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ESTIMATES OF THE TASK OF RICE PRICE STABILIZATION
IN THE PHILIPPINES, 1969-1974
(Revised)

by

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1. THE SETTING

There is little need to call attention to the great impact that
the new varieties of rice, especially those developed in the Philippines,
have made on rice production in Asia in the last few years. It was clear
from the last session of the FAO Study Group on Rice that many Asian
countries have shifted their concern from the production - population race
to the search for export markets and the tempering of price "volatility".[1]

In the Philippines the policy emphasis has passed from ensuring a
minimum per capita consumption of rice to supporting a minimum farm price
level, with implications for both domestic and international policy. It
appears certain that over the next few years a substantial part of output
will have to be shunted away from the domestic market in order to maintain
farm prices. The government, anxious that as much of this as possible be
diverted to the export market, took the lead in the export expansion move-
ment at the Study Group session, and made several proposals:

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[1]See Documents from the 13th Session, FAO Study Group on Rice,
Manila, March 20-27, 1969.

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(1) that a "consultative rice council", equally composed of exporting and importing countries, be established; in this connection it was hoped that the competition from concessional sales (reference here to certain exports of Japan and the United States) would be minimized by the adoption of some code of behavior;

(2) that an international price stabilization mechanism be established, with given minimum and maximum prices set for a definite future period, say 6 months to a year, with certain actions to be automatically taken when the price level falls outside the acceptable range;

(3) that an international payments arrangement (one that would conserve convertible currencies) be established;

(4) that an international buffer stock of 10-15% of world trade be established;

(5) that rice be included as a commodity in international food aid.[2]

It is true that the response to these proposals was mixed. Some exporting countries, benefiting from the status quo, did not feel that an

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[2] See "International Action on Rice: A Philippine Proposal," 13th Session, FAO Study Group on Rice, Document CCP: Rl 69/CRS/10. The Philippine delegation also expressed a willingness to support these proposals on a regional or sub-regional basis.

international agreement on rice was urgent. It was natural for importing countries to desire full gains from an anticipated decline in the world price of rice. The proposals seemed to be intended to benefit mainly a new class of countries, the emerging exporters, including the Philippines. This paper's purpose is to attempt to forecast the magnitude of the price problem brought about by this emergence.

2. TRADITIONAL ANALYSIS

If a large enough export market is not found, then government must purchase part of domestic output for indefinite[3] storage in order to support the farm price, given that the price level consistent with total output is unacceptably low. A first indication of the possible magnitude of these operations is given by government forecasts of output and of "requirements" for 1968/69 to 1973/74, found in Table 1 and Fig. 1.

The forecast for output, Q, is a sustained rapid growth throughout the period at the rate of about 11% annually. (This is about the same as the actual growth of crop year 1968 output over crop year 1967). This pattern is based mainly on a projected rapid increase in average irrigated yields, viz., a yield of 70 cavans[4] /ha. for 1970/71, increasing by 10 cavans

61 cavans /ha 150 kg

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[3]Domestic purchase operations may have little effect on the open market price if government merely withdraws rice at the farmer's end and restores it at the consumer's end, with no net effect on supply, unless there are significant changes in demand due to the income changes of those who benefit from subsidy operations.

[4]One cavan = 44 kg. rough rice.

annually up to the end of the period. Thus it is probably not inaccurate
to term the forecast path as also a target path.[5] Continued rapid dif-
fusion of the new high-yielding varieties is presupposed, and the projected
increase in aggregate hectarage is not large.

Requirements, $\boxed{R}$, are on the other hand projected to grow at
from 3.5 to 4 per cent annually. The projection is based on forecasts of
the rice-eating population (growing nearly 3.5% yearly), per capita consump-
tion levels for a base year (1959), and allowances for waste, feed, and seed
(estimates are proportional to output, hectarage, or human consumption).
The food component represents at least 90% of the estimated requirement.

Rice import and export policy since 1959 has been based on estimated
deviations in total supply (output plus beginning stocks, K_1) from a so-called
"requirement" or "self-sufficiency level" (human consumption, based on 1959
per capita levels, and allowances) plus a desired buffer stock, B.[6] The
implied exportable surplus[7], X, is computed in Table 1 as growing from
202,000 tons in 1968/69 to nearly a million tons in 1974/75. Thus, con-
sidering all these forecasts, it may already be concluded that the main-

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[5]It is not the intention here to question whether the forecast levels
of Q are likely to be attained, but rather to determine the implications
of the forecasts for price support policy.

[6]This method of course subjects the residual to much greater estima-
tion error than either supply or requirements. A forthcoming study by the
author, "Towards More Efficient Formulation of Rice Import/Export Policy",
will discuss this method extensively and suggest an improvement.

[7]Exports are subject to government licensing.

Table 1. Government forecasts of rice output, requirements,
stocks and exportable surpluses, 1968/69-
1974/75, Philippines

In thousand m. tons milled rice

Crop Year	Output Q	Relative Change in Output(%) $\Delta Q/Q$	Beginning Stock K_1	Require-ment R	$Q + K_1 - R = K_2$	Buffer and ending stock $.1Q = B$	Exportab Surplus $K_2 - B =$
68/69	3139[a]	11	575	3199	516	314	202
69/70	3516[a]	11	314	3308	522	351	170
70/71	3765	10	351	3461	655	376	279
71/72	4060	10	376	3589	847	406	441
72/73	4363	10	406	3722	1048	436	611
73/74	4675	10	436	3859	1251	467	784
74/75	4996	10	467	4392	1461	500	961

[a]Lower bounds of forecast interval.

Source: Philippine Technical Working Group (13th Session, FAO Study
Group on Rice, Manila, March 20-27, 1969), International
Action on Rice, vol. II: Background Papers, Charts and Tables,
pp. 55-56. A weight conversion ratio of .65 was applied to
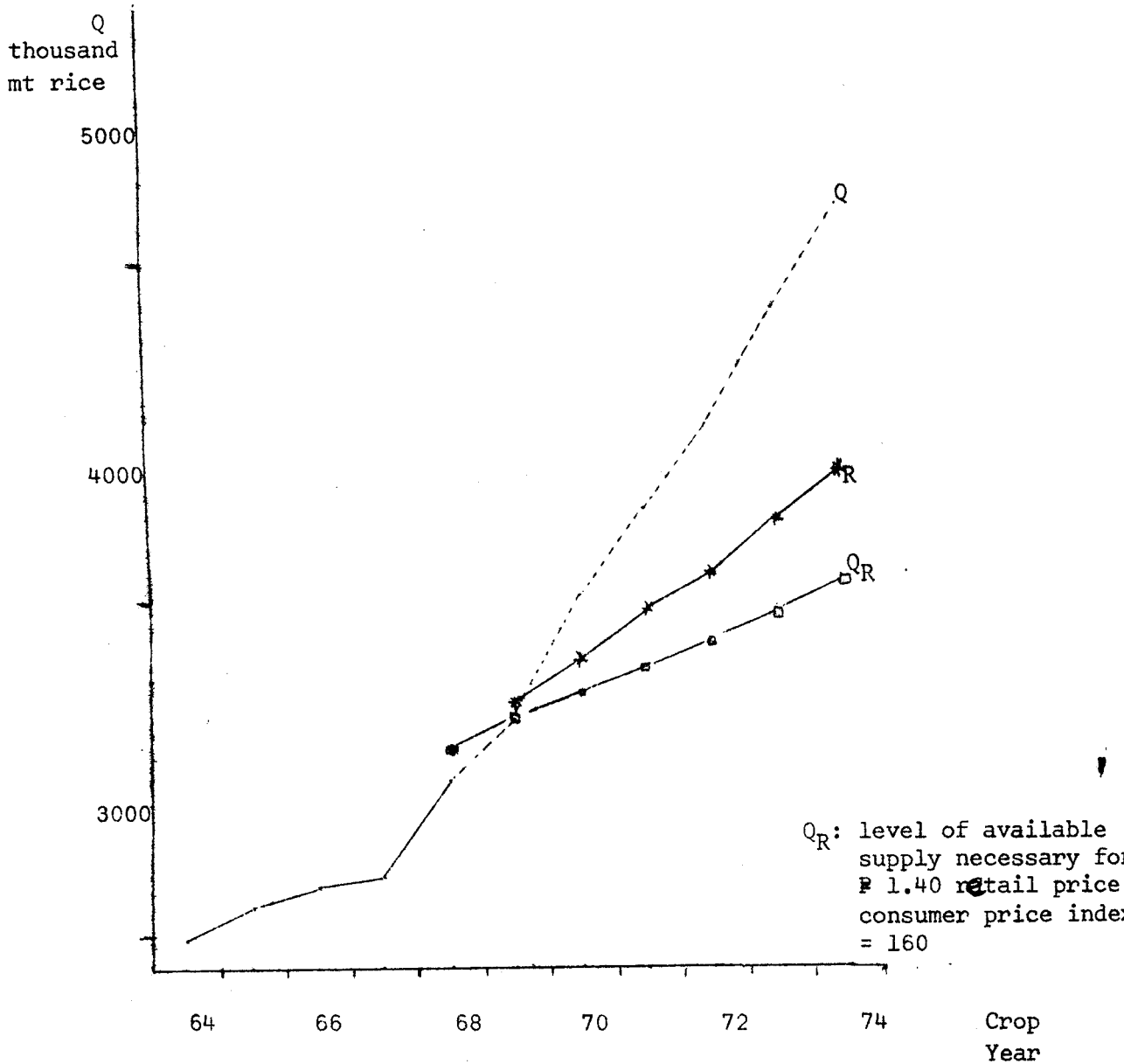original data, which were in terms of rough rice.

Fig. 1

Table 2

Calendar Year	Average deflated retail price of Macan 2nd class in Manila, for the calendar year.[a] Pesos/ganta	Net milled rice imports of the Philippines, for the calendar year.[b] Thousand m. tons	Philippine palay output in milled rice equivalent, for the crop year.[c] Thousand m. tons	Crop Year
1956	.8107	42	2125	1955/56
1957	.9406	78	2172	1956/57
1958	.9522	231	2079	1957/58
1959	.7533	6	2392	1958/59
1960	.8633	-2	2427	1959/60
1961	.8978	186	2405	1960/61
1962	.8251	0	2538	1961/62
1963	.8927	256	2575	1962/63
1964	.9676	299	2494	1963/64
1965	1.0020	560	2591	1964/65
1966	1.1314	108	2644	1965/66
1967	1.0855	234	2657	1966/67
1968	1.0211	-45	2960	1967/68

[a] Original monthly averages are (unpublished) Central Bank data; available from Prof. L. Mears' collection of data, identified as Table 19. These averages were then deflated by the Central Bank Consumer Price Index for Manila, adjusted to exclude rice; deflator available from Mears' data, Table 18. Then the deflated data were averaged; weighted by the 1956 Central Luzon harvest distribution, found in D.A. Maulit, "Palay Harvest and the Supply of Rice, "The Philippine Statistician, 6:2 (June, 1957). July - December 1968 data are from the Bureau of Agricultural Economics.

[b] Data for 1956-1963 as revised and adopted by an Inter-Agency Committee of the government on March 31, 1965. Data for 1964-1966 from the Bureau of Census and Statistics, Foreign Trade Statistics of the Philippines, 1964-1965-1966. Available from Mears' data, Table 5. Data for 1967 and 1968 are from the Rice and Corn Administration.

[c] From the Department of Agriculture and Natural Resources' Crop and Livestock Surveys (only 1955/56 to 1958/59 are published). Available from Mears' data, Table 1, except for 1966/67 and 1967/68.

tenance of a domestic support price of about $150 per m. ton[8] of milled

rice will impose a tremendous burden on government unless substantial ex-

port markets are found. An alternative procedure, presented below, may

provide a more accurate indication of the task, and, indeed, will suggest

that the task may be even larger than it already appears.

3. AN ALTERNATIVE

An important deficiency in the use of the current method for price

stabilization guidelines is the absence of information on the effects of

changes in output, local demand and imports/exports on the price level.

This may be remedied via a model[9] which has been reasonably successful in

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[8]In the discussion following it will be convenient to use ₱ 1.40
per ganta retail as the support price. Using the conversion: one ganta =
56/23.5 kg., then the price per m.ton is ₱586, or $150 at the exchange
rate ₱3.9 = $1.

[9]This model was introduced in M. Mangahas, "The Effect of Impor-
tation on the Price of Rice," The Philippine Review of Business and Econo-
mics, December 1968. The rationale for separate coefficients for I_t and
Q_t is contained in a theory of retailer behavior involving anticipation
of government competition. The estimate of the reduced equation for 1956-
1967 data (previous to small revisions for 1967) is $P_t = 281.5 - 1.536I_t$
$- 9.735Q_t + 7.727t$ ($R^2 = .81$). The new estimate therefore continues to
support the conclusions drawn from the previous estimate, in particular
that importation was a relatively ineffective means of price control.

Clearly I_t and Q_t should represent levels available to the
market, and this may be presumed for 1956-1967 levels of imports and out-
puts. However, large additions to RCA stocks, coming mainly from domestic
procurements, was made over crop year 1967/68. The figure for Q for this
year (Table 2) is an estimate of the net available domestic supply. See
ibid.

predicting the retail price level (Macan second-class variety, Manila):

(1) $M_t = a_o + a_1 P_t + a_2 t + u_{1t}$ Demand

(2) $M_t = b_o + b_1 P_t + b_2 I_t + b_3 Q_t + u_{2t}$ Supply

where M_t is the quantity marketed during the calendar year, P_t is the retail price level (calendar year average), t is time in years (proxy for population and real income growth), I_t is total imports (calendar year) and Q_t is total domestic output (crop year). A type of six-month lag is thus assumed between output and the retail price.

The variable M is not exactly intended to indicate the marketable surplus out of Q ; rather it is the total quantity sold on the market in the calendar year. These sales are both out of domestic stocks and out of imported stocks. But this point is really quite academic, since data on M , or on the marketable surplus for that matter, are not regularly collected.[10] M is introduced into the model to provide the rationale for forecasting P , i.e., to establish that a supply-demand framework can be found which is consistent with the estimation and forecasting procedure discussed below.

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[10] This data gap is generally true in less developed countries, and inspired Krishna's pioneering attempt to obtain a method for estimating the price elasticity of the marketed surplus if time-series data on the marketed surplus do not exist. (Raj Krishna, "A Note on the Elasticity of the Marketable Surplus of a Subsistence Crop," Indian Journal of Agricultural Economics, 17:3 (July - September, 1962), 79-84.)

The variable t is introduced purely for computational efficiency. Population, first of all, is almost linear with time. Real income, on the other hand, is a rather inaccurately measured variable.[11] On these two bases inclusion of these two factors in a fashion other than via simple trend did not seem worth the effort. The most important consideration, after all, is whether a model's forecasts are verified to be accurate enough; and, although the forecasting experience with the model is short indeed, it is at least encouraging.[12]

The model (1) - (2) gives a reduced equation,

$$(3) \quad P_t = \text{const.} + c_1 I_t + c_2 Q_t + c_3 t + v_t$$

which is estimated, using the data for 1956-1968 in Table 2, by

$$(4) \quad P_t = 250.4 - 1.688 I_t - 8.254 Q_t + 7.013 t$$
$$\quad\quad\quad\quad (1.369) \quad (2.516) \quad (1.633)$$

$$R^2 = .794 \quad , \quad DW = 2.131.$$

where P_t is in centavos/ganta (1955 prices), I_t and Q_t are in units of 100,000 m.tons, and $t = 1$ stands for 1956.

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[11]See for example G.P. Sicat, "On the Accuracy of Philippine National Income Accounts," The Philippine Review of Business and Economics, 1:2 (October 1964), 21-39.

[12]Cf. Mangahas, op. cit., p. 42.

Eq. (4) implies: (a) given no change in I or Q , the effect
of passage of one year (population and real income growth) is to increase
P by about 7 real centavos per ganta; (b) in order that P be kept cons-
tant over a succeeding year (stabilized) without resorting to imports (I = 0),
the necessary increase of Q over the preceding crop year is estimated at

$$\Delta Q_R = \frac{7.013}{8.254} \times 100,000 = 85,000 \text{ m.tons.}$$

If this increase is actually met, then it may presumed that the nation has
preserved the "degree of self-sufficiency" which obtained in the preceding
period. For if, at a given price level, the per capita quantity demanded
increases due to population and real income growth, and if the price level
then remains unchanged, then per capita consumption of rice cannot have
decreased.

Note that the estimated necessary increase in Q is much less than
the increase in the estimated annual "requirement" (Table 1); this estimated
increase is 110,000 m.tons in 1969/70 over 1968/69, and is even larger for
years farther off. I would view this as an indication of error in the es-
timate of "requirement" rather than in the estimated ΔQ_R . Roughly speak-
ing, the "requirement" estimate is the food consumption estimate, which in
turn can be roughly represented by the product raN , where r is the
proportion of the population which is rice-eating, N is the total popula-
tion, and a is a per capita consumption level. r and a are benchmarks
from surveys in 1958 and 1959, respectively. N is a "medium" population
projection. Therefore raN is not, conceptually, that level of supply

which if attained will keep the price of rice stable.[13]

Since the Rice and Corn Administration is required by law to sell
rice at a current price per ganta within the range (₱ 1.00, ₱ 1.40)[14],
let us then assume that the stabilization objective is to maintain the mar-
ket retail price at ₱ 1.40[15] in current terms, and that the relevant general
price index level is 160 (approximately 157 in 1968). Then for a real price
level $P = (1.40/1.60)$, and $I = 0$, eq. (4) implies that the required levels
of output, Q_R , over certain years of interest are:

Crop year		Q_R in 10^5 m.t.
t = 13	1967/68	30.5
t = 14	1968/69	31.4
t = 15	1969/70	32.2
t = 16	1970/71	33.0
t = 17	1971/72	33.8
t = 18	1972/73	34.7
t = 19	1973/74	35.6

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[13]And if it were, it might still have to cope with substantial esti-
mation error, since the relative error of estimate of the product is the
sum of the relative errors of estimate of the separate three factors.

[14]The actual RCA retail price for ordinary varieties at present is
₱ 1.40.

[15]Let g = the number of gantas in a 56 kg. sack of milled rice,
m = the number of 56 kg. sacks of rice obtainable from a 44 kg. cavan of
rough rice, and s = the excess of marketing and processing costs (profit
included) over the value of milling by products. Let P_f be the farm price
per 44 kg. cavan and P_r be the retail price, per ganta. Then $P_f = gm(P_r)$
- s. Since the range of g is approximately (23.5, 24) and that of M is
(.52, .57), then the range of (gm) is (12.2, 13.7). For $P_r = 1.40$, P_f ha
the range (17.1 - s, 19.2 - s). This range is consistent with the RCA
minimum purchase price for rough rice, namely ₱ 16 per 46 kg. sack.

These levels of Q_R are indicated on Fig. 1 by small boxes, and are seen to be much less than R , the differences being of the order of 100,000 m.t. in earlier years and rising to about 300,000 m.t. in later years. (In the case of 1968, it is seen that Q_R is greater than the available supply. The average price level for that calendar year was ₱ 1.61.) Thus the empirical analysis indicates a much greater farm support problem than the analysis currently in use. Conversely, it indicates a much easier task of defending consumer prices.[16]

If the output forecasts are not exceedingly over-optimistic, the Philippine government will therefore be forced to shoulder a heavy burden from domestic purchases and explorations for outside markets, if it is to maintain the maximum government retail price. With this objective, the quantity of ric required to be removed from the domestic market may be estimated by the fore-casted increase in output less the necessary increase in output.[17] The fore-cast increase in potential supply is 180,000 m.t. in 1968/69 and ranges from 250,000 to 320,000 m.t. in the rest of the period. The necessary increases in available supply on the other hand may be estimated by the differences

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[16] The usefulness of the suggested analysis may be tested by taking forthcoming data for 1969, interpreting Q as total national output (for July 1968 - June 1969) less the net addition to government stocks over the period, forecasting P from eq. (4) and comparing it to actual P after adjustment for inflation. It should be noted that, previous to 1967/68, government made no significant additions to its stocks from local procurements.

[17] Estimation error is considerably reduced by using changes instead of absolute values.

between Q_R for that year and the available supply for the preceding year. For 1968/69, this is 31.4 - 29.6 = 1.8 hundred thousand m.t.; for succeeding years, assuming that available supply is limited to Q_R , the necessary increase in estimated by ΔQ_R, or 85,000 m.t. per year. Hence the estimated quantity of rice required to be removed, such that the market retail price be supported at ₱ 1.40, is negligible for 1968/69, but ranges from 164,000 to 227,000 m.t. during the rest of the period. At the support price of $150 per metric ton, the implied purchase values range from $25 to $34 million for the period.

If the combination of export and government market is not as large as this, then price decreases will not be avoided, leading to a redistribution of part of the gains from technological change from producers to consumers. Shifts of hectarage away from rice may then be expected to follow[18], with a resulting dampening in the time path of output. This analysis suggests that the potential for consumer gain from technological change in agriculture is greater in developing countries than in developed ones, in spite of a policy which favors producers, because of the larger burden of farm support relative to total government resources.

[18]See M. Mangahas, A.E. Recto and V.W.Ruttan, Market Relationships for Rice and Corn in the Philippines, forthcoming (1969) as Technical Bulletin No. 8, International Rice Research Institute.