AGRICULTURAL REFORM AND LONG-TERM INCREASE IN FOOD OUTPUT
A QUANTITATIVE ANALYSIS

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I. AGRICULTURAL REFORM IN VIETNAM

The agricultural reform in Vietnam, from the 1980s on, included: reform in the mechanism for controlling agricultural production in which the farmer who uses the land pays a fixed rent in kind, reform in price of farm products fixed by the State, and liberalization of trade in agricultural materials and products. The agricultural reform could be divided into three phases:

- Phase 1 (the early 1980s): reform in the mechanism for controlling agricultural production and in prices of farm products.
- Phase 2 (the late 1980s): Prices of farm products kept changing and the mechanism for controlling agricultural production was perfected.
- Phase 3 (the early 1990s): Prices of farm products were allowed to change according to market forces, and the market for agricultural materials and products was liberated step by step.

II. ASSESSMENT MODEL AND RESULTS

The food production function is based on the Cobb-Douglas function with four traditional variables: land, labor, tractor and fertilizer. In addition, five more variables are also taken into consideration: percentage of cooperatives applying reformed mechanism, relation between prices of food and of manufactured goods fixed by the State, relation between market prices of food and of manufactured goods, sowing index, and time trend.

The food production function Y depending on factor inputs is as follows:

(1) $\ln (Y_{it}) = \alpha_1 + \alpha_2 \ln (Land_{it}) + \alpha_3 \ln (Labor_{it}) + \alpha_4 \ln (Tractor_{it}) + \alpha_5 (Fertilizer_{it}) + \alpha_6 (Cooperative_{it}) + \alpha_7 (Sowing_{it}) + \alpha_8 (Time) + \alpha_9 (Zone) + e_{it}$

where:

α_1 - α_9: coefficients need to be assessed

i = 1 for Northern provinces; i = 2 for Southern ones

t = year

Y_{it}: total food output

$Land_{it}$: farming land area

$Labor_{it}$: labor force in the surveyed district

$Tractor_{it}$: amount of cattle used as pulling force in the district

$Fertilizer_{it}$: amount of fertilizer in the district

$Cooperative_{it}$: percentage of cooperatives applying reformed mechanism

$Sowing_{it}$: sowing index

Time: time trend

Zone (unreal variable) = 0.1

e_{it}: error

Food output and four traditional variables are in the form of natural logarithm.

The food supply function is also used for comparing and estimating effects of reformist measures. This is a log- linear function that is used for assessing effects of changes in the price policy and managing mechanism on the food output (Y). The function is written:

(2) $\ln (Y_{it}) = \beta_1 + \beta_2 (Cooperative_{it}) + \beta_3 (Market\ price_{it}) + \beta_4 (Official\ price_{it}) + \beta_5 (Time) + \beta_6 (Zone) + u_{it}$

where:

β_1 - β_6: coefficients need to be assessed

i = 1 for Northern provinces; i = 2 for Southern ones

t = year

u: error

$Cooperative_{it}$: percentage of cooperatives applying reformed mechanism

$Market\ price_{it}$: relation between market prices of food and manufactured goods

$Official\ price_{it}$: relation between prices of surplus food output fixed by the State and market prices of manufactured goods

Time: time trend

Zone (unreal variable) = 0.1

The variable "time" in this function not only reflects technical changes but also shows the availability of factor inputs.

Results of the assessment of production function presented in the column (1) of Table 1 show that, apart from the coefficient "labor", other coefficients are considered as different from 0 at levels of 1%, 5% and 10%. These results are used for calculating the growth rate.

Results of the assessment of food supply function are presented in the column (2) of Table 1. Apart from the variable "price index of food fixed by the State", other coefficients are greater than 0, that is, statistically meaningful. The co-efficient of "price index of surplus output" which is negative and meaningless shows that the price of surplus output fixed by the State fails to encourage the food production because during this period the price reform wasn't carried out strongly. In other words, the official price of the surplus output changed more slowly than the market price did.

Prices of factor inputs (manufactured consumer goods) increased quicker than the official price of surplus output (Phan Văn Tiệm, 1991). The surplus output (the total output minus land rent in kind) in the 1980s was very small, therefore rises in its price had no considerable effect on the food production.

Examining results presented in columns (1) and (2), we could see that:

(i) Decollectivization produced a positive and meaningful effect on the growth of food production which started from changes in the use of factor inputs.

(ii) Changes in market prices of food also influenced the growth of food production. Unlike reforms in mechanism for controlling the agricultural production and market prices, the official price of food had no effect on the food production.

III. SOURCES OF FOOD OUTPUT GROWTH IN THE EARLY 1980S

Results of calculation of the food output growth and importance of reformist factors to the growth are presented in Tables 2 and 3.

In Table 2, sources of food output growth could be divided into three kinds: (1) changes in such traditional factor inputs as land, labor and tractor; (2) factors of reforms; and (3) other "inexplicable" factors.

In Table 3, sources of food output growth include such factors as the percentage of cooperatives applying reformed mechanism, changes in market and official prices of food, time trend and other inexplicable factors.

1. In the early 1980s

- The food output increased by 26.5%. Calculations presented in Table 1 show that 76.7% of this increase originated from the increasing use of factor inputs (45.4% came from the increasing use of chemical fertilizer and 39.7% from

the use of tractor in preparation of soil). Effect of labor on the food output growth was small, around 4%. Falls in the food planting area made the food output decrease by 12.4%.

- Reforms in agricultural production contributed significantly to the food output growth in this period. Agricultural reform contributed 49.7% of the increase in food output. The most important factor is the introduction of decollectivization. This reform in the managing mechanism contributed 40.2%. Changes in the sowing index also reflected effects of the reform in managing mechanism and these changes represented 9.5% of the increase in food output.

- Table 3 also affirmed that changes in the official price of food in the early 1980s produced no effect on the food output while rises in the market price of food influenced it significantly. In comparison with the decollectivization, changes in prices of food produced much smaller effect. Phan Văn Tiệm (1991) remarked that the reform in pricing in the late 1980s wasn't carried out strongly enough, and in this period the official price rose more slowly than the market one. The time trend which reflected changes in farming techniques and increase in agricultural materials supplied by the free market accounted for 54.7% of the growth of food output.

In short, the decollectivization in the early 1980s affected favorably the growth of food output. It encouraged farmers to work harder and apply new farming techniques (use of tractors, new grain seeds and chemical fertilizer).

2. In the late 1980s

- The decollectivization was basically completed in 1989. Table 2 shows that the food output increased by 26%. Increases in factor inputs accounted for 62.2% of the growth of food output. Changes in labor productivity caused by other factors accounted for some 10%. The remaining 27.7% was due to other inexplicable factors. The growth of food output originating from the increasing use of chemical fertilizer reduced from 45.4% in the years 1980-85 to 8% in 1985-90. Meanwhile, the increasing use of equipment and cattle in preparing the soil accounted for 52% of the growth of food output. Besides the increasing use of cattle, the data show that there was an increase in the labor force and farming land area. Thus, the decrease in volume of chemical fertilizer used was made up for by the increasing use of cattle and labor in farming food.

- Changes in official price of food made the food output increase by some 0.8% in the years 1986-90 in comparison with 1980-85. The time trend increased the food output by 44.7%. This reflected the popularity of new farming techniques.

In short, the reform in the managing mechanism, or the decollectivization, continued to affect favorably the food production in spite of the fact that its effects were weaker in comparison with those in the years 1986-90. Reforms in official price of food weren't strong enough to produce better results.

3. In the early 1990s

The reform in the pricing policy was characterized by the introduction of "one price" policy in which the official price was adjusted to the market prices of agricultural materials and food. In addition, the liberalization of trade in agricultural materials also encouraged the use of those materials.

- Table 2 shows that traditional factor inputs became increasingly important to the growth of food output in this period. The farming land area that increased by 1.8% a year accounted for 22% of the growth while the chemical fertilizer contributed 17.7% as compared with 8.05% in 1986-90 and tractor 20.6%. The labor in use although decreased from 1.7% to 1.09% kept contributing the same percentage, around 6-7%. The sowing index accounted for some 9%, lower than the contribution in 1986-90.

- Table 3 shows that in 1991-95, changes in official price made the food output decrease by 29% in comparison with the period 1986-90. However, this was made up for by rises in market price of food that caused the food output to increase by 34.7%, much higher than the increase in 1986-90.

In short, the price reform in 1991-95 had great effects on the growth of food output.

Table 1: Results of the assessment of food production function and food supply function

Variable	Production function (1)	Supply function (2)
ln (land)	0.36** (0.17)	
ln (labor)	0.21 (0.15)	
ln (equipment)	0.55***(0.17)	
ln (fertilizer)	0.047**(0.033)	
Proportion of families applying reformed mechanism	0.11**(0.049)	0.13*(0.084)
Market price/ Factor inputs		0.00045**(0.00022)
Official price/ Factor inputs		–0.000058 (-0.000040)
Sowing index	0.0038**(0.0019)	
Time		0.029***(0.0082)
Zone		0.39***(0.033)
Adjusting R^2 co-efficient	0.962	0.901
FProportion	143.70	61.31
Surveyed number	34	34

Note: values in bracket are standard error
(*) significant at 10% level,(**) significant at 5% level, (***) significant at 1% level

IV. CONCLUSION AND SUGGESTIONS

1. Conclusion

This article aims only at calculating effects of reforms on the food output in a certain period. The analysis shows that agricultural reforms encouraged farmers to make greater efforts and apply new farming techniques. Thus, the agricultural reforms should be continued in order to exert long-lasting effects on the food production.

2. Suggestions

- Rural reforms should be continued with a view of making farmers become more autonomous in their business. Top priority should be given to construction of infrastructure: irrigation system, road network, power supply, etc. The money

Table 2: Effects of factor of productions on growth of food output (production function)

Variable	Co-efficient (1)	1980-1985		1986-1990		1991-1995	
		Changes in variable (2)	Contribution to growth (%) (3)= (1)*(2)	Changes in variable (4)	Contribution to growth (%) (5)= (1)*(4)	Changes in variable (6)	Contribution to growth (%) (7)= (1)*(6)
Factor inputs			20.36 (76.74)		16.14 (62.17)		9.89 (67.69)
Land	0.36	–9.10	–3.28 (-12.36)	–3.10	–1.12 (-4.31)	8.93	3.21 (21.97)
Labor	0.21	5.06	1.06 (4.00)	7.81	1.64 (6.36)	5.17	1.09 (7.46)
Tractor (equipment)	0.55	19.17	10.54 (39.73)	24.61	13.53 (52.11)	5.48	3.01 (20.60)
Fertilizer	0.047	256.07	12.04 (45.38)	44.54	2.09 (8.05)	35.75	2.58 (17.66)
Others			13.18 (49.68)		2.62 (10.09)		1.31 (8.97)
Proportion of families applying reformed mechanism	11.00	0.97	10.67 (40.22)	0.00	0.00	0.00	0.00
Farming co- efficient	0.38	6.60	2.51 (9.46)	6.9	2.60 (10.09)	3.43	1.31 (8.97)
Difference			–7.01 (-26.42)		7.20 (27.74)		3.41 (23.34)
Growth of food output			26.53 (100)		25.96 (100)		14.61 (100)

Table 3: Analysis of effects by factors of production on growth of food output (supply function)

Variable	Co-efficient (1)	1980-1985		1986-1990		1991-1995	
		Changes in variable (2)	Contribution to growth (%) (3)= (1)*(2)	Changes in variable (4)	Contribution to growth (%) (5) = (1)*(4)	Changes in variable (6)	Contribution to growth (%) (7)= (1)*(6)
Proportion of families applying reformed mechanism	13	0.97	12.61	0.00		0.00	
Market price	0.045	29.3	1.32	–5.1	–0.23	770.1	34.45
Official price	–0.005 8	117	–0.6 8(-2.60)	–144.3	0.84 (3.24)	4,994.4	–28.96 (-198.22)
Time trend	2.9	5	14.5 (54.66)	4	11.6 (44.68)	3	8.7 (8.48)
Difference			–1.21 (-4.56)		13.75 (52.97)		1.24 (8.48)
Growth of food output			26.53 (100)		25.96 (100)		14.61 (100)

market in rural areas is also needed for facilitating new investment and improving farmers' living standard.

- Appropriate pricing policies for each period, including price support, should be adopted in order to maintain and increase farmers' income. Foreign experience shows that developing countries that want to ensure food safety had to offer price support or purchase farm products at high prices although the average yield is high and the area of farming land doesn't contracted. In Vietnam, to give price support to farmers effectively, it's necessary to create favorable conditions for food production (giving subsidies for power, transport, irrigation, etc.) in order to reduce production and transport costs.

- A system of rural banks is also necessary. Banks should ensure a volume of credit for farmers and Government's subsidies are needed for providing farmers with soft loans.■

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