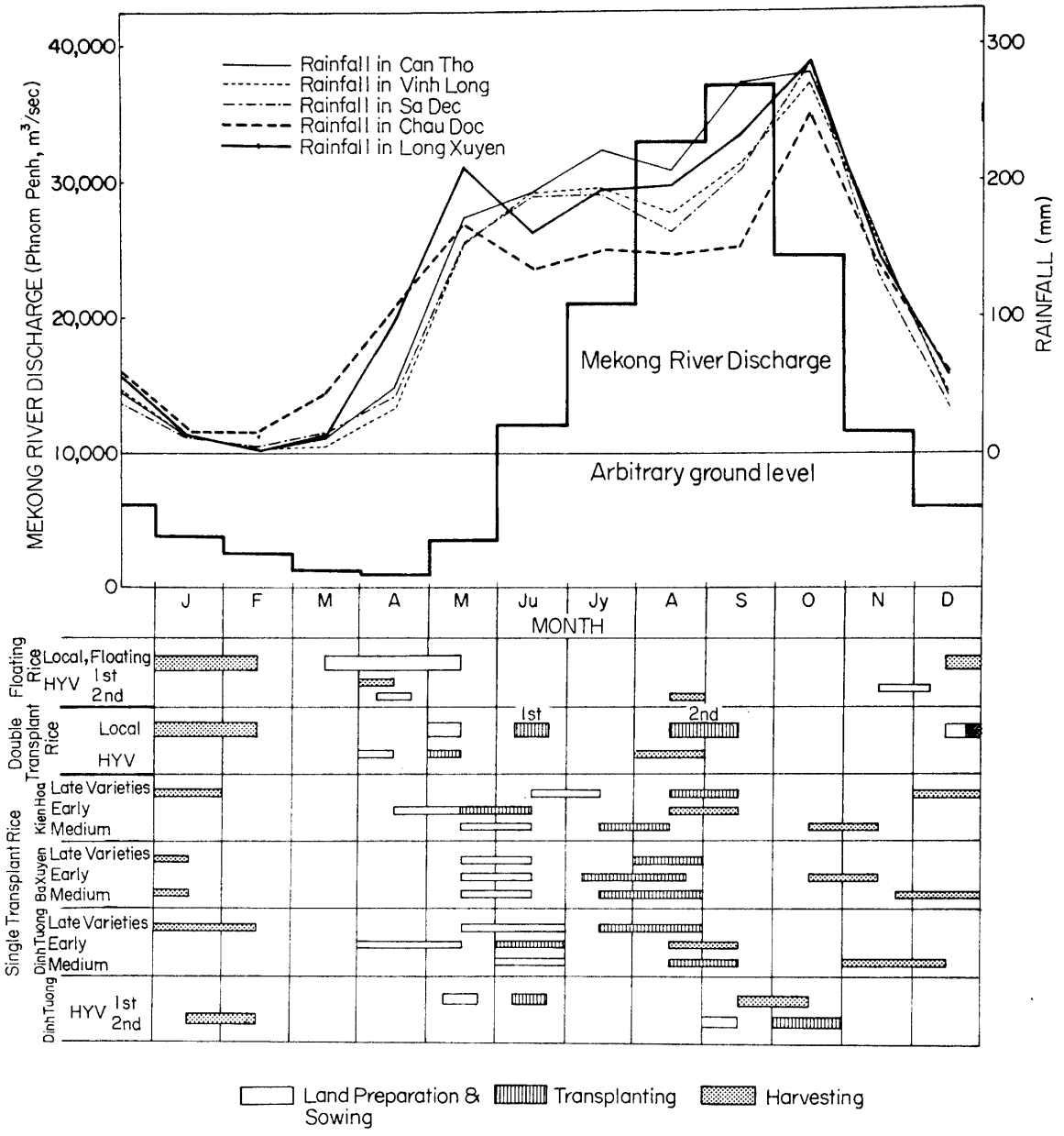

Fig. 2 Mekong Delta rice cropping schedules as related to Mekong water regimes and rainfalls in selected provinces

III Rice Cultivation Systems

A. *Traditional patterns*

Despite some published reports indicating the low fertility status of the delta, we Vietnamese have been observing, and believe, that our land and water resources are fertile enough to support us for generations without acquiring additional inputs. Our subsistent farmers' livelihood has been derived from both land and water. Ultimately, water from the Mekong river is the decisive factor that commands our farmers' living. It is their

'elixir of life.' It brings alluvial to fertilize their land and nourish their crops, and fish to enrich their diets all year round. Not mentioning the natural beauty it charms the region, the Mekong river system also serves well as communication channels to unite the delta inhabitants.

The traditional cultivation techniques practised by today's delta farmers are actually the results of thousands of field tests by their ancestors. By following the traditional ways, there is no risk involved; they feel very safe—except in time of unexpected natural catastrophies. Particularly the old folks are so attached to these techniques because they are the expert growers. Fukui (1974) has extensively explained the rationals of these traditional techniques in an agro-environmental study on the Mekong Delta. As mentioned earlier, based on water regimes, there are three different rice planting systems in the delta:

1. *Floating rice system*

Floating rice is grown in the low lying zone in the upstream of the Vietnamese part of the Mekong river. It occupies about 500,000 hectares covering the Chau Doc and An Giang provinces and part of the provinces of Kien Phong, Sa Dec, Kien Giang, and Phong Dinh. The water level in the floating rice region reaches 1.5 to 5 meters in September. Natural draining of the fields occurs when flood water recedes after September, starting first from areas closer to main riverbanks inwards.

After harvest in January or February, the fields, with a thick mat of intertwined long straw stubble, are let dry. Each individual stubble measures as long as 1.5 to 3 meters. Land preparation begins in early March to April, with burning of stubble as the first operation. The land is then plowed to turn up the soil. In the old days plowing used to be accomplished by cows or water buffaloes. Today, four-wheel tractors can do the job more thoroughly, much faster, and at a reasonable cost. Therefore, except for a minority of farmers having small land holdings (less than 2 ha), most landowners contracted tractor operators for land preparation. Rich farmers may plow 2 times, one early, and one late in the dry months. During the interval of the two plowings, some small rains in April break up large soil clods. The second plowing breaks up the clods further while destroying weeds and volunteer red rice. It is important to note that the heavy clay soils in the floating rice fields are thus prepared in dry condition, therefore they are generally not puddled during the early part of rice growth. Puddling to some extent occurs only at harvest time.

Figure 2 shows the cropping schedules of various rice planting systems in the delta. For floating rice, farmers sow seeds in early May at a rate of 100 kg/ha. If the soil is too wet at that time, pregerminated seeds will be used, otherwise dry seeds are preferrable. During the last few years farmers have been mixing seeds, before sowing, with DDT 75% wettable powder (1 kg/100 kg seed), or Gamma-BHC 10% granules (10 kg/100 kg seed) to prevent crabs, crickets, or ants from eating the seeds. Although generally no post-sowing land preparation is carried out, a few farmers may run a wooden harrow over the

field to further loosen soil clods and simultaneously cover up rice seeds, preventing birds from eating them.

There is a saying among the rice farmers in the floating rice region: 'Growing floating rice is like a game. Gamble a sowing and harvest a real crop.' Little care is taken after seeds have been sown. Indeed, when rains and water levels occur normally, farmers seldom visit their fields until near harvest time. It is not convenient to travel to the fields because of the great distance from the houses. However if the normal rains in May are delayed, one or two reseedings would be inevitable. Usually no weeding nor crop protection is under taken after the rice stand has been established. Farmers engage themselves in fishing either for home consumption or as an 'off-season' business.

During harvest time individual farmers with their family labor alone cannot manage both harvesting and fishing at the same time. Fish are abundant as well as rice. Usually the locality cannot supply sufficient workers at that peak demand. Farmers in the past had to make arrangements with people in other provinces to come to their fields around December to help harvesting. Today, this has become an established labor movement. Tens of thousands of landless people earn a substantial living by harvesting floating rice. When harvest time approaches, in their boat —their floating house— with their whole family, these mobiled hired laborers from other provinces usually come to the floating rice region to apply for harvesting jobs. They arrive first in shallower water area, then move to the deeper water areas where the flood recedes last. They live through the harvest season on floating shelters or in temporary huts. While the adults are harvesting, the children do fishing and wandering about the harvested fields to pick up dropped panicles. Their income from rice harvest and fishing would make them feel happy for part of the year.

Harvesting floating rice is a tedious chore. It is harvested panicle by panicle. As the water level goes lower and lower, the panicles recline gradually, and finally the entire plant lays on the mud. Harvesters come in, pick up each panicle with a wooden sickle, and cut the panicle with a steel blade scythe. After a handful of panicles is gathered, the harvester sets it aside. Another laborer is responsible for gathering the harvested panicles into piles scattered throughout the field. An ox cart, or a tractor-drawn trailer, comes by later to haul these piles to the drying pad. On the pad, the dried panicles are spread in a circle and most conveniently threshed by water buffalo drawing a large wooden roller over the rice straw. Nowadays a four-wheel tractor can accomplish the threshing operation in much shorter time. No whacking frame can be used because the panicles are not arranged in order. Winnowing of threshed grains is then accomplished by wind. Bamboo tripods about 5 meters tall are set up in the field. Grains are conveyed manually to a man standing amidst the tripod who pours them down slowly, chaff and broken straw are separated from the grains.

Generally the yield of floating rice varies depending on the land elevation. In deeper water yield is slightly higher. Average yield is about 1 t/ha. Of all the existing floating

rice varieties, the most popular ones are Nang Tay C, Tau Binh, Nang Dum, Nang Kieu, Tau Nut, Trung Hung.

2. *Double transplanted rice system*

The downstream farmers in Phong Dinh, Vinh Long, and part of Sa Dec and Chuong Thien provinces covering about 250,000 ha (see Fig. 1), receive a different water regime from the upstream farmers. Their land surface is undulated in comparison to the flatness of the floating rice region. At the onset of monsoon rains, some areas are slightly inundated but the greater portion remains dry. During the height of Mekong river flood in late August through September, water level rises rapidly to a depth of 0.3 to 0.6 meter. In some parts the water level may reach the 1-meter mark.

As the name indicates, double transplanting of rice involves two transplanting operations.

(a) *First nursery*: Seedlings for the first transplanting are grown early in May (see cropping schedule in Fig. 2). The nursery is usually located at places near a water source so that it is conveniently watered by hand. It is prepared first by clearing a land area of approximately 200 sq.m. for a final transplanting of one hectare. Holes of 5 to 7 cm in diameter and about 3 cm deep are made 10 cm apart throughout the area. Each hole is covered first with half-burnt rice hull in the bottom, then with a handful of pregerminated seeds. Finally the whole field is covered on top with a large rice straw mulch. Watering by hand is carried out several times a day depending on the weather. Straw mulch is removed after seedlings attain a height of about 5 cm.

(b) *First transplanting, or the second nursery*: After 30 to 45 days, the seedlings are pulled by simply twisting each bundle out of its hole. Normally rain water has been accumulated in part of the field at this time, sufficient for the preparation of the second nursery. Soil puddling is essential for a good production of seedlings in the second nursery. It consists of one plowing and at least two harrowings. Seedlings from each hole of the first nursery are separated to transplant into 8 to 10 hills. Spacings between hills are about 30 cm. Rice plants in the second nursery are allowed to grow for about 60 days. During this time, as Figure 2 shows, the field is fed with rain water in the first half, and with combined Mekong river water in the second half.

(c) *Land preparation for the second transplanting*: From July through early August, as more rain water combined with river water covers the entire field, farmers start preparing for the second transplanting. First, tall weeds, predominantly sedges, are chopped off with an extra large scythe and raked out of the field. A few days later but before transplanting farmers come back to the weed-free field to cut weed stubbles using the same type of scythe. This second cutting is less laborious than the first one. The main objective is to work up the top soil to a certain extent. The field is thus ready for the second transplanting. There is no plowing or harrowing.

(d) *Preparation of seedlings for the second transplanting*: After about 60 days the rice plants in the second nursery are about 70 to 80 cm tall. At this stage, the plants can only be uprooted with the use of machetes. Each hill of rice plants, roots trimmed close to the base, forms a handy bundle of seedlings. The bundles are then stacked in circular pads with their bases in the water. These pads are left floating in the field for 2 to 5 days for new roots to be stimulated by the rising temperature within the stack. Although seedlings are so tall, they are never pruned since their intended height is suitable to survive the moderate flood.

(e) *Second transplanting*: As shown in Figure 2, the second transplanting, which starts sometime between late August to early September, coincides with the rising flood and with the increasing height of rainfalls. However, the resulting field water level is influenced by daily tidal flows. Farmers try to avoid transplanting within a few days of new moon or full moon which are the two periods of highest tide in every month. When transplanting, farmers separate the tillers from the second nursery, then make a hole in the hard soil beneath the water surface using a specially made wooden dagger, and simultaneously push 3 to 4 large tillers into the hole. Spacing between hills is about 30 to 35 cm. After the transplanting, daily fluctuation of field water level is essential for good rice growth. Obviously such natural daily intermittent irrigation and drainage would remove part of toxic substances produced as a result of the degradation of fresh organic matters in the fields. Normally weeds are no longer a problem during crop growth; however insects and plant diseases often cause damage.

(f) *Harvest*: Since all double transplanted rices are seasonal, they mature in time for harvest in the dry months from late December through early February. During the maturity stage, the plants lodge heavily. Total lodging over a large area is not uncommon. Harvested rice is usually threshed in whacking frames, and winnowed by wind. Today home made thresher-cleaners — designed by ingeneous farmers, but not by any engineer— are gaining popularity.

Grain yield of double transplanted rice is variable depending on the pest situation and water regime. On the average the yield is about 2 t/ha; in good year it may reach 3 t/ha. Any late seasonal variety of rice can be used in double transplanting. But there are indications showing some varieties are more suitable than others. Today, varieties like Tau Huong, Mong Chim, Chau Hang Vo, Nang Chet Cut, Trang Tep, Nang Tra are among the most popular ones.

3. *Single transplanted rice system*

About 1.5 million hectares of rice land stretching from Dinh Tuong, Go Cong, Kien Hoa, Vinh Binh, Ba Xuyen, Bac Lieu, An Xuyen provinces are least benefited from the Mekong water. Rice growth depends largely from rain water. Two distinct zones can be identified in this region: (1) Zone 1 covering Dihn Tuong, Go Cong, and Kien Hhoa

provinces where the soils are both acidic and affected by salt intrusion; (2) Zone 2 covering the southern coastal plain including Vinh Binh, Ba Xuyen, Bac Lieu, and An Xuyen provinces where soil salinity is dominating.

Growing season in this region is shortened by at least 1 month compared to other regions to allow the rain washing off excess salts in the soils. Within a province, soil conditions suitable for crop growth are not uniform. Therefore farmers have developed two separate cropping patterns, namely single and double cropping. Each pattern employs appropriate early, medium, or late varieties of rice.

(a) *Single cropping of local rice*: This practice is seen in places where soil problems have not been alleviated soon enough in the wet season (mostly in zone 2 described above). Farmers wait until rains have washed off acid or saline substances before preparing seedlings in June or July (see Fig. 2). Mostly medium or late varieties are planted. Medium varieties are useful in areas where the soils become saline or acidic as soon as rainfall starts decreasing. Usually 2-month-old seedlings are transplanted at spacings of about 30×30 cm in well puddled soil during late August or through September (see Fig. 2). At this time field water level fluctuates very little. Water depth is between 0.1 to 0.5 meter. Some farmers prefer to prune their seedlings if they are too tall compared to water level. During crop growth, weeds, insects, and diseases often cause damage to various degrees. Harvest time is around November for medium varieties, and between late December to February for late varieties. Grain yield averages 2 to 2.5 t/ha. Among the most popular varieties are:

Medium varieties:	Nang Tra, Ca Dung Ket Lo, Doc Phung, Trang Cut, Nep Ba Bong, Nang Phet Do, Nang Thom Lo, Nang Keo, Tat No, Ba Thiet, Tam Vuot Lua.
Late varieties:	Soc Nau, Ve Vang, Nang Thom, Tau Huong, Ba Tuc, Nang Cho, Nep Troi, Mo Nhac.

(b) *Double cropping of local rice*: This system is practised both in Zone 1 and Zone 2 wherever soil problems are minimal. Here, rain water in the entire wet season feeds one crop of early local rice followed by one crop of late rice variety. As represented in Figure 2, seedbeds of early varieties are usually prepared between mid-April to May. Farmers normally transplant 30-day-old seedlings at spacings of 30×30 cm in well puddled soil in June, saving sufficient area to make seedbeds for seedlings used in the second crop. As soon as the early crop has been harvested in September, the second crop is transplanted with 60-day-old seedlings produced previously. Harvest time of the late crop is in December through January or February. Grain yield of early varieties usually does not surpass 2 t/ha, while that of late varieties often reaches 2.5 t/ha on better soil and less than 2 t/ha on problem soils. Among the early varieties are: Tieu Trang, Tieu Do, Giau Dumont, Tunsart.

B. *Recent changes in rice cultivation*

Although Vietnamese farmers have strong attachment to the values inherited from their ancestors, it is not for this reason that they resist change. Changing agents experienced with Vietnamese farmers often found that the latter are among the early to medium adopters. Like any subsistent farmer in other countries, the Vietnamese farmer needs a chance to try out new technology. That opportunity only came in 1968 when high yielding rice seeds from the Philippines were imported to Vietnam with a sufficient amount to plant 40,000 hectares on suitable soils. Farmers' acceptance of the new seeds was so great that in the following years, acreage planted to HYV rice has been increasing many-fold, while that planted to traditional varieties decreased (see Table 1). For crop year 1973–1974, government statistics reported a record 890,400 hectares of HYV rice. The short stem, slightly to non-photosensitive HYV rice quickly replaced most local early varieties. Since then farmers have been trying new cropping system with HYV rice. At present, two systems can be distinguished:

1. *Multiple cropping system involving only HYV rice*: Fortunate farmers whose fields are located close to water sources employ sampan shrimp tail pumps to irrigate two or three successive crops of rice. Highest percentage of this system is found in Dinh Tuong province where heavy fighting occurs daily. Table 2 shows the cultivated areas per provinces within the Mekong Delta. Virtually half of Dinh Tuong's rice area was planted to HYV. Sporadically this system is practised to some extent in other provinces. Noteworthy of all is the increasing acreage of this system taking place in the floating rice region. An Giang province is leading with 27.4% area planted to two successive crops of HYV, and Chau Doc 10.3%. Double or triple cropping with HYV rice may or may not involve transplanting depending on farmers' judgement on the weed population of their respective fields. If weeds are likely to be abundant, the first crop should be transplanted to facilitate subsequent hand weeding. The second crop is direct seeded usually, although some farmers may transplant seedlings in between undisturbed stubbles left after the first crop. Dinh Tuong is a typical province for this system whose cropping schedule is presented in Figure 2.

In the floating rice region, HYV farmers adjust their seeding date such that two crops can be realized without being affected much by the flood. As shown in Figure 2, as soon as flood recedes in mid-November, soil preparation was carried out thoroughly and quickly in more elevated areas. Soil puddling must be thorough in order to minimize weed population and at the same time to ensure good growth of direct seeded rice. In fact, soil puddling is inevitable because the soil was too wet then. Pregerminated seeds were broadcast soon after soil preparation but not later than the first week of December. The first crop matured in early April; the second crop began immediately. Harvesting of the second crop, which was between late August to mid-September was laborious because flood water was rising. Almost the whole mature rice plant was submerged. The land after harvest remained flooded for about 2 months without crop.

As cost of production increases, and time pressure imposes, double or triple cropping rice farmers tend to direct broadcast their HYV rice. But the weeds and insects, sometimes accompanied by rice diseases, must be efficiently controlled, otherwise farmers may become discouraged eventually.

2. *Double cropping system involving HYV and local rice*: Realizing the unbeatable values of HYV rice, farmers who have been double cropping local rices replaced the local early varieties with HYV. The cropping schedule is almost similar to that discussed in Section III.A.3.(b) above. The most significant change, however, has taken place in the double transplanted rice region. It was reported that total acreage of double transplanted rice had been reduced from 250,000 ha to 90,000 ha (Xuan *et al.* 1973; Xuan and Kanter, 1974). Vinh Long province, with 75,000 ha of HYV rice (Table 2), was the leading province adopting this system. The HYV crop was started in April. The nursery was made exactly like that of double transplanted rice because there was not sufficient water to prepare wet-bed nursery. Additional irrigation with sampan shrimp tail pumps was required in preparing land for transplanting in May if rain water was not enough. Seedlings were 30 to 35 days old. There were additional expenditures initially for levelling the undulated land, as well as for construction of new levees to contain irrigation water in the

Table 2 Cultivated area and production of rice in the Mekong Delta during crop year 1973–74

Province	Cultivated Area (ha)				Production (Metric tons)			Grain Yield (T/ha)	
	Total	Local Varieties	HY Varieties	Percent HYV	Total	Local Varieties	HY Varieties	Local Varieties	HY Varieties
VIETNAM	2,830.100	1,939,700	890,400	31.5	7,025,100	3,834,900	3,190,200	1.98	3.58
MEKONG DELTA	2,039,000	1,489,800	549,200	26.9	5,141,200	3,105,200	2,036,000	2.11	3.70
An Giang	180,500	131,000	49,500	27.4	352,700	154,700	198,000	1.18	4.00
An Xuyen	109,800	105,000	4,800	4.4	299,900	280,700	19,200	2.67	4.00
Ba Xuyen	218,000	175,000	43,000	19.7	630,700	458,700	172,000	2.62	4.00
Bac Lieu	150,000	105,000	45,000	30.0	407,800	241,300	166,500	2.29	3.70
Chau Doc	142,700	128,000	14,700	10.3	297,900	231,500	66,400	1.80	4.52
Chuong Thien	118,400	97,000	21,400	18.1	327,800	242,400	85,400	2.49	3.99
Dinh Tuong	138,400	64,000	74,400	53.6	449,800	159,500	290,300	2.49	3.90
Go Cong	46,000	34,000	12,000	26.1	127,700	88,400	39,300	2.60	3.27
Kien Giang	153,400	117,800	35,600	23.2	329,900	218,300	111,600	1.85	3.13
Kien Hoa	119,000	79,000	40,000	33.6	247,900	119,900	128,000	1.52	3.20
Kien Phong	135,000	121,000	14,000	10.4	246,400	193,600	52,800	1.60	3.77
Kien Tuong	44,000	35,000	9,000	20.4	76,900	52,500	24,400	1.50	2.71
Phong Dinh	147,000	92,000	55,000	37.4	402,200	193,200	209,000	2.10	3.80
Sa Dec	74,900	42,400	32,500	43.4	242,100	106,100	136,000	2.50	4.18
Vinh Binh	134,900	111,600	23,300	17.3	309,900	234,400	74,600	2.10	3.20
Vinh Long	127,000	52,000	75,000	59.0	392,500	130,000	262,500	2.50	3.50

Source: Ministry of Agriculture, Directorate of Agricultural Economics. *Bulletin of Agricultural Economics*, Special Issue. 1974.

field. Sufficient land area, well puddled, should be reserved for the second nursery of the double transplanted rice whose transplanting schedule remained unchanged. When the HYV rice crop had been harvested in August, the stubbles were chopped off, and seedlings from the second nursery of double transplanted rice were transplanted to the same field.

IV Rice Production Problems

Much had been said about rice production problems in Vietnam. Xuan *et al.* (1973) in a comprehensive report to the International Rice Research Institute have outlined several constraints to higher Vietnamese rice production. Until now, the problem of other problems is the real figures for cultivated area and production. Conflicting reports often appeared to overestimate or underestimate the actual situation. But what we know for sure is that since 1965 Vietnam ceased to be a rice exporting country, and has since been importing rice. Table 3 shows the quantities and values of Vietnam rice imports from 1965 to 1973. In 1974, the country was self sufficient in rice. Studying Tables 1 and 3 we note that in 1967 the rice cultivated area was 2,295,800 ha, and gradually increased about 100,000 ha per year. Consequently production was increasing from 4.7 million metric tons in 1967 to 7 million metric tons in 1973. But even so, the population of 19.8 million (1973) has been steadily increasing at about 3% per year in spite of the death toll due to the war and some unofficial government campaigns to control the growth rate through distribution of birth control devices. The government had to import rice annually from 129,703 metric tons in 1965, rising to 303,600 metric tons in 1973. Thus we can see that rice shortage was real while production potential is high. There are speculations about illegal exports of rice off the coast of Ha Tien and Rach Gia, or across the Vietnamese-Cambodian border. Other observers believed that actual cultivated area is much less than what had been reported by local military and civilian authorities. Nevertheless, in the absence of real figures, agricul-

Table 3 Vietnam rice imports

Year	Quantity (metric tons)	Value (VN $1,000)
1965	129, 703	2, 370, 772
1966	434, 194	8, 341, 066
1967	765, 089	15, 899, 296
1968	677, 925	18, 303, 975
1969	325, 671	8, 793, 117
1970	559, 100	13, 046, 623
1971	137, 200	3, 237, 920
1972	275, 700	15, 871, 935
1973	303, 600	33, 396, 000

Source: USAID/Vietnam

tural statistics from the Ministry of Agriculture are being used here as guidelines.

The Mekong Delta — rice bowl of Vietnam — supplies 73% of total national rice production on about 70% of total rice cultivated areas in Vietnam. Excluding the war effect, and the uncontrollable weather (which inflicted drought damage to the rice crops in 1973 and 1974), let us examine some factors limiting rice production in the Mekong Delta in order to find solutions to the problems.

1. *Irrigation and drainage*

The main constraint to higher rice production in the delta is water control. Presently only about 22% of the rice fields in this part of Vietnam are irrigated either by communal irrigation systems or by individual pumps (Mekong Delta Soils Project, 1974) during the dry season. On the other hand, lack of adequate drainage in the deep water area in the wet season prevents the spread of existing HYV rices. Communal irrigation schemes were not successful due to inefficient management and maintenance. Irrigation authorities often attributed the irresponsibility and lack of discipline among farmers to the failure of irrigation schemes. The present trend is toward small scale irrigation units of about 100 ha area to be managed by government inspired private operators. These units are to be located along main waterways mostly upstream in the Vietnamese part of the Mekong river. Hydrologists fear that during the Mekong low flow period (dry season) the more water is extracted from the upstream, the more the coastal plain will be vulnerable to severe salt intrusion, including those areas which are presently not affected. In this connection there must be a monitoring system to check the movement of salt intrusion line during the dry season.

2. *Fertilizers and pesticides*

The supplies of fertilizers and pesticides have been adequate. However during periods of peak demand, retailers always tried to manipulate the prices of these inputs, thus causing an annual pseudo-shortage. The worst effect of this artificial shortage was that it encouraged retailers to falsify various products, rendering them less effective. For instance, complete fertilizer was mixed with ground brick and stone, urea with table salt, emulsifiable insecticide with kerosene, wettable powdered insecticide with cassava flour, granular insecticide with sand. The farmer consumer usually could not identify the falsification, yet until now there is no effective measure to stop these acts.

With regard to fertilizers, they are the inputs almost every farmer like to use. The general tendency is to apply only urea, although the recommended formula for the general delta soil is nitrogen-phosphate (50-40-0 in the main season). Phosphatic fertilizer was not given due attention in the past several years although the soils in the delta are dominantly acidic (except for a short period from 1963 to 1965 when more phosphatic fertilizer was imported). Therefore it was no surprise when high percentage of empty grain has been suffered by many farmers. In 1973 there were 372, 183 metric tons of fertilizers brought in to Vietnam, more than half of it was nitrogenous, and about one third was complete

Table 4 Vietnam's fertilizer imports (in metric tons)

Year	Nitrogenous	Potassic	Phosphatic	Others	Total
1960	55, 427	7, 789	65, 794	1, 740	130, 750
1961	49, 361	15, 646	59, 906	1, 764	126, 677
1962	54, 362	7, 719	52, 593	879	115, 553
1963	185, 761	15, 935	104, 707	16, 200	322, 603
1964	109, 070	8, 372	121, 979	22, 020	261, 441
1965	42, 000	8, 640	160, 613	40, 000	251, 253
1966	125, 700	11, 400	85, 670	44, 000	266, 770
1967	85, 000	15, 000	—	105, 000	205, 000
1968	55, 074	2, 300	12, 500	—	69, 874
1969	226, 104	5, 800	45, 250	205, 879	483, 033
1970	202, 289	7, 527	43, 040	264, 657	517, 513
1971	107, 111	4, 600	14, 553	52, 255	178, 519
1972	160, 973	12, 786	26, 085	114, 798	314, 642
1973	215, 433	10, 820	28, 812	117, 118	372, 183

Source: Directorate General of Customs (From *Agricultural Statistics 1960–1973*. Directorate of Agricultural Economics, Ministry of Agriculture. 1974)

fertilizer (see Table 4). Fertilizer imports during 1974, in spite of the mark-up in price, were projected at the 400,000 metric ton level, with increasing phosphatic materials. The effect of the oil crisis on the prices and availability of fertilizers was felt very slightly by Vietnamese farmers. The government, with assistance from the U.S. Agency for International Development, has subsidized a considerable cost to keep the price of fertilizers low enough to help farmers. But how long this subsidy will last is very uncertain. If fertilizer price goes up too much while the price of rice is maintained at low level, a reversion to old traditional rice varieties is foreseen. Agronomic efforts toward solving the fertilizer crisis have just taken off: the newly released IR28, IR29, and IR30 were said to be able to tolerate low fertility conditions. Some preliminary findings from the University of Cantho, Faculty of Agriculture indicated that some specific floating rice weeds were able to fix nitrogen from the air symbiotically and supply to rice plants.

Since the old days Vietnamese farmers have been using rotenone extracted from fish poisoning roots to kill insects attacking their rice. Synthetic insecticides were introduced notably since 1960, but their consumption was very low because, in addition to the lack of sufficient spraying equipment, farmer's general knowledge on pesticide uses has been very limited. Supply of insecticides increased after the HYV program was accelerated. The average annual consumption since 1969 was about 2,500 metric tons (see Table 5). This figure included technical materials as well as finished products, mostly granular insecticides. Since 1972 Vietnam has been formulating granular insecticide locally using imported technicals. Comparing the acreage of rice land and the locally formulated and import quantities

Table 5 Vietnam's insecticide imports

Year	Quantity (kg)	Value (US$)
1965	266, 624	534, 697
1966	422, 298	807, 972
1967	372, 727	701, 943
1968	270, 000	536, 362
1969	2, 157, 747	1, 498, 083
1970	3, 140, 131	1, 853, 457
1971	1, 676, 241	2, 105, 742
1972	2, 561, 000	4, 733, 000

Source: Ministry of Agriculture, Directorate of Agricultural Economics. 1973; *Agricultural Statistics Yearbook 1972.*

of insecticides during the last 3 years, roughly about 25% of the rice crop were protected in which about 10% of HYV rice area were applied with granular insecticides annually. Insect ecology changes as HYV rice area increases, hence the demand for insecticides will increase if insect resistant rice varieties are not available soon enough. In the years ahead farmers will have to buy pesticides at higher price and yet they may not obtain the required quantities due to the worldwide insecticide shortage. Vietnam's rice crop depends largely on imported pesticides whose timely arrivals in periods of peak demand (see Section IV. 4) can never be assured.

In the aspect of weed control, chemical control is still a new idea to most Vietnamese farmers. For those who tried once, they immediately adopted the technology, especially where they can control water level in the field. Until 1973 only sprayable herbicides were available, their application was extremely difficult. In 1974, granular herbicide was introduced for the first time. The acceptance was tremendous because this form of herbicide is simple to apply correctly without injuring rice plants. Unfortunately, the world has been in an acute shortage of weedicide, particularly the least expensive but effective one like 2,4-D, hence the Vietnamese rice farmers have to suffer more weeds in their fields because handweeding is always late, incomplete, and more expensive.

3. *Agricultural credits*

Every poor farmer with a small land holding of less than 2 ha dreams to maximize the output of his land. It is this category of farmers who are most inspired by the marvels of HYV rices. The most essential input they need is some money to start with. Using the results of the Land-to-the-Tillers program, since 1970 to date we find that approximately 2 million farmers have become landowners, each obtaining 1 to 3 ha of rice land free of charge. This massive program would have been a great opportunity for the country to increase its agricultural outputs, especially rice, if well planned, well supported, and well executed supporting services had accompanied it. Most of the available money was used

in paying compensation to former landlords, instead of being used for agricultural credits. The Agricultural Development Bank, successor of the former National Agricultural Credits Agency, was formally put into service since 1967 with 34 branches and 13 sub-branches throughout the country, among them 13 branches and 3 sub-branches are in the Mekong Delta. Because the money was so tight, the ADB was able to serve only 10 to 15% of all Vietnamese farmers[1]. In 1972 (see Table 6) only 202,714 farmers were able to borrow a total amount of VN$18,924 million from the ADB. Out of this number, 90.69% were farmers on short term loan basis. The great majority of rice farmers could not obtain loans from the ADB. In fact they became discouraged by the bank's conditions for loan which were designed for easy collection of paybacks.

The Rural Bank system formed since 1969 did not improve the situation. Until the end of 1974, according to an ADB report, there are 84 Rural Banks throughout the country, among them 41 are in the Mekong Delta, each located in one district of the province. Up to the first half of 1973, during the $4\frac{1}{2}$ years in operation, all the rural banks gave loans to only 45,058 farmers.

Payback rate was reported as satisfactory at about 70%. Ultimately, every banker concerns himself about payback and his lending capacity, hence the rigid selection of debtors. To the debtor-farmer, payback is not only a duty but also a way of expressing gratitudes if, — a big IF — he obtains a good harvest by making good use of their loans. However, there has been little following up to find out whether the money had been used as intended. Reports on the misuse of loans and favoritism in giving loans were widespread. Attempts to eliminate misuse of loans by giving credits in kinds were foiled for two times.

Table 6 Agricultural Development Bank's loans to farmers

Year	Total loans (VN$ million)	No. of farmers
1967	1,756	83,709
1968	4,641	69,668
1969	4,614	89,070
1970	6,715	116,663
1971	10,067	170,611
1972	18,924	202,714
1973	33,079	328,961

Source: Agricultural Development Bank, Saigon.

4. *Rice pests and farmers' misuse of pesticides*

(a) *Insects*: Insect pests are changing in kinds and populations every month and every year. While stem borers were the main problem in 1968 to 1970, the planthoppers, specifically the brown planthoppers (BPH), have been inflicting damage on rice yields

[1] Agricultural Development Bank, 1973 Report.

since 1971. It has been observed in the Mekong Delta that the dynamics of insects varied according to season. In the main crop (wet) season, BPH prevailed with peak population occurring in August-September. This is the time when insecticides against BPH are needed most. In the dry season, the stem borers of all types were dominant with peak population occurring in November through January. Damage by BPH were most devastating and rapid. Yet not many farmers practised preventive measures to avoid them; they usually applied insecticides when damage had been advanced, therefore the control was not effective. Besides they may have used the wrong insecticide, or one which had been falsified, and applied at a wrong dosage. Furthermore, government's monitoring system to check insect population build-up is inadequate, and their warning system is too slow. The extent of damage during BPH outbreaks in several years over the areas planted to HYV rice was estimated to be as high as 20 to 30% of total production per crop. There were farmers who reported in tears that they harvested nothing but a few panicles of rice in the main season.

(b) *Weeds*: Weeds of all kinds are abundant especially during the first crop when the soil has just ended its fallow. Soil puddling did help suppressing weed population, but most of the fields, either transplanted or direct seeded, looked weedy. Farmer's weeding habits are hard to change. They always waited until weeds had grown to at least 20 cm to make the handweeding 'worthwhile', without concerning the fact that those weeds had been absorbing their precious fertilizers and water added to the soil. Improved practices call for two weedings, one at 20 days after transplanting, the other at 40 days. But farmers seldom followed this recommendation.

(c) *Rice diseases*: Rice diseases so far did not cause much reduction in rice yield. The most common diseases nowadays are sheath blight, bacterial leaf blight, and neck blast, in decreasing order of importance. Sheath blight occurred often wherever brown planthoppers were present. Virus diseases transmitted by plant- and leafhoppers were not found widespread, fortunately. But there is a constant threat that virus diseases may attack the rice crop in the Mekong Delta if BPH are not checked.

5. *Soil fertilization*

Although the soil fertility status of most cultivated areas in the delta is adequate for local rice growth, additional nutrients are always needed to grow HYV rices. Due to their ignorance based on common sense, many farmers have been using fertilizers wrongly. This misconception of fertilizer use has been discussed thoroughly (Xuan, 1974). Essentially, farmers did not apply fertilizer at the specified time, nor by the correct method of application, nor at the correct dosage, and nor with the suitable kind of fertilizer.

Little reclamation works have been done for problem soils. In spite of local availability of lime, this has not been used widely. Furthermore there is no suitable HYV rice presently that is tolerant to acidic or saline conditions.

6. *Post-harvest processing of rice*

This has been the most forgotten aspect of rice production in the delta. In 1974 the National Food Agency invited a UNDP team to Vietnam to assess this problem. How soon will the team's recommendations be realized remains to be seen. In the meantime losses due to damage of paddy and milled rice continue to persist at an estimated rate of 10%. Rotten, moldy, and low headrice recovery rice stocks are direct results of inadequate paddy drying. Drying of newly harvested HYV rice during the rainy season in most flooded delta areas is an awful job. Best drying pads have been the surface of national and provincial routes. Farmers had to carry rice in their boats to come to the roadsides where they built a temporary hut to live in a few days while drying their paddy on the road. Of course many of them could not stay long that way. They had to give others a chance, too. Thus the drying might not be thorough. On the other hand, most rice mills are obsolete, but their Chinese owners form a very strong and consolidated group that is difficult to penetrate. These mills are not equipped with mechanical dryers. There are only cemented drying pads where they can dry the rice shortly before milling.

7. *Price policy*

Caught in the midst of the oil crisis and high inflation, the government seems to be in a dilemma in finding a price policy for rice. On one hand, prices of inputs are definitely increasing, and on the other hand consumer's buying power is decreasing. What would be the best price policy for rice farmers appears difficult. Already last year the government subsidized fertilizers in order to maintain a '2 to 1' policy, meaning 2 kg of rice would buy 1 kg of urea. The problem is how to keep the price of urea unchanged. Otherwise, grain yield per unit area must be increased.

8. *Farm extension system*

The failure or success of any agricultural development program depends so much on farm extension. It is the link between modern technologies and the farmers. Most local extension men in the villages of Vietnam, those who are supposed to be in contact with farmers everyday, have seldom finished a high school level. Their knowledge on modern agriculture is limited. Because of their level of education, their government scale salary is almost next to the lowest. Besides, they do not have provided means to move about the village or district. They are, in fact, the most unenthusiastic workers in their job. We cannot blame them for their failure to improve the farmers.

Valuable tools in farm extension such as the mass media have not been exploited.

V Recommendations for Increasing Rice Production

The increasing scarcity and skyrocketting prices of fertilizers and pesticides may eventually result in a substantial reduction in the HYV acreage. There were farmers who expressed their readiness to return to traditional rice if high cost of inputs will make the venture with

HYV rice unprofitable. Thus, to maintain the present cultivated acreage would call for tremendous effort. How much more if we want to increase acreage?

The strategies to boost up rice production in the delta should aim at:

(1) reclaiming new arable land for intensive agriculture, mainly by construction of water control devices;

(2) improving existing grain yield per unit area, i.e. maximizing present cultivated land use.

While the first objective above will require great financial support, the second objective appears to be more feasible in the immediate future.

Improving grain yield of existing cultivated land will need both a long term and a short term program. These two programs must be considered as complimentary one to another.

1. *Short term development program*

a. *Without expanding existing HYV acreage*: Studying carefully the problems causing low production as discussed in Section IV, we can be certain that improvement of grain yield can be achieved without disturbing the existing socio-physiographical environment if the following constraints will be overcome:

(1) *Farmer's educational level on modern crop technology* should be improved by all means in a crash program. It should be emphasized that new technology comes in "package", not as separate components. Just providing a farmer with new seeds and irrigation water is like giving him a piece of cloth with some thread and a needle without showing him how to sew a modern dress. Farmer education must be given top consideration, and should take priority over other development activities. We must have a strong farm extension machinery in which the village-level agricultural cadres — the most important change agents — will be able to establish high creditability among farmers within his coverage by having:

— Strong technical support through higher education in agricultural field and periodical refresher courses;

— Strong service support with facilities to move about his respective area;

— Incentives to meet more farmers. The Agricultural Development Bank and rural banks could pay a commission to the extension cadres every time a cadre gives assistance to a bank customer from obtaining the loan, following up the proper use of the loan, advising in farming operations, and collecting payback. Presently the banks are wasting resources by employing district agents whose main job is to guide farmers obtaining loans, and to collect paybacks.

In addition, agricultural broadcasting must play a bigger role since it can reach every farmer without delay. It was observed that almost every farming family possessed a portable radio receiver.

(2) *An integrated crop protection program* should be launched immediately. New

seeds of insect and disease resistant HYV rices should be distributed widely to farmers as soon as possible. Preventive measures in insect control must be encouraged to save more precious insecticides. This ecological control effort, to the farmers, will be most effective and least expensive to increase production.

(3) *Agricultural credits* should be made available to more farmers. Easy credits must reach as many small farmers as possible. The ADB and the rural banks should share the burden arising from farm extension. By involving itself in the farm extension program, the bank has thus insured a more successful payback rate.

(4) *Price policy* should be maintained as attractive as possible.

b. *With expanding HYV area*: For this case, all the steps described above will be taken. In addition, small irrigation schemes should be set up in areas close to water sources in the floating and double transplanted rice regions to allow double cropping with HYV rice. This program is being realized by the government. It should be pointed out again that as the number of these schemes grows, a monitoring system must be organized to evaluate the comparative advantage as compared to the potential damage done to the salt affected areas.

2. *Long term development program*

The long term program of increasing rice production is envisioned to comprise an accelerated basic and adaptive rice research program, and a gradual mechanization of farming operations including post-harvest processing.

a. *Accelerated rice research program*:

Given the heterogenous environment in the delta, the rice research program must be aimed at maximizing grain yields in various soil and water conditions. At present, rice research in Vietnam is fragmented and not fully understood. Hence it lacks enthusiastic support from the government. To be successful, scattered rice research efforts should receive strong and genuine support under a unified body in order to tackle the following aspects: *Adaptive research*:

(1) Evaluation of promising HYV breeding lines from other countries under normal local conditions with moderate fertilizer application, and without using insecticide. This evaluation must be carried out under controlled water, rainfed, and deep water conditions. Selected lines should possess at least the following characteristics:
   i. Tolerance to adverse water conditions;
   ii. Resistance to specified insect pests;
   iii. Resistance to specified diseases;
   iv. Tolerance to low N–P fertilizer level; and
   v. High yielding ability.

(2) Evaluation of promising insecticides and their application on rice.

(3) Evaluation of promising weedicides for transplanted as well as direct seeded rice under wet and dry conditions.

Basic research:

(1) Study on the physico-chemical characteristics of various soil types in the delta in order to prescribe ways to make best use of their potential capability for rice production under various water regimes.

(2) Identification of various organic fertilizing materials and their application to both local and HYV rices. This is, in fact, an urgent topic for research to solve part of the current problems of the energy crisis.

(3) Evaluation of the fertility status of each soil type in the provinces of the delta in order to provide more accurate recommendations to local farmers.

(4) Breeding for salt tolerant HYV rice and acid sulfate soil tolerant HYV rice to enable farmers double cropping on their problem soils while water control devices are still not available.

(5) Breeding for drought tolerant HYV rice to be planted without, or with minimum, irrigation in the floating rice region after floating rice had been harvested.

(6) Study on rice insect ecology and population dynamics, and set up an effective rice pest forecast network throughout the delta.

b. *Mechanization of rice production*

Mechanized farm operations from transplanting to harvest and drying should be encouraged. More attention should be given to land preparation equipment to ensure better soil tillage. Each of the soil working implement should be thoroughly tested, and redesigned if needed, to suit the general heavy clay soil condition in the delta.

Integrated system of rice drying-milling-storage should be installed to save appreciable losses by rice spoilage. The best ways to obtain more quantity and better milled rice to the consumers is, not to reject already spoiled rice, but to prevent it from getting spoiled.

VI Summary and Conclusion

The Vietnamese rice farmers in the Mekong Delta are blessed by nature with a treasure of land and water resources. Presently the delta supplies 73% of total rice production on 70% of total rice cultivated area in the country. Through generations farmers have learned how to fit in their natural environment by their traditional means. Their rice cultivation techniques have been developed in such a way to make best benefit from the various water regimes under the influences of the hot monsoonal climate and Mekong river flows. Generally there are three distinguished rice cultivation systems: floating rice in the low lying floodplain, double transplanted rice in the moderately depressed active delta apex, and single transplanted rice in elevated and coastal areas. Traditional rice yields were averaged to 1 to 2.5 t/ha. Since 1968, HYV rice was introduced, and to date there are more than 800,000 ha, or roughly 27% of delta's total rice acreage, planted in all three rice growing

regions. But even so, rice production was not completely satisfactory. Dry spells during the early rainy (wet) season in 1973 and 1974 have affected some areas in the delta. Other factors causing reduction in rice production were: lack of irrigation in the dry season, lack of drainage in the wet season, increasing costs of fertilizers and pesticides, inadequate agricultural credits, farmer's incapability to combat rice pests, farmer's misuse of fertilizers, lack of post-harvest processing systems, unstable price policy, and inefficient farm extension machinery.

Obviously, to increase rice production in the delta, one way is to improve the water control. As a guideline, development planners should bear in mind that water from the Mekong river is the 'elexir of life' for delta farmers. This water is not for irrigation only; rather it means living. Any device designed for altering the course of this water will definitely affect Mekong delta farmers' lives, for better or worse.

Another strategy for increasing delta rice production is to improve grain yields on existing cultivated areas. This calls for a short term program in which farm extension, bank credits, integrated rice crop protection, and stabilized price policy play the major roles. A long term program envisions an accelerated rice research program, and a gradual mechanization of rice production, particularly the installation of integrated systems for rice drying, milling, and storage.

International assistances toward the development of the Mekong Delta have been tremendous. Going through the numerous and voluminous reports of the studies on the delta, we Vietnamese are fascinated at the fact that the foreigners know our resources better than most of us ourselves. However, it must be remembered that they can see our land, our water, and our crops, but they cannot read our minds. Upstream storage of Mekong river water, for instance, to provide better condition for increasing crop production in the delta is a great concept. But here we are affecting the water, the 'elixir of life' of delta farmers. I think and firmly believe, that the traditional society in the delta needs a longer transitional period to switch to such total change. Let us create first a condition in which the subsistent farmers feel the need for such innovation. Let us put our scarce financial supports into improving the existing situation without altering greatly the water course. The short term and long term development programs prescribed above may help us achieving our objectives.

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