

# **ECONOMIC THEORY APPLICATIONS AND ISSUES**

**Working Paper No. 50**

**Structural Transformation in the Pig Sector  
in an Adjusting Vietnam Market:  
A Preliminary Investigation of Supply-side  
Changes**

**by**

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<sup>1</sup> A revised and extended version of a paper prepared for a Stakeholders' Workshop for the ILRI/ACIAR Research Project "Improving the competitiveness of pig producers in an adjusting Vietnam market" held in Hanoi on Friday, 22 August, 2008.

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# **Structural Transformation in the Pig Sector in an Adjusting Vietnam Market: A Preliminary Investigation**

## **ABSTRACT**

*This abstract summarises this article which relies on available official statistics to outline salient features of Vietnam's pig industry and changes in its structure occurring between 1996 and 2006. However, coverage of the latter aspect is limited by the availability of data. The focus of the article is on primary supplies of the quantity of pork. Between 1996 and 2006, Vietnam's volume of production of pork more than doubled and its availability of pork per capita (from its own stock) approximately doubled. This was an outstanding achievement. In 2006, however, growth rates in pork supplies and its availability per capita slowed. Both increased pig numbers and rising pork yields contributed to the increased supply of pork in Vietnam between 1996 and 2006. When the whole of the period 1996-2006 is considered, increased pig numbers made the major contribution to Vietnam's increased pork supplies. However, during this period increasing yields rose in relative importance as a contributor to expanding pork supplies and towards the end of the period, became the major influence on growth of pork supplies. In fact, increased yields were solely responsible for the continuing increase in pork supplies in 2006. This implies that the intensification of Vietnam's pig sector has accelerated in recent years and that it has become more market dependent. Nevertheless, the latest available statistical evidence indicates that Vietnam's pork production is still highly dependent on its household sector. In 2001, this sector accounted for over 90% of Vietnam's pigs and over 90% of these were held by households having 10 pigs or fewer. The continuing importance of households as suppliers of pork in Vietnam is underlined further by the fact that there were only 10,811 registered pig farms in Vietnam in 2006. These specialized farms (which have higher average holdings of pigs than household) are located mainly in three regions (the Red River Delta, the South East and the Mekong River Delta). The Red River Delta accounts for just over half of these farms. Insufficient data were available to me to provide much evidence of changes in the scale of pig production by individual households and farms and to specify the relative growth of the household versus the farm component of pork supplies. However, some evidence emerged of a slight increase in scale.*

*The regions of Vietnam contribute unevenly to the supply of its pork. In 2006, the largest volume of supply was from the Red River Delta (31.72%) and the Mekong Delta (19.57%) followed by the North East, South East and North Central Coast, each of which supplied about 12% of Vietnam's pork. The remaining three regions were relatively minor contributors to Vietnam's supply of pork. No **major** changes occurred in the relative suppliers of pork by Vietnam's regions between 1996 and 2006, and all increased their supplies of pork.*

*Pork yield in relation to pig stocks is found to vary substantially between Vietnam's regions. For example, in 2006, the lowest yield of pork was in the North West (39.18 kgs) and the highest was in the Mekong River Delta (123.11 kgs), a difference of 83.93 kgs. Average pork yields in all the regions of Vietnam rose between 1996 and 2006 and a large increase was recorded in average pork yields in Vietnam. The absolute disparity in pork yields between Vietnam's regions magnified. For instance, the difference between yields in the Mekong Delta and the North West (the regions with highest and lowest yields respectively) was 65.07 kgs in 1996 and rose to 83.93 kgs in 2006. When all regions are taken into account, the hypothesis is confirmed that absolute differences in yields between Vietnam's regions have risen although a small decline occurred in relative differences in regional yields. Therefore, the extent of intensification of pork production and market dependence shows considerable regional variation in Vietnam and the variation has probably risen. Those regions surrounding or near Vietnam's two major cities appear to be engaged in greatest intensification of pork production and have more market dependence than more distant regions. It should not, however, be automatically concluded that the economic efficiency of the pork production is greater in regions that have higher productivity than in those with lower productivity. This is because economic conditions are not the same in all regions, and there are environmental variations that affect productivity. In those regions having high productivity, pork producers seem to face higher economic risks because of their greater exposure to market volatility than in regions with lower productivity. Since 2006 Vietnam has begun to face the challenge of increased pork imports. This is a new source of competition for its pig industry. A few comments are provided on this subject.*

# **Structural Transformation in the Pig Sector in an Adjusting Vietnam Market: A Preliminary Investigation**

## **1. Introduction**

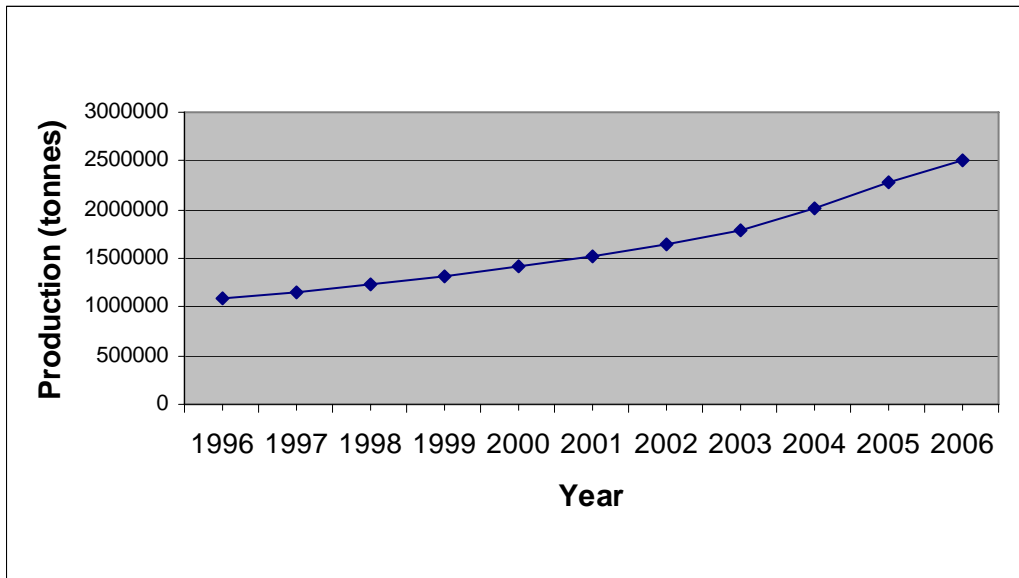
With rising incomes in Vietnam in recent years, the market for pork has expanded, the pig sector has become more market-oriented and the demand for better quality pork has increased. At the same time, new techniques for pig production, including improved breeds of pigs, have been introduced and this has added substantially to the supply of pork in Vietnam.

The purpose of this article is to present some observations on changes in the Vietnamese pig sector using the official data available to me. The data which I have been able to obtain to date are limited and thus the scope of this presentation is restricted. The article will be extended as further data comes to hand.

Information is provided on trends in the level of Vietnam's pork production, the number of pigs and changes in yields mainly for the period 1996-2006. Sources of the increases in supply of pork are decomposed, that is identified. Some information is provided on the relative importance of supply of pork by households compared to its supply by other than households, that is registered farms. Variations in the regional supply of pork, in the regional size of pig populations and in pork productivity are also considered.

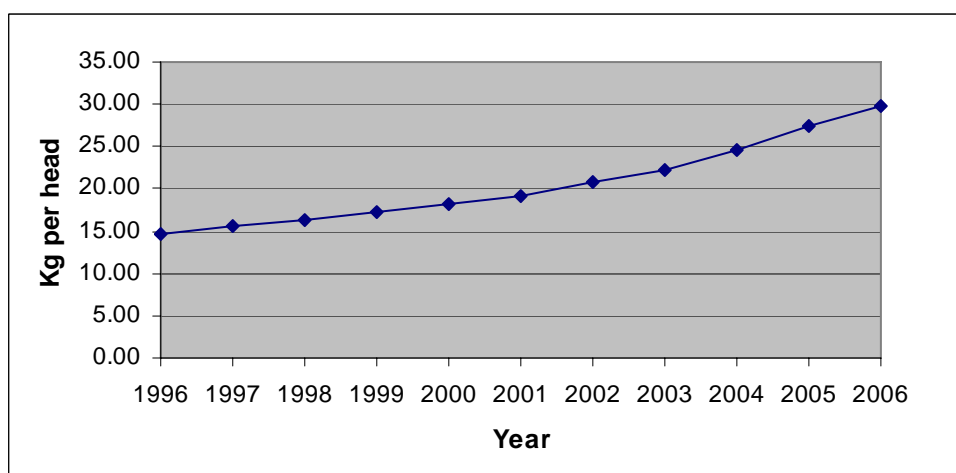
## **2. The Level of Pork Production and Per Capita Supplies of Pork**

Figure 1 graphs the level of Vietnam's pork production between 1996 and 2006. In this period, Vietnam's production of pork (based on liveweight equivalents) rose by 132%. In other words, it more than doubled. Although the growth rate of the increasing production tended to accelerate between 1996 and 2005, in 2006 this growth rate declined (see Table A1 and Figure 1). This **may** signal the beginning of slower future growth in Vietnam's supply of pork.



**Figure 1: Vietnam's volume of pork production (liveweight), 1996-2006. In this period, the volume of Vietnam's pork production rose by 132% (more than doubled). The growth rate slowed in 2006. (Source: based on Table A1)**

The growth in Vietnam's supply of pork outstripped the increase in its population between 1996 and 2006 and consequently, Vietnam's available supply of pork per capita rose. Figure 2 shows that in this period, Vietnam's per capita supply of pork increased annually but in 2006 its growth rate slowed. Vietnam's supply of pork rose from 14.76 kgs per head of its population in 1996 to 29.77 kgs in 2006. Consequently, it slightly more than doubled.



**Figure 2: Per capita production of pork in Vietnam, 1996-2006. Per capita production of pork approximately doubled in this period. A slow down in its growth is evident in 2006. (Source: based on Table A1)**

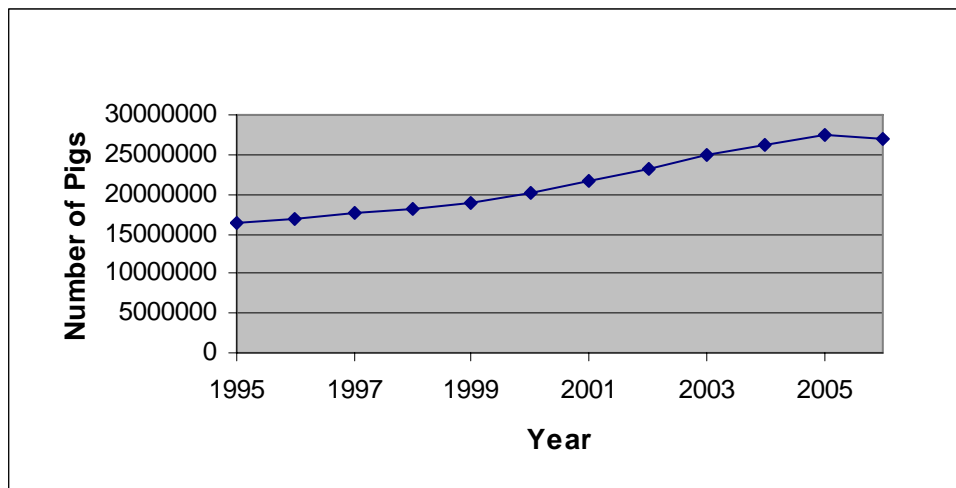
During the period 1996-2006, Vietnam had virtually no imports and no exports of pork. Consequently, Figure 2 also shows the level of per capita consumption of pork (in liveweight equivalents) in Vietnam in this period. However, the situation has now changed and is expected to change further. From 2007 onwards, Vietnam has begun importation of chilled and frozen pork from Canada and the USA. Imports are expected to increase. These nations have been able to obtain increased access to the Vietnamese market because Vietnam has joined the WTO and they are able to out-compete Vietnamese producers in supplying some types of pork suitable for processing or for supply to supermarkets. Vietnam's imports of pork are expected to continue to rise. This is expected to place growing economic pressure on its pork sector and to force structural change in this sector. To the extent that supermarkets expand as a component of Vietnam's retail sector, this is likely to reinforce these trends.

Let us, however, consider the basic factors that have contributed to an increase in the supply of pork in Vietnam in the period 1996-2006. The increase in the volume of pork produced in Vietnam is attributable both to a rise in Vietnam's pig stocks and the growth in the meat yield obtained from these stocks. Let us examine these components.

### **3. The Stock of Pigs in Vietnam**

The numbers of pigs in Vietnam during the years 1995 to 2006 are graphed in Figure 3. The number increased in every year between 1995 and 2005 but declined in 2006. The overall increase in pig numbers between 1995 and 2006 was almost 65%. The numbers of pigs in Vietnam increased by more than 10 million in this period.



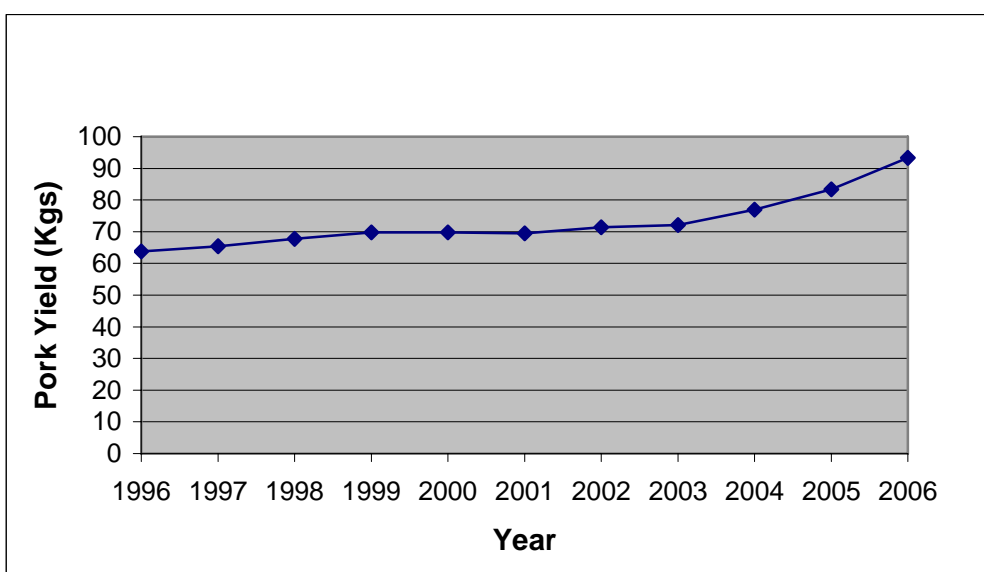


**Figure 3: Number of pigs in Vietnam, 1995-2006. The stock of pigs increased substantially in this period and was a major contributor to increased pork supplies. However, the stock declined in 2006. (Source: based on Table A2)**

There has also been a significant change in the genetic composition of Vietnam's stock of pigs. An increasing proportion of Vietnam's pig stock consists of exotic breeds and their crosses. However, I do not have concrete data on this aspect.

#### **4. The Imputed Yield of Vietnam's Stock of Pigs**

There has been a substantial increase in the yield of pork from Vietnam's stock of pigs. It rose from an average of 63.82 kgs per pig in the estimated stock to 93.28 kgs in 2006, that is by 46%. Average national yields for the period 1996-2006 are graphed in Figure 4. This graph indicates how the rate of increase in yields has accelerated in recent years. However, yields have not increased in every year since 1996. They declined slightly in 2000 and again in 2001 before displaying a strong upward trend. This pattern could be a reflection of how long it has taken for a new genetic stocks of pigs to diffuse as well as the lag in the adoption of new techniques for the husbandry of pigs. In addition, learning-by-doing takes time and those raising pigs would have had to familiarize themselves with new production methods and the best way to husband exotic breeds and their crosses.



**Figure 4: Pork yields in Vietnam, 1996-2006. Pork yields per pig in the stock rose from 63.82 kgs to 93.28 kgs (that is by 46%) in this period and made a significant contribution to increased supplies of pork in Vietnam. Yields have tended to rise at an increasing rate. (Source: based on Table A3)**

Rising pork yields indicate increasing intensification of Vietnam's pork sector and this suggests rising dependence of this sector on marketed inputs. This increases the vulnerability of Vietnam's pig sector to market fluctuations.

Given the measure of yield adopted here, (namely the annual volume of pork produced divided by the number of pigs in the stock), factors that can contribute increased yield include

- (1) Larger surviving litter sizes;
- (2) Faster growth rates of pigs which results in their being marketed at a younger age; and
- (3) Fewer boars due to the greater use of artificial insemination.

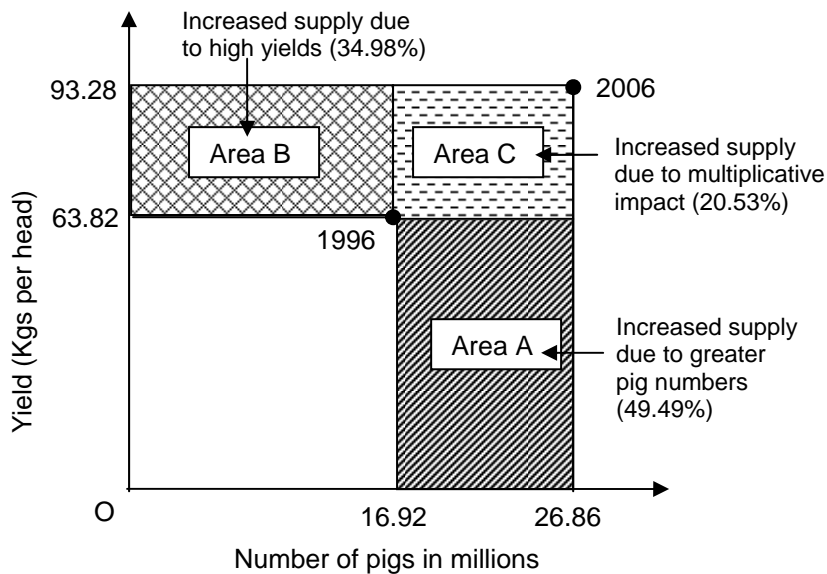
In turn each of these factors can be considered further to identify their causes. For example, faster growth rates may be due to genetic improvements, better nutrition, more satisfactory housing of pigs and an increase in their healthiness. These individual factors could be investigated further. It should however, be noted that increased yields from pig production when measured in the way done here do not necessarily imply that pig production has become more profitable. This would again separate investigation.

## **5. Increased Yield versus Increased Pig Stocks as Sources of the Growth in Vietnam's Supply of Pork**

To what extent has the extent of the expanded supply of pork in Vietnam been a result of increased pig numbers compared to higher pork yields? Between 1996 and 2006, Vietnam's pork production rose by 1,425,104 tonnes. This increase can be decomposed into three components:

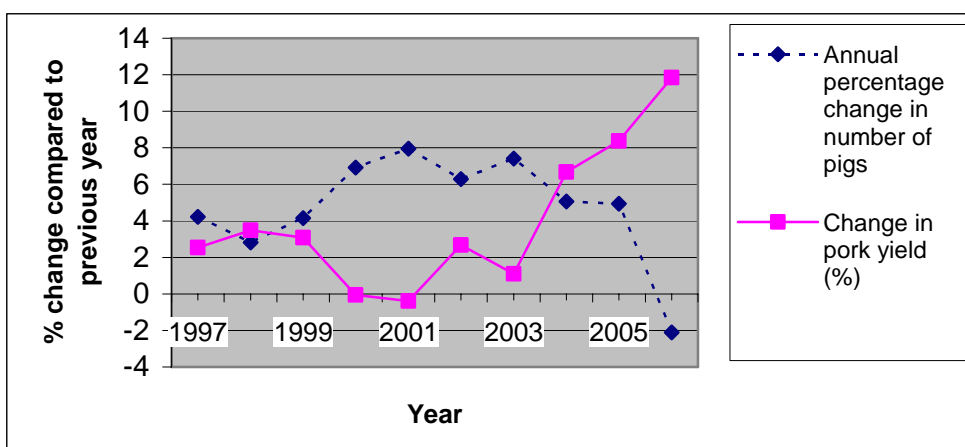
- (A) that due to the increase in the number of pigs;
- (B) that due to the rising yield from pigs; and
- (C) that due to the multiplicative impact of increased yield and rising pig numbers.

These items are identified in Figure 5 by the areas marked A, B and C respectively. It is found that increased pig numbers accounted for the largest proportion of the increase (49.49%) in pork supply between 1996 and 2006, higher yields contributed 34.98% of the increase and the combination of rising yield and pig numbers comprised 20.53% of the growth. Thus overall in this period, both rising pig numbers and yield were important for the growth in the volume of Vietnam's supply of pork, but the increased stock of pigs made the greater contribution.



**Figure 5: Decomposition of the increase in volume of pork production in Vietnam in 2006 compared to 1996. The main source of the growth in the volume of pork production was due to increased pig numbers (49.49%), increased yields (34.98%) and the combined effect of these factors (20.53%).**

Nevertheless, while during the period 1996-2003 rising pig numbers made the largest contribution to the rising supply of pork in Vietnam, from 2004 to 2006 yield became the most important contributor to Vietnam’s rising supply of pork. This is illustrated by Figure 6. From 2003 onwards, intensification of production in the pig industry in Vietnam rose sharply.



**Figure 6: Annual percentage change in pork yields and number of pigs, Vietnam. 1997- 2006. In earlier years, increases in the number of pigs made the largest contribution to increasing Vietnam’s output of pork but in later years increased yields have become the major contributor. (Source: based on Tables A2 & A3)**

## 6. The Distribution of the Size of Pig Holdings by Households and the Relative Importance of Households in Vietnam's Pig Sector

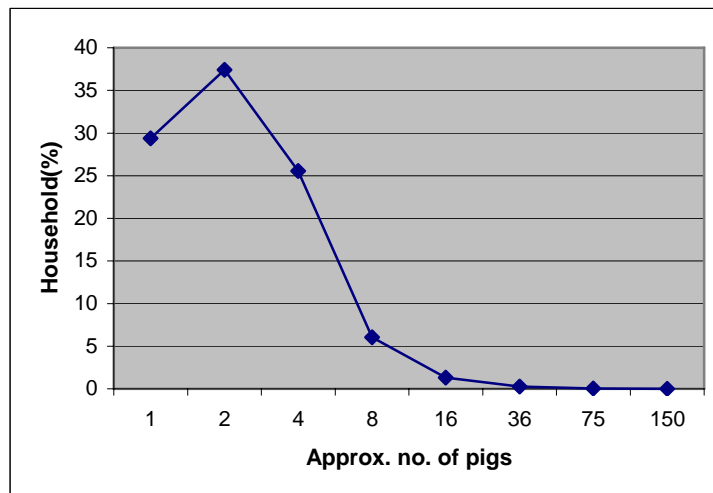
According to Vietnam's Agro-Census 2001, 7,390,875 households kept pigs and this amounted to 56.57% of Vietnam's rural households. However, the average number of pigs kept per household was small, namely 2.73 on average per household. Table 1 provides information on the distribution of pigs by the size of the holdings kept by households in 2001. The most frequently held number of pigs was two. Figure 7 indicates that the relative distribution of pig holdings per household is heavily skewed to the left. Most households had fewer than 6 pigs. The highest number of pigs is accounted for by those households having 3-5 pigs.

**Table 1: Distribution of pigs per pig household in Vietnam, 2001.**  
**Holdings of 5 or fewer pigs dominate the distribution of pigs held by households.**  
**(Source: adapted from Agri-Census,2001 )**

Total rural households =	13,065,756
Total pig producing households =	7390875
Percentage of pig households =	56.57%
Average no. of pigs per household =	2.73

Scale of pig holdings by pig households	Average approximate no. of pigs per household	Number of households	Total number of pigs for each household size (estimated) (a)	% of total pigs accounted for each household size	% of households in each category
1	1	2,172,828	2,172,828	10.18	29.40
2	2	2,764,524	5,529,048	25.91	37.40
3 -- 5	4	1,887,408	7,549,632	35.38	25.54
6 -- 10	8	446,573	3,572,584	16.74	6.04
11 -- 20	16	97,024	1,552,384	7.28	1.31
21--50	36	20,064	722,304	3.39	0.27
51--99	75	1,724	129,300	0.61	0.02
100 & above	150	730	109,500	0.51	0.01
		<b>Total =</b>	<b>21,337,580</b>	100.00	100.00

(a) Estimated using mid-points. The total of 21,337,5801 pigs is an over estimate, but the relative distribution is approximately correct.



**Figure 7 : The distribution of the relative frequency of pig households in Vietnam by approximate number of pigs held in 2001. In 2001, over 90% of pigs in Vietnam were held by households. They were the backbone of Vietnam's supply of pork. Most households held few pigs – the average holding was 2.5 pigs per household.(Source: based on Table 1)**

In 2001, results from the Agro-Census demonstrated that households accounted for the majority of pigs in Vietnam. From the fact that it was reported that 7,390,875 households held an average of 2.73 pigs each, it follows that households held 20,177,088 pigs. The total number of pigs present in Vietnam in 2001 was reported to be 21,800,100. This indicates that 1,623,212 pigs were not accounted for by households, that is approximately 7.5% of pigs stocks. These were presumably accounted for by farms as opposed to households. Also there could be some errors and shortcomings in the statistics. Nevertheless, it seems that around 92.5% of Vietnam's stock of pigs is accounted for by its household sector. This is one of the reasons why the ILRI study of this nature concentrating on the adjustment of households to market adjustments is important.

I have not yet been able to get data which provide an indication of the changing relative importance of the household sector in the supply of pork in Vietnam but I am seeking it. It is possible that the relative importance of the household sector is declining and that of the farm sector is growing in importance. However, a shift forwards to larger-sized pig-producing units appears to be slow.

Data in Table 91 (p.217) of the *Results of the 2006 Rural, Agricultural and Fishing Census: Volume 3 – Agriculture, Forestry and Fishing*, General Statistics Office, Hanoi, 2007, indicate that in 2006 more than half of Vietnamese households (55.72%)

keeping pigs had 2 pigs or less and only 1.75% had 21 pigs or more. In 2001, the corresponding percentages were 66.8% and 0.3% respectively. It can be concluded that the average scale of pig holdings increased, but not dramatically. Vietnam's pork production is still dominated by small-scale producing units. Production units vary from subsistence type, to semi-commercial to completely commercial units. Considerable heterogeneity in production units seems to exist although most units have probably become more involved in market transactions.

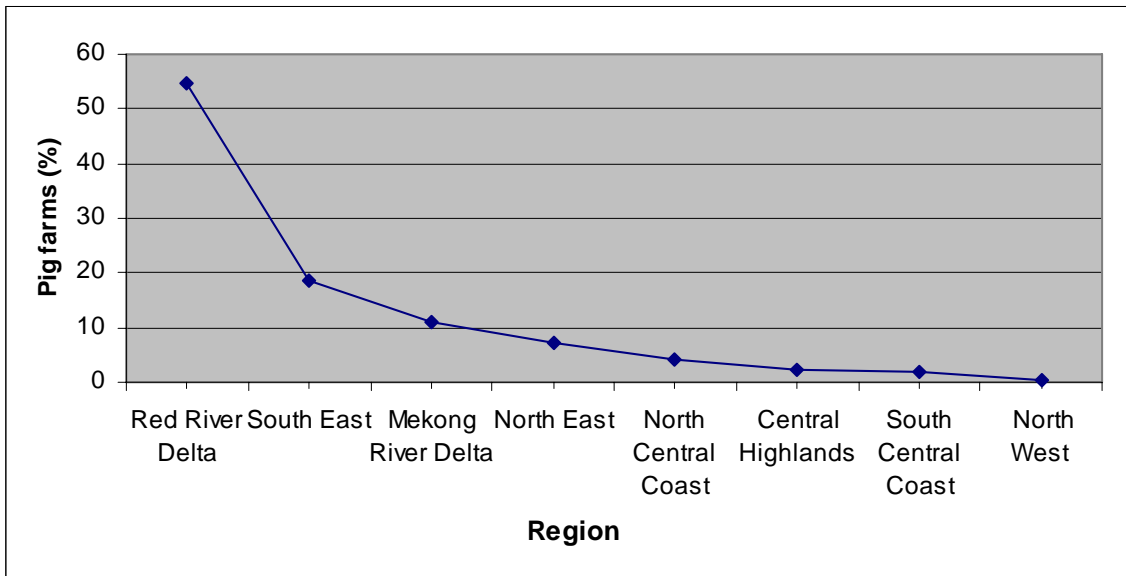
## 7. Pig Farms in Vietnam

Data on the number of pig farms in Vietnam and their attributes, such as their sizes, and changes with the passage of time have proven difficult for me to obtain to date. It is, however, known that the size of registered farms varies considerably and their average holding of pigs is substantially higher than that of households. Those who have registered farms obtain some concessions and subsidies but are also more likely to be taxed.

Data for 2006 indicate that there were 10,811 registered pig farms in Vietnam (see Table 2). Their regional distribution was very uneven (see Table 2 and Figure 8) with the Red River Delta accounting for more than half of these farms and with the South East Region and the Mekong Delta being next in importance. This suggests that most pig farms tend to be located not too far away from the major cities of Hanoi and Ho Chi Minh City.

**Table 2: Regional distribution of pig farms in Vietnam in 2006**  
**Three regions account for most of these farms.**  
 (Source: based on Table 63, pp. 164-165 results of 2006 Rural Agriculture Fishery Census, Vol 3 Agriculture, Farming and Fishery, GSO Hanoi, 2007)

Region	No. of pig farms	Pig farms (%)
Red River Delta	5902	54.59
South East	1997	18.47
Mekong River Delta	1179	10.91
North East	790	7.31
North Central Coast	452	4.18
Central Highlands	253	2.34
South Central Coast	210	1.94
North West	28	0.26
<b>Total no. of pig farms =</b>	<b>10,811</b>	100.00



**Figure 8 : Regional distribution of pig farms in Vietnam in 2006. Pig farms are not yet the major suppliers of pork in Vietnam. Their regional distribution is uneven. They have a concentration in the regions containing Hanoi and Ho Chi Minh City.**

## **8. The Regional Distribution of Pigs and Pork Production in Vietnam**

There is considerable variation in pig stocks held in the different regions of Vietnam. In 2006, the regions accounting for the largest number of pigs were in declining order: the Red River Delta, the North East Region, The Mekong River Delta and the North Central Coast (see Table 3). While the ordering is very similar when the volume of pork production by regions is considered, the percentage shares alter and the South East moves up the scale (see Table 4). Nevertheless, there is a high positive association between the number of pigs in each region and the volume of pork supplied in each as can be seen from Figure 9. Observe that there were some changes in the boundaries of regions between 1995 and 2006. **My data has not been adjusted for boundary changes, but adjustment does not seem to make a major difference (see Appendix II).**



**Table 3: Percentage of pig stocks accounted for to the different regions of Vietnam in 2006 and 1995. There is considerable regional inequality in the number of pigs in Vietnam in both years. (Source: Based on Table 4)**

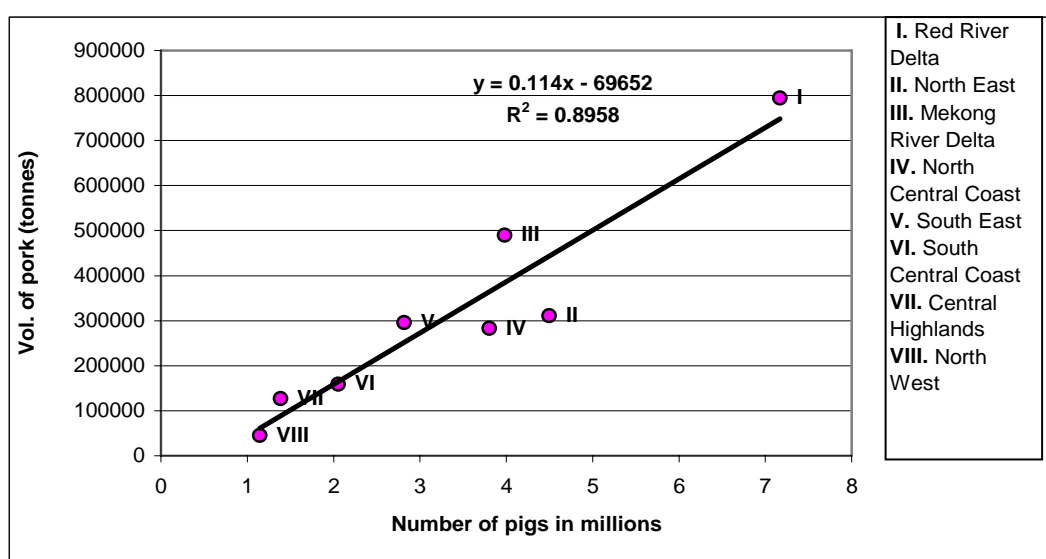
YEAR : 2006		
Rank	Region	% Pig stock
1	Red River Delta	26.69
2	North East	16.75
3	Mekong River Delta	14.83
4	North Central Coast	14.17
5	South East	10.50
6	South Central Coast	7.64
7	Central Highlands	5.16
8	North West	4.26

YEAR : 1995		
Rank	Region	% Pig stock
1	Red River Delta	26.24
2	North East	17.59
4	Mekong River Delta	14.58
3	North Central Coast	16.17
6	South East	6.94
5	South Central Coast	9.21
7	Central Highlands	4.80
8	North West	4.47

**Table 4: Percentage of volume of pork production accounted for by the different regions of Vietnam in 2006 and 1996. There is considerable inequality in the regional supply of pork in both years.**

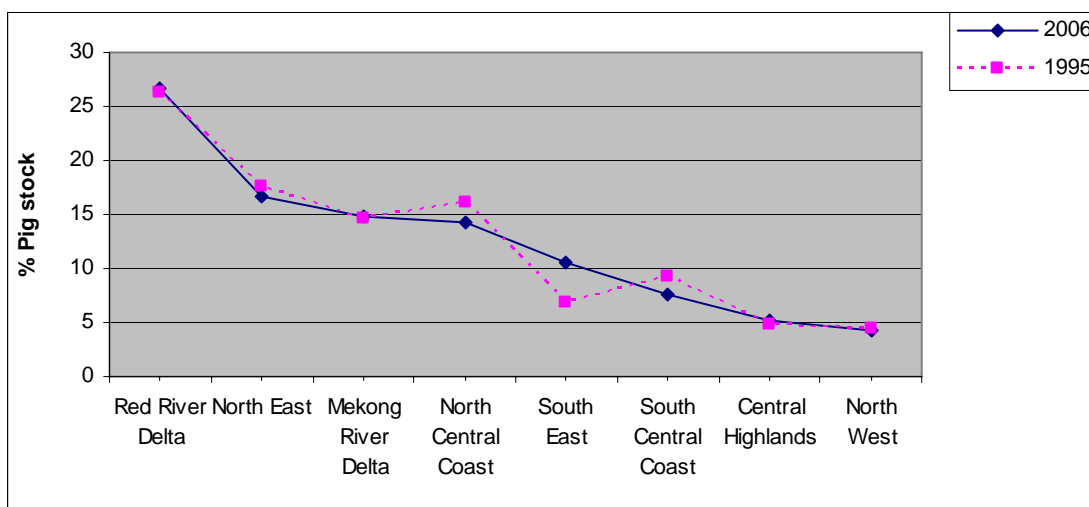
YEAR : 2006		
Rank	Region	%Pork production
1	Red River Delta	31.72
2	Mekong River Delta	19.57
3	North East	12.42
4	South East	11.79
5	North Central Coast	11.29
6	South Central Coast	6.36
7	Central Highlands	5.06
8	North West	1.79

YEAR : 1996		
Rank	Region	%Pork production
1	Red River Delta	29.83
2	Mekong River Delta	21.52
4	North East	12.35
5	South East	9.33
3	North Central Coast	13.12
6	South Central Coast	7.96
7	Central Highlands	3.99
8	North West	1.89

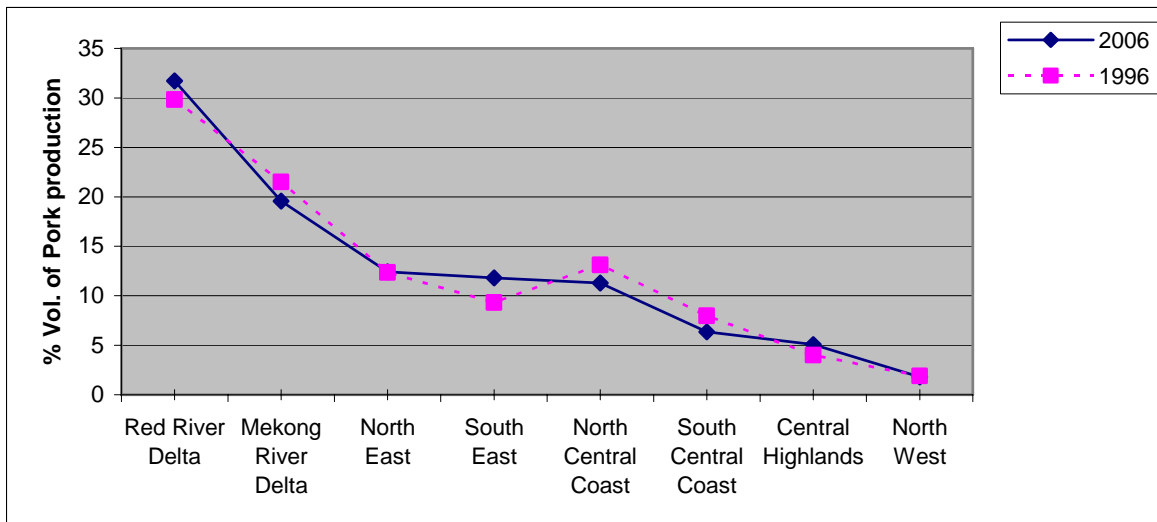


**Figure 9: Volume of pork in relation to pig stocks in the different regions of Vietnam in 2006. There is a relatively close association between volume of pork produced in each of the regions and the stock of pigs in each. Note that x in the equation refers to the number of pigs. (Source: based on Tables A1 and A2)**

Figures 10 and 11 graph the distribution of the pig population and the volume of pork supply by the regions of Vietnam for 1996 and 2006. No major change occurred in the regional distribution of pig stocks. However, it can be seen that relative numbers declined on the North Central Coast, increased significantly in the South East and declined in the South Central Coast. In relation to the supply of pork, a noticeable feature is the relative decline in the importance of the South Central Coast and North Central Coast as suppliers of pork. Increases in the relative supply of pork from the South East Region and Red River Delta can also be observed.



**Figure 10 : Graph of the percentage of pig stocks accounted for by the different regions of Vietnam in 2006 and 1995. In 1995 and 2006 the general regional distribution of pig stocks were similar, except that the percentage of pigs accounted for by the South East was higher in 2006 than 1996. (Source: based on Table 3)**



**Figure 11: Percentage of volume of pork production accounted for by the different regions of Vietnam in 2006 and 1996. The relative contributions of the regions of Vietnam to its volume of pork production were similar in 1996 and 2006. However, the South East increased its relative contribution. (Source: based on Table 4)**

## 9. Pork Yields in the Different Regions of Vietnam

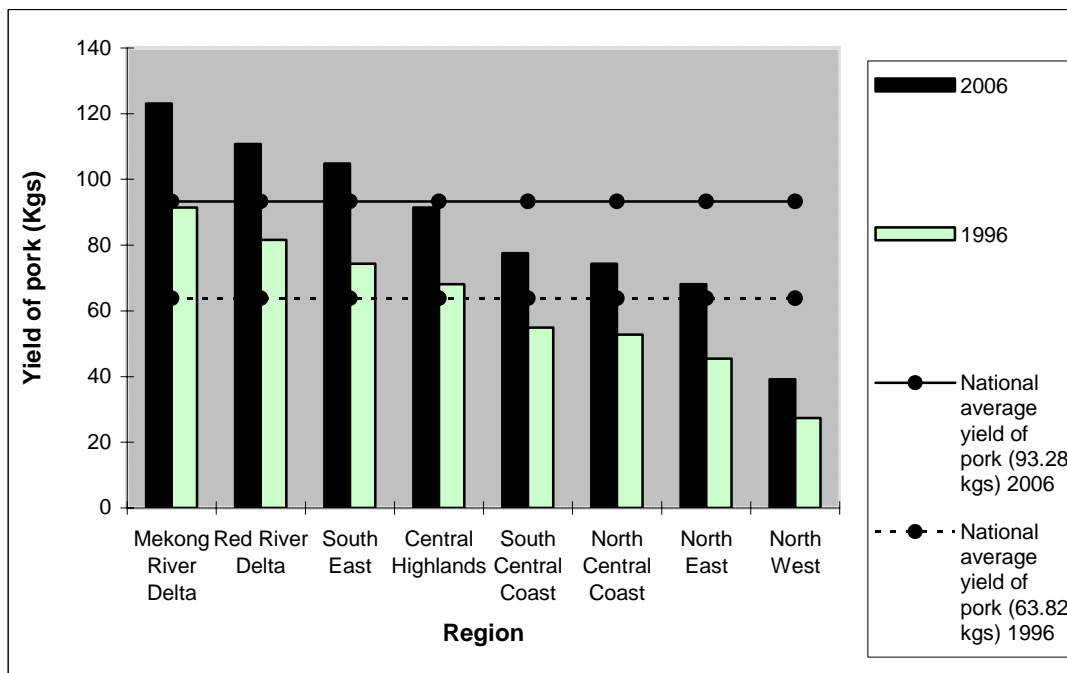
Between 1996 and 2006, pork yields increased in all regions of Vietnam as can be seen from Figure 12. Note that regional yields have been estimated by dividing reported annual volumes of pork supply for each region by pig numbers in each region.

Caution should be exercised in drawing inferences from these results because it seems that official Vietnamese regional data could be subject to considerable errors in estimation. But these are the only available relevant data at present and can provide results that can be further investigated. Furthermore, observe that it is assumed that the stated volume of output of pork for each region is produced in each region itself. The figures are assumed not to reflect regional movements of pigs for actual slaughtering but refer to the liveweight output of each region whether its local pigs are slaughtered there or not. Furthermore, there have been boundary changes for the regions. Allowing for these Achilles Costales (pers. conn. 30/8/2008) has obtained the results reported in Appendix II.

The results indicate that considerable disparity continues to exist in pork yields between Vietnam's regions. For example, in 2006, the region with the highest yields (Mekong River Delta) had a yield of 3.41 times that of the region with the lowest yield (the North West Region). In 1996, this disparity was 3.34. Using this measure, there appears to have been some increase in the disparity of pork yields between regions in Vietnam in 2006 compared to 1996 (see Table 5). Nevertheless, the calculations shown in the last column of Table 5 indicate that there has on average been some reduction in the relative deviation of regional yields away from the average national yield. Nevertheless, the average absolute deviation rose from 18.27 kgs to 21.83 kgs.

**Table 5: Yields of pork in relation to pig stocks in the different regions of Vietnam in 2006 and 1996. (Based on Tables A4 and A5). The absolute regional disparity of yields has increased and the relative disparity is virtually unchanged.**

<b>YEAR : 2006</b>					
<b>Region</b>	<b>Rank</b>	<b>Pig yield (Kgs)</b>	<b>Rank</b>	<b>Pig stock (Numbers)</b>	<b>Deviation of regional from national avg. yield of 93.28 kgs.</b>
Mekong River Delta	<b>1</b>	123.11	<b>3</b>	3,982,000	29.83
Red River Delta	<b>2</b>	110.83	<b>1</b>	7,168,800	17.55
South East	<b>3</b>	104.81	<b>5</b>	2,819,000	11.53
Central Highlands	<b>4</b>	91.47	<b>7</b>	1,386,200	-1.81
South Central Coast	<b>5</b>	77.59	<b>6</b>	2,052,000	-15.69
North Central Coast	<b>6</b>	74.36	<b>4</b>	3,804,600	-18.92
North East	<b>7</b>	68.10	<b>2</b>	4,498,300	-25.18
North West	<b>8</b>	39.18	<b>8</b>	1,144,400	-54.10
<b>Average absolute deviation in yield=</b>					21.83
<b>divided by national average=</b>					0.23
<b>YEAR : 1996</b>					
<b>Region</b>	<b>Rank</b>	<b>Pig yield (kgs)</b>	<b>Rank</b>	<b>Pig stock (Numbers)</b>	<b>Deviation of regional from national avg. yield of 63.82 kgs</b>
Mekong River Delta	<b>1</b>	91.42	<b>4</b>	2,542,100	<b>27.60</b>
South East	<b>2</b>	81.62	<b>6</b>	1,235,000	<b>17.80</b>
Red River Delta	<b>3</b>	74.30	<b>1</b>	4,336,200	<b>10.48</b>
South Central Coast	<b>4</b>	54.95	<b>5</b>	1,565,200	<b>-8.87</b>
North Central Coast	<b>5</b>	52.77	<b>3</b>	2,685,300	<b>-11.05</b>
Central Highlands	<b>6</b>	49.37	<b>7</b>	873,000	<b>-14.45</b>
North East	<b>7</b>	45.39	<b>2</b>	2,939,100	<b>-18.43</b>
North West	<b>8</b>	27.35	<b>8</b>	745,800	<b>-36.47</b>
<b>Average absolute deviation in yield=</b>					18.27
<b>divided by national average=</b>					0.29



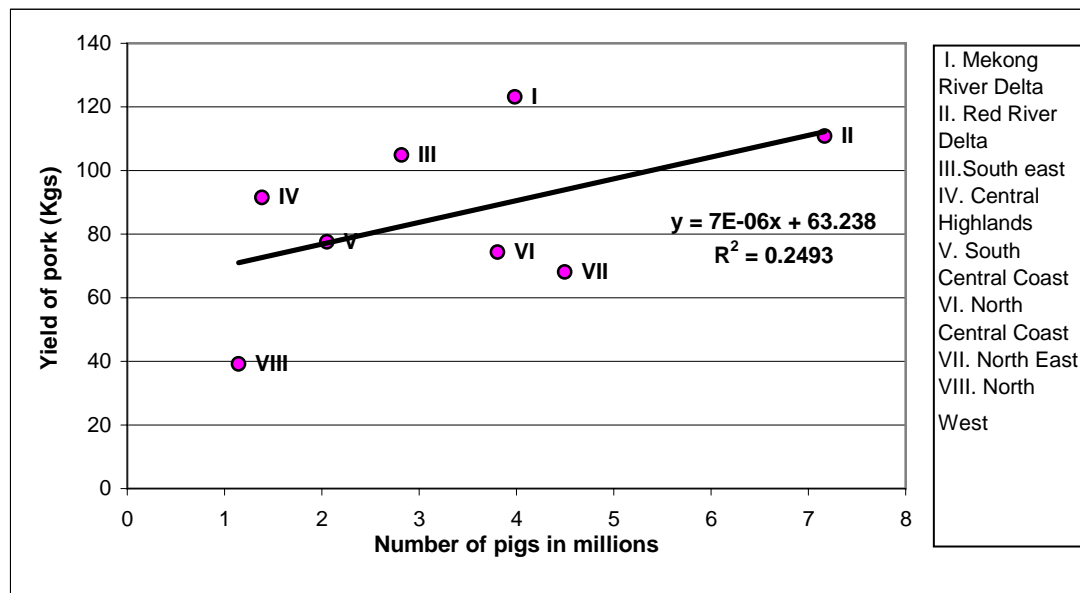
**Figure 12: Pork yields in the different regions of Vietnam in 1996 and 2006. Pork yields increased in all regions but remained very unequal. A number of measures indicate that the inequality of regional yields has risen. This inequality needs more investigation. However, some regional inequality is likely to be economic. (Source: based on Table 5)**

Disparity in the levels of pork productivity by regions in Vietnam may occur due to several factors. Differences could, for example reflect differences in the genetic composition of the pig stocks, and also could be a result of variations in nutrition and in husbandry techniques. However, variations in yield by regions cannot necessarily be said to demonstrate low economic efficiency in regions with low yields. Economic conditions can vary considerably by regions, and a high level of productivity in some areas will not be profitable.

Note that the three regions of Vietnam (the Mekong River Delta, the Red River Delta and the South West) had the highest levels of pork productivity (yields) in Vietnam in both 1996 and 2006 and the North West had the lowest yield in both years. Some changes in rankings occurred. For example, the Central Highlands moved from a ranking of 7<sup>th</sup> place to 4<sup>th</sup> place amongst the 8 regions. Yields in this region rose from 49.37 kgs. to 91.47 kgs.

From Table 5, it seems that regions that surround or are close to Vietnam's major cities (namely Hanoi and Ho Chi Minh City) have the highest yield of pork in relation to pig stocks.

Only a weak positive association was found between the number of pigs in each region and yields of pork as is evident from Figure 13 which further highlights the extent of disparities in the pork yields in Vietnam.



**Figure 13 : Yield of pork in relation to pig stocks in the different regions of Vietnam in 2006. There is only a very weak positive relationship between the number of pigs in the region of Vietnam and pork yields. Note that x in the equation is the number of pigs.**

## 10. Concluding Comments

The volume of pork production, the number of pigs and the average yield of pork per pig in Vietnam's stock of pigs have risen greatly since 1996. Vietnam's increased supply of pork since 1996 has been a result of increasing pig numbers and growing pork yields. While increased pig numbers accounted for the largest percentage of increased pork production between 1996 and 2006, increased yield was also important. In recent years, increased pork yield has become the major source of the growth in Vietnam's supply of pork. But the rate of growth in the volume of pork supplies was not sustained in 2006. This could be an indication that the rate of growth in Vietnam's supply of pork is slowing.

From the 2001 data, it appears that pig households account for over 90% of Vietnam's pig stocks. The average number of pigs held by households is quite small: 2.73 head. It seems likely that households account for the bulk of Vietnam's supply of pork. Whether the importance of households as suppliers of pork has declined since 2001 might become evident once the results of the 2006 Agro-Census are released.

Registered pig farms appear to vary significantly in size but usually tend to farm pigs on a larger scale than households. Registered pig farms seem to be concentrated in the regions surrounding or near Hanoi and Ho Chi Minh City.

The number of pigs in the various regions of Vietnam show considerable variation as does the volume of regional pork production. The Red River Delta, the Mekong River Delta, the North East and the South East were the most important sources of pork supply in 2006. Some regional changes in supply occurred between 1996 and 2006 but no major change is apparent.

Regional variations in pork yields are very considerable. Yields appear to be highest in regions containing Vietnam's two major cities or nearby. Although all regions of Vietnam have recorded increased pork yields since 1996, there appears to have been no reduction in the disparity of the regional yields.

It is apparent that intensification of Vietnam's pig sector has increased since 1996 and that pork production has become more market dependent. Therefore, the economic future of Vietnam's pig sector depends more than ever on changing market conditions. This probably means that the economic vulnerability of Vietnam's pig sector to external and (non-controlled) market forces has increased. Therefore, the present ILRI study is of considerable importance.

Despite positive indicators of improved performance in the period 1996-2006, Vietnam's pig industry has yet to achieve a strong competitive position internationally. This is reflected in its meagre level of exports of pork and since 2006 its rising imports of chilled and frozen pork from North America. These developments are likely to accelerate structural change in Vietnam's pork industry which so far has been slow to alter its structure. Unfortunately, increased pork yields and better quality pork produced in Vietnam are not certain to prevent further penetration of Vietnam's pork market by imports. How Vietnam and Vietnamese pig suppliers can best adjust to this new market challenge (this new source of market competition) is a matter requiring separate investigation.



## **11. Acknowledgements**

I wish to thank Lucy Lapar and Pham Phuong for assisting with the supply of official statistics, and Zeeshan Rahman for her research assistance. All statistics used in this paper are from sources of the Government Statistical Office, Hanoi. I also wish to thank participants in the Workshop held in Hanoi for their valuable comments on my presentation and Achilles Costales of the FAO for his helpful comments on the first draft of this paper which have enabled the original draft of this paper to be improved. I also wish to thank ILRI and ACIAR for the financial support for the research involved in preparing this paper.

# APPENDIX I

## ADDITIONAL TABLES

**Table A1: Vietnam's total pork production (liveweight) and its relationship to Vietnam's population, 1996-2006**

Year	Tonnes of production	Population of Vietnam	Kgs of pork per head	Absolute change in volume of production	Change in volume of production (%)
1996	1,080,000	73,156,700	14.76	-	-
1997	1,154,200	74,306,900	15.53	74,200	6.87
1998	1,228,000	75,456,300	16.27	73,800	6.39
1999	1,318,400	76,596,700	17.21	90,400	7.36
2000	1,409,015	77,635,400	18.15	90,615	6.87
2001	1,515,299	78,685,800	19.26	106,284	7.54
2002	1,653,595	79,727,400	20.74	138,296	9.13
2003	1,795,400	80,902,400	22.19	141,805	8.58
2004	2,012,021	82,031,700	24.53	216,621	12.07
2005	2,288,315	83,106,300	27.53	276,294	13.73
2006	2,505,104	84,155,800	29.77	216,789	9.47

**Table A2: Vietnam's pig stocks and changes in those, 1995-2006**

Year	Number of pigs	Annual change in number of pigs	Annual percentage change in pig numbers	Population of Vietnam	Pigs per head of population
1995	16,306,400	--	--	71,995,500	0.226
1996	16,921,700	615,300	3.77	73,156,700	0.231
1997	17,635,800	714,100	4.22	74,306,900	0.237
1998	18,132,400	496,600	2.82	75,456,300	0.240
1999	18,885,800	753,400	4.15	76,596,700	0.247
2000	20,193,800	1,308,000	6.93	77,635,400	0.260
2001	21,800,100	1,606,300	7.95	78,685,800	0.277
2002	23,169,500	1,369,400	6.28	79,727,400	0.291
2003	24,884,600	1,715,100	7.40	80,902,400	0.308
2004	26,143,700	1,259,100	5.06	82,031,700	0.319
2005	27,435,000	1,291,300	4.94	83,106,300	0.330
2006	26,855,300	-579,700	-2.11	84,155,800	0.319

**Table A3: Vietnamese pork yields, 1996-2006**

<b>Year</b>	<b>Pork yield in kgs</b>	<b>Absolute change in pork yield in kgs</b>	<b>Change in pork yield (%)</b>
1996	63.82	0.00	0.00
1997	65.45	1.62	2.54
1998	67.72	2.28	3.48
1999	69.81	2.08	3.08
2000	69.77	-0.03	-0.05
2001	69.51	-0.27	-0.38
2002	71.37	1.86	2.68
2003	72.15	0.78	1.09
2004	76.96	4.81	6.67
2005	83.41	6.45	8.38
2006	93.28	9.87	11.84

**Table A4: Regional distribution of pork production (liveweight production in tonnes) and percentage of total production in Vietnam, 1996-2006**

Year	Total pork production (liveweight) in Vietnam in tonnes	Red River Delta		North East	
		Pork production in tonnes (liveweight)	%Pork production	Pork production in tonnes (liveweight)	%Pork production
1996	1,080,000	322,200	29.83	133,400	12.35
1997	1,154,200	349,500	30.28	140,300	12.16
1998	1,228,000	374,400	30.49	150,200	12.23
1999	1,318,400	387,300	29.38	169,600	12.86
2000	1,409,015	416,735	29.58	181,796	12.90
2001	1,515,299	467,024	30.82	196,241	12.95
2002	1,653,595	501,579	30.33	210,863	12.75
2003	1,795,400	545,597	30.39	228,516	12.73
2004	2,012,021	621,975	30.91	252,529	12.55
2005	2,288,315	719,355	31.44	292,629	12.79
2006	2,505,104	794,536	31.72	311,134	12.42

Year	Total pork production (liveweight) in Vietnam in tonnes	North West		North Central Coast	
		Pork production in tonnes (liveweight)	%Pork production	Pork production in tonnes (liveweight)	%Pork production
1996	1,080,000	20,400	1.89	141,700	13.12
1997	1,154,200	21,700	1.88	144,000	12.48
1998	1,228,000	24,200	1.97	147,300	12.00
1999	1,318,400	22,700	1.72	152,800	11.59
2000	1,409,015	23,446	1.66	161,103	11.43
2001	1,515,299	26,325	1.74	170,877	11.28
2002	1,653,595	28,283	1.71	188,828	11.42
2003	1,795,400	30,395	1.69	208,724	11.63
2004	2,012,021	35,504	1.76	229,029	11.38
2005	2,288,315	40,952	1.79	263,963	11.54
2006	2,505,104	44,834	1.79	282,897	11.29

**Table A4: Regional distribution of pork production (liveweight production in tonnes) and percentage of total production in Vietnam, 1996-2006 (Cont. )**

Year	Total pork production (liveweight) in Vietnam in tonnes	South Central Coast		Central Highlands	
		Pork production in tonnes (liveweight)	%Pork production	Pork production in tonnes (liveweight)	%Pork production
1996	1,080,000	86,000	7.96	43,100	3.99
1997	1,154,200	90,000	7.80	44,800	3.88
1998	1,228,000	91,600	7.46	46,500	3.79
1999	1,318,400	99,900	7.58	60,600	4.60
2000	1,409,015	105,970	7.52	66,722	4.74
2001	1,515,299	110,955	7.32	67,749	4.47
2002	1,653,595	120,691	7.30	71,604	4.33
2003	1,795,400	124,253	6.92	78,764	4.39
2004	2,012,021	132,729	6.60	99,044	4.92
2005	2,288,315	147,415	6.44	114,138	4.99
2006	2,505,104	159,225	6.36	126,794	5.06

Year	Total pork production (liveweight) in Vietnam in tonnes	South East		Mekong River Delta	
		Pork production in tonnes (liveweight)	%Pork production	Pork production in tonnes (liveweight)	%Pork production
1996	1,080,000	100,800	9.33	232,400	21.52
1997	1,154,200	106,200	9.20	257,700	22.33
1998	1,228,000	124,000	10.10	269,800	21.97
1999	1,318,400	148,700	11.28	276,800	21.00
2000	1,409,015	155,662	11.05	297,581	21.12
2001	1,515,299	162,434	10.72	313,694	20.70
2002	1,653,595	182,456	11.03	349,291	21.12
2003	1,795,400	201,287	11.21	377,864	21.05
2004	2,012,021	224,611	11.16	416,600	20.71
2005	2,288,315	250,726	10.96	459,137	20.06
2006	2,505,104	295,462	11.79	490,224	19.57

**Table A5: Regional distribution of pigstocks (number of pigs and percentages) in Vietnam, 1995-2006**

Year	Total number of pigs in Vietnam	Red River Delta		North East		South East	
		Number of pigs	% Pig stock	Number of pigs	% Pig stock	Number of pigs	% Pig stock
1995	163,064	42,793	26.24	28,689	17.59	11,319	6.94
1996	169,217	43,362	25.63	29,391	17.37	12,350	7.30
1997	176,358	46,146	26.17	30,461	17.27	13,285	7.53
1998	181,324	47,950	26.44	31,910	17.60	13,940	7.69
1999	188,858	50,512	26.75	33,384	17.68	14,979	7.93
2000	201,938	53,985	26.73	35,098	17.38	16,496	8.17
2001	218,001	59,218	27.16	38,680	17.74	16,518	7.58
2002	231,695	63,071	27.22	40,074	17.30	18,627	8.04
2003	248,846	67,576	27.16	42,361	17.02	20,725	8.33
2004	261,437	68,985	26.39	43,910	16.80	24,027	9.19
2005	274,350	74,206	27.05	45,686	16.65	26,180	9.54
2006	268,553	71,688	26.69	44,983	16.75	28,190	10.50

Year	Total number of pigs in Vietnam	North West		North Central Coast		Mekong River Delta	
		Number of pigs	% Pig stock	Number of pigs	% Pig stock	Number of pigs	% Pig stock
1995	163,064	7,285	4.47	26,369	16.17	23,768	14.58
1996	169,217	7,458	4.41	26,853	15.87	25,421	15.02
1997	176,358	7,640	4.33	27,642	15.67	25,916	14.70
1998	181,324	8,187	4.52	27,743	15.30	25,936	14.30
1999	188,858	8,349	4.42	27,096	14.35	27,972	14.81
2000	201,938	8,675	4.30	29,440	14.58	29,766	14.74
2001	218,001	10,269	4.71	33,519	15.38	29,461	13.51
2002	231,695	10,509	4.54	35,699	15.41	31,516	13.60
2003	248,846	10,989	4.42	38,034	15.28	34,486	13.86
2004	261,437	11,763	4.50	38,523	14.74	37,138	14.21
2005	274,350	12,527	4.57	39,131	14.26	38,286	13.96
2006	268,553	11,444	4.26	38,046	14.17	39,820	14.83

**Table A5: Regional distribution of pigstocks (number of pigs and percentages) in Vietnam, 1995-2006 (Cont.)**

Year	Total number of pigs in Vietnam	South Central Coast		Central Highlands	
		Number of pigs	% Pig stock	Number of pigs	% Pig stock
1995	163,064	15,011	9.21	7,830	4.80
1996	169,217	15,652	9.25	8,730	5.16
1997	176,358	16,216	9.19	9,052	5.13
1998	181,324	16,178	8.92	9,480	5.23
1999	188,858	16,261	8.61	10,304	5.46
2000	201,938	17,250	8.54	11,228	5.56
2001	218,001	19,220	8.82	11,116	5.10
2002	231,695	20,287	8.76	11,912	5.14
2003	248,846	21,377	8.59	13,298	5.34
2004	261,437	22,205	8.49	14,887	5.69
2005	274,350	22,429	8.18	15,905	5.80
2006	268,553	20,520	7.64	13,862	5.16

**Table A6: Estimated pork productivity for each region in Vietnam, 1996-2006**

Year	Red River Delta			North East		
	Pork production (kgs)	Number of pigs	Pork productivity in kgs per head of stock	Pork production (kgs)	Number of pigs	Pork productivity (kgs) per head of stock
1996	322,200,000	4,336,200	74.30	133,400,000	2,939,100	45.39
1997	349,500,000	4,614,600	75.74	140,300,000	3,046,100	47.74
1998	374,400,000	4,795,000	78.08	150,200,000	3,191,000	49.31
1999	387,300,000	5,051,200	76.67	169,600,000	3,338,400	53.15
2000	416,735,000	5,398,500	77.19	181,796,000	3,509,800	54.46
2001	467,024,000	5,921,800	78.87	196,241,000	3,868,000	55.91
2002	501,579,000	6,307,100	79.53	210,863,000	4,007,400	54.51
2003	545,597,000	6,757,600	80.74	228,516,000	4,236,100	57.02
2004	621,975,000	6,898,500	90.16	252,529,000	4,391,000	59.61
2005	719,355,000	7,420,600	96.94	292,629,000	4,568,600	66.64
2006	794,535,600	7,168,800	110.83	311,133,001	4,498,300	68.10

Year	North West			North Central Coast		
	Pork production (kgs)	Number of pigs	Pork productivity in kgs per head of stock	Pork production (kgs)	Number of pigs	Pork productivity in (kgs) per head of stock
1996	20,400,000	745,800	27.35	141,700,000	2,685,300	52.77
1997	21,700,000	764,000	28.40	144,000,000	2,764,200	52.09
1998	24,200,000	818,700	29.56	147,300,000	2,774,300	53.09
1999	22,700,000	834,900	27.19	152,800,000	2,709,600	56.39
2000	23,446,000	867,500	27.03	161,103,000	2,944,000	54.72
2001	26,325,000	1,026,900	25.64	170,877,000	3,351,900	50.98
2002	28,283,000	1,050,900	26.91	188,828,000	3,569,900	52.89
2003	30,395,000	1,098,900	27.66	208,724,000	3,803,400	54.88
2004	35,503,001	1,176,300	30.18	229,029,000	3,852,300	59.45
2005	40,952,000	1,252,700	32.69	263,963,000	3,913,100	67.46
2006	44,833,001	1,144,400	39.18	282,897,000	3,804,600	74.36



**Table A6: Estimated pork productivity for each region in Vietnam, 1996-2006 (Cont.)**

Year	South Central Coast			Central Highlands		
	Pork production (kgs)	Number of pigs	Pork productivity in kgs per head of stock	Pork production (kgs)	Number of pigs	Pork productivity (kgs) per head of stock
1996	86,000,000	1,565,200	54.95	43,100,000	873,000	49.37
1997	90,000,000	1,621,600	55.50	44,800,000	905,200	49.49
1998	91,600,000	1,617,800	56.62	46,500,000	948,000	49.05
1999	99,900,000	1,626,100	61.44	60,600,000	1,030,400	58.81
2000	105,970,000	1,725,000	61.43	66,722,000	1,122,800	59.42
2001	110,955,000	1,922,000	57.73	67,749,000	1,111,600	60.95
2002	120,691,000	2,028,700	59.49	71,604,000	1,191,200	60.11
2003	124,253,000	2,137,700	58.12	78,764,000	1,329,800	59.23
2004	132,729,000	2,220,500	59.77	99,044,000	1,488,700	66.53
2005	147,414,001	2,242,900	65.72	114,138,000	1,590,500	71.76
2006	159,224,001	2,052,000	77.59	126,793,001	1,386,200	91.47

Year	South East			Mekong River Delta		
	Pork production (kgs)	Number of pigs	Pork productivity in kgs per head of stock	Pork production (kgs)	Number of pigs	Pork productivity (kgs) per head of stock
1996	100,800,000	1235000	81.62	232,400,000	2,542,100	91.42
1997	106,200,000	1328500	79.94	257,700,000	2,591,600	99.44
1998	124,000,000	1394000	88.95	269,800,000	2,593,600	104.03
1999	148,700,000	1497900	99.27	276,800,000	2,797,200	98.96
2000	155,662,000	1649600	94.36	297,581,000	2,976,600	99.97
2001	162,434,000	1651800	98.34	313,694,000	2,946,100	106.48
2002	182,456,000	1862700	97.95	349,291,000	3,151,600	110.83
2003	201,287,000	2072500	97.12	377,864,000	3,448,600	109.57
2004	224,611,000	2402700	93.48	416,600,000	3,713,800	112.18
2005	250,726,000	2618000	95.77	459,137,000	3,828,600	119.92
2006	295,462,000	2819000	104.81	490,223,800	3,982,000	123.11

## APPENDIX II

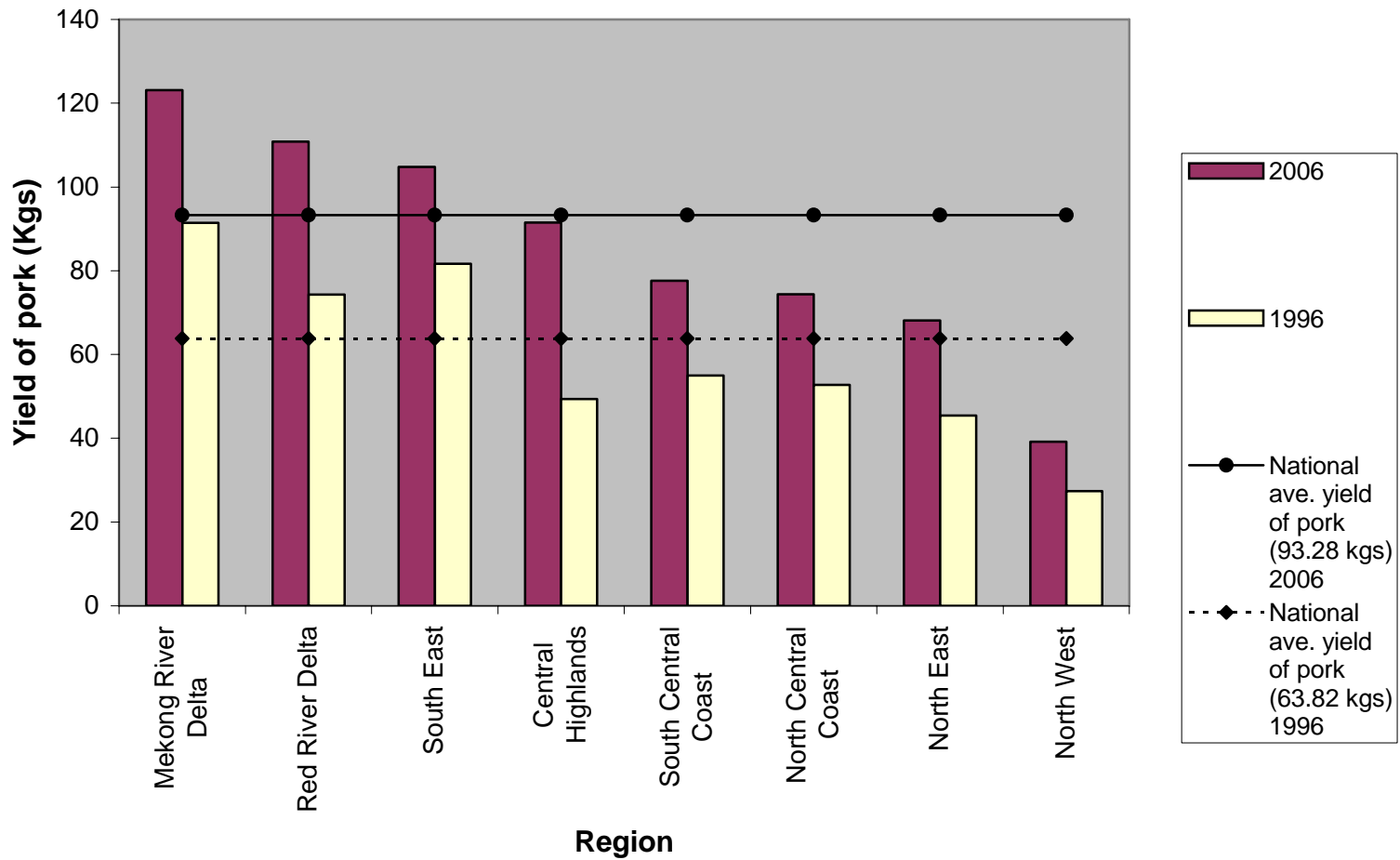
### **Reworked Estimates of Regional Pork Yields to Allow for Regional Boundary Changes**

Achilles Costales (pers. comm. 30/8/2008) of the FAO reworked the data in Table 5 and Figure 12 to allow for boundary changes in Vietnam's regions. The results are summarised in Figure A1. He makes the following observations:

“The figure shows the following:

- The Mekong river delta, South east and Red river delta still remain as top three in rank, but RRD and SE switch places as you have noted.
- The jump of C. Highlands, however, is from 6<sup>th</sup> to 4<sup>th</sup>.
- Two other unchanged rankings are that N. West and N. East remain last and second-to-the-last respectively – both northern mountain regions (NMR).”

This suggests that the regional rankings have not been altered basically by the regional boundary changes. Furthermore, the large and persistent disparities in regional yields are confirmed by these further results.



**Figure A1: Figure 5 reworked by Achilles Costales to allow for regional boundary changes between 1996 and 2006**

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