A NOTE ON THE RATIO BETWEEN VALUE ADDED AND GROSS VALUE FROM AGRICULTURAL CROPS

BY

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Much criticism has been levelled against the official estimators of national income for their use of constant value added ratios in deriving value added from gross value.

Conceptually, the criticism is well-founded. In a country which is developing, structural changes in some sectors (very probably in agriculture) occur quite rapidly. These changes are a most interesting hallmark of development; they must be properly reflected in the national accounts. Thus an estimating method which proceeds on the assumption that the value added ratios are constant may fail to reflect these structural sectoral changes. This is because constant value added ratios imply constancy in the share of factor costs in total gross value of production, which in turn could easily mean constancy in input-output relations and also in production function. Futhermore, in all countries, agricultural output is greatly influenced by the weather. Years of relatively good weather, yield better and bigger crop returns to the *same* inputs than less fortunate years. Use of constant value added ratios does not allow these different returns to the same inputs to be reflected in the national income accounts. To summarize: annual changes in value added ratios, due either to short-run variables (weather) or long-run variables (change in production functions), are not captured and reflected in the value added figures, which is derived by applying a constant value added ratio to gross value.

The criticism is serious enough to warrant investigation. It strikes hard at an estimating assumption forced on the official investigators by lack of data; it also casts grave doubts upon the ability of the national income accounts to fulfill one of their basic objectives: the proper recording of fluctuations in net income originating from the different sectors of the economy.

This paper attempts to obtain value added by crops without using the constancy assumption, and then to compute value added ratios on the basis of these new and more directly estimated value added

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figures. It will then be possible to see whether indeed the constancy assumption has led to estimates of value added by crops which are "devoid of much meaning."

The method used here takes the state of empirical ignorance concerning the cropping patterns of many individual crops as a constraint. Thus it produces no breakdown of value added by individual crops, impressive as this may have been. Only one value added figure — for total crop production — is computed; and this is derived by subtracting several non-factor costs from the gross value figure.

A detailed description of the method is appended.

Some basic assumptions are implied in this new method:

1. The costs of fertilizer, insecticides and pesticides are considered as non-factor costs and therefore deducted from gross value on the principle that materials coming from outside agriculture are intermediate products.

2. The cost of water is deducted on the same principle. However, the cost of water, as defined here, is identical with the cost of maintaining and operating, irrigation systems. This identification is made on the principle that materials used in agriculture but not paid for are not considered as non-factor costs. Thus no value is imputed for water used in agriculture but drawn freely from rain or from other sources.

3. The cost of seeds and of crops for animal feeds is deducted on the principle that materials coming from within agriculture are to be subtracted once. In the case of seeds, it is clear that their cost has to be subtracted from the gross value of crops; but in the case of crops for animal feeds, it was a matter of arbitrary choice to subtract their cost from crop production; it is no longer considered as a cost in meat consumption.

4. The cost of crops wasted is deducted on the principle that these crops are not eventually "valuable" for human welfare.

The resulting value added figure and the consequent value added ratios are set forth below together with comparable official data.

CROP PRODUCTION

	Official			New		
	Gross Value	Value Added	Var.[1,3]	Gross Value	Value Added	Var[1]
	(Million Pesos)			(Million Pesos)		
1949	1449	1371	94.61	1561	1450[2]	2
1948	1325	1264	95.39	1351	1249[2]	2
1950	1498	1419	94.69	1441	1310	90.91

	Gross Value	Value Added	Var	Gross Value	Added Value	Var
1951	1624	1535	94.49	1513	1374	90.84
1952	1554	1462	94.11	1458	1299	89.05
1953	1555	1462	94.02	1380	1247	90.41
1954	1527	1420	92.96	1306	1201	91.94
1955	1563	1458	93.25	1344	1227	91.36
1956	1571	1475	93.88	1365	1255	91.99
1957	1648	1550	94.05	1433	1291	90.10
1958	1798	1686	93.77	1556	1427	91.67
1959	1809	1688	93.34	1576	1430	90.75
1960	2046	1919	93.79	1799	1648	91.61
1961	2207	2087	94.56	1994	1822	91.40
1962	2414	2276	94.28	2188	1954	90.53
1963	2733	2567	93.59	2542	2325	91.58

[1] Value Added Ratio

[2] Value Added tabulation incomplete.

[3] This ratio is implicit in the official data. This was obtained by: first dividing the value added data for different crops by the official VAR; this gives the gross value figure; second, summing up the gross value figures for different crops; third, dividing total value added by crops by the sum of gross value of all crops.

Is is clear from the table above that:

(a) the value added ratio, resulting from the more aggregative method, has not changed markedly since 1950. Value added by crops has been around 90% of gross value since 1950, and until 1963 it has shown no propensity to move from that percentage figure. However, the standard deviation computed from the new VAR is higher (0.8823) than that computed from the VAR implicit in the official data (0.4923).

(b) the "new" value added ratio is below the value added ratio implicit in the official accounts for all years.

The implications of these observations are quite clear. The observed constancy in the value added ratio can easily mean the relative absence of structural changes in Philippine agriculture. Furthermore, this means that there has not been a marked general improvement in applied agricultural techniques since 1950.

Whether the weather is exceptionally good, the VAR is expected to go down; on the other hand, when the weather is exceptionally bad, the VAR is expected to go up. In the face of the evidence above concerning the relative constancy of the VAR, the conclusion is that the effects of weather were not peculiarly marked in any particular year.

Even granting that the official gross value figures are correct, the VAR used by official estimators lead to value added figures that are overstated. Such VARs are too high.

The conclusions above must be considered as "tentative". The data on non-factor costs still await improvement. The data on gross value of crop production depend mainly on the results of the annual surveys conducted by the Department of Agriculture and National Resources. The accuracy of these survey results in reflecting annual changes in agricultural output can stand further improvement. Until improved empirical evidence is available, users of our official national income data may take the fluctuations recorded in value added by crops as reasonable, although they must regard the absolute figures for value added by crops as overstated.

APPENDIX

VOLUME

In these related estimates, an attempt has been made to use figures. Where inconsistency between census figures and survey results was found, census figures were used.

Data on the volume of production of crops are available annually for the period of our interest, 1948-1963. The 1948 data are census data; those for 1949-1953 are estimates made by the census bureau, those for 1954-1963, on the other hand, are results of surveys conducted annually by the Department of Agriculture and Natural Resources.

The quantity data for various crops from 1954 to 1963 were revised on the basis of the results of the 1960 census on Agriculture.

First, the 1960 Survey data were compared with the 1960 census data. On the basis of this comparison, a coefficient of difference was multiplied by the annual survey data. The product is the revised quantity figure.

Thus, it was assumed that the same coefficient of difference applied to all years between 1954 and 1963. This means that the survey results understated or overstated the actual volume in all these years to the same degree as in 1960. This sounds heroic; however, no quick alternatives were available.

The quantity data for various crops from 1949 to 1953 were revised on the basis of the 1948 census data and the revised 1954 quantity data.

First, total growth in percentage points between 1948 (census) and 1954 (revised) was computed. This was done by dividing the 1954 quantity figure by the corresponding figure for 1948 and by subtracting one (1) from this quotient. The result of all this, a number representing total growth in percentage points, we call A.

Second, A is used to estimate the quantity data for the years between 1948 and 1954. This is done by averaging A out into an annual rate and by then applying this average of A into the 1948 figure.

Thus, it is assumed that each crop grew smoothly during the period. Drastic as this may sound, this was the only way to make the revised quantity data for the years 1949-1953 consistent with both the 1948 census data and the revised quantity data for all later years.

PRICE

Again, unit prices implicit in the census reports were more relied upon than unit prices implicit in the annual survey results. The rationale for this lies in the greater extensiveness of the census.

Unit prices for 1954-1963 implicit in the survey results were revised on the basis of unit prices implicit in the Census of 1960.

First, a price index was constructed from the unit prices in the survey results. This index run from 1954 to 1963, with 1960 as a base.

Second, the actual unit prices found in the 1960 census were multiplied by the price index.

Thus, it was assumed that the extent of the difference between actual prices and the survey prices was the same all throughout the period.

Unit prices for 1949-1953 implicit in the estimates of the Bureau of the Census were revised on the basis of the 1948 census prices. Again, a price index was constructed $(1948 = 100)$ from the unit prices in the annual estimates. Then, this index was multiplied against the unit prices found in the 1948 census.

GROSS VALUE

The revised quantity figures were multiplied by their corresponding revised unit price data. The product is the gross value of crop production. However, this is not the final figure since it is unadjusted for non-farm crop production.

Unfortunately, the 1960 census on Agriculture contains no information on non-farm crop production. In view of this, the share of non-farm (0.98%) in total crop production for 1948 was used for all years. Thus the revised though unadjusted gross value figure is divided by $(1 — 0.98)$, i.e. 99.02. The quotient is the revised and adjusted gross value figure.

VALUE ADDED

The standard procedure used by official estimator in obtaining value added by crops has not been followed in this work. Official estimators have been using constant value added ratios and multiplying these against the gross value figures.

Use of constant value added ratios for each crop is a sophisticated procedure. It produces an impressive breakdown of value added. However, it requires an intimate knowldege about production techniques for each crop. This knowledge, made fresh from year to year, is imperative so that the annual changes in value added ratios, due either to short-run variables (weather) or long-run variables (change in the production function), are captured and reflected in the value added figures. Where such changes are not known or are implicitly assumed not to occur, as is the case when *constant* value added ratios are used from year to year, then the value added figures would not be very meaningful. The array of value added figures crop by crop may on the surface give the impression of high statistical sophistication; but it would be the better part of candor to abandon such pretenses and be satisfied with a single value added figure for all crops combined.

In this work, the gross value of each crop is left *as is,* then summed up. From this total are deducted the following:

(a) Cost of fertilizers
(b) Cost of insecticides and pesticsides

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(c) Cost of water

(d) Cost of crop used for animal feeds

(e) Cost of crop wasted

(f) Cost of seeds

The cost of fertilizers, insecticides, and pesticides is computed by the "commodity flow" approach. The value of local production and net importation were summed up. This equals supply for the year, and this is generally assumed to be equal to consumption for the year — except in some years where the importation value is abnormally high followed by a relatively low value for the succeeding years. In these cases, the importation value for the two successive years are averaged out.

The cost of water in agriculture is assumed to be equal to the cost of maintaining irrigation systems. This means that water drawn freely from rain or from other sources is given no imputed value. Water tapped from organized water systems and used for crop production purposes is deemed to be too small in volume as to be safely disregarded.

The following crops are used for animal feeds: rice, corn, root-crops, coconut, and mango.

The volume allotted for feeds is taken as a fixed percentage of the total volume of production of the above-named crops — except for rice and crop where the feed percentage is applied against that part of production set aside for human consumption. The ratios used for estimating volume alloted for feeds are as follows:

(a) Palay $= 1.9\%$ of human consumption

(d) Corn $= 30.3\%$ of human consumption

(c) Cassava $= 11.0\%$ of total production

(d) Sweet potatoes
and other roots and
tubers $= 8.0\%$ of total production

(e) Mongo and
coconut $= 1.0\%$ of total production

Multiply the unit price by the volume alloted for feeds. The product is the value of crops used for feeds.

The following crops are subject to wastage: rice, corn, fresh vegetables, tomatoes, fresh fruits, bananas, and citrus. Other crops are also subject to wastage, but they are not as perishable as the crops named above such that wastage of these other crops is deemed quite negligible.

The National Economic Council has estimated that the following percentages of total volume of production go to waste:

(a) .05% for rice

(b) .06% for corn

(c) 4.00% for tomatoes

(d) 4.10% for fresh vegetables, bananas and other fresh fruits, and citrus.

By applying these percentages to the revised volume of production, one gets an estimate of the volume of wastage. Unit prices are then applied against the latter to get the value of crops wasted.

The following crops are grown from seeds: rice, corn, irish potatoes, roots and tubers, peanuts, beans and peas.

Seeds are taken from the produce of the preceding planting period. Thus the allowance for seed for period 2 must be subtracted from the volume of production of period 1.

The seeding ratio per hectare is assumed to be constant. The following ratios were used:

(a)   0.89 sacks of rice per hectare

(b)   16.24 sacks of corn per hectare

(c)   900.00 metric tons of potatoes per hectare

(d) 1500.00 metric tons of roots and tubers per hectare

(e)   38.00 metric tons of peanuts per hectare

(f)   15.00 metric tons of beans and peas per hectare

Unit prices were then used to value the amount alloted for seeds.

The residual, after subtracting the above non-factor cost items, is value added from crop production.