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### **Does production of traded agricultural products help poverty reduction? evidence from Vietnam**

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#### **Abstract**

This paper measures the impact of production of traded agricultural products on households' welfare and poverty in rural Vietnam. It is found that the production of rice has very small and not statistically significant impact on household income and expenditure. However, the production of traded perennial crops and aquacultural products helps the producing households increase expenditure and income. Regarding to the impact on poverty, perennial crops and aquacultural products reduce the poverty incidence of the producing households by 3.1 and 4.7 percentage points, respectively. Perennial crops and aquacultural products also help the households decrease the poverty gap and the poverty severity.

## 1. INTRODUCTION

Agriculture can contribute to economic growth and poverty reduction by different ways such as provision of food and employment generation (e.g., see Johnston and Mellor, 1961; Ranis et al., 1990; Irz et al., 2001; Timmer, 2002, etc.). Agricultural export can bring an important source of income for countries, especially the developing ones.<sup>1</sup> However, agriculture is not always a panacea for economic development and poverty reduction. A country which relies on agricultural export can be adversely affected by global economic shocks. A channel for shock transmission is the price of output and inputs (Winters et al., 2004; Easterly and Kraay, 2000). A sudden decrease in prices of agricultural outputs can quickly push the poor households who are in tradable agriculture into losses and poverty. In addition, the industry and service sectors tend to grow more quickly than the agricultural sector in the long run. The shrinking of agriculture relative to industry and service has been observed in both developed and developing countries. The non-farm employment and business have been proved to be an effective way to increase household income and reduce poverty (e.g., Lanjouw and Lanjouw, 1995; Lanjouw, 1997, van de Walle, 1994, Ruben and van den Berg, 2001, etc.)

Vietnam has been an agricultural country. The agriculture sector accounted for around 20% of GDP in 2007. The agriculture sector also absorbed 54% of the total labors. The export value of agricultural products increased from 40380 billion VND to 153985 billion VND during the period 1995-2006.<sup>2</sup> However, like other countries, the agricultural sector tends to shrink overtime in Vietnam. The ratio of households involved in agricultural activities decreased remarkably from 65% to 54% during the period 2000-2007. The share of agriculture in GDP was also reduced from 25% to 20% during the same period. The share of agricultural products in total export revenue was reduced from 32% to 14% during the period 1995-2006.

Thus, it is not clear whether the traded agricultural products still make a great contribution to household income and poverty reduction. If the agriculture sector covers a lower proportion of the poor or it does not lead to a significant increase in income and consumption, its effect on poverty will be smaller. Information on impact evaluation of agricultural production on poverty can be helpful for the government in implementing policies and programs on agricultural promotion and poverty reduction. The main objective of this paper is to measure the impact of households' production of main traded agricultural products on household welfare and poverty reduction using data from Vietnam Household Living Standard Surveys in 2002 and 2004.

There are five sections in this paper. The second section describes data sources used in this study. The third section gives brief overview poverty and the traded agricultural sector in Vietnam. Next, the fourth section presents findings on impact estimation. Finally, the fifth section concludes.

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<sup>1</sup> The role of trade liberalization is discussed in numerous studies e.g., Harrison, 2005; Winters et. al., 2004; and McCulloch et al., 2001.

<sup>2</sup> 1 USD is approximately 16000 VND in January 2006.

## 2. DATA SET

The study relies on data from the two recent Vietnam Household Living Standard Surveys (VHLSS), which were conducted by the General Statistics Office of Vietnam (GSO) with technical support from the World Bank (WB) in the years 2002 and 2004. The 2002 and 2004 VHLSSs covered 30,000 and 9,000 households, respectively. The samples are representative for the national, rural and urban, and regional levels. The 2002 and 2004 VHLSSs set up a panel of 4,000 households, which are representative for the whole country, and for the urban and rural population.

The surveys collected information through household and community level questionnaires. Information on households includes basic demography, employment and labor force participation, education, health, income, expenditure, housing, fixed assets and durable goods, participation of households in poverty alleviation programs. This study focuses on the rural population. The main reason is that commune variables are used in regression analysis of the remittance impact, and there are only data on commune variables for rural areas in the 2004 VHLSS. In addition, most of the poor and agricultural households are living in rural areas. The number of households in the rural panel for 2002-2004 is 3,099.

## 3. POVERTY AND AGRICULTURAL SECTOR IN VIETNAM

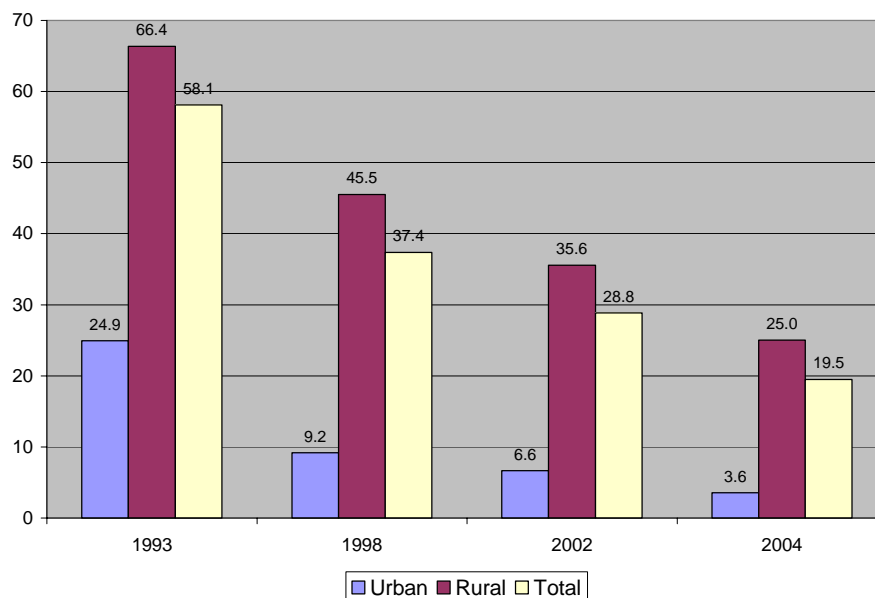
In this study, a household is classified as poor if their per capita expenditure is below the poverty line which is set up by WB and GSO. The poverty line is equivalent to the expenditure level that allows for nutritional needs and some essential non-food consumption such as clothing and housing. This poverty line was first estimated in 1993. Poverty lines in the following years are estimated by deflating the 1993 poverty line using the consumer price index.<sup>3</sup> Figure 1 presents the poverty rates over the period 1993-2004. It shows that the proportion of people with per capita expenditure under the poverty line dropped dramatically from 58% in 1993 to 37% in 1998. The poverty rate continued to decrease to 29% and 20% in 2002 and 2004, respectively.<sup>4</sup> However, the poverty rate remains rather high in rural areas, at 25% in 2004. Together with reduction in poverty, inequality has been increasing overtime, albeit at a moderate pace. The Gini index increased from 0.33 in 1993 to 0.37 in 2004.

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<sup>3</sup> Regional price differences and monthly price changes over the survey period have been taken into account when the poverty lines are calculated.

<sup>4</sup> The poor are classified based on the expenditure poverty line constructed by WB-GSO. The poverty lines in the years 1993, 1998, 2002, and 2004 are equal to 1160, 1790, 1917, and 2077 thousands VND, respectively.

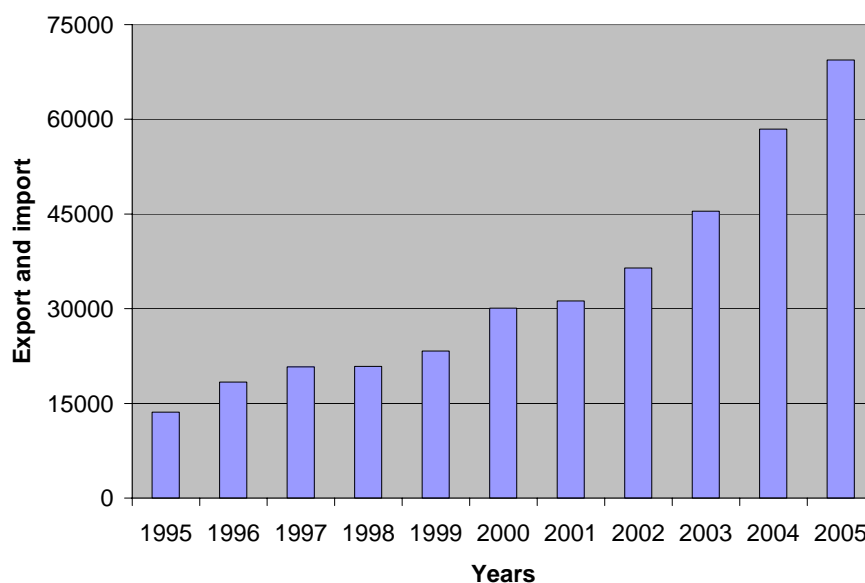
Figure 1: Poverty rate over the period 1993-2004 (%)



Source: Estimation of VHLSS in 1993, 1998, 2002, and 2004.

Since the economic reform in 1980s, Vietnam economy has been integrated increasingly into the global economy. Economic openness and trade liberalization have increased import and export revenue of Vietnam remarkably. The foreign trade revenue increased from 13604 million USD in 1995 to 69420 million USD in 2005, at the average annual growth rate of more than 30% (Figure 2).

Figure 2: Revenue of import and export of Vietnam during 1995-2005 (million USD)

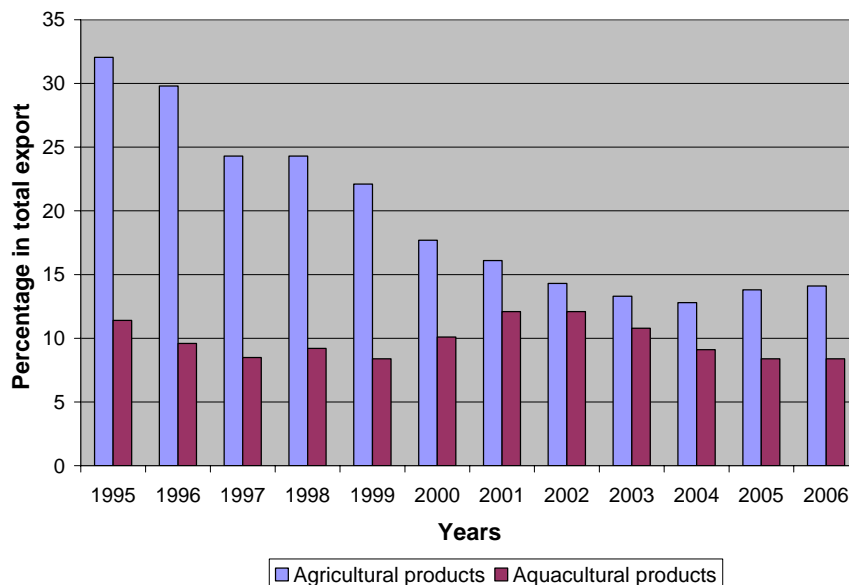


Source: Statistical Year Books of General Statistical Office of Vietnam

However, the share of agricultural products (excluding aquaculture) in total export revenue has been reduced (Figure 2). The share decreased from 32% in 1995 to

14% in 2006. The share of aquaculture products in the total export revenues was also reduced in the recent years. During the period 2003-2006, this share decreased by 3 percentage points from 11% to 8%.

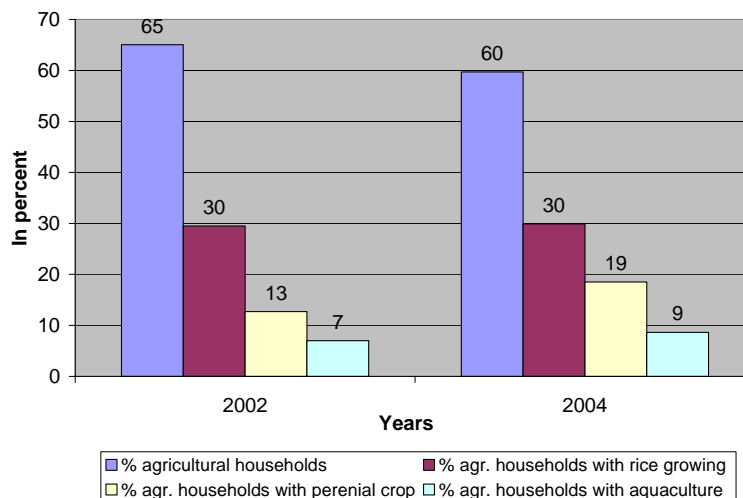
Figure 3: Share of agricultural and aquaculture products in total export revenue



Source: Statistical Year Books of General Statistical Office of Vietnam

In this paper, we examine the impact of the production of main agricultural products for export including rice, perennial crops and aquacultural products. Figure 4 presents the percentage of agricultural households in whole population, and the percentage of agricultural households who produce these products for sale during the period 2002-2004. It shows that the ratio of household involved in agricultural sector was decreased from 65% to 60%. However, among these agricultural households, the ratio of households with crop products and aquaculture were increased.

Figure 4: Percentage of agricultural households producing main exported products



Source: Estimation from VHLSSs 2002 and 2004

## 4. IMPACT OF PRODUCTION OF TRADED AGRICULTURAL PRODUCTS

### 4.1. Impact Evaluation Method

This section presents the method to measure the impact of agricultural production on household income and consumption expenditure. Assume the following function of households' outcome at time  $t$ :

$$\ln(y_i) = \alpha + X_{it}\beta + D_{it}\gamma + u_i + v_{it}, \quad t = 1, 2, \quad (1)$$

where  $y_i$  is income or expenditure of household  $i$ ;  $X_{it}$  are household characteristics at time  $t$ ; and  $D_{it}$  are the binary variables indicating the productions of the agricultural products, i.e. rice, perennial crops and aquacultural products. The effect of  $D$  is measure by  $\gamma$ . The unobservable component is decomposed into two elements:  $u_i$  which is time-invariant and allowed to be correlated with  $D_{it}$ , and  $v_{it}$  which is time-variant but uncorrelated with  $D_{it}$ .

The difficulty in estimating effect of the trade variables is endogeneity of the trade variables. In this study, we apply the fixed-effect regression, which can correct the problem of correlation between the agricultural variables and error terms under an assumption that the correlation goes only through time-invariant error terms. This assumption would be reasonable during a short time period of 2002-2004. Using the panel data, we can running regression on the difference in outcome on the differences in explanatory variables, i.e., differencing out (1) over time  $t=1$  and  $t=2$ :

$$\Delta \ln(y_i) = \Delta X_{it}\beta + \Delta D_{it}\gamma + \Delta v_{it}, \quad (2)$$

Once the parameters in (1) are estimated, we can estimate the impact of  $D$  on poverty reduction. In this paper, poverty is measured by three Foster-Greer-Thorbecke poverty indexes which can all be calculated using the following formula (Foster, Greer and Thorbecke, 1984):

$$P_\alpha = \frac{1}{n} \sum_{i=1}^q \left[ \frac{z - Y_i}{z} \right]^\alpha, \quad (3)$$

where  $Y_i$  is a welfare indicator (consumption expenditure per capita in this paper) for person  $i$ ,  $z$  is the poverty line,  $n$  is the number of people in the sample population,  $q$  is the number of poor people, and  $\alpha$  can be interpreted as a measure of inequality aversion.

When  $\alpha = 0$ , we have the headcount index  $H$  which measures the proportion of people below the poverty line. When  $\alpha = 1$  and  $\alpha = 2$ , we have the poverty gap  $PG$  which measures the depth of poverty, and the squared poverty gap  $P_2$  which measures the severity of poverty, respectively.

Impact of the program on a poverty index of the participants is expressed as follows:

$$\Delta_p = P(D > 0, Y) - P(D > 0, Y_{(D=0)}), \quad (4)$$

where the first term in the left-hand side of (4) is the poverty measure of households in the presence of the agricultural production. This term is observed and can be estimated directly from the sample data. However, the second term in the left-hand side of (4) is the counterfactual measure of poverty, *i.e.*, poverty indexes of the agricultural households if they had not produced the agricultural products. This term is not observed directly, and it is estimated using predicted expenditure from the fixed-effect regression. For an agricultural household  $i$ , their expenditure without the agricultural production (also called counterfactual expenditure) is estimated simply as follows:

$$Y_{i(D=0)} = \exp[\ln(y_i) - \hat{\gamma}] \quad (5)$$

## 4.2. Estimation Results

Table 1 presents the impact estimation of the production of the agricultural products on per capita expenditure and income per capita using the fixed-effect regressions. Explanatory variables include household composition, characteristics of household head, education of head and head's spouse, household assets, and characteristics of communes and villages. It shows that production of rice has negative point estimates of impact, but the estimates are not statistically significant in both the expenditure and income equations. On the other hands, growing perennial crops and aquaculture helps households increase per capita expenditure by around 4.9% and 5.1%, respectively. The production of perennial crops and aquaculture also increases per capita income of households by around 8.9% and 7.5%, respectively.

Table 1: Fixed-effect regression of per capita expenditure and income

Explanatory variables	Per capita expenditure		Per capita income	
	Coef.	Std. Err.	Coef.	Std. Err.
Production of rice	-0.0072	0.0147	-0.0336	0.0291
Production of perennial crops	0.0490**	0.0199	0.0888***	0.0270
Production of aquaculture	0.0508***	0.0166	0.0749***	0.0202
Ratio of members younger than 16	-0.4730***	0.0541	-0.4565***	0.0699
Ratio of members who older than 60	-0.3438***	0.0619	-0.5069***	0.0769
Household size	-0.1685***	0.0196	-0.1485***	0.0242
Household size squared	0.0077***	0.0016	0.0053***	0.0019
Ratio of members working in agriculture	-0.1848***	0.0237	-0.3035***	0.0291
Log of living areas	0.0708***	0.0168	0.0629***	0.0188
Living in permanent house	0.1316***	0.0324	0.1684***	0.0381
Living in semi-permanent house	0.0666***	0.0176	0.0849***	0.0221
Living in temporary house	Omitted			
Using flush toilet	Omitted			
Using other toilet	-0.1576***	0.0251	-0.1080***	0.0319
No toilet	-0.1468***	0.0287	-0.1316***	0.0374
Area of annual crop land (m2)	0.0058***	0.0016	0.0132***	0.0020
Area of perennial crop land (m2)	0.0015	0.0015	0.0055**	0.0027
Area of aquaculture water surface (m2)	0.0046	0.0034	0.0162***	0.0057
Forestry land (m2)	0.0012	0.0008	0.0030***	0.0012

Explanatory variables	Per capita expenditure		Per capita income	
	Coef.	Std. Err.	Coef.	Std. Err.
Social allowance (thousand VND)	0.0173**	0.0081	0.0377**	0.0162
Foreign remittances (thousand VND)	0.0016	0.0014	0.0094***	0.0023
Domestic remittances (thousand VND)	0.0256***	0.0028	0.0311***	0.0021
Distance to nearest road (km)	0.0010	0.0036	-0.0016	0.0052
Distance to nearest post (km)	-0.0041***	0.0011	-0.0021	0.0014
Dummy year of 2004	0.1136***	0.0075	0.1299***	0.0096
Constant	8.5374***	0.0856	8.6709***	0.0979
Observations	6198		6198	
Number of households in panel data	3099		3099	
R-squared	0.433		0.41	

Robust standard errors in brackets.

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%

Source: Estimation from VHLSSs 2002 and 2004

Table 2 presents impact estimates of the production of the traded agricultural products on poverty. It shows that the estimated impact of the rice production is very small and not statistically significant. However, the production of perennial crops and aquaculture helps the producing households reduce poverty. More specifically, the production of perennial crops reduces poverty incidence (P0) by 3.1 percentage points. It also decreases the poverty gap index (P1) and the poverty severity (P2) by around 12% and 13%, respectively. The aquacultural production results in a decrease of 4.7 percentage points in the poverty incidence of the producing households. The poverty gap index (P1) and the poverty severity are decreased by around 14% and 17%, respectively.

Table 2: Impact of agricultural production on poverty of the producing households in 2004

Poverty index	Production of rice			Production of perennial crop			Production of seafood		
	Y1	Y0	Impact (Y1-Y0)	Y1	Y0	Impact (Y1-Y0)	Y1	Y0	Impact (Y1-Y0)
P0	0.253*** [0.013]	0.246*** [0.014]	0.003 [0.008]	0.337*** [0.022]	0.368*** [0.028]	-0.031** [0.016]	0.282*** [0.014]	0.329*** [0.023]	-0.047*** [0.019]
P1	0.063*** [0.005]	0.062*** [0.005]	0.001 [0.003]	0.080*** [0.007]	0.091*** [0.009]	-0.011** [0.005]	0.070*** [0.005]	0.081*** [0.006]	-0.011*** [0.004]
P2	0.023*** [0.002]	0.023*** [0.002]	0.0003 [0.0011]	0.027*** [0.003]	0.031*** [0.004]	-0.004** [0.002]	0.025*** [0.002]	0.030*** [0.003]	-0.005*** [0.002]

Figures in parentheses are standard errors. Standard errors are corrected for sampling weights and estimated using bootstrap (non-parametric) with 500 replications.

\* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

Source: Estimation from VHLSSs 2002 and 2004.

## 5. CONCLUSIONS

This paper aims to measure the impact of production of traded agricultural products on income, consumption expenditure and poverty of the producing households using fixed-



effect regressions. The data used in this paper are from Vietnam Household Living Standard Surveys in 2002 and 2004. It is found that the production of rice does not have a significant impact on per capita income and per capita expenditure. It means that rice-growing households are not better off compared to other households. However, the production of perennial crops and aquaculture helps households increase expenditure and income. More specifically, the perennial crops help the crop-growing households increase per capita expenditure and per capita income by around 4.9% and 8.9%, respectively. Aquaculture also increases per capita expenditure and per capita income of farm households by 5.1% and 7.5%, respectively.

Regarding to impact on poverty, the production of rice has a very small and not statistically significant impact. However, the estimated impact of the production of perennial crops and aquaculture on poverty is negative and statistically significant. The production of perennial crops and aquaculture reduces the poverty incidence of the producing households by 3.1 and 4.7 percentage points, respectively. It also decreases the poverty gap index and the poverty severity of the producing households.

The findings suggest that agricultural production, especially the production of high-value products, remain an important tool to increase household income and consumption, and to reduce poverty. Thus, the government should have measures to promote the agricultural production such as stimulation of loans, improvement of roads and local market.

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