Comparing Agricultural Sector Performance Measures : Indonesia vs Vietnam since 1990

Richard Barichello[1] and Kurt Klein[1]

Abstract

For developing countries, a significant part of the economy, and the country's poverty, is found in the agricultural sector and rural areas. This makes it quite important to achieve economic success of that sector, not only for improving overall economic growth but also to achieve key distributional objectives such as alleviating poverty. Vietnam's agricultural sector's successes are well known and striking to observe, especially when one looks at the country's remarkable export performance. In contrast, Indonesia has had a modest record of agricultural performance and competitiveness, relying only on tree crop exports and a history of food crop protectionism.

However, when one considers a range of measures of sectoral performance, the verdict is more nuanced. In this paper we examine a selection of five measures over the time period from 1990 to 2010 for both countries, measures beyond simple export statistics. The more detailed data show two different dimensions of these two countries' agricultural sector performance. First, by some measures of productivity, Vietnam has a very strong record as expected, much better than that of Indonesia. But by other measures, Indonesia is at least as strong as Vietnam. Second, Vietnam's performance is clearly strongest in the 1990s, but since 2000 its record is more modest, while Indonesia's record in the 2000s is relatively strong, even surpassing Vietnam in some cases and years.

This re-examination of available data forces a reconsideration of what is the cause of these changes in relative performance. It also provides lessons on how countries generally can reform their agricultural policies in order to achieve the best results for growth and poverty reduction. For both these countries, improved agricultural sector results are attainable with careful reform.

Introduction

For developing countries, a significant part of the economy, and the country's poverty, is found in the agricultural sector and rural areas. This makes it quite important to achieve economic success of that sector, not only for improving overall economic growth but also to achieve equitable growth through key distributional objectives such as alleviating poverty. In these countries, agricultural productivity growth holds great promise for strengthening country-wide economic growth even as the agricultural sector's share in the total economy is gradually diminishing.

[1] University of British Columbia and University of Lethbridge, respectively, Canada

Indonesia is one such middle income country with a relatively large agricultural sector. Yet its economy-wide growth over the last two decades has appeared to be held back by modest agricultural sector performance (Barichello and Patunru). Its export record is largely due to tree crops, now heavily palm oil, and it has a lamentable history of food crop protection. Vietnam is another middle income country with a large agricultural sector, but one that is acknowledged to be productive and competitive. Its export growth performance among agricultural commodities is remarkable, and arguably unmatched by any country in the world over the past thirty years (OECD, 2015).

However, when one considers a range of measures of sectoral performance, the verdict between these two agricultural sectors is more nuanced. In this paper, which is at an early stage and reports work in progress, we examine a selection of five measures over the time period from 1990 to 2010 for both countries, measures beyond simple export statistics. These more detailed data show two different dimensions of the two countries' agricultural performance. First, by some measures of productivity, Vietnam has a very strong record, much better than that of Indonesia. But by other measures, Indonesia is at least as strong as Vietnam. Second, Vietnam's performance is clearly strongest in the 1990s, but since 2000 its record is more modest, while Indonesia's record in the 2000s is relatively strong, even surpassing Vietnam in some cases and years. The productivity paths of these two appear to be diverging. In this paper we compare these two seemingly quite different agricultural productivity experiences to draw lessons about how each country can sustain and improve their records.

Key Variables to measure Ag Sector Performance

We have data on five variables that reveal different aspects of the performance of these two agricultural sectors. They are the agricultural share in total GDP, the growth rate of agricultural GDP, two partial productivity measures, for land and labour, and total factor productivity growth. We do not examine export performance, although a good summary of Vietnam's export performance is found in OECD 2015.

Changing Economic Structure

A key feature of the modernization of any developing country economy is its declining share of agriculture in total GDP. This is universally observed if there is aggregate economic growth, if for no other reason than the decline in the Engel coefficient as incomes grow. Technical change on the agricultural supply side will further push this process. The other side of this process is the growth in the manufacturing sector as an economy modernizes.

For Indonesia (see Fig 1), its agricultural share of GDP in 1990 was 19.4 percent but it fell to 15.6 percent by 2000 (actually jumping up to 19.6 percent in 1998-99 during the Asian Financial Crisis). Subsequently, over the next 13 years it stayed flat to 14.4 percent in 2013. What these data tell us is that there has been a normal and steady shift of resources out of agriculture that was relatively faster on trend to about 2000, but then the shift stalls. The commodity price boom of 2006-2010 is evident in the small increase in the agriculture share

during that period. To see this structural change in context, the Indonesian manufacturing sector's share rises from 20.7 percent in 1990 to 29.1 percent in 2001, after which it declines to 23.7 percent in 2013. The service sector and the non-manufacturing component of the industrial sector account for the remainder of the economy not shown in Fig.1.

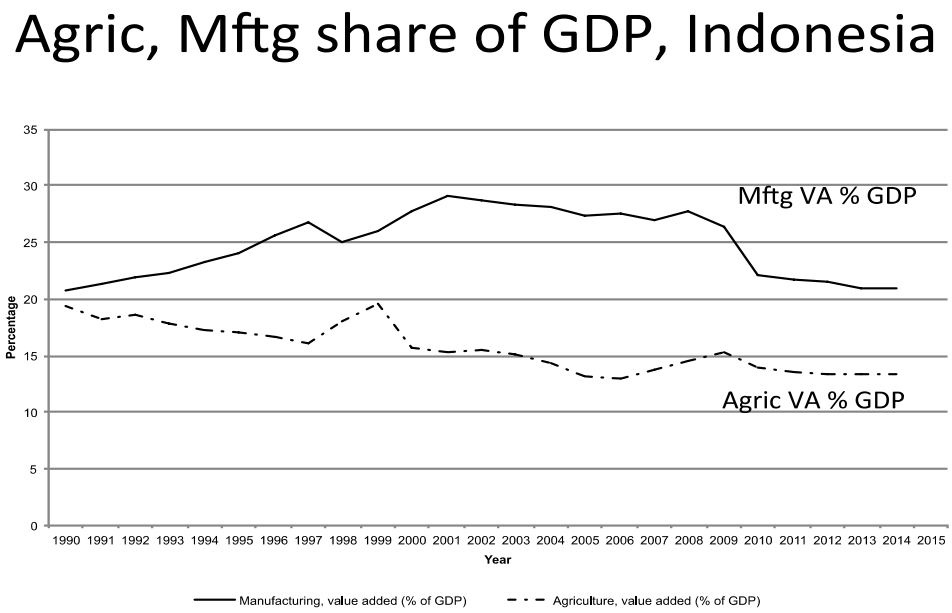

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Figure 1 Agriculture and Manufacturing Shares of GDP, Indonesia, 1990-2013

The changes in Vietnam's economic structure are shown in Fig. 2. Here we see a dramatic decline in agriculture's share of GDP from the very high level of 40 percent in 1990-91. It falls very quickly to 27.2 percent by 1995, and stabilizes at 25 percent during the Asian Financial Crisis (1997-99). Then it declines to 20 percent by 2004, and fluctuates around a slight declining trend to 18.4 percent by 2013. In other words, Vietnam's steady decline in its agricultural GDP share largely attenuates to about 20 percent after 2004, in contrast with Indonesia's stabilizing at about 15 percent.

Vietnam's manufacturing sector rises from 12 percent of GDP in 1990 to peak at 19.4 percent in 2006, then declines slightly to 17.5 percent by 2013. This pattern is quite similar to what is seen in Indonesia, which started at 20 percent in 1990, peaked in 2001 at close to 30 percent, and has since declined to 24 percent in 2013.

Although the pattern is similar, the levels of manufacturing's share are always lower in Vietnam, perhaps due to the consistently higher share of agriculture in GDP in Vietnam. This situation is almost certainly temporary and it shows that the process of structural change in Vietnam is at an earlier stage than in Indonesia. If economic growth continues at a strong pace, both countries will experience further declines in the agricultural share, and increases in the share of manufacturing and services in GDP. It is in the context of this process that the declining

GDP share of agriculture can be seen as a measure of productivity improvement in agriculture. These data are shown in table form for three years, 1990, 2000, and 2013 in Table 1.

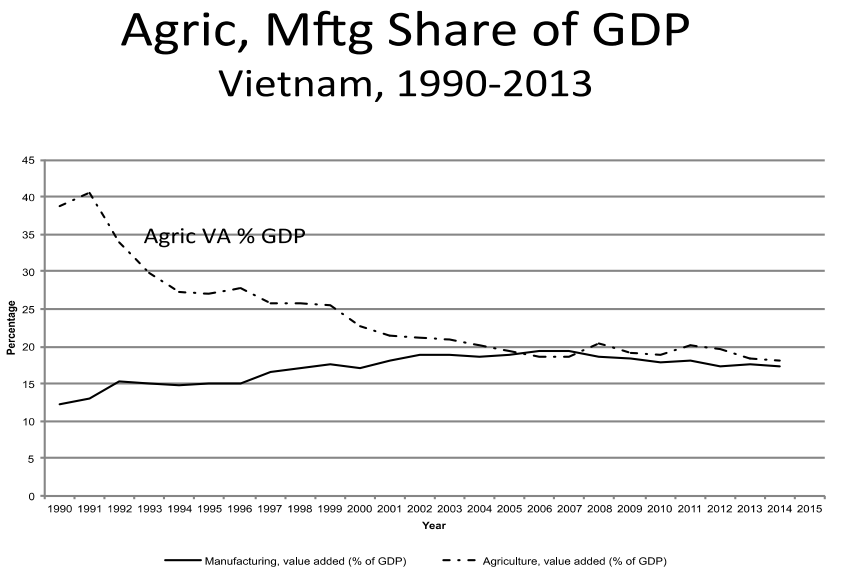

Figure 2 Agriculture and Manufacturing Shares of GDP, Vietnam, 1990-2013

Table 1 Agriculture and Manufacturing Shares of GDP, Vietnam vs Indonesia

	1990	2000	2013
Vietnam			
Agriculture	38.7%	22.7	18.4%
Manufacturing	12.3%	17.1	17.5%
Indonesia			
Agriculture	19.4%	15.6%	14.4%
Manufacturing	20.7%	27.7%	23.7%

Agricultural GDP Growth Rates

The second measure of the performance of the agricultural sector is the growth rate of agricultural GDP. Figure 3 shows in green the growth rate of agricultural GDP over the period from 1990 to 2013. The blue line shows the growth rate of total GDP, across all sectors of the economy. Except for 1998 (Asian Financial Crisis), the agricultural sector has grown more slowly than the aggregate economy. This is a normal state of affairs across virtually all economies, but the difference in the case of Indonesia is significant. The average growth rate for the agricultural sector over these 23 years was 2.9 percent per year. It was quite variable in the 1990s, but more stable since then (excepting the extreme high and low, in the range of 2.7 to 4.2% per year). The average growth rate for the whole economy was 5.2 percent per year. Removing the serious drop in 1998, the average growth was 6.0%/yr. Over the whole period,

agricultural GDP has grown at 55 percent of the whole economy's growth rate. The good news is that this ratio has increased over the period, reflecting both a slower growing aggregate economy and a modest increase in the agricultural sector's growth rate in the 2000s.

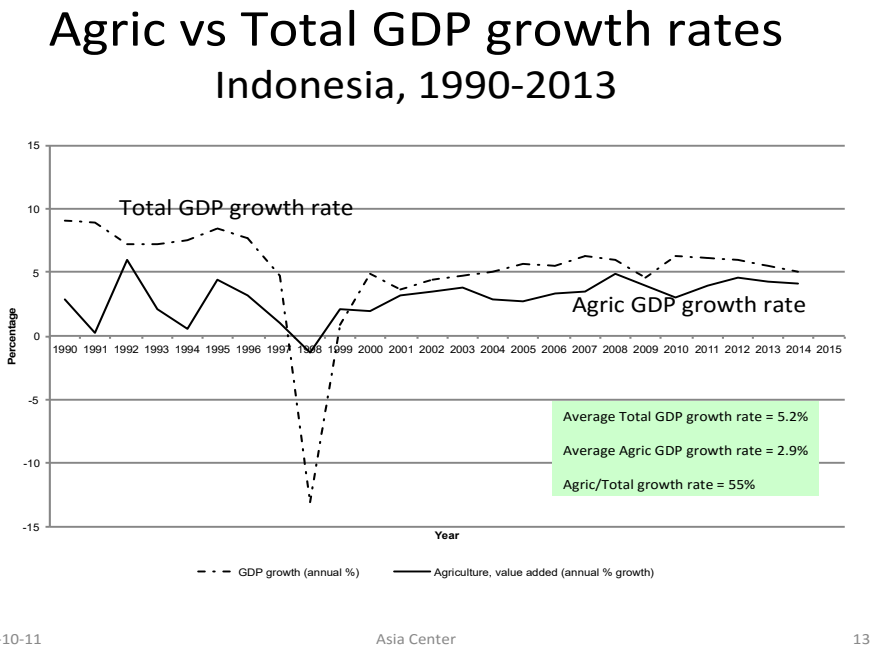

Figure 3 Agricultural vs Total GDP Growth Rates, Indonesia 1990-2013

In the case of Vietnam, the agricultural and aggregate GDP growth rates are shown in Figure 4. Both growth rates for Vietnam are higher than those in Indonesia over this time period. Total Vietnamese GDP growth averages 6.8 percent per year (5.2% for Indonesia), and annual agricultural GDP growth averages 3.7 percent (2.9% for Indonesia). The ratio of agricultural to total GDP growth for Vietnam is 54 percent. So despite the export prowess of Vietnam's agricultural sector, it underperforms the rest of the economy just the same as does Indonesia's agricultural sector.

In addition, both Vietnamese growth rates are trending downward. This is unlike Indonesia, where its 1990s agricultural growth was highly erratic but flat overall, while in the 2000-2013 period it showed much faster agricultural GDP growth. The average for the 1990s (Indonesian Agricultural GDP annual growth rate) was 2.1 percent while the 2000-2013 average growth rate was 3.4 percent.

This is shown also in Fig 5 where the agricultural GDP growth rates are shown for Vietnam and Indonesia side-by-side. Although Vietnam's growth rate is higher over the whole period, if you look only at 2008-2013, Indonesia's agricultural sector actually grew faster than Vietnam's, likely due to its rapid growth in oil palm.

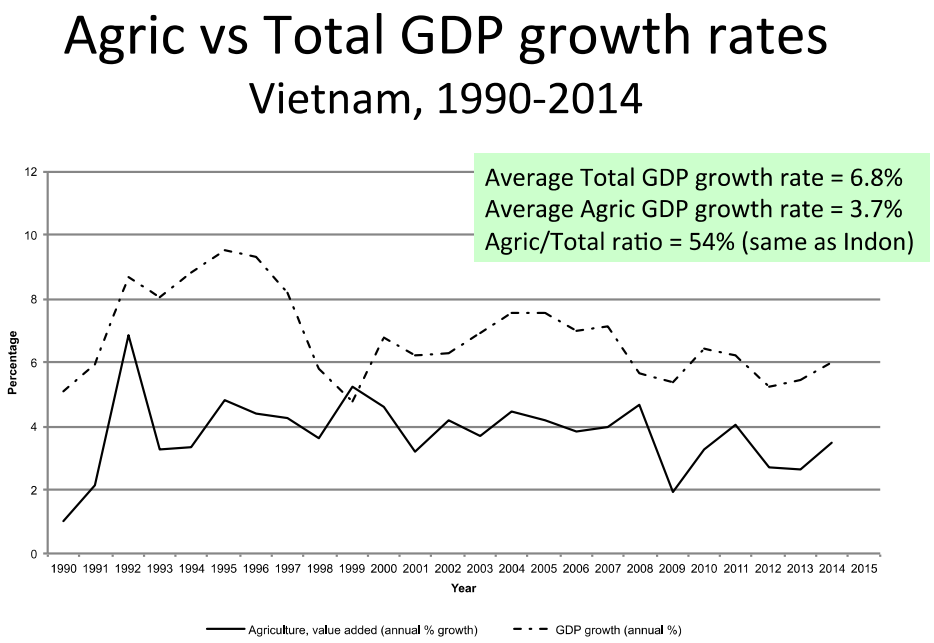

Figure 4 Vietnams' Agricultural and Total GDP Growth Rates

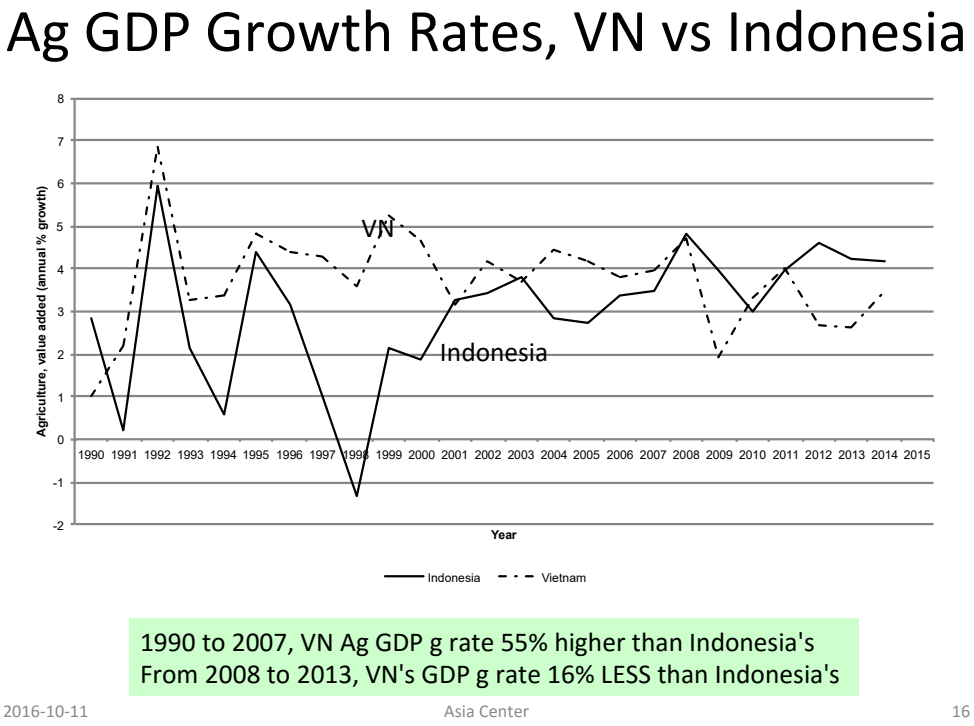

Figure 5 Comparing Agricultural GDP Growth, Vietnam vs Indonesia

Land and Labour Productivity

Land

The third and fourth performance measures are land and labour productivity. The measures used calculate only partial productivity but are still instructive for basic comparisons. The land productivity data are measured as total agricultural output, in constant 2005 US dollars, divided by total agricultural land. This land measure is expressed in 'rainfed cropland equivalents', and is all sourced from US Department of Agriculture world agricultural productivity calculations (Fuglie and Rada, 2013). 'Rainfed cropland equivalents' is obtained by summing the area of rainfed cropland with a weight of 1.0, irrigated cropland with a weight of 2.9933 (value for Asia), and permanent pasture, which is weighted (for Asia) at 0.0566. So the same weights are being used in this aggregation for both Vietnam and Indonesia. However, there is an issue with the treatment of land used for tree crops, particularly for oil palm, which we address later. It appears that this land area is under-calculated, in which case the land productivity measure is overstated (because tree crops output *appears* to be included in the numerator). With this measure, land productivity will grow if production uses more non-land inputs, or enjoys increased output from technical change, including higher yields.

The data are shown in Figure 6, including seven Asian countries. Vietnam is shown as the solid black line, while Indonesia is the blue line with diamonds for each year. China is the star performer here, as for most measures of agricultural sector performance, but our focus is Indonesia and Vietnam. Over the period 1990-2010, Vietnam's land productivity increased by 67%. This is less than China, where it more than doubled, slightly less than Malaysia, but it is more than Indonesia, Thailand, the Philippines and India.

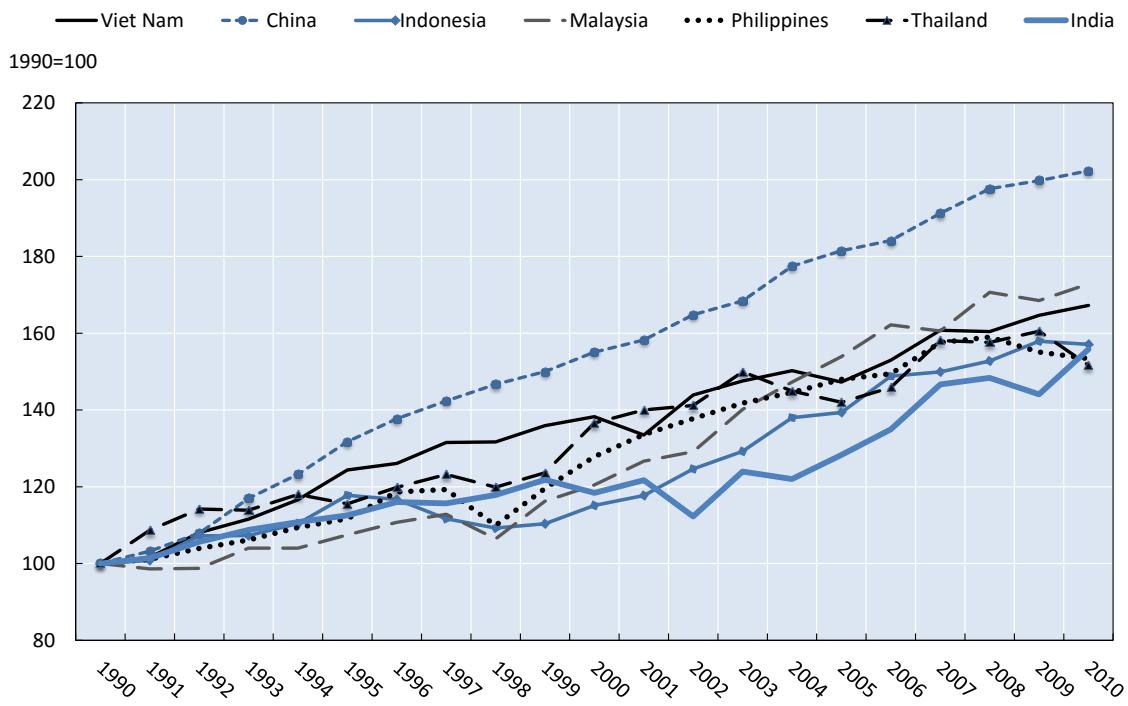

Figure 6 Land Productivity 1990-2010

In Indonesia, land productivity increased by 57 percent over this period, with only the Philippines and Thailand being lower. If we look at sub-periods, we see that Indonesian land productivity grew more quickly than Vietnam's after 1999, and at a similar rate to Vietnam from 2007 to 2010. If we take account of the apparent problem in properly accounting for new lands being put into oil palm production in Indonesia, then Indonesia's land productivity would rank lower, possibly placing it below Vietnam in the post-1999 period or even the Philippines and Thailand.

Labour

The measure of labour productivity is total agricultural output divided by the total number of 'economically active persons' working in the sector in that given year' (Fuglie and Rada, 2013). This calculation is also potentially problematic because most developing country data sources do not calculate the labour input in hours or days. Ideally one would like labour input measure in full time equivalent days, but with the measure used, a person who worked two hours during a week in agriculture would be counted equally with someone working full time. If this problem is encountered equivalently in both countries, the data are still helping in making a comparison, but it is unlikely that this is the case. In particular, the degree of off-farm employment in Indonesia is likely higher than in Vietnam, making it likely in our view that the Indonesian labour input is overstated, compared to that of Vietnam. This would mean the labour productivity measure for Indonesia is understated. Labour productivity will increase when non-labour inputs are added, or where there is improved technology.

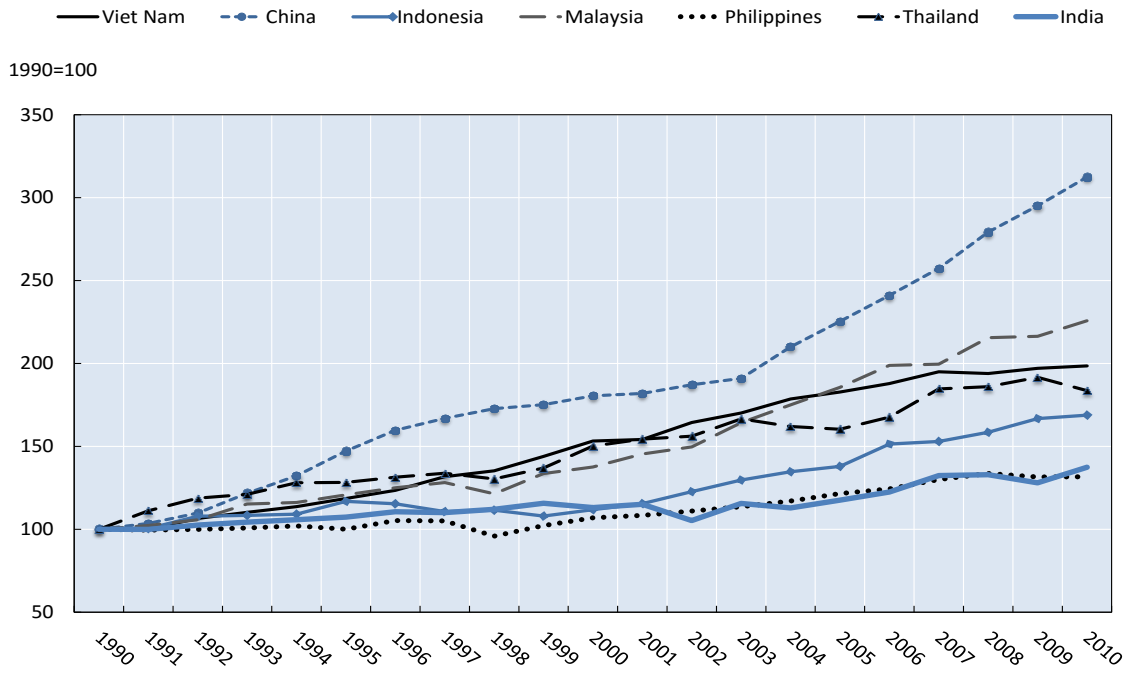

Figure 7: Labour Productivity Comparison, 1990-2010

The data are shown above in Figure 7. Once again, China tops these seven countries after about 1993. As for land productivity, Vietnam is the third highest with a doubling of land productivity. China and Malaysia have higher labour productivity results, where in those two countries, agricultural production has grown while farm employment has actually shrunk! In Vietnam, farm employment was still increasing by 2010, and only recently has its level of farm employment stabilized. Indonesia's labour productivity increased by 70 percent, making it the fifth fastest among these countries, with only the Philippines and India show less labour productivity growth. However, once again if one looks at sub-periods, Indonesia's labour productivity growth matches that of Vietnam. The source of this growth remains unclear but we suspect it is due to the rapid growth in oil palm production.

Total Factor Productivity

Our fifth and final measure of agricultural sector performance is total factor productivity (TFP), widely considered the best indicator of agricultural sector productivity (Ball *et al*, 2016). The reason for its superiority is that it shows how much agricultural output has increased after adjusting for the growth in agricultural inputs. Therefore, it focuses on increases in output due to improvements in efficiency, such as due to improved technologies (e.g., due to yield-increasing, or input-saving improvements). Putting it differently, it shows increased competitiveness from *low cost* growth. The measure used is standard, the difference between output and an aggregate of input growth rates.

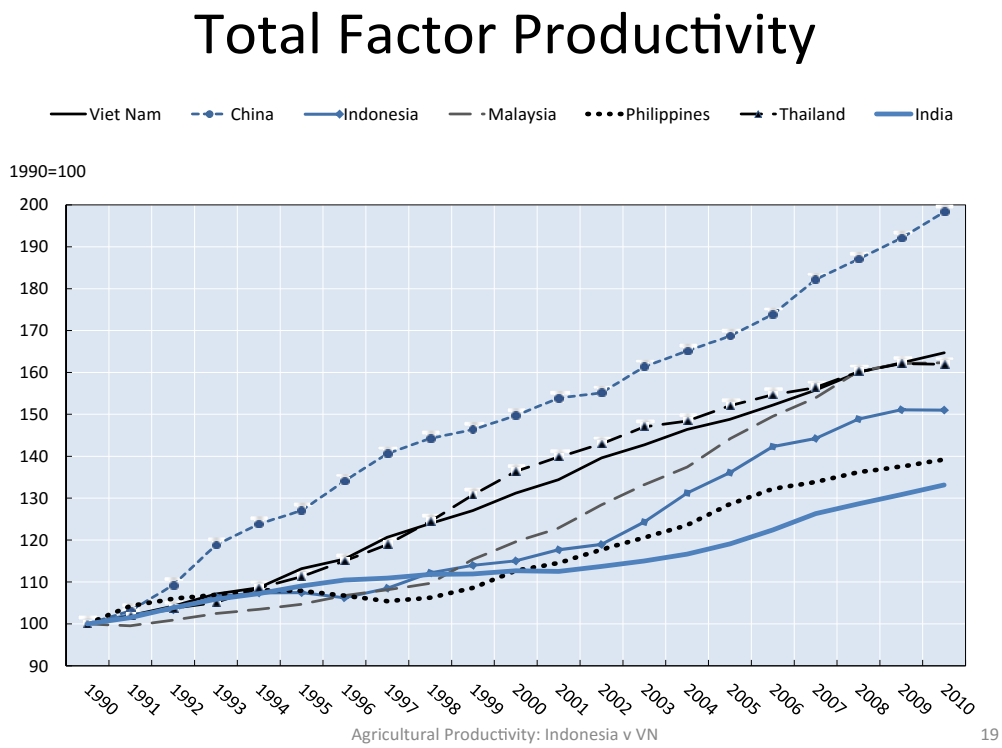

Figure 8 Total Factor Productivity Comparison, 1990-2010

The data are shown first in Figure 8, above, and also numerically in Table 3 below for various sub-periods, and with importantly updated data. The black numbers are all from Fuglie and Rada's 2013 data, whereas the red numbers (Vietnam and Indonesia only) are from their 2015 revision. For Vietnam, their TFP growth from 1990-2010 is 2.65 percent per year. This is the fourth fastest among the top closely clustered countries among the seven; the top three are China (3.1%/yr), Malaysia (2.9%/yr), and Thailand (2.7%/yr). These are all rapid rates of agricultural sector productivity growth, and show impressively strong economic performance. Indonesia's TFP growth was fifth, at 2.3 percent per year.

Within sub-periods (Table 2), the rankings differed. From 1990-2000, Vietnam grew at 2.9 percent per year, which placed them third, but from 2006 to 2010, they grew at only 2.2 percent which placed them fifth. Whatever was the cause, Vietnam's stellar agricultural productivity growth of the 1990s clearly slowed. For Indonesia, their 1990s growth was only 1.2 percent per year, which is fifth among these countries, and a disappointing performance level for the agriculture sector. However, the 2013 data show a sharp break with the past, growing at 3.0 percent per year from 2001-2010. During this period it had the second fastest growth rate in TFP among these seven countries, behind only Malaysia.

Table 2 Total Factor Productivity Comparisons by sub-period

Total Factor Productivity by sub-period

Years	Vietnam	China	India	Indonesia	Malaysia	Philippines	Thailand
1981-90	1.03 1.45	1.69	1.32	0.52 0.56	3.32	0.30	0.47
1991-00	2.86 2.07	4.13	1.12	1.23 0.88	1.87	0.46	3.27
2001-05	2.52 2.18	2.39	1.11	3.36 2.87	3.73	2.64	2.18
2006-10	2.18 2.66	3.25	2.36	2.62 2.49	2.94	1.68	1.60
1991-10	2.65	3.10	1.25	2.26	2.92	1.67	2.73
Source: Fuglie and Rada 2013, 2015							

Agricultural Productivity: Indonesia v VN 20

However, when the updated data, released in October 2015, are used, the results show some important differences. The changes that occurred in the data were the inclusion of an explicit measure of livestock feed inputs. What this has shown is that feed per animal was increasing over time, accounting for part of the increases in animal productivity, and lowering

the calculated TFP, particularly for Vietnam. The result is that TFP for Vietnam has declined slightly in the latest decade. The old data showed 2.74 percent per year growth from 2002-2011, while the new data has a growth rate of 2.71 percent per year (personal correspondence, Keith Fuglie, Nov 2015).

The second change of importance to us concerns the agricultural land input for Indonesia. The national statistics agency has reported significantly less land in agriculture than is published in FAO data. The suspicion that this is due to under-reporting of land in plantation crops is borne out. An important amount of land in oil palm is actually classified as 'forest land', and hence is not in the national agency data for agricultural land. This means that some of the productivity growth previously found was actually due to land input growth, not TFP. The revised 2015 data (red numbers) use the FAO land data for Indonesia, which at least would appear to go some way in reconciling this problem.

Looking at our Table 2 data (1990-2010), the results show some slowing of the overall growth rate for Vietnam from 1990 to 2000 (by 0.7%/yr), slowing again from 2001-2005 (by 0.3%/yr), and an increase in growth from 2006-2010 (by 0.4%/yr). Adding two more years of data increases these numbers slightly for the last decade. However, the growth pattern no longer shows a steady decline from the 1990s to the 2000s. It now shows modest but steady growth over this time period, and at a respectable 2.7% annual rate.

Indonesia's TFP performance is consistently negatively affected for the last two decades by the revised data. The drop is by 0.35 percentage points/yr for the 1990s, 0.49 points/yr for the 2000-2005 period, and 0.13 points/yr for the 2006-2010 period, or roughly a 15% decline in overall TFP growth.

Comparing the two agricultural sectors with the revised data, Vietnam widely outpaces Indonesia in the 1990s (by 1.2 percentage points, more than twice as fast), lags Indonesia by 0.7 percentage points in the 2000-2005 period, but then surpasses Indonesia again by 0.17 percentage points in the 2006-2010 period.

To gain some corroboration of these TFP data, we have been able to examine data on crop yields from 1990-2013 and fertilizer consumption since the year 2000. On cereal crop yields, Vietnam's yield has grown at 2.4 percent per year over the 24 years, starting well below Indonesia but now higher. Indonesia's yield growth rate was 1.2 percent per year (see Figure 9 below). However, in the more recent time period from 2002 to 2013, the two growth rates have converged, Vietnam down to 1.8%/yr, and Indonesia's up to 1.8%/yr (mostly due to very rapid growth in yields in 2007-2009).

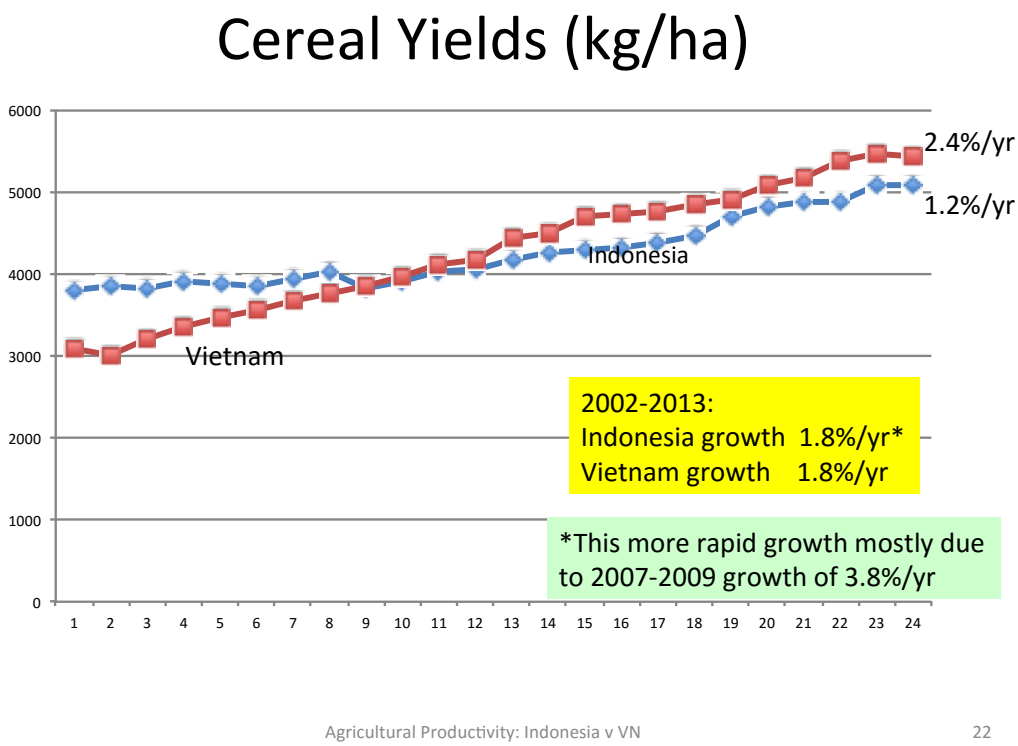

Figure 9 Cereal Yield Comparison, 1990-2013

The story for fertilizer consumption, measured as kg fertilizer per hectare of arable land for the time period 2002-2012, shows much higher fertilizer applications but widely different growth rates. Vietnam's growth is 0.0%/yr but the level of fertilizer is 300kg/ha. For Indonesia, consumption is 200kg/ha but its growing at 4.6 percent per year. The stagnant rates of fertilizer growth for Vietnam must be offset by labour productivity growth and other aspects of yield growth to produce the high and rising TFP growth observed in Table 2.

Summary

To summarize the productivity data, Vietnam's agricultural sector performance is largely what one would expect from a country whose agricultural export performance has taken commodity markets by storm. They have had rapid productivity growth over this 20 year period that is impressive by any measure, and showing increasing TFP growth. Their labour and land productivity are third best to China and Malaysia. Their agricultural GDP growth is also rapid over the 20 year period, but is very gradually declining. It is outperformed by the aggregate Vietnamese economy GDP growth rate by almost 2:1. The share of GDP from agriculture is steadily declining, but has almost leveled off at a still-high 18 percent.

This record is relatively strong, but shows some indications of slowing growth that may be due more to the price side than the quantity side. Vietnam is known to receive lower-than-average prices for a number of commodities, due to quality issues.

Indonesia is a different case. It has had agricultural sector performance that is inferior to that of Vietnam on almost all counts. Growing labour productivity may be Indonesia's strong point, buttressed by its heavy and historically unrestricted internal migration from rural to urban areas. But like Vietnam, its agricultural share of GDP is sluggishly high at just below 15 percent, and its agricultural GDP growth is also about half the rate for the aggregate economy. However, the bright side for Indonesia's agricultural performance is its growth in the post-2000 period. Notably, TFP performance rose markedly from less than 1 percent per year in the 1990s to a level similar to Vietnam's after the year 2000, upward of 2.5 percent per year. In that last decade, Indonesia was only clearly passed by China and Malaysia.

The question for the rise in Indonesian agricultural productivity since 2000 is why is it occurring. One cannot help but be impressed by the export data for tree crops, notably oil palm (or palm oil). But if that is the source of the measured TFP growth, one must look more closely to see if all the land going into oil palm is being counted. In other words, still more of this TFP growth may be illusory. Secondly, there is an environmental cost to that increased land input and production of oil palm, as anyone in neighbouring countries know from the haze problem from burning in the dry season. If this were accounted for, perhaps the TFP performance would also be offset, at least partly. And there is finally the question of how much recent productivity growth is due to the 2007-2012 increase in commodity prices. As those have fallen more substantially since 2012, the TFP growth may have fallen as well.

Conclusions

In 2009, I wrote with Arianto Patunru that Indonesia was badly lagging in its agricultural sector performance and policies. That was plausible with the available data, but it reflected heavily on what had occurred in the 1980s and 1990s. Using more recent data, it appears that productivity by various measures has started to improve since the year 2000. Now Indonesia is performing at a level below but comparable to Vietnam in agricultural productivity measures. The reasons for this, and some refinement of the data are somewhat unclear but should be a priority topic for further research. It is likely that it relates to tree crop production (Indonesia's export sector) rather than the food crop sector which is on an import basis. Another aspect of this productivity growth is that to the extent it derives from the tree crop sector, it is closely related to private sector initiatives, bolstered by high commodity prices, rather than government policy. All these hypotheses beg for further research.

For Vietnam, the findings are less surprising that a post-1990 agricultural export powerhouse shows relatively high measures of productivity. It does show that by some measures Vietnam's agricultural sector growth is slowing down. And its export performance is reputed to suffer from low quality levels or quality consistency issues, resulting in price discounts for some of those exports. This may explain some of the slowing growth and performance results for the sector. But it still shows relatively high and rising TFP growth that is an important source of maintained competitiveness in world markets. This growth also likely derives in part from high recent commodity prices for those exports, as well as being the result

of farm level performance. The role of the government in this is also debated, as in Indonesia. Most agricultural commodities are exported substantially through state-owned enterprises that have varying degrees of monophony power, and in the domestic market, monopoly power.

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