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INTERREGIONAL COMPARATIVE ADVANTAGE OF RICE PRODUCTION IN TAIWAN

Rice is the single most important crop in Taiwan. The value of rice in total agricultural output has varied between 40 percent in 1956 and 23 percent in 1972 before returning to 30 percent in 1974.

Due to differences in resource endowment, rice production has been concentrated in certain regions of Taiwan. For purposes of examining rice cultivation, the west coastal plain of Taiwan, where rice is the dominant crop, can be divided into three parts—the northern, central, and southern regions. In 1973, three prefectures (Taoyuan, Changhwa, and Pingtung) were the most important rice production areas. Each of the three rice-growing regions contained one of these prefectures. Table 1 shows the cultivated area and yield per hectare in these three prefectures during 1971-74.

In general, temperature is high and rainfall abundant in Taiwan. However, in the northern region the winter is cool, damp, and sunless for four months or longer, and the annual rainfall of about 2,500 millimeters is relatively well-distributed throughout the year. In the southern and central regions, on the other hand, the winter is warm and dry, and a distinct dry season runs from October through February. The principal agricultural areas are concentrated in the central and southern areas where irrigation systems have been extensive and well developed for the rice paddies. Rice yields in the central and southern regions are higher than those in the North. The total rice production of these three prefectures accounted for around 35 percent of total provincial production during the past 15 years.

The purposes of this paper are to calculate the social returns from and the social costs of rice production in Taiwan and to analyze the relative economic efficiency of various producing areas through use of the domestic resource cost (DRC) measure. The data used in the paper are mainly from secondary sources, including

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TABLE 1.—RICE PRODUCTION IN SELECTED AREAS OF TAIWAN, 1971-74*

Year	Taoyuan	Changhwa	Pingtung	Subtotal	Provincial total	Percentage of subtotal in provincial total
1974						
Area (*thousand hectares*)	78	105	79	262	773	34
Yield (*tons/hectare*)	2.4	3.6	3.7		3.2	
Production (*thousand metric tons*)	183	382	293	858	2,443	35
1973						
Area (*thousand hectares*)	78	99	74	251	719	30
Yield (*tons/hectare*)	2.5	3.6	3.7		3.1	
Production (*thousand metric tons*)	199	354	277	830	2,244	37
1972						
Area (*thousand hectares*)	80	101	74	255	742	34
Yield (*tons/hectare*)	2.9	3.7	3.7		3.2	
Production (*thousand metric tons*)	232	372	270	874	2,440	36
1971						
Area (*thousand hectares*)	81	103	76	260	748	35
Yield (*tons/hectare*)	2.6	3.3	3.8		3.1	
Production (*thousand metric tons*)	208	377	287	832	2,301	36

*Taiwan Provincial Department of Agriculture and Forestry, *Taiwan Agricultural Yearbooks, 1971-74*.

reports and yearbooks. The figures presented are calculated with care to ensure their accuracy and representativeness.

THE SYSTEM OF INCENTIVES AFFECTING RICE PRODUCTION

The system of incentives affecting rice production in Taiwan consists of two channels. The Taiwan Water Conservancy Bureau and Irrigation Association manage the water resources for rice production, while the Taiwan Provincial Food Bureau (PFB) and farmers' associations carry out the trade, taxes, regulated prices, credit policies, general extension services and marketing of rice and of inputs for rice production (e.g., fertilizers).

In Taiwan, the production of rice depends heavily on a well controlled water supply throughout the entire growing season. The water resources development program in the postwar period has included both intensive improvement and extensive expansion. Emphasis is placed not only on the economic and efficient

utilization of water resources for the already developed areas through rotational irrigation and canal lining to prevent loss, but also on the construction of new reservoirs for multiple purposes, mainly for irrigation and drilling of wells for ground water development. As a result, the highly developed, well organized, and efficiently managed irrigation systems are in many ways the fundamental conditions supporting the development of rice production in Taiwan.

In addition to irrigation, rice production is also influenced by the improvement of quality of inputs. The PFB and farmers' associations play the main role in this respect, while the Joint Commission on Rural Reconstruction (JCRR) provides both technical and financial assistance.

One of the characteristics of rice growing in Taiwan has been the intensive cultivation experienced during the past two decades. Intensive as used here means the use of more labor and other inputs per hectare of land. The use of human labor in the growing of rice has increased and then declined. In 1950, 96.7 man-days per hectare were used on average for the first crop and 88.5 man-days for the second crop. The highest level experienced was 109 man-days for the first crop in 1965 and 104.8 man-days for the second crop in 1967. Since then the shortage of labor and the resultant increase in wage rates have led to a decline in the average days of human labor used in the production of rice, and by 1972, human labor used had fallen to 99.4 days for the first crop and 96.2 days for the second crop. Farm machines have substituted for part of the labor used in producing rice. In spite of the decline in the number of man-days used in the production of rice, labor costs in the percentage of total cash costs have increased from about 50 percent in 1950 to almost 60 percent in 1972. In absolute terms, labor costs per hectare increased almost 11 times in 22 years from New Taiwanese (NT) $688 in 1950 to NT$7,664 in 1972.

In addition to the increased cost of labor, the use of non-farm inputs in the production of rice has increased markedly in the past 22 years. Chemical fertilizers, which occupied around 25 percent of total costs, have been the most important input after labor costs in Taiwan's rice production. Farmers have been encouraged to use fertilizers through the system of bartering fertilizer for rice which was handled by PFB. The amount of chemical fertilizers distributed by the government for rice production was 301 kilograms per hectare in 1950. The figure steadily increased reaching an all time high of 919 kilograms in 1964. Since then, chemical fertilizers allocated for rice production have maintained a level of around 900 kilograms per hectare. The proportion of fertilizer costs in the total costs showed a declining trend due mainly to the decrease of fertilizer prices and the increase in wage rates. With respect to the first crop, for example, fertilizer costs were NT$319 per hectare or about 25 percent of the total rice production costs in 1950 and reached a record high of NT$3,284 or about 30 percent of the total production costs in 1968. However, in 1972 the fertilizer costs dropped to NT$2,478 per hectare.

Due to a shift of emphasis of rice policies, since 1970 the incentives for promoting rice production have changed from input subsidies to price incentives. Hence, the scope of PFB activities has become narrower with the elimination of production programs, such as irrigation and demonstration projects. The supplying of some materials, including feeds and agricultural chemicals, was also

abandoned by PFB. Most important, the fertilizer-rice barter system was formally abolished in 1973, and thus the portion of rice handled by PFB has been drastically reduced.[1]

The government has recently established a guaranteed price for rice to protect the incomes of rice growers. The minimum price of paddy rice was set at NT$5.20 per kilogram for the first crop of rice in 1973 and was increased to NT$6 for the second crop of rice. The price was set at NT$10 for the first and second crops of rice in 1974, the highest price farmers have ever received. Meanwhile, a rice stabilization fund of NT$3 billion (or US$79 million at exchange rate of US$1-NT$38) was established in April 1974 to permit the government to participate in the rice market rather than to direct control over rice supply. In addition, a land tax continues to be collected in kind, but the tax rate has been lowered. The compulsory purchase of rice is still mandatory but it has been stipulated that the purchase price should be no lower than the market price. The nature of policies and measures adopted by the government has therefore shifted importantly in a direction more favorable to the rice farmers.

Before 1970 the emphasis of rice policies was put on consumers' welfare, government revenue, and economic stability. Since that time, self-sufficiency has been considered the primary objective of rice policy. The self-sufficiency policy is not likely to be changed in the coming 10 or more years if world food supplies remain tight causing prices to be high. The government has changed its rice price policy by setting a higher price for rice for the purpose of increasing both rice production and farmers' incomes. The goals of this new price policy are to provide incentives for rice production and to narrow the disparity in income between farmers and nonfarmers.

COMPARATIVE COSTS IN RICE PRODUCTION

In this section we illustrate the methods we have used to obtain DRC ratios of rice production in three localities of Taiwan and the average of the whole island. To evaluate paddy, we have used the international f.o.b. price of rice in April 1975, US$400 per ton, as a base.

In Taiwan, PFB has undertaken a survey of rice production costs for every crop since 1952. In their reports, rice production costs are divided into two categories—direct costs and indirect costs. The first group includes seeds, fertilizers, labor costs (including wages), cost of animal and machine services, insecticides (including herbicides), and other materials. The second group includes due fees for irrigation associations and farmers' associations, depreciation costs and repair costs for farm houses, depreciation costs and repair costs for farm implements and equipment, taxation, land rent of both self-owned and rented land, and interest on both self-financed and borrowed capital. We have used the 1974 results with necessary modifications. But because Taiwanese farmers are accustomed to recording their costs of operation, these data are quite accurate.

The growing season of the first rice crop runs from February/March to May/June and that for the second rice crop from June/July to September/October,

[1] With respect to the management of rice by PFB, see H.Y. Chen, W.F. Hsu, and Y.K. Mao, "Rice Policies of Taiwan," *Food Research Institute Studies*, XIV, 4, 1975.

depending on the locality. Two basic varieties of rice, ponlai (*japonica*) and native (*indica*) are grown in Taiwan. Though ponlai has a higher yield and is gradually replacing the native rice, the difference in the adaptability to local conditions has maintained the proportion of production of these two varieties at 70 percent and 30 percent, respectively. Ponlai rice is short grained and responsive to irrigation and fertilizers, while native rice is long grained and tolerant of dry conditions. Therefore, the cost structure of rice production varies due to crop seasons, varieties, and localities in Taiwan.

Table 2 contains the results of our DRC calculations which reflect these different cost structures. The averages shown are mixtures of three localities and two varieties, taking the production of the respective regions as weights. However, due to the significant differences in yield between the first rice crop and the second rice crop, the DRCs of each are shown separately.[2]

The detailed cost structures underlying the DRC ratios in Table 2 are shown in Appendix Tables 1-14. In general, the DRC of the second rice crop was higher than that of the first rice crop regardless of varieties and localities. In the central and southern regions, the difference in DRC was much narrower for the second rice crop (from 32.15 to 33.81) than for the first rice crop (from 19.57 to 27.77). The opposite occured in the northern region where the difference in DRC of the second rice crop was larger (39.70 vs. 47.70 for ponlai and native, respectively) than that of the first rice crop (30.89 vs. 31.17).

TABLE 2.—ESTIMATED DRC OF RICE PRODUCTION IN TAIWAN, 1974*
(*NT$ per US$*)

Region	Ponlai	Native
First rice crop		
Northern	30.89 (3,898)[a]	31.17 (3,740)
Central	27.77 (5,608)	24.64 (5,440)
Southern	19.57 (6,210)	20.19 (5,703)
Provincial average		25.75 (5,103)
Second rice crop		
Northern	39.70 (2,958)	47.70 (2,379)
Central	33.81 (4,238)	33.34 (4,079)
Southern	33.39 (3,760)	32.15 (3,530)
Provincial average		34.94 (3,683)

*From Appendix Tables 1-14.

[a]Figures in parentheses indicate yields in kilograms per hectare.

[2] There is a great need to raise the yield of the second rice crop. For this purpose, the Research Institute of Agricultural Economics, National Chung Hsing University, has joined the International Rice Research Institute's Agro-Economic Rice Production Network Project to determine whether the differences in yield are due to cultural methods (or management packages) or levels of inputs (fertilizers, pesticides, and insecticides).

It is interesting to note that the DRC of the second rice crop occupied the upper half of the range which extended from 32.15 to 47.70. The lowest DRC of the second rice crop, 32.15, was higher than the highest DRC of the first rice crop, 31.17. From the information in Table 2, we can tentatively conclude that the production of rice in the northern region is less profitable than that in the central and southern regions and that the most profitable increases in rice production could occur with expansion of the first rice crop, especially in the southern region.

As shown in Appendix Tables 13 and 14, we have calculated the average DRC of first crop production, 25.75, and that of second crop production, 34.94 for the whole island. The difference between the first and second crops was mainly due to the difference in yield per hectare. The first crop had higher yields and thus lower unit costs than the second crop. We consider the official exchange rate (NT$38 = US$1) to be an adequate approximation of the shadow price of foreign exchange.[3] The ratio of DRC to the exchange rate is 0.68 for the first rice crop and 0.92 for the second rice crop. Therefore, our calculation shows that the production of rice does possess comparative advantage. The continuation of comparative advantage depends on the maintenance of favorable price relationships as discussed below.

FACTOR SHARES IN RICE PRODUCTION IN TAIWAN

Rice cultivation has generally been considered to be a labor-intensive operation in Taiwan. However, due to the local and seasonal shortage of labor in recent years, the use of machines has replaced part of labor in land preparation, transplanting, and harvesting. As a result of the progress of Taiwan's economy, disguised unemployment in agriculture largely disappeared about 1964. Furthermore, a strong competition for labor between the industrial and agricultural sectors was evidenced in 1968 when the absolute number of farm workers declined for the first time. In 1974, family labor costs accounted for 37 percent of total labor costs. The imputed costs of family labor in rice production have been based on the wage rates for hired labor for various operations. Because the practice of hiring labor for rice production is widespread and the labor market functions well, we assume that agricultural laborers receive payments equal to their social opportunity costs.

In Table 3 we present data on the percentage of labor costs and costs of machine services in total domestic costs (both direct and indirect) in three localities for two varieties and for two rice crops. The aggregate percentage of costs for both labor and machine use is high, around 60 percent and ranges from 56 to 64 percent. The costs for labor alone amounted to over 50 percent, ranging from 50 to 64 percent. Differences in the percentage of labor costs between the varieties and the two crops and among the localities are not great. The mechanization of rice cultivation is more prevalent in the South. Mechanization is well adapted for the second rice crop because power tillers are needed to provide speedy land preparation. In the future, the mechanization of rice cultivation will be increasingly

[3] The economic development of Taiwan relies heavily on foreign trade. The total value of foreign trade accounts for over 90 percent of the gross national product. Any deviation of the official foreign exchange rate from the shadow price would result in an adverse effect on the economy. Therefore, we assume that the present official foreign exchange rate must be very close to its shadow price.

TABLE 3.—THE PERCENTAGE OF LABOR COSTS AND COSTS OF MACHINE SERVICES IN TOTAL DOMESTIC COSTS IN TAIWAN[a]

Region	Ponlai	Native
First rice crop		
Northern		
Labor	52.69	50.24
Machine services	5.72	8.04
Central		
Labor	59.77	63.85
Machine services	0.09	—
Southern		
Labor	51.14	52.74
Machine services	5.24	5.98
Second rice crop		
Northern		
Labor	52.10	56.68
Machine services	8.40	7.81
Central		
Labor	53.53	54.25
Machine services	4.37	3.44
Southern		
Labor	55.02	55.81
Machine services	6.91	5.99

[a]Total domestic costs = direct costs + indirect costs.

encouraged, and the costs of machine use are likely to occupy a higher percentage than the present level.

Land is a very important element in rice cultivation. It is especially important in Taiwan where land is clearly a scarce resource in agricultural development (the average farm size is about one hectare). Hence, costs for land use can be expected to be high. The social opportunity costs of farmland in this study are estimated on the basis of rent of farmland. In Taiwan 37.5 percent of the annual crop is considered to be a fair rent. Since the yield of the second rice crop is lower than that of the first rice crop, the costs for land use of the first rice crop are higher than those of the second rice crop. The costs for land use of both rice crops are higher in the northern region than in the other two. The cause of this difference is probably the impact of industrialization and urbanization of Taipei on the Taoyuan region.

Taiwan's rice production is also characterized by a rather heavy application of fertilizers and insecticides. The interest on working capital, derived from holding stocks of these inputs, occupies around 2.5 percent of total domestic costs and ranges from 2 to 3 percent. The opportunity cost of capital used in this study is the interest rate charged by the credit division of the township farmers' association for short-term agricultural loans. It is the price farmers have to pay for the use

of capital if they do not have capital of their own. The interest rate in 1974 was 15.25 percent per annum. The information in Table 4 shows that the percentage of costs for land use and interest is higher for native rice than for ponlai rice and that the percentage for the first rice crop is higher than for the second rice crop.

Working capital mainly consists of fertilizers and insecticides. About 98 percent of insecticides are imported. Fertilizers, which occupy around 25 percent of total cash costs in Taiwan, make up about 10 percent of total domestic resource costs. The percentage range from 5 to 12 percent. The information in Table 4 shows that, with one exception, the percentages of costs for fertilizers for the second rice crop are higher than those of the first rice crop.

From the above analysis, it is clear that the most important change in the cost structure will involve the substitution of machines for human labor. The result of

TABLE 4.—THE PERCENTAGE OF COSTS FOR LAND USE, INTEREST ON CAPITAL, AND FERTILIZERS IN TOTAL DOMESTIC COSTS IN TAIWAN

Region	Ponlai	Native
	Costs for land use	
First rice crop		
Northern	27.9	26.4
Central	23.0	22.4
Southern	25.1	24.5
Second rice crop		
Northern	22.5	22.6
Central	21.8	21.0
Southern	17.3	19.8
	Interest on capital	
First rice crop		
Northern	2.5	2.5
Central	2.6	2.6
Southern	2.7	2.7
Second rice crop		
Northern	2.2	2.2
Central	2.3	2.3
Southern	2.5	2.5
	Costs for fertilizers	
First rice crop		
Northern	5.7	7.3
Central	11.1	9.3
Southern	8.2	8.9
Second rice crop		
Northern	10.6	4.9
Central	11.7	12.3
Southern	12.2	10.4

this substitution will change both costs for labor and machine use and yields (due to deeper plowing and associated increased application of fertilizers). Whether this change will increase or decrease total costs needs further study. In fact, the cost structure of rice production has been rather stable in Taiwan.

Since 1970, rice production in Taiwan has been mainly for the domestic market. Rice policy has been aimed at self-sufficiency, and the export of rice will be feasible only when there is a surplus. As mentioned earlier, the first rice crop usually has a higher yield and lower costs. Therefore, farmers consider the first rice crop as a main crop and the second rice crop as a secondary or additional crop. Production of the first rice crop has fully developed, and there is little scope for further expansion of area. In the absence of yield-increasing innovations, any additional supply of rice most likely will have to come from the second crop.

SUMMARY AND CONCLUSIONS

Rice yields differ in the northern, central, and southern regions. This difference is especially significant between the northern region, on one hand, and the central and southern regions, on the other. The yield in the northern region averaged 2.6 tons per hectare during 1971-74, while that of the central and southern regions was 3.6 tons per hectare for the same period. This yield difference contributes to lower DRC ratios for producing rice in both the southern and central regions. In addition to the yield difference among regions, there is also a yield difference between the first and second rice crops. The second rice crop has a uniformly lower yield across all three regions.

The increases in rice production in Taiwan are the result of well developed water resources, biological innovation in the development of rice varieties, the adoption of labor-intensive techniques, and the application of substantial amounts of fertilizers (from 100 to 900 kilograms per hectare). The incentives are provided through the irrigation and farmers' associations, the Agricultural Research Institute, the Agricultural Improvement Stations, and the PFB. In addition, the Sino-American Joint Commission on Rural Reconstruction, an independent cooperative organization, has provided both technical and financial assistance to the development of the agricultural sector including rice.

Since 1970, Taiwan's rice policy has shifted from providing input subsidies to raising the price level of rice. The fertilizer-rice barter system and other control measures have been abolished. Hence, the amount of rice handled by the PFB has decreased from 55 to 25 percent of total sales of rice.

The costs of labor and of machine use together occupy about 60 percent of total domestic resource costs, and labor alone accounts for about 55 percent of the total. Future shifts in the cost structure of rice production are expected to result from the substitution of machine use for human labor. The extent of this shift will depend on the relative movements of wage rates and costs. The wage rates for hired farm labor have been on the increase, but so have the costs of machinery, especially of imported machinery.

On the basis of our DRC calculations, for which cost figures for 1974 and the price levels of rice for April 1975 were employed, the production of rice in Taiwan is socially profitable and exhibits comparative advantage. During 1973-75, high

rice prices encouraged farmers to produce more rice by increasing acreage. Rice production in Taiwan thus had a slight comparative advantage at the time of high world food prices. If rice policy aims at self-sufficiency and the world price of rice remains high, the production of rice may be economically justified.

APPENDIX: EXPLANATORY NOTES FOR TABLES 1-14

1. The estimation of costs of processing and transportation is as follows:
   a. The cost of processing is estimated at NT$200 per ton of milled rice, including
      (1) imported portion:
          40 percent for depreciation of machine
      (2) import tax:
          10 percent
   b. The cost of transportation is calculated at NT$1.25 per ton per kilometer, including
      (1) imported portion
          (a) depreciation of trucks:
              NT$0.043 per ton per kilometer
          (b) imported crude oil:
              NT$0.265 x 0.3053*=0.081
              *The value of imported crude oil occupies 30.53 percent of value of gasoline
      (2) taxation:
          NT$0.265 x 0.1877* = NT$0.050
          *The rate of tax is 18.77 percent
   c. The mileage from production areas to port is estimated for three localities as follows:

Northern	100 kilometers
Central	200 kilometers
Southern	50 kilometers

2. The subsidy portion of fertilizer by government is calculated as follows: Price proposed by fertilizer company (based on *adjusted* calculation of costs) minus price regulated by the government.
3. Materials include major items such as products of wood, bamboo and rattan, plastics and products, and electricity (which is expressed by code numbers of 01, 08, 30, 33, 40, 41, and 65, in Input-Output Table prepared by Economic Planning Council, Executive Yuan).
   The portion of materials is calculated on the proportion of imports in total material costs in the Input-Output Table.

APPENDIX TABLE 1.—AN ESTIMATION OF DRC FOR FIRST PONLAI RICE CROPS IN NORTHERN TAIWAN, 1974 [a]

Item	Domestic costs (*NT$*)		Foreign costs (*NT$*)	
	Direct	Indirect	Direct	Indirect
Costs for labor	16,677.6	—	—	—
Interests on capital	780.1	—	—	—
Depreciation	544.2	—	—	—
Costs for land use	8,815.8	—	—	—
Costs for machine use	1,812.0	—	—	—
Imported portion	—	-94.4	—	94.4
Taxation	—	-140.9	—	—
Costs for seeds	605.6	—	—	—
Costs for fertilizers	1,589.0	—	—	—
Imported portion	-301.3	—	301.3	—
Government subsidies	529.9	—	—	—
Import tax	—	-19.2	—	—
Costs for insecticides	1,361.2	—	—	—
Imported portion	—	-936.6	936.6	—
Import tax	—	-337.7	—	—
Costs for materials	308.4	—	—	—
Imported portion	—	-9.6	—	9.6
Taxation	—	-96.0	—	—
Costs for processing and transportation	869.1	—	—	—
Imported portion	—	-247.1	—	247.1
Taxation	—	-58.5	—	—
Total	33,591.6	-1,940.0	1,237.9	351.1

[a] Yield per hectare was 3,898 kg.

$$\text{DRC} = \frac{(33{,}591.6 - 1{,}940)/3{,}898}{(10.4 - 1{,}589.0/3{,}898)/38} = \text{NT\$}30.89/\text{US\$}1$$

APPENDIX TABLE 2.—AN ESTIMATION OF DRC FOR FIRST NATIVE RICE CROPS IN NORTHERN TAIWAN, 1974 [a]

Item	Domestic costs (*NT$*)		Foreign costs (*NT$*)	
	Direct	Indirect	Direct	Indirect
Costs for labor	15,389.9	—	—	—
Interests on capital	758.0	—	—	—
Depreciation	757.0	—	—	—
Costs for land use	8,083.0	—	—	—
Costs for machine use	2,465.9	—	—	—
Imported portion	—	-128.5	—	128.5
Taxation	—	-191.8	—	—
Costs for seeds	597.6	—	—	—
Costs for fertilizers	1,955.0	—	—	—
Imported portion	-370.7	—	370.7	—
Government subsidies	652.0	—	—	—
Import tax	—	-23.6	—	—
Costs for insecticides	1,189.8	—	—	—
Imported portion	—	-818.7	818.7	—
Import tax	—	-295.2	—	—
Costs for materials	122.0	—	—	—
Imported portion	—	-3.8	—	3.8
Taxation	—	-38.0	—	—
Costs for processing and transportation	833.8	—	—	—
Imported portion	—	-237.0	—	237.0
Taxation	—	-64.1	—	—
Total	32,433.3	-1,800.7	1,189.4	369.3

[a] Yield per hectare was 3,740 kg.

$$\text{DRC} = \frac{(32{,}433.3 - 1{,}800.7)/3{,}740}{(10.4 - 1{,}558.7/3{,}740)/38} = \text{NT\$}31.17/\text{US\$}1$$

APPENDIX TABLE 3.—AN ESTIMATION OF DRC FOR SECOND PONLAI RICE CROPS IN NORTHERN TAIWAN, 1974 [a]

Item	Domestic costs (*NT$*)		Foreign costs (*NT$*)	
	Direct	Indirect	Direct	Indirect
Costs for labor	15,788.7	—	—	—
Interests on capital	659.4	—	—	—
Depreciation	482.4	—	—	—
Costs for land use	6,818.6	—	—	—
Costs for machine use	2,547.9	—	—	—
Imported portion	—	-132.0	—	132.0
Taxation	—	-194.1	—	—
Costs for seeds	594.2	—	—	—
Costs for fertilizers	2,795.0	—	—	—
Imported portion	-530.0	—	530.0	—
Government subsidies	932.0	—	—	—
Import tax	—	-33.8	—	—
Costs for insecticides	1,305.2	—	—	—
Imported portion	—	-898.1	898.1	—
Import tax	—	-323.7	—	—
Costs for materials	107.2	—	—	—
Imported portion	—	-3.3	—	3.3
Taxation	—	-33.0	—	—
Costs for processing and transportation	659.5	—	—	—
Imported portion	—	-187.5	—	187.5
Taxation	—	-50.7	—	—
Total	32,160.1	-1,860.4	1,428.1	324.5

[a] Yield per hectare was 2,958 kg.

$$\text{DRC} = \frac{(32{,}160.1 - 1{,}860.4)/2{,}958}{(10.4 - 1{,}752.6/2{,}958)/38} = \text{NT\$}39.70/\text{US\$}1$$

TABLE 4.—AN ESTIMATION OF DRC FOR SECOND NATIVE RICE CROPS IN NORTHERN TAIWAN, 1974 [a]

Item	Domestic costs (*NT$*)		Foreign costs (*NT$*)	
	Direct	Indirect	Direct	Indirect
Costs for labor	16,254.8	—	—	—
Interests on capital	635.6	—	—	—
Depreciation	963.0	—	—	—
Costs for land use	6,469.0	—	—	—
Costs for machine use	2,239.7	—	—	—
Imported portion	—	-116.7	—	116.7
Taxation	—	-174.2	—	—
Costs for seeds	507.0	—	—	—
Costs for fertilizers	1,234.0	—	—	—
Imported portion	-234.0	—	234.0	—
Government subsidies	411.5	—	—	—
Import tax	—	-14.9	—	—
Costs for insecticides	2,020.5	—	—	—
Imported portion	—	-1,390.2	1,390.2	—
Import tax	—	-501.2	—	—
Costs for materials	46.5	—	—	—
Imported portion	—	-1.4	—	1.4
Taxation	—	-14.0	—	—
Costs for processing and transportation	530.4	—	—	—
Imported portion	—	-150.8	—	150.8
Taxation	—	-40.8	—	—
Total	31,078.0	-2,404.2	1,624.2	268.9

[a] Yield per hectare was 2,379 kg.

$$\text{DRC} = \frac{(31{,}078.0 - 2{,}404.2)/2{,}379}{(10.4 - 1{,}893.1/2{,}379)/38} = \text{NT\$}47.70/\text{US\$}1$$

APPENDIX TABLE 5.—AN ESTIMATION OF DRC FOR FIRST PONLAI RICE CROPS IN CENTRAL TAIWAN, 1974 [a]

Item	Domestic costs (*NT$*)		Foreign costs (*NT$*)	
	Direct	Indirect	Direct	Indirect
Costs for labor	20,649.2	—	—	—
Interests on capital	1,061.5	—	—	—
Depreciation	711.6	—	—	—
Costs for land use	9,271.0	—	—	—
Costs for machine use	2,429.6	—	—	—
Imported portion	—	-126.8	—	126.8
Taxation	—	-189.1	—	—
Costs for seeds	532.0	—	—	—
Costs for fertilizers	3,961.6	—	—	—
Imported portion	-751.2	—	751.2	—
Government subsidies	1,321.1	—	—	—
Import tax	—	-47.9	—	—
Costs for insecticides	2,573.6	—	—	—
Imported portion	—	-1,770.8	1,770.8	—
Import tax	—	-638.5	—	—
Costs for materials	268.8	—	—	—
Imported portion	—	-8.4	—	8.4
Taxation	—	-84.0	—	—
Costs for processing and transportation	1,731.2	—	—	—
Imported portion	—	-403.1	—	403.1
Taxation	—	-115.2	—	—
Total	43,760	-3,383.8	2,522.0	538.3

[a] Yield per hectare was 5,608 kg.

$$\text{DRC} = \frac{(43{,}760 - 3{,}383.8)/5{,}608}{(10.4 - 3{,}060.3/5{,}608)/38} = \text{NT\$}27.77/\text{US\$}1$$

APPENDIX TABLE 6.—AN ESTIMATION OF DRC FOR FIRST NATIVE RICE CROPS IN CENTRAL TAIWAN, 1974 [a]

Item	Domestic costs (*NT$*)		Foreign costs (*NT$*)	
	Direct	Indirect	Direct	Indirect
Costs for labor	18,527.6	—	—	—
Interests on capital	924.9	—	—	—
Depreciation	535.8	—	—	—
Costs for land use	7,857.8	—	—	—
Costs for machine use	2,413.8	—	—	—
Imported portion	—	-126.0	—	126.0
Taxation	—	-187.9	—	—
Costs for seeds	370.0	—	—	—
Costs for fertilizers	2,872.6	—	—	—
Imported portion	-544.7	—	544.7	—
Government subsidies	958.0	—	—	—
Import tax	—	-34.7	—	—
Costs for insecticides	1,911.8	—	—	—
Imported portion	—	-1,315.4	1,315.4	—
Import tax	—	-474.3	—	—
Costs for materials	404.6	—	—	—
Imported portion	—	-12.6	—	12.6
Taxation	—	-126.0	—	—
Costs for processing and transportation	1,679.3	—	—	—
Imported portion	—	-390.9	—	390.9
Taxation	—	-111.7	—	—
Total	37,911.5	-2,779.5	1,860.1	529.5

[a] Yield per hectare was 5,440 kg.

$$DRC = \frac{(37{,}911.5 - 2{,}779.5)/5{,}440}{(10.4 - 2{,}389.6/5{,}440)/38} = NT\$24.64/US\$1$$

APPENDIX TABLE 7.—AN ESTIMATION OF DRC FOR SECOND PONLAI RICE CROPS IN CENTRAL TAIWAN, 1974 [a]

Item	Domestic costs (*NT$*)		Foreign costs (*NT$*)	
	Direct	Indirect	Direct	Indirect
Costs for labor	18,195.6	—	—	—
Interests on capital	823.9	—	—	—
Depreciation	457.2	—	—	—
Costs for land use	7,951.2	—	—	—
Costs for machine use	3,329.8	—	—	—
Imported portion	—	-173.8	—	173.8
Taxation	—	-259.2	—	—
Costs for seeds	574.8	—	—	—
Costs for fertilizers	3,778.4	—	—	—
Imported portion	-716.4	—	716.4	—
Government subsidies	1,260.0	—	—	—
Import tax	—	-45.6	—	—
Costs for insecticides	2,808.2	—	—	—
Imported portion	—	-1,932.2	1,932.2	—
Import tax	—	-696.7	—	—
Costs for materials	223.6	—	—	—
Imported portion	—	-7.0	—	7.0
Taxation	—	-70.0	—	—
Costs for processing and transportation	1,308.3	—	—	—
Imported portion	—	-304.6	—	304.6
Taxation	—	-87.0	—	—
Total	39,994.6	3,576.1	2,648.6	485.4

[a] Yield per hectare was 4,238 kg.

$$\text{DRC} = \frac{(39{,}994.6 - 3{,}576.1)/4{,}238}{(10.4 - 3{,}134/4{,}238)/38} = \text{NT\$}33.81/\text{US\$}1$$

APPENDIX TABLE 8.—AN ESTIMATION OF DRC FOR SECOND NATIVE RICE CROPS IN CENTRAL TAIWAN, 1974 [a]

Item	Domestic costs (*NT$*)		Foreign costs (*NT$*)	
	Direct	Indirect	Direct	Indirect
Costs for labor	17,503.8	—	—	—
Interests on capital	791.4	—	—	—
Depreciation	362.4	—	—	—
Costs for land use	7,264.0	—	—	—
Costs for machine use	3,183.8	—	—	—
Imported portion	—	-166.2	—	—
Taxation	—	-247.9	—	—
Costs for seeds	451.6	—	—	—
Costs for fertilizers	3,761.8	—	—	—
Imported portion	-713.3	—	713.3	—
Government subsidies	1,254.5	—	—	—
Import tax	—	-45.4	—	—
Costs for insecticides	2,731.8	—	—	—
Imported portion	—	-1,879.6	1,879.6	—
Import tax	—	-677.7	—	—
Costs for materials	135.6	—	—	—
Imported portion	—	-4.2	—	4.2
Taxation	—	-42.0	—	—
Costs for processing and transportation	1,259.2	—	—	—
Imported portion	—	-293.1	—	293.1
Taxation	—	-83.7	—	—
Total	37,986.6	3,439.8	2,592.9	463.5

[a] Yield per hectare was 4,079 kg.

$$\text{DRC} = \frac{(37{,}986.6 - 3{,}439.8)/4{,}079}{(10.4 - 3{,}056.4/4{,}079)/38} = \text{NT\$}33.34/\text{US\$}1$$

APPENDIX TABLE 9.—AN ESTIMATION OF DRC FOR FIRST PONLAI RICE CROPS IN SOUTHERN TAIWAN, 1974 [a]

Item	Domestic costs (*NT$*)		Foreign costs (*NT$*)	
	Direct	Indirect	Direct	Indirect
Costs for labor	17,101.8	—	—	—
Interests on capital	845.8	—	—	—
Depreciation	461.6	—	—	—
Costs for land use	8,013.0	—	—	—
Costs for machine use	1,603.8	—	—	—
Imported portion	—	-83.7	—	83.7
Taxation	—	-124.9	—	—
Costs for seeds	516.2	—	—	—
Costs for fertilizers	2,307.8	—	—	—
Imported portion	-437.6	—	437.6	—
Government subsidies	769.6	—	—	—
Import tax	—	-27.9	—	—
Costs for insecticides	2,408.6	—	—	—
Imported portion	—	-1,657.3	1,657.3	—
Import tax	—	-597.5	—	—
Costs for materials	297.2	—	—	—
Imported portion	—	-9.2	—	9.2
Taxation	—	-92.0	—	—
Costs for processing and transportation	1,118.3	—	—	—
Imported portion	—	-367.2	—	367.2
Taxation	—	-95.8	—	—
Total	35,006.1	-3,055.5	2,094.9	460.1

[a] Yield per hectare was 6,210 kg.

$$\text{DRC} = \frac{(35{,}006.1 - 3{,}055.5)/6{,}210}{(10.4 - 2{,}555.0/6{,}210)/38} = \text{NT\$}19.57/\text{US\$}1$$

APPENDIX TABLE 10.—AN ESTIMATION OF DRC FOR FIRST NATIVE RICE CROPS IN SOUTHERN TAIWAN, 1974 [a]

Item	Domestic costs (*NT$*)		Foreign costs (*NT$*)	
	Direct	Indirect	Direct	Indirect
Costs for labor	16,365.8	—	—	—
Interests on capital	806.9	—	—	—
Depreciation	459.5	—	—	—
Costs for land use	7,394.0	—	—	—
Costs for machine use	1,194.0	—	—	—
Imported portion	—	-62.3	—	62.3
Taxation	—	-93.0	—	—
Costs for seeds	498.8	—	—	—
Costs for fertilizers	2,359.5	—	—	—
Imported portion	-447.4	—	447.4	—
Government subsidies	786.8	—	—	—
Import tax	—	-28.5	—	—
Costs for insecticides	2,430.0	—	—	—
Imported portion	—	-1,671.9	1,671.9	—
Import tax	—	-602.8	—	—
Costs for materials	271.0	—	—	—
Imported portion	—	-8.4	—	8.4
Taxation	—	-84.0	—	—
Costs for processing and transportation	1,027.0	—	—	—
Imported portion	—	-337.3	—	337.3
Taxation	—	-88.0	—	—
Total	33,145.9	-2,976.2	2,119.3	408.0

[a] Yield per hectare was 5,703 kg.

$$DRC = \frac{(33,145.9 - 2,976.2)/5,703}{(10.4 - 2,527.3/5,703)/38} = NT\$20.19/US\$1$$

APPENDIX TABLE 11.—AN ESTIMATION OF DRC FOR SECOND RICE CROPS IN SOUTHERN TAIWAN, 1974 [a]

Item	Domestic costs (*NT$*)		Foreign costs (*NT$*)	
	Direct	Indirect	Direct	Indirect
Costs for labor	17,219.0	—	—	—
Interests on capital	788.6	—	—	—
Depreciation	400.4	—	—	—
Costs for land use	5,401.4	—	—	—
Costs for machine use	2,484.8	—	—	—
Imported portion	—	-129.7	—	129.7
Taxation	—	-193.4	—	—
Costs for seeds	728.6	—	—	—
Costs for fertilizer	3,347.4	—	—	—
Imported portion	-634.7	—	634.7	—
Government subsidies	1,116.3	—	—	—
Import tax	—	-40.4	—	—
Costs for insecticides	3,617.6	—	—	—
Imported portion	—	-2,489.1	2,489.1	—
Import tax	—	-897.5	—	—
Costs for materials	272.6	—	—	—
Imported portion	—	-8.5	—	8.5
Taxation	—	85.0	—	—
Costs for processing and transportation	677.1	—	—	—
Imported portion	—	-222.4	—	222.4
Taxation	—	-58.0	—	—
Total	35,419.1	-4,124.0	3,123.8	360.6

[a] Yield per hectare was 3,760 kg.

$$\text{DRC} = \frac{(35{,}419.1 - 4{,}124)/3{,}760}{(10.4 - 3{,}484.4/3{,}760)/38} = \text{NT\$}33.39/\text{US\$}1$$

APPENDIX TABLE 12.—AN ESTIMATION OF DRC FOR SECOND NATIVE RICE CROPS IN SOUTHERN TAIWAN, 1974 [a]

Item	Domestic costs (*NT$*)		Foreign costs (*NT$*)	
	Direct	Indirect	Direct	Indirect
Costs for labor	16,075.2	—	—	—
Interests on capital	709.7	—	—	—
Depreciation	287.6	—	—	—
Costs for land use	5,700.0	—	—	—
Costs for machine use	1,983.0	—	—	—
Imported portion	—	-103.5	—	103.5
Taxation	—	-154.4	—	—
Costs for seeds	598.0	—	—	—
Costs for fertilizers	2,652.4	—	—	—
Imported portion	-502.9	—	—	—
Government subsidies	884.5	—	—	—
Import tax	—	-32.0	—	—
Costs for insecticides	3,421.0	—	—	—
Imported portion	—	-2,353.9	2,353.9	—
Import tax	—	-848.7	—	—
Costs for materials	172.4	—	—	—
Imported portion	—	-5.4	—	5.4
Taxation	—	-54.0	—	—
Costs for processing and transportation	635.7	—	—	—
Imported portion	—	-208.8	—	208.8
Taxation	—	-54.5	—	—
Total	32,616.6	-3,815.2	2,353.9	317.7

[a] Yield per hectare was 3,530 kg.

$$\text{DRC} = \frac{(32{,}616.6 - 3{,}815.2)/3{,}530}{(10.4 - 2{,}671.6/3{,}530)/38} = \text{NT\$}32.15/\text{US\$}1$$

APPENDIX TABLE 13.—AN ESTIMATION OF DRC PER HECTARE OF FIRST RICE PRODUCTION IN TAIWAN, 1974 [a]

Item	Domestic costs (*NT$*)		Foreign costs (*NT$*)	
	Direct	Indirect	Direct	Indirect
Costs for labor	17,996.0	—	—	—
Interests on capital	887.5	—	—	—
Depreciation	576.3	—	—	—
Costs for land use	8,569.9	—	—	—
Costs for machine use	2,020.3	—	—	—
Imported portion	—	-105.4	—	105.4
Taxation	—	-157.2	—	—
Costs for seeds	533.4	—	—	—
Costs for fertilizers	2,575.7	—	—	—
Imported portion	-488.4	—	488.4	—
Government subsidies	858.9	—	—	—
Import tax	—	-31.1	—	—
Costs for insecticides	2,005.1	—	—	—
Imported portion	—	-1,379.7	1,379.7	—
Import tax	—	-497.4	—	—
Costs for materials	298.5	—	—	—
Imported portion	—	-9.2	—	9.2
Taxation	—	-92.8	—	—
Costs for processing and transportation	1,258.3	—	—	—
Imported portion	—	-335.4	—	335.4
Taxation	—	-89.6	—	—
Total	37,091.5	-2,697.8	1,868.1	450.0

[a] Yield per hectare was 5,103 kg.

$$\text{DRC} = \frac{(37{,}091.5 - 2{,}697.8)/5{,}103}{(10.4 - 2{,}318.1/5{,}103)/38} = \text{NT\$}25.75/\text{US\$}1$$

APPENDIX TABLE 14.—AN ESTIMATION OF DRC PER HECTARE OF SECOND RICE CROP PRODUCTION IN TAIWAN, 1974 [a]

Item	Domestic costs (*NT$*)		Foreign costs (*NT$*)	
	Direct	Indirect	Direct	Indirect
Costs for labor	17,097.1	—	—	—
Interests on capital	760.3	—	—	—
Depreciation	441.5	—	—	—
Costs for land use	6,659.2	—	—	—
Costs for machine use	2,767.0	—	—	—
Imported portion	—	-144.2	—	144.2
Taxation	—	-214.3	—	—
Costs for seeds	620.6	—	—	—
Costs for fertilizers	3,288.3	—	—	—
Imported portion	-623.5	—	600.8	—
Government subsidies	1,096.6	—	—	—
Import tax	—	-39.7	—	—
Costs for insecticides	2,706.0	—	—	—
Imported portion	—	-1,861.9	1,861.9	—
Import tax	—	-671.3	—	—
Costs for materials	198.5	—	—	—
Imported portion	—	-6.2	—	6.2
Taxation	—	-62.0	—	—
Costs for processing and transportation	891.9	—	—	—
Imported portion	—	-240.5	—	240.5
Taxation	—	-65.9	—	—
Total	35,903.5	-3,306.0	2,462.7	390.9

[a] Yield per hectare was 3,683 kg.

$$\text{DRC} = \frac{(35{,}903.5 - 3{,}306.0)/3{,}683}{(10.4 - 2{,}853.6/3{,}683)/38} = \text{NT\$}34.94/\text{US\$}1$$