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منظمة
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State of Food and Agriculture in Asia and the Pacific Region, including Future Prospects and Emerging Issues

Executive Summary

1. The Asia and the Pacific region has made remarkable progress in reducing food insecurity and malnutrition over the past quarter of a century, albeit with variations across subregions. Nevertheless, the triple burden of malnutrition, the coexistence of undernutrition, obesity and overweight, and micronutrient deficiencies, weighs heavily on the performance of countries of the region.
2. The improvements in food security and nutrition, as well as the increase in obesity and overweight – have resulted to a large extent from the increased availability of and access to food. Diets have improved in quality and quantity as overall, people consume less cereals and more livestock products, as well as in some areas more fruits and vegetables. However, consumption of oils, fats, and sugar has also increased, contributing to the rise in obesity and overweight.
3. These changes in dietary intake and quality were made possible, *inter alia*, by the development of crop agriculture, through the adoption of improved varieties of rice, wheat and maize, coupled with increased use of fertilizer and other inputs and an increase in the areas under irrigation. In turn, these factors made it possible to increase cereal production for food and animal feed. Improved feed coupled with improvements in livestock breeding allowed increased production of meat, milk, eggs and other livestock products. Horticulture and fisheries also saw large increases in some countries. The development of agriculture, covering crops, livestock, fisheries and forestry,

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APRC34

led to higher incomes for rural households and kept food prices lower than they would otherwise have been. These factors improved availability of and access to food, thus improving nutrition, but with large subregional disparities. South Asia, for example, lagged behind Southeast Asia and East Asia.

4. Looking ahead, the question is whether the countries of the region can sustain and build on these successes so as to achieve the eradication of food insecurity and malnutrition by 2030. The key challenge for the region's governments is to feed not only the growing population, but also animals to accompany changing diets.

5. A sustainable approach to intensification is required. In fact, the amount of arable land in the region is more or less fixed, chemical fertilizer use per hectare is already extremely high in some countries, freshwater withdrawals for agriculture already account for the bulk of freshwater withdrawals in the region, and greenhouse gas (GHG) emissions from agriculture are rising rapidly.

6. At the same time, to tackle the triple burden of malnutrition, governments will need to take a food systems approach that involves multiple stakeholders and sectors, since changes in food systems, notably the changing nature of supply chains, are an important cause of the triple burden. Moreover a holistic age- and gender-sensitive approach is essential, taking into account the specific needs, challenges and opportunities of youth, as well as women and men. Changes will be required at every stage of the food systems of the countries of the region, and this will demand changes to policies and regulatory frameworks as well as public and private investments to tackle the issue of malnutrition, including overweight and obesity. Global and regional dynamics, such as climate change, urbanization and migration out of rural areas, which have an influence on the root causes of hunger and malnutrition as well as on the impacts that food and nutrition security policies might have, must also be part of the equation.

7. Encouragingly, several governments in the region have recently launched national nutrition strategies and investment plans. Others need to follow suit. Agriculture and rural development should be part of these plans and part of a national strategy to make food systems more responsive to nutritional needs. The region's agriculture is already diversifying towards foods that are more nutritious, such as fruits and vegetables and livestock products, but this process requires support from governments, e.g. by promoting research on private sector and consumer behaviour aimed at identifying nutrition improving interventions. In general, publicly funded research will need to change its focus from boosting productivity of major staple crops towards crops that provide better economic returns to farmers. Finally, governments need to raise awareness and promote knowledge about the importance of better diets, lifestyle and sanitation.

Guidance sought from the Regional Conference

The Regional Conference is invited to:

- note that the decrease in child malnutrition has been gender-neutral so far and urge the region's governments to ensure that these trends continue into adolescence and adulthood;
- provide guidance on priorities and policies to make food systems more responsive to nutritional needs, especially to halt the rapid rise of overweight and obesity, differentiating the needs of Asia from those of the Pacific Island countries;
- provide advice on how to increase public spending on basic research on crops, livestock and fisheries, while encouraging the private sector to focus on commercially oriented agricultural research;

- provide guidance on how best to integrate information and communications technology with agriculture to promote a more efficient and environmentally friendly agriculture in the region;
- discuss initiatives at regional scale to better understand the complex relationship between food security and nutrition, agriculture and migration and harness the development potential of safe and informed migration in terms of food security and nutrition.

I. Introduction

1. Countries of the region have made marked progress in reducing hunger and poverty, albeit with significant differences across subregions. This edition of the *State of food and agriculture in Asia and the Pacific region* provides an analytic narrative of the factors that led to the remarkable transformation of the Region over time and, in particular, of the part played by the development of agriculture.¹ It also asks whether the path followed by the region's countries can be sustained in order to achieve the complete eradication of hunger by 2030, or whether modifications will be needed to deal with the new challenges that this progress has brought about.

II. The current situation of food security and nutrition in the Asia and the Pacific region

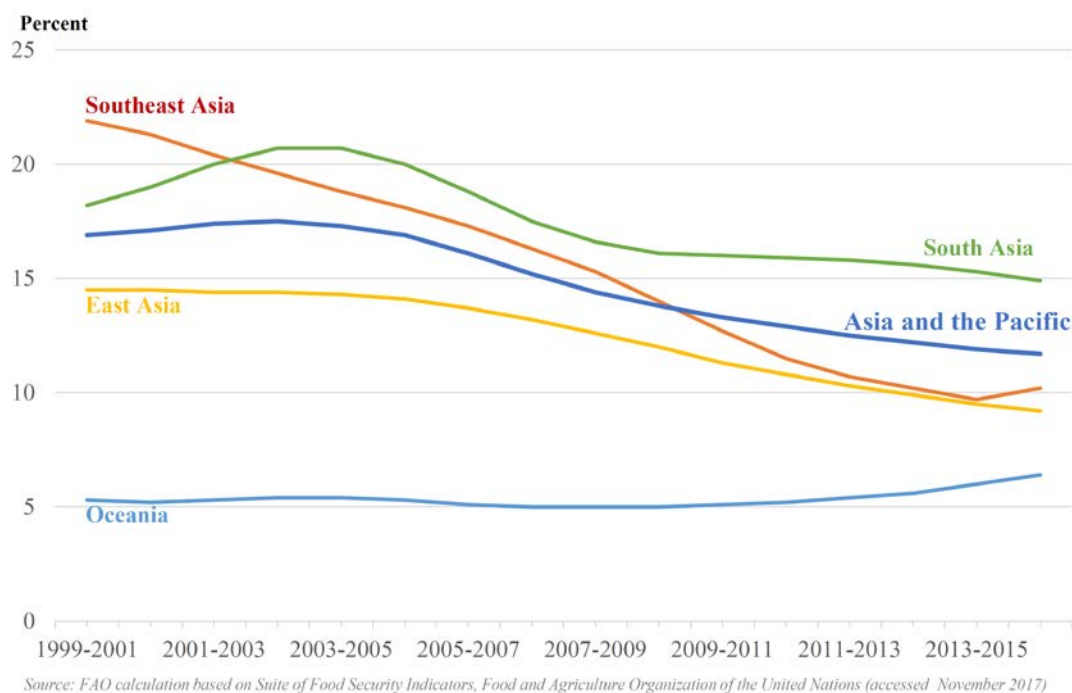
2. Fifty years ago, the Asia and the Pacific region was relatively homogeneous in terms of agricultural development and food security and nutrition. Since then the subregions have diverged considerably. In summary, the Southeast and East Asia subregions have achieved dramatic reductions in the prevalence of food insecurity and undernutrition, while the South Asia subregion has achieved significant reductions. The progress of the Oceania subregion at reducing undernutrition was less marked, although its initial prevalence was low and a new problem of obesity has emerged (see below).

Undernourishment

3. Figure 1 below depicts the prevalence of undernourishment² by subregion from 1999-2001 to 2013-15. As a whole, the prevalence of undernourishment declined from 17 percent of the population in 1999-2001 to about 12 percent in 2013-15. However, this decline was far from uniform across all subregions. The prevalence of undernourishment fell most sharply in Southeast Asia, followed by East Asia and South Asia. In the Oceania subregion, the prevalence of undernourishment remained slightly above 5 percent throughout the period.

¹ The FAO definition of agriculture, covering crops, livestock, forestry and fisheries (including aquaculture), will be used in this document.

² Undernourishment, as measured by FAO, is defined as the condition in which an individual's habitual food consumption is insufficient to provide the amount of dietary energy required to maintain a normal, active and healthy life.

Figure 1. Prevalence of undernourishment by subregion

Undernutrition

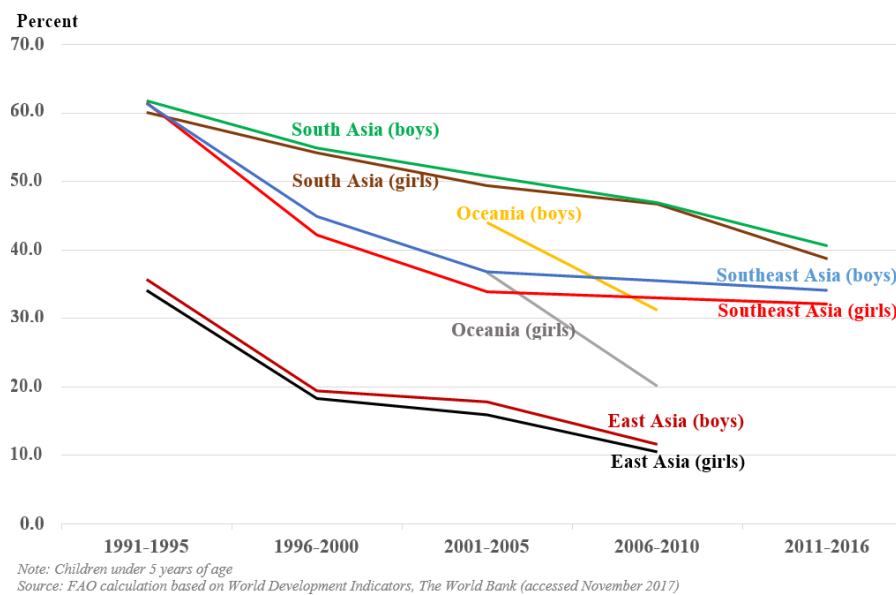
4. Nutritional adequacy can be assessed through anthropometric indicators, such as stunting and underweight in children under the age of five. Child malnutrition is known to lead to poor health outcomes, impaired brain development, cognitive deficits and reduced productivity throughout life. Nutritional deficits in the first 1 000 days of life imply long-term developmental problems.

5. From Figure 2 below, it is apparent that there has been significant progress in Asia over the past 25 years in reducing the prevalence of stunting in children under five (which reflects long-term nutritional deprivation). South, Southeast and East Asia have all reduced the prevalence of stunting in both boys and girls since the early 1990s by at least a third. Despite this progress, stunting remains a serious problem: between 30 and 40 percent of children under five years of age remain stunted in Southeast and South Asia. In Southeast Asia since 2005, there appears to have been a slowdown in the rate of decline stunting prevalence, for reasons that are not entirely clear. As regards Oceania, unfortunately the data for this subregion only cover the period from 2001 to 2010, and these show a decrease in stunting prevalence.³ Whether this trend continued in the period after 2010 is therefore not known.

6. A striking feature of Figure 2 is that the stunting prevalence for girls has consistently been below the prevalence for boys in all subregions, even in South Asia, where discrimination against girls is common in large parts of the subregion. It is beyond the scope of this paper to identify the factors behind this phenomenon, but it is brought to the attention of the conference.

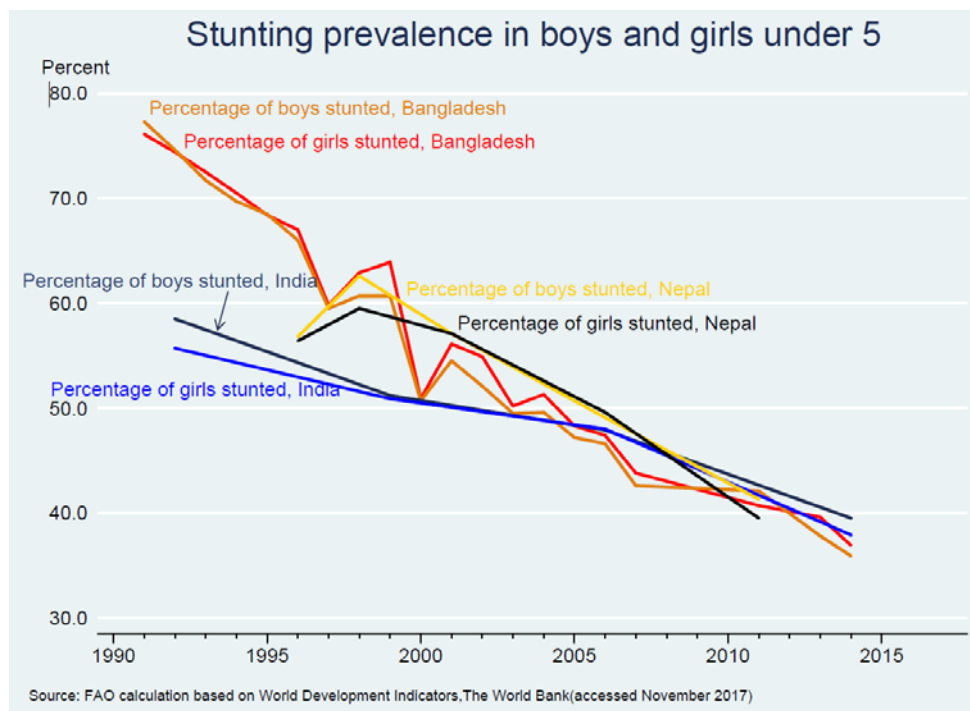
³ UNICEF, WHO, WORLD BANK. 2015. Joint malnutrition dataset
<http://data.unicef.org/nutrition/malnutrition.html>

Figure 2. Prevalence of stunting in boys and girls by subregion, 1991-1995 to 2011-2015



In order to confirm that this finding at regional level accurately reflects the situation at country level, Figure 3 depicts the prevalence of stunting in boys and girls for three individual South Asian countries. It can be seen that there has been a decline in the prevalence of stunting for both boys and girls in all three countries⁴. Moreover the prevalence has declined at approximately the same rate for boys and girls in each country of South Asia⁵.

Figure 3. Stunting prevalence in boys and girls in three South Asian countries



⁴ The prevalence of stunting increased slightly for boys but not for girls in Pakistan after 2010.

⁵ With the exception of Afghanistan, for which there is little or no data.

Micronutrient deficiencies

7. The people of the Asia and the Pacific region also suffer from significant micronutrient deficiencies, especially in iron, Vitamin A and iodine. Iron-deficiency anaemia in children under five years of age remains widespread in Southeast Asia, with prevalence ranging from 15 to 65 percent. In South Asia, the prevalence of anaemia ranges from 40 to 60 percent in all countries except Sri Lanka. In East Asia the prevalence of anaemia ranges from 22 (China) to 31 percent (Mongolia) and is increasing. In Oceania, the prevalence of anaemia ranges from 27 to 50 percent. The general conclusion is that anaemia remains a serious problem in the region, with no clear sign that it is decreasing.

8. Similar patterns prevail for vitamin A deficiency. Iodine deficiency is also widespread in the region, with several countries having a prevalence higher than 20 percent.

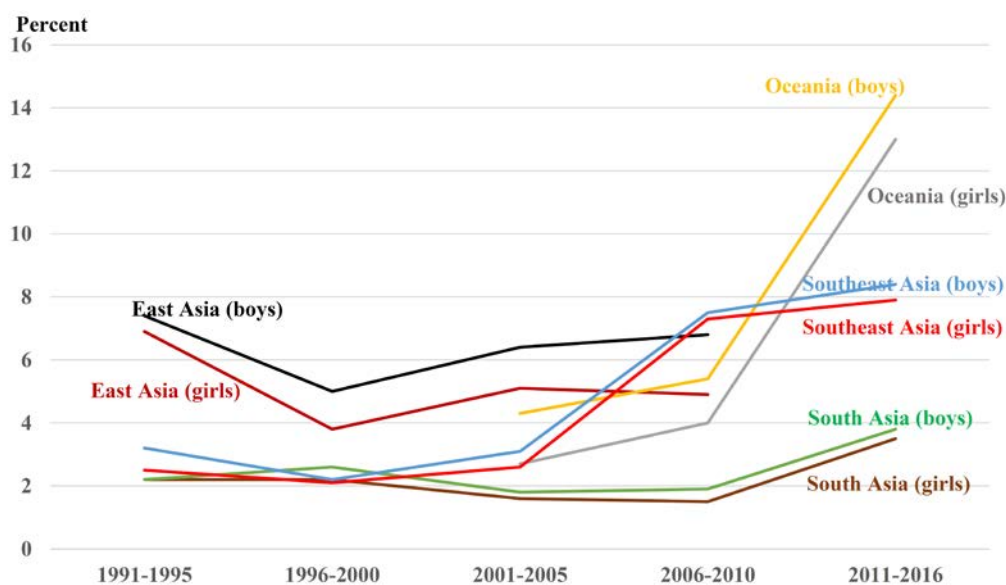
Overweight and obesity in children and adults

9. Unfortunately, this region also has to contend with rising rates of overweight and obesity in children and adults, one of the burdens in the so-called triple burden of malnutrition. From Figure 4 below, it can be seen that the prevalence of overweight in children under five years of age has tended to increase in every region except East Asia. The sharpest increases were in Oceania between 2001-05 and 2011-16 and Southeast Asia between 1990-95 and 2011-16. If data were available for the period 2011-16, it possibly would display a rising trend for East Asia.

10. Obesity, disability and early death have become important public health, national economic, and regional political issues in Oceania. Indeed, the world's top ten prevalence rates for obesity are all found in the Pacific.⁶ The obesity crisis is caused by many factors, but the nutrition transition towards refined foods high in sugar, salt and fats plays a major role in the current epidemic.

11. As with the prevalence of stunting, the prevalence of overweight in boys is higher than the prevalence of overweight in girls in every subregion.

⁶ NCD Risk Factor Collaboration (NCD-RisC). 2017. Body-Mass Index: Evolution of BMI over time. In: NCD RisC [online]. London. [cited March 19, 2018] <http://ncdrisc.org/obesity-prevalence-ranking.html>

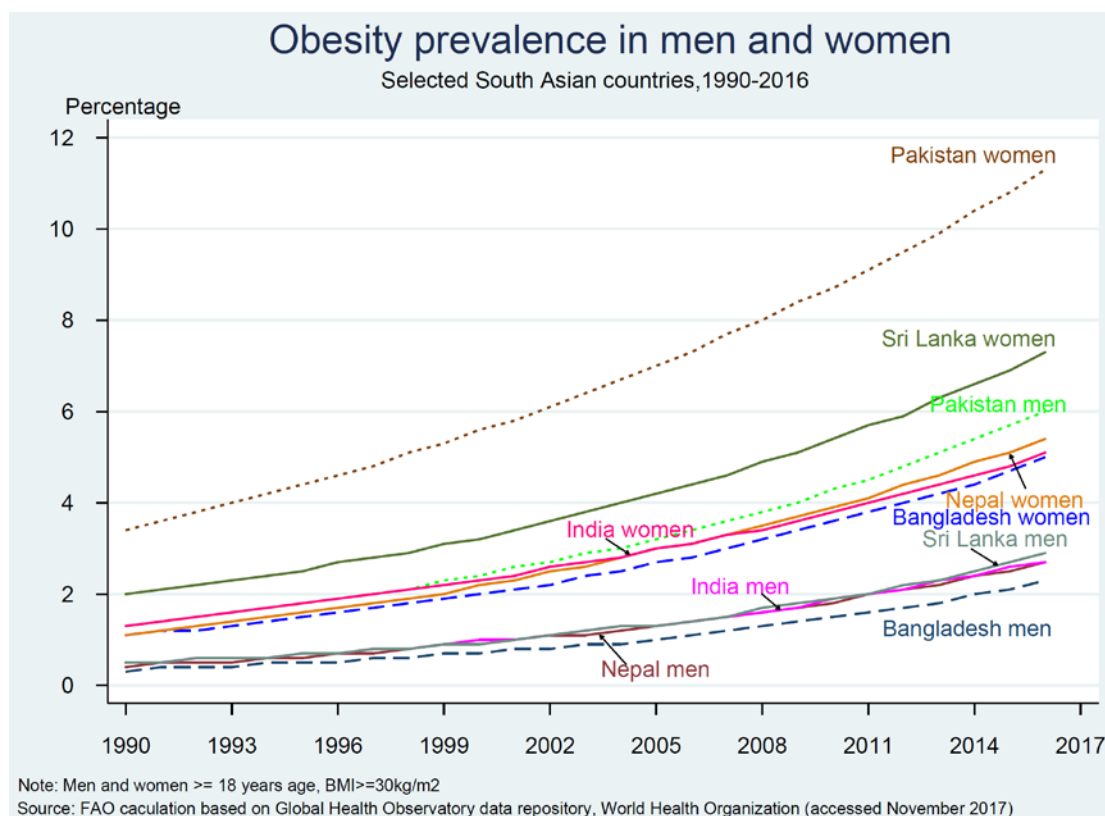
Figure 4. Prevalence of overweight in boys and girls by subregion, 1991-1995 to 2011-2015

Note: Children under 5 years of age

Source: FAO calculation based on World Development Indicators, The World Bank (accessed November 2017).

12. However, this pattern is reversed when one looks at obesity in adults. From Figure 5 below, which shows the situation in five countries of South Asia, the prevalence of obesity is significantly higher for women than for men in Bangladesh, India, Nepal, Pakistan and Sri Lanka. Similar patterns prevail in other subregions. The reasons for this pattern are not yet well understood.

13. The foregoing analysis leads to a natural question: what were the factors behind these changes in the food security and nutrition situation? It will be shown below that changes in food availability and access had a major role to play. Child nutrition is affected by other inputs as well, notably sanitation and sewage, vaccinations against common childhood diseases, maternal care, and so on. These aspects were covered in the *State of Food and Agriculture* presented to the 33rd Session of the Regional Conference for Asia and the Pacific (APRC) and are not covered here.

Figure 5. Obesity in men and women: South Asia

Food availability and access

14. Figures 6a to 6d below show the evolution of the sources of per capita consumption⁷ of dietary energy over time in the four subregions of the Asia and the Pacific region. From these figures it can be seen that food consumption per capita (as measured by dietary energy consumption) increased in every subregion from 1961 to 2015, although with significant variations among the subregions and across countries within subregions. The largest percentage increases in food consumption were achieved in East Asia, where dietary energy consumption more than doubled to almost 3 200 kcal/person/day, followed by Southeast Asia (more than 50 percent), South Asia (30 percent) and Oceania (10 percent). It must be kept in mind that Oceania had started with the highest per capita food consumption by far. It is noteworthy that in China today, dietary energy supply per person per day is about 3 200 kcal, which is in the same range as some high-income countries and higher than the equivalent figure for Japan.

15. The contribution of traditional staple foods, such as cereals and starchy roots, to the diet declined, while the contribution of non-staple crops, such as livestock products,⁸ oil crops, sugar and fruits and vegetables, increased. Increases in dietary energy consumption in East, Southeast and South Asia were driven by increasing cereal consumption up to about 1990. From that point onwards, in East Asia, it was driven largely by increasing consumption of livestock products, such as pork, while cereal consumption actually declined after 1985.

⁷ These figures are taken from FAO's Food Balance Sheets (FBS). The FBS do not record actual food consumption by individuals, but rather availability of food at the national level, which, divided by population, gives an estimate of the food available for consumption per year by individuals on average.

⁸ In these graphs, the category "livestock products" includes fish (wild and cultured) as well as seafood.

16. Since 1961, the Pacific subregions (Melanesia, Micronesia and Polynesia) have experienced substantial declines (of 8 to 12 percentage points) in the share of total dietary energy coming from starchy roots. During the same period, Melanesia and Micronesia have also experienced an increase in the share of total dietary energy coming from cereals. Nevertheless, Melanesia and Micronesia in particular (along with many countries in Africa) still rely heavily on starchy roots for food security and nutrition (16 and 9 percent of total dietary energy, respectively, in 2013), just as they have for centuries.

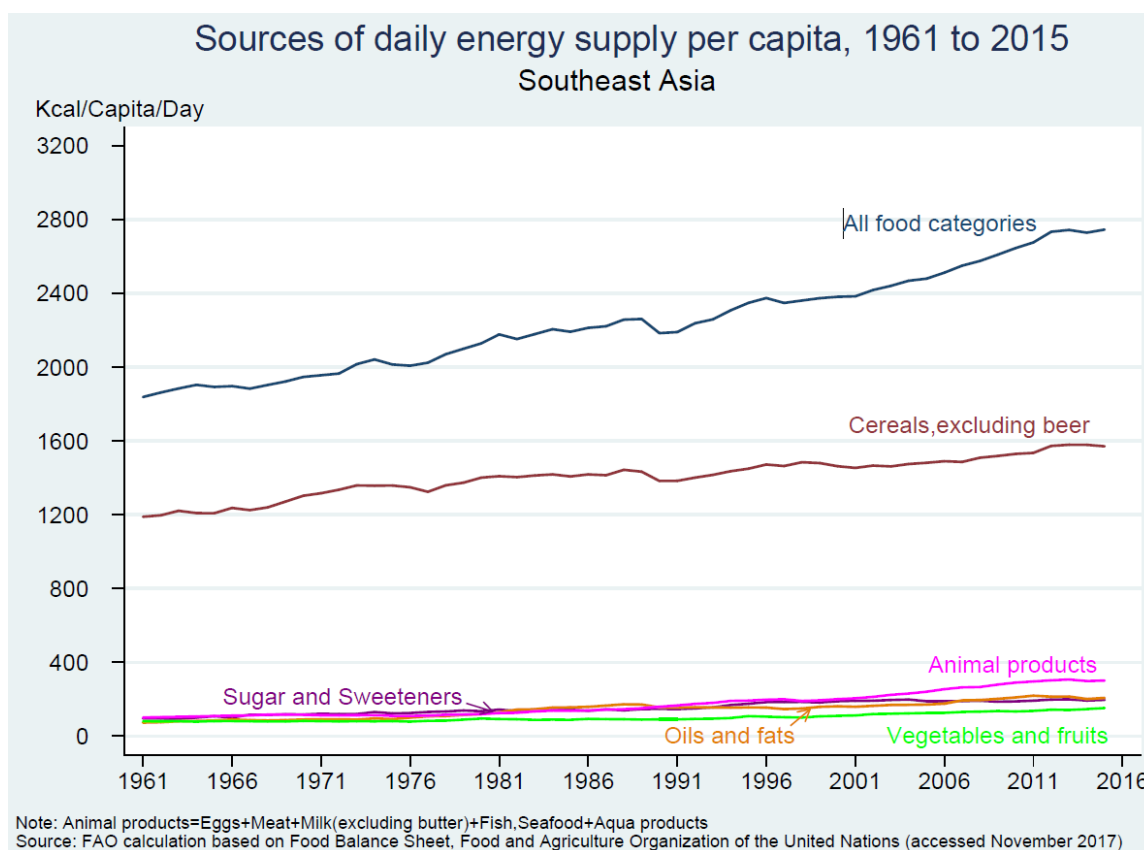
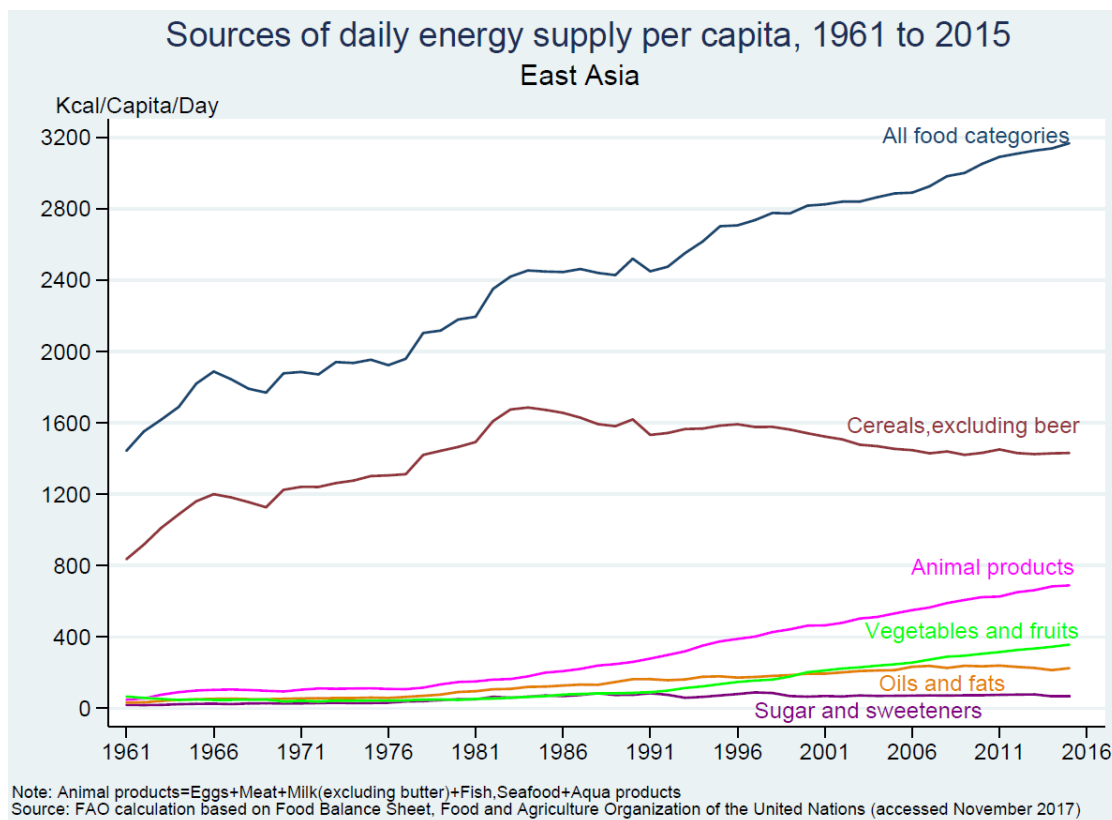
17. A comparison of East Asia with South Asia illuminates these changes in diets. Whereas livestock products provided barely 100 kcal/person/day as recently as the late 1970s in East Asia, this increased to 700 kcal/person/day by 2015. As livestock products are good sources of protein and also of fat, it is not surprising that fat and protein consumption had grown to about 100 g/person/day in that subregion by 2015. In South Asia, on the other hand, the increase in consumption of livestock products was only slight, consistent with the smaller increase in average household income and thus average household food consumption. This meant that fat consumption, driven mainly by an increase in consumption of oils and fats, had attained only half the level of East Asia by 2015. It also meant that protein consumption was about two-thirds of the average for East Asia. In both subregions, cereal consumption declined, consistent with the pattern seen in other countries when household incomes increase.

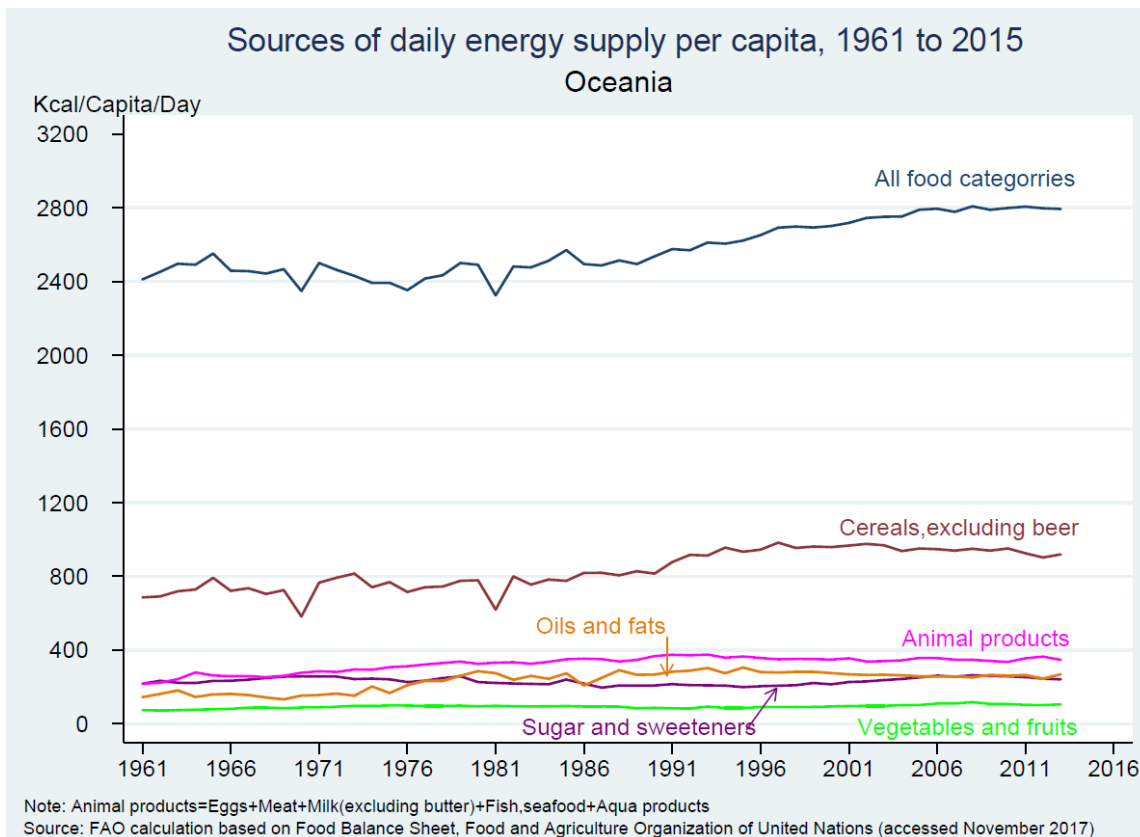
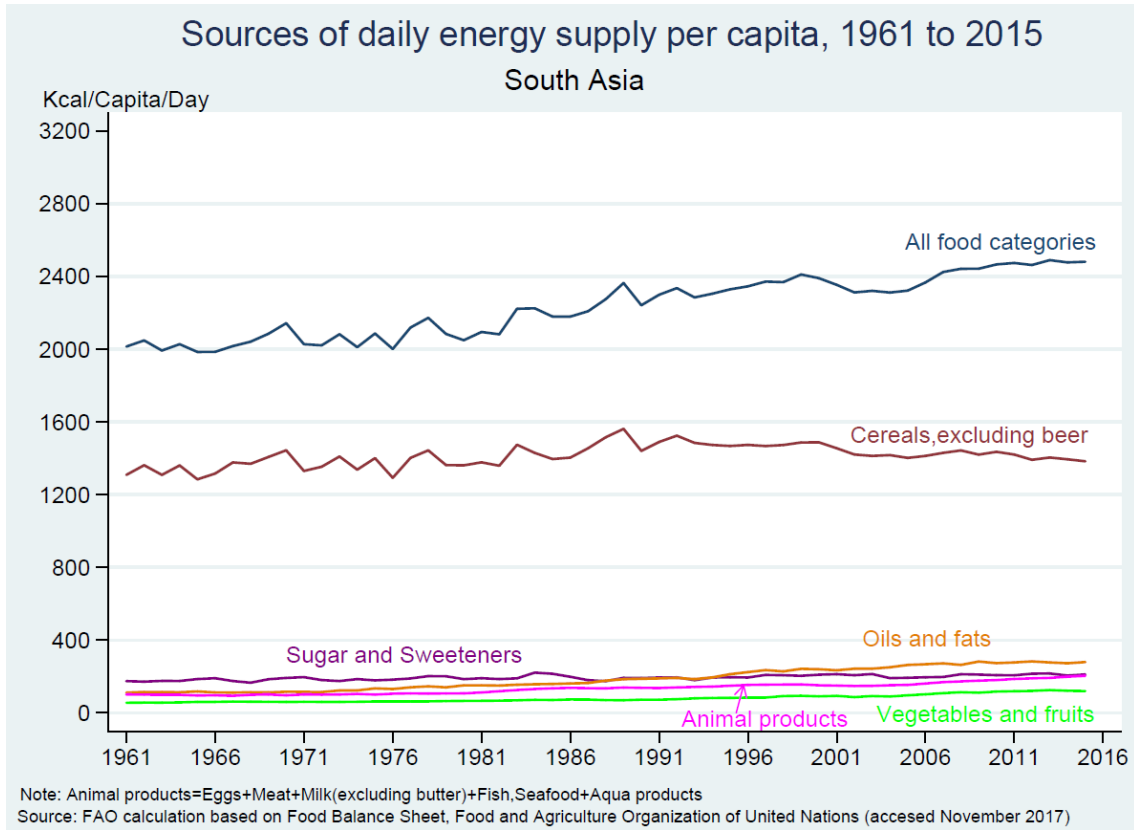
18. In Southeast Asia, consumption of livestock products also increased in addition to cereal consumption. This meant that fat consumption was higher in Southeast Asia than in South Asia (65 g/person/day against 55 g/person/day in South Asia). However, protein consumption was approximately the same in both subregions, although the vegetable-source protein consumed in South Asia was not of the same nutritional quality as the animal-source protein consumed in Southeast Asia.

19. Fish are a significant source of animal-source protein in some parts of the region. Micronesia and Southeast Asia have a greater share of animal-source protein (62 and 41 percent respectively) coming from fish and seafood than any other subregions in the world, with Melanesia in fourth place at 33 percent (the share is just 11 percent in Europe and 7 percent in the Americas). Aquaculture is a major source of fish and fish products, in addition to capture fisheries. Asia is the only region in the world that produces more farmed fish than wild fish (76 million tonnes against 52 million tonnes in 2011), and the aquaculture sector grew at 7 percent per annum in the first decade of the 21st century, against 1.7 percent per annum for capture fisheries.

20. It is encouraging to note that fruit and vegetable consumption also increased significantly in East Asia. Unfortunately, the same cannot be said of South Asia, Southeast Asia and Oceania, where consumption of fruits and vegetables showed only a slight increase.

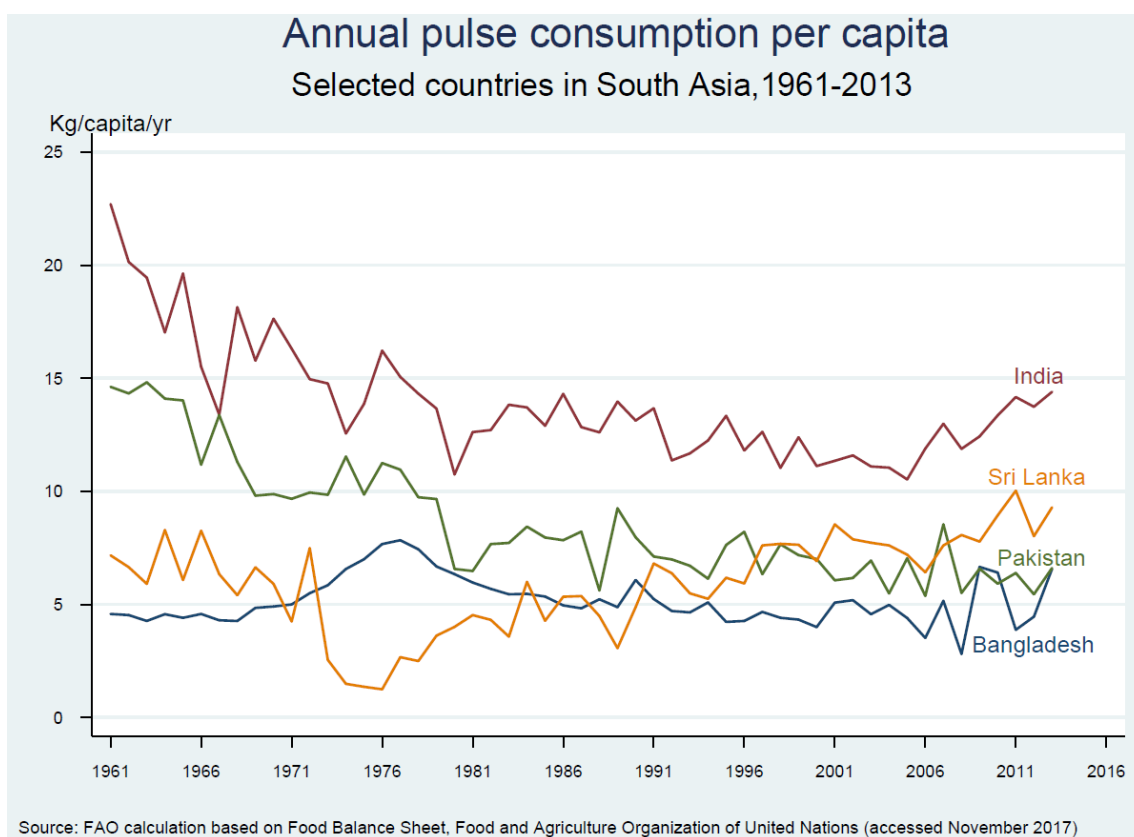
Figures 6a-6d. Sources of daily energy supply per capita, by subregion





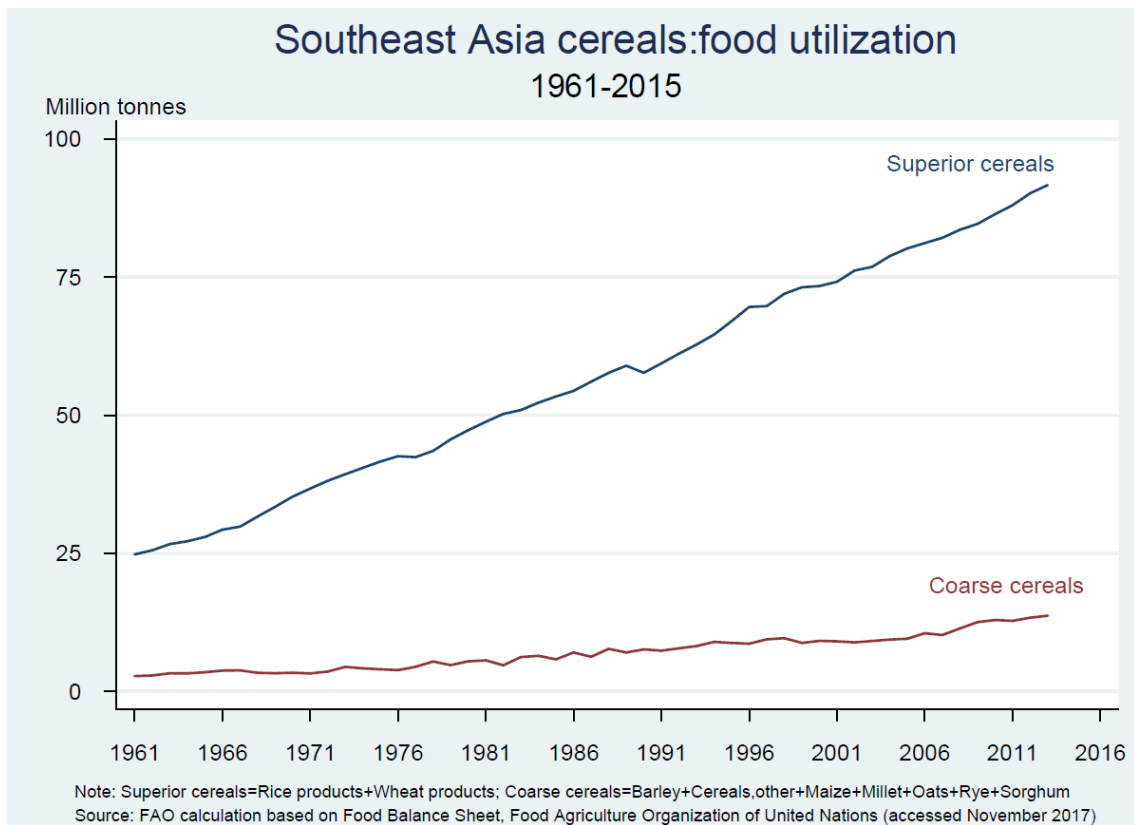
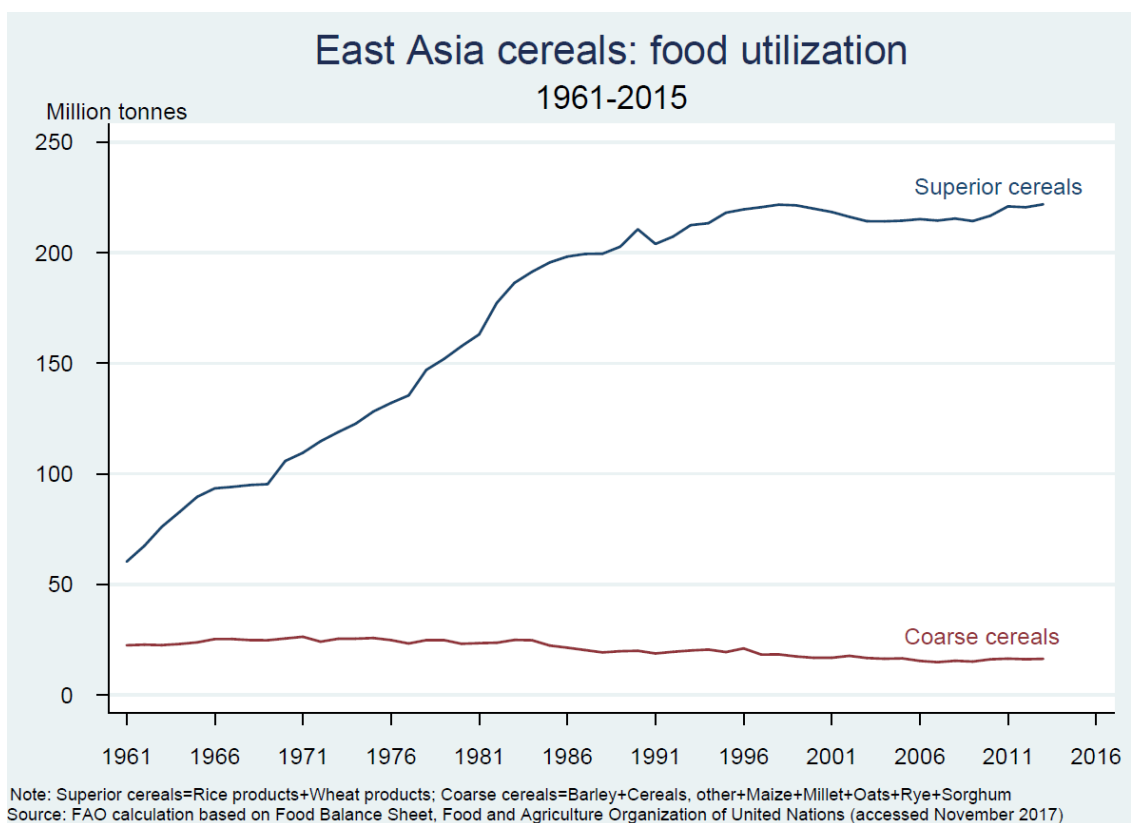
21. As countries become richer, populations are shifting from vegetable proteins, such as those found in pulses and beans, to more expensive animal source proteins such as those found in dairy products and meat. For illustrative purposes, this document focuses on South Asia, which is the largest consumer of pulses in the world. From Figure 7 below, it can be seen that in India, pulse consumption declined from about 22 kg/person/year to about 15 kg/person/year from 1961 to 2013, while in Pakistan it declined from about 15 kg/person/year to about 7 kg/person/year. This decline was consistent with trends elsewhere in the world. In Sri Lanka, however, pulse consumption seems to have fluctuated between 5 and 10 kg/person/year since 1960, except for a sharp drop from 1970 to 1985.

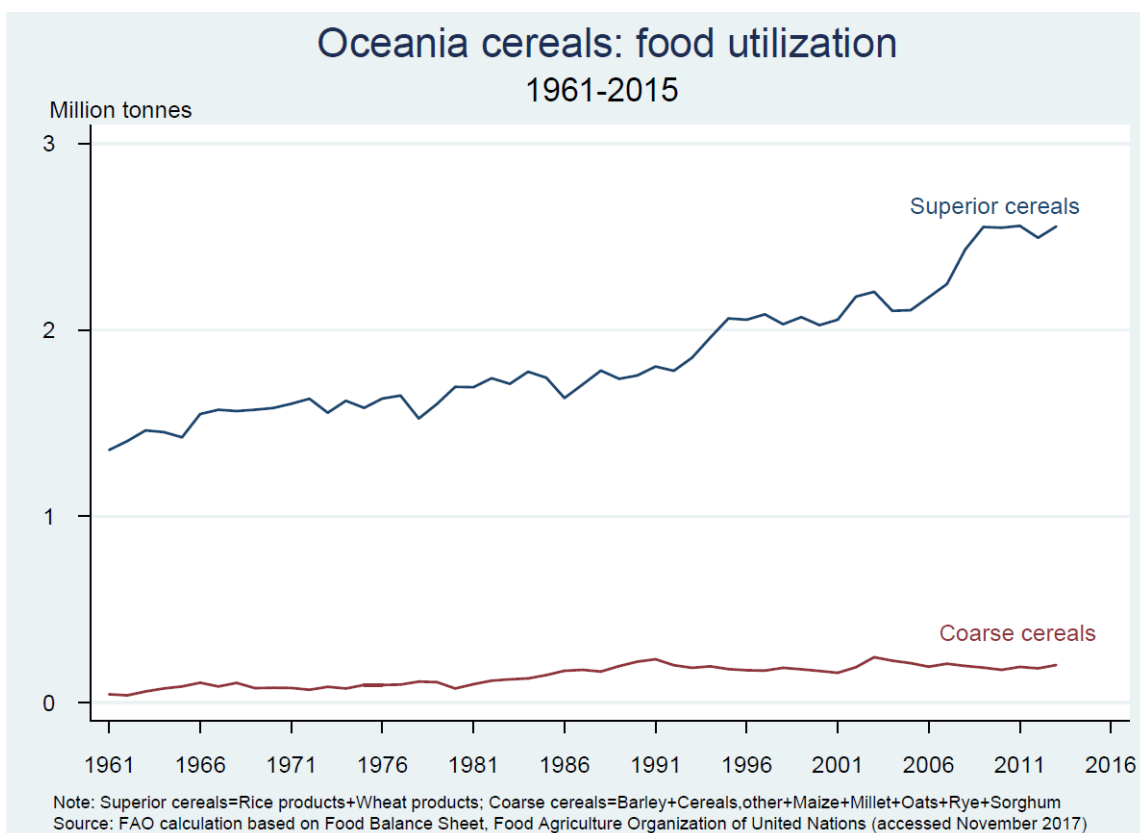
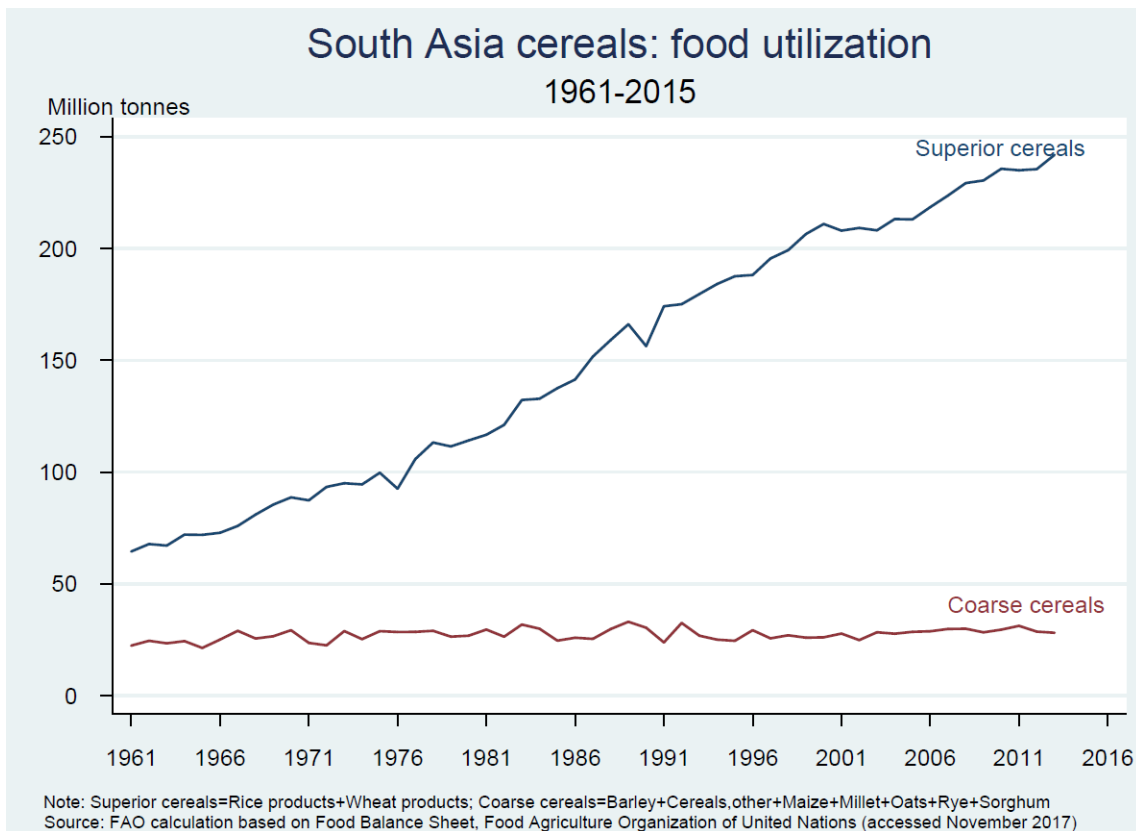
Figure 7. Pulse consumption in South Asia



22. It is also worth pointing out that although overall cereal consumption per capita either declined or remained constant, within the cereal group itself there were important changes. Utilization of rice and wheat for food increased, in some cases sharply, while total food utilization of coarse cereals, which had been relatively important in the 1960s, either declined or remained steady, implying a fall in per capita consumption, since the population was increasing. For example, in East Asia, rice and wheat utilization for food was about 220 million tonnes per year in 2015, versus 20 million tonnes per year⁹ for coarse cereals. In the early 1960s, the corresponding figures were 60 million and 30 tonnes per year, respectively, for total food utilization of “superior” and coarse cereals. Total utilization of “superior” cereals was still rising in 2013 mainly because of continuing population growth, even though per capita utilization had started declining from the mid-1990s onwards. These points are illustrated below in Figures 8a to 8d.

⁹ The population more than doubled in the intervening period, which reinforces the point. On a per-capita basis, coarse cereal consumption declined sharply while the consumption of “superior” cereals increased.

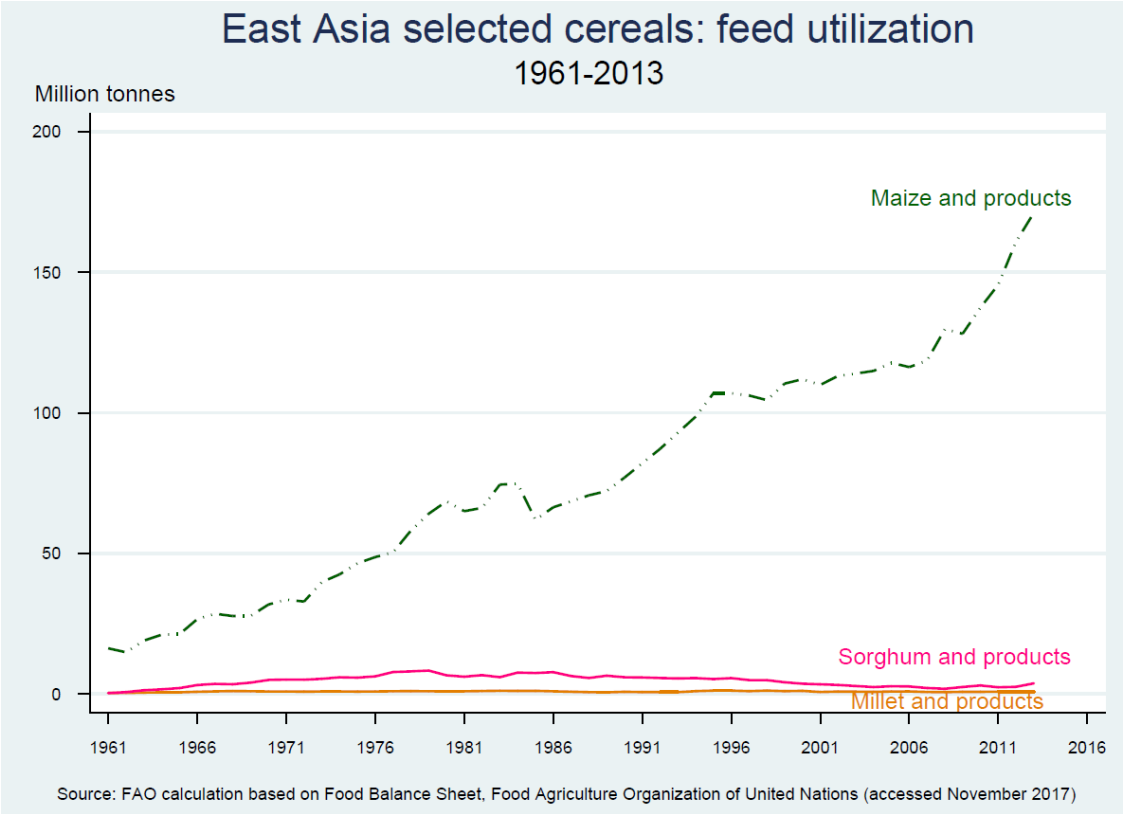
Figures 8a-8d. Utilization of various cereals for food, by subregion

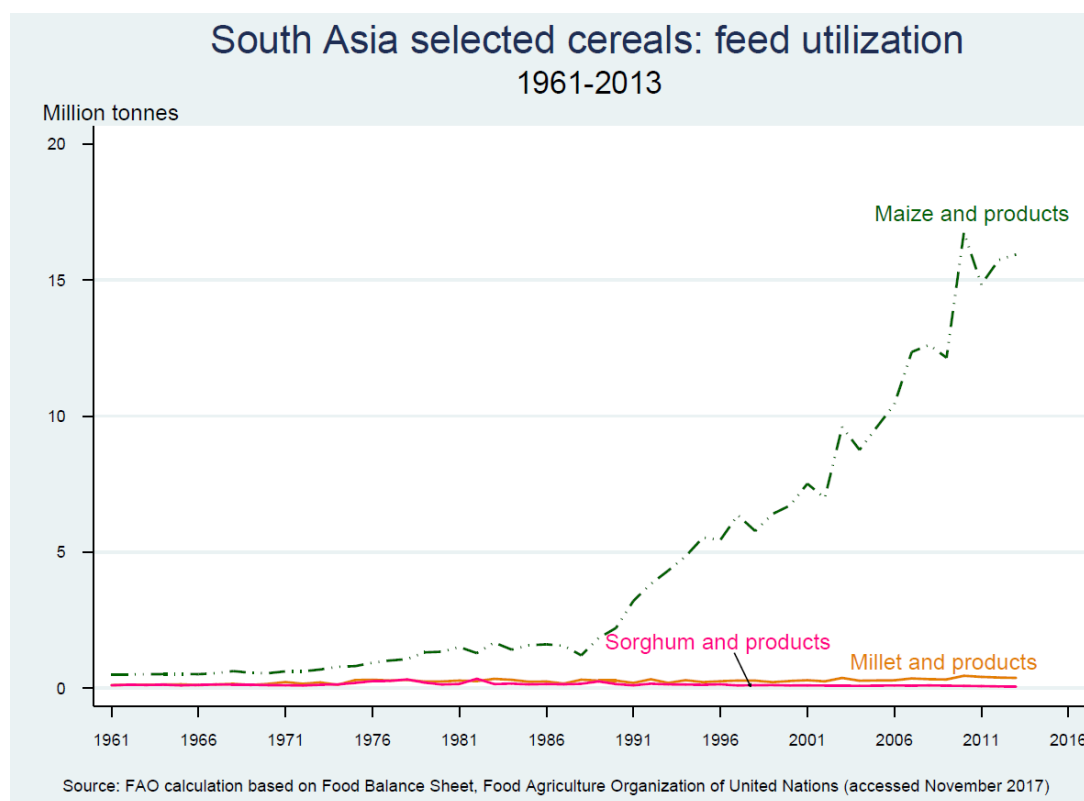


23. As noted above, coarse cereals, especially maize, were increasingly utilized for animal feed because of the increase in demand for livestock products that resulted from rising incomes. For illustrative purposes, the experiences of South Asia and East Asia are depicted in Figures 9a and 9b below. South Asia, especially India, is not generally regarded as a large consumer of meat. Yet even there, maize utilization for animal feed (mainly to feed chickens) saw an eightfold increase from 1990 to 2013, from barely 2 million tonnes per annum to almost 16 million tonnes. In absolute terms this is, of course, far below the corresponding quantities for East Asia (180 million tonnes), but the relative increase since the early 1990s is larger.

24. Not all the increases in animal feed came from domestic production, as imports also increased sharply in some cases. For example, in China, starting from the mid-1990s, when imports of soybeans were negligible, there was a very sharp increase in soybean imports to over 80 million tonnes by 2013. Other countries also saw sharp increases in soybean and maize imports, but the increase in China was particularly evident.

Figures 9a-9b. Cereal utilization for feed





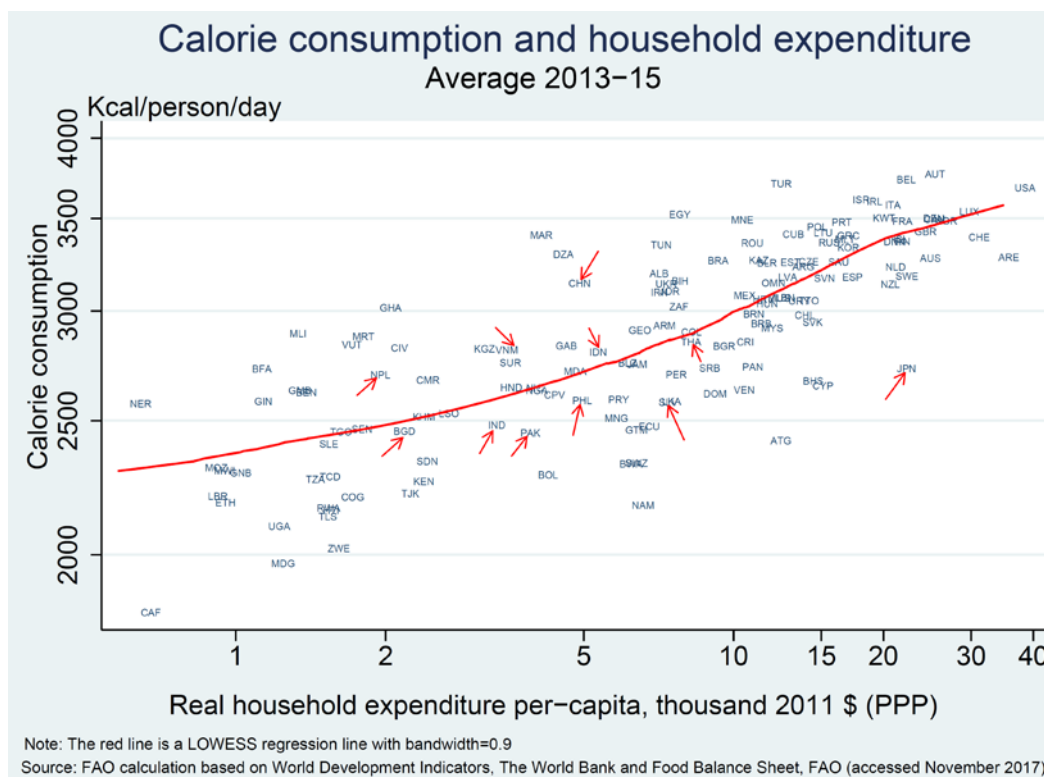
25. These changes in the quantity and quality of the diet were driven by rising household incomes resulting from agricultural growth as well as general economic growth. The relatively slow growth in per capita food consumption in South Asia is a large part of any explanation of the slow progress in reducing undernourishment in that subregion. Figure 10 below plots calorie consumption per capita against per capita household expenditure in real terms, measured using Purchasing Power Parity (PPP) exchange rates. The regression line indicates, for any level of per capita household expenditure, the expected per capita calorie consumption in countries with that level of per capita income. It slopes upward because calorie consumption per capita is expected to be higher in countries with higher incomes and thus higher household expenditure per capita. However, other factors clearly play a role in influencing calorie consumption, as there is a range of per capita calorie consumption levels corresponding to every income level. Thus, four South Asian countries, Bangladesh, India, Pakistan and Sri Lanka, are below the red line, indicating that their calorie consumption is below the level that would be expected given their per capita household expenditure, while Nepal is above the line. China's calorie consumption per capita, on the other hand, is far higher than expected given its per capita household expenditure, while Japan's is considerably below the expected level despite a much higher per capita household expenditure.

26. The key message from this graph is that a wide range of average dietary consumption levels is compatible with any given income level (as proxied by per capita household expenditure in real terms), implying that factors other than income influence food consumption. This suggests an important role for public policy in influencing food consumption, including the implementation of social protection policies that can provide an income floor for the poor while also promoting good practices in terms of food and hygiene.

27. In many ways, Japan can be considered "a global model for healthy diets". Japan has the lowest rate of obesity among developed countries, standing at less than 4 percent, and its life expectancy at birth is among the highest in the world today. There is little doubt that the relative frugality of the Japanese diet and its composition have an important role to play in this regard. For example, average fat consumption in Japan is exceptionally low by the standards of wealthy countries, about 40 percent less than that of the United States of America, while its cereal consumption is only

about 15 percent less. Consumption of fruits and vegetables is also quite high. At the same time, food waste is exceptionally low compared to other developed nations.

Figure 10. Calorie consumption and household expenditure



III. How did the region arrive at its current position?

A. Changes in the structure of agriculture

28. These changes in food consumption and dietary structure went hand in hand with changes in the structure of agricultural production. In South Asia, East Asia and Oceania, about one-third of the gross domestic product (GDP) still originated in agriculture as recently as 1980. Today this share is about 18 percent in South Asia, 8 percent in East Asia and 12 percent in Oceania. In Southeast Asia, where the share of agriculture in GDP was about 22 percent in 1980, it had declined to about 12 percent by 2015. As expected, the share of agriculture declined faster in regions where GDP growth was stronger.

29. Even though the share of agriculture in GDP was declining, agricultural production was growing (but non-agricultural output was growing even faster). The evolution of net agricultural production¹⁰ by subregion is shown in Figure 11.

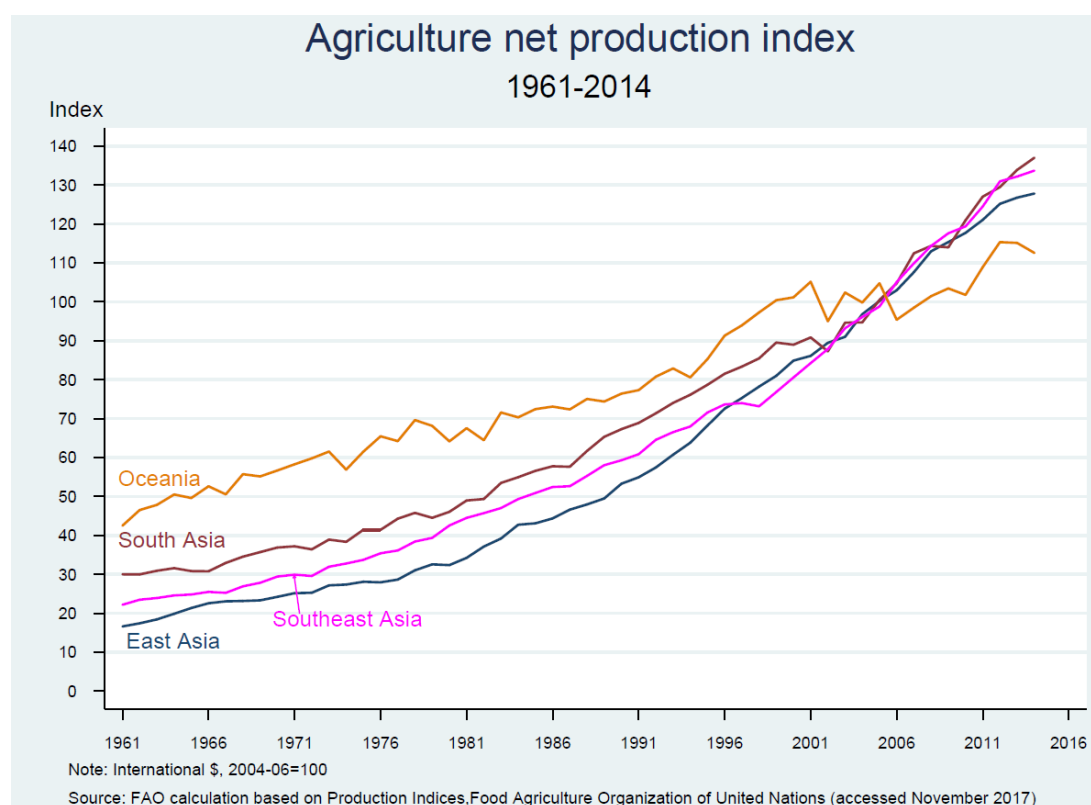
¹⁰ For an explanation of how to use the Geary-Khamis procedure to calculate the set of common international prices for agricultural commodities used as weights for production quantities in the construction of the FAO production index numbers, please see Broca, Sumiter S. 2009. Food and agriculture in the Asia-Pacific region: past performance and future prospects, Appendix 1 (A note on the Geary-Khamis procedure for estimating “international prices” for agricultural commodities) in *Agricultural reforms and trade liberalization in China and selected Asian countries: lessons of three decades*. FAORAP [<http://www.fao.org/3/a-i1032e.pdf>].

30. In East Asia, agricultural production increased 8-fold over this 55-year period, in Southeast Asia 6-fold, in South Asia 4.5-fold and in Oceania 2.5-fold. There is also evidence of a marked slowdown in the growth of net agricultural production starting from about 2000. This reinforces the widespread belief that both GDP growth and agricultural growth have been very strong in East Asia and less strong in the rest of the region.

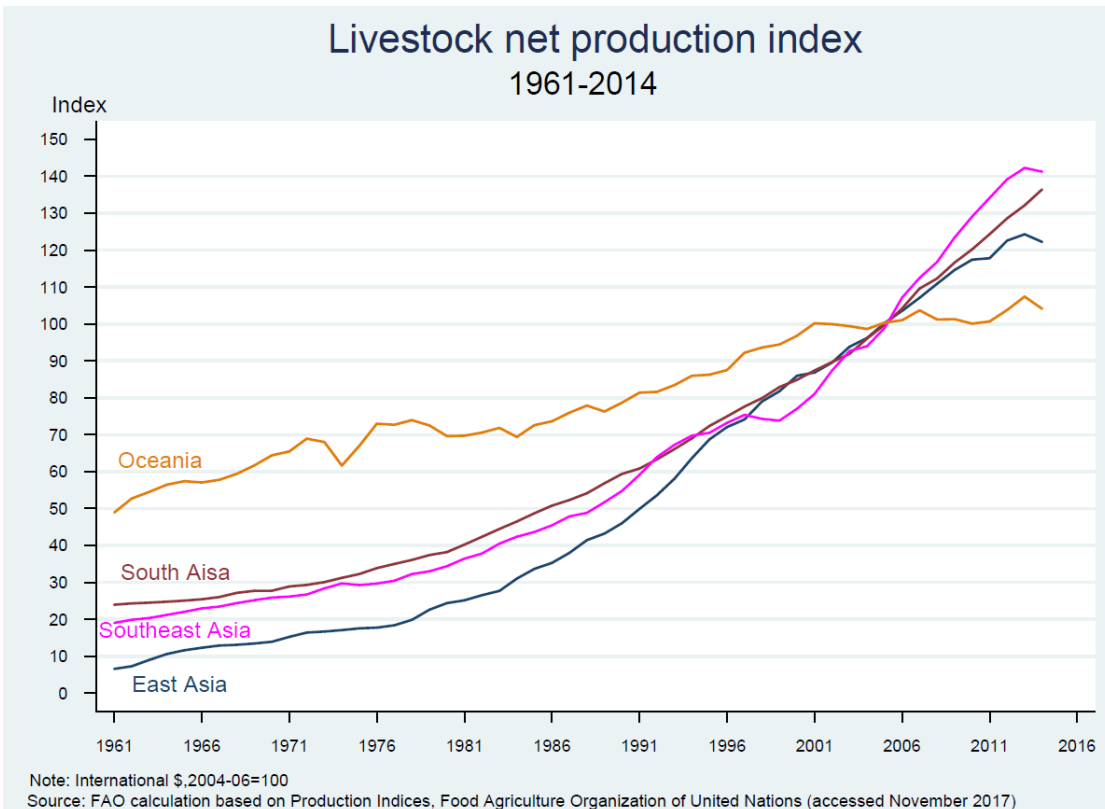
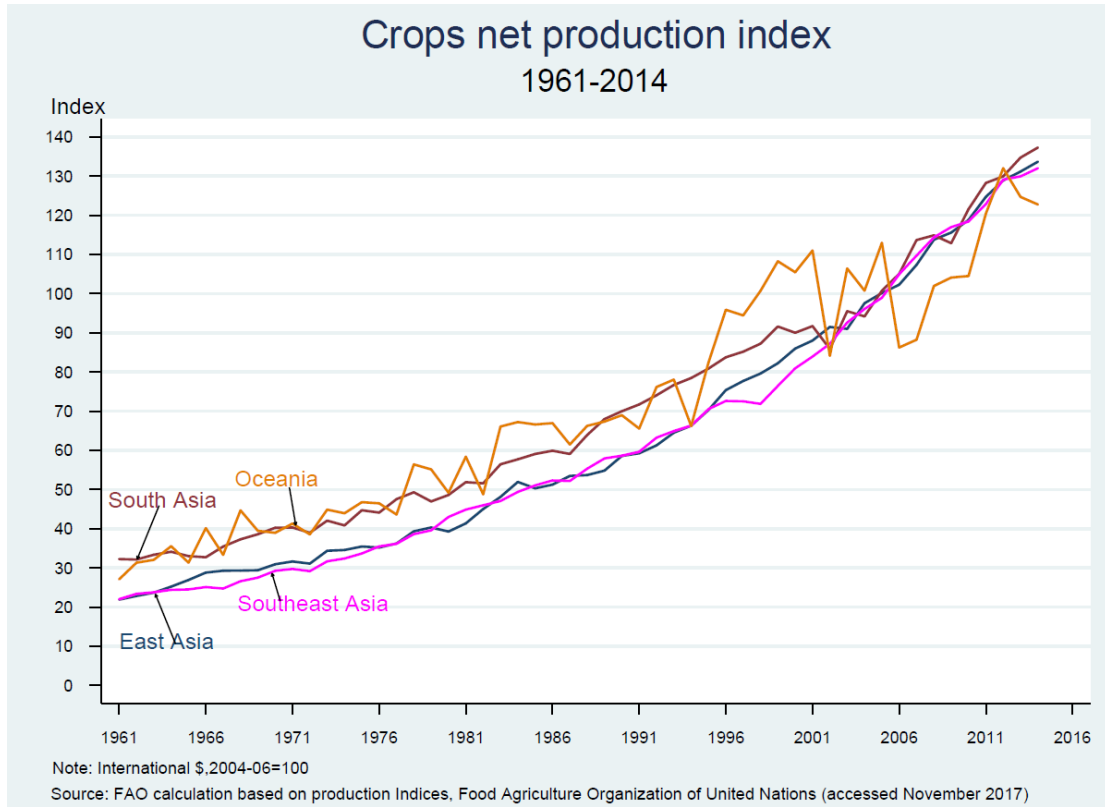
31. Disaggregating agriculture into crops, livestock and fisheries is worthwhile, as it provides a deeper understanding of the nature of the agricultural transformation in the Asia and the Pacific region. As far as crop agriculture was concerned, production increased about 6-fold in both East and Southeast Asia from 1961 to 2014, about 4.5-fold in South Asia and about 4-fold in Oceania over the same time period. Changes in crop production technology made it possible to increase livestock production in response to rising demand for livestock products resulting from rising incomes in the region.

32. From the third subgraph of Figure 11 below, it can be seen that in East Asia, livestock production increased 15-fold, in Southeast Asia 7-fold, in South Asia a little over 6-fold and in Oceania about 2-fold. It is clear that the agriculture of East Asia has been transformed far more radically towards increased production of livestock products in response to increased consumption, than the agriculture of the other subregions.

Figures 11a-11c. Agriculture, crop and livestock net production index¹¹ numbers by subregion

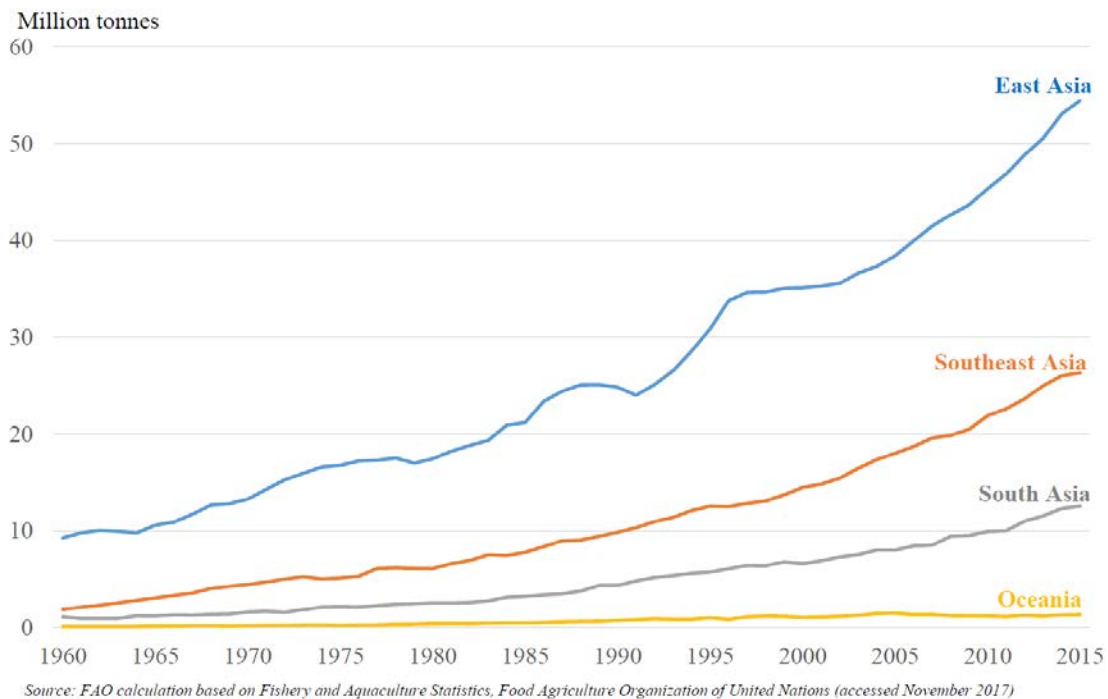


¹¹ The indexes for agriculture, crops and livestock are constructed by adding up the net production of different kinds of agricultural products. Net production is defined as (Gross Production - Feed - Seed) and is expressed in “International dollars”, derived using the Geary-Khamis formula (see footnote 9) for the agricultural sector. This method assigns a single “price” to each commodity. The indexes all have a base period of 2004-2006.



33. Turning now to fisheries, from Figure 12 it can be seen that East Asia is the largest capture and aquaculture fisheries producer in the region, followed by Southeast Asia, South Asia and Oceania. (However, on a per capita basis, Oceania has the highest production of wild fish, amounting to about 60 kg/capita in 2012, down from a maximum of 80 kg/capita in 2005.¹²) Together, the East and Southeast Asia subregions account for 85 percent of the region's production of capture and aquaculture fisheries. Figure 12 illustrates the growth in fish production, from both capture fisheries and aquaculture.

Figure 12. Fisheries production by subregion

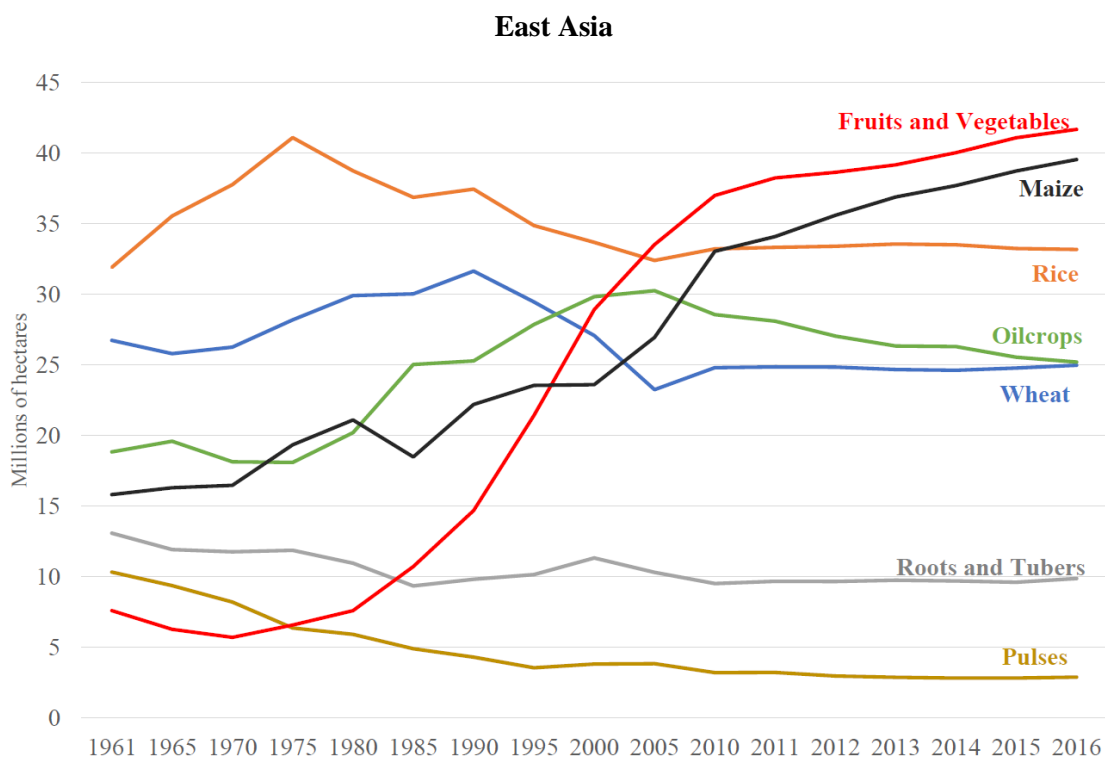


34. To sum up, agricultural transformation has gone farthest in East Asia, with Southeast Asia, South Asia and Oceania following behind. While crop, livestock and fisheries production increased in all subregions, East Asia saw a radical transformation of its livestock sector, in particular to feed the growing demand for livestock products, but the other subregions also saw large changes. One possible reason for the relatively slow pace of change in production in Oceania is that it is dependent on imports of livestock products.

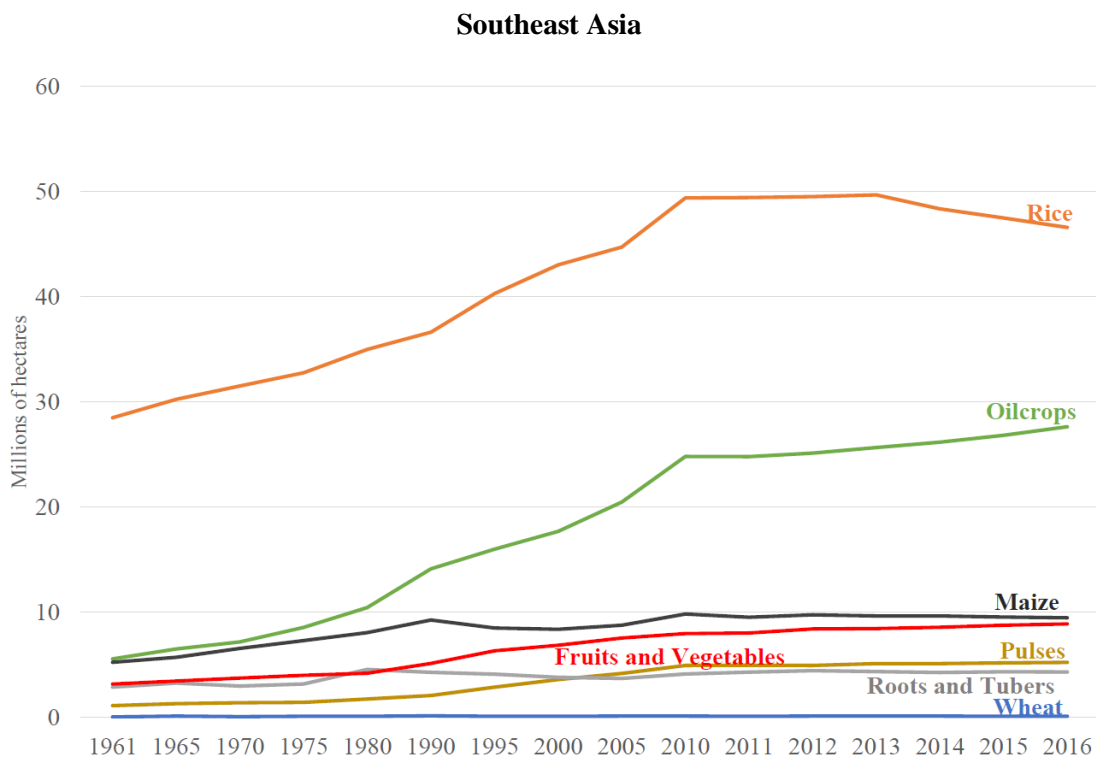
35. As regards crop production, it is natural to ask if the increases in crop production that took place responded to the changing demands of consumers. This question is addressed in Figures 13a-d below by examining changes in area harvested for some major crops in each subregion between 1961 and 2016.

¹² Figure 12 is different from Figures 11a to 11c because it adds up wild fish and aquaculture production in tonnes without assigning weights to different kinds of fish based on their value at a common set of international prices, as in Figures 11a to 11c. It is not an index, but records actual production.

Figures 13a-13d: Area harvested for selected crops by subregion

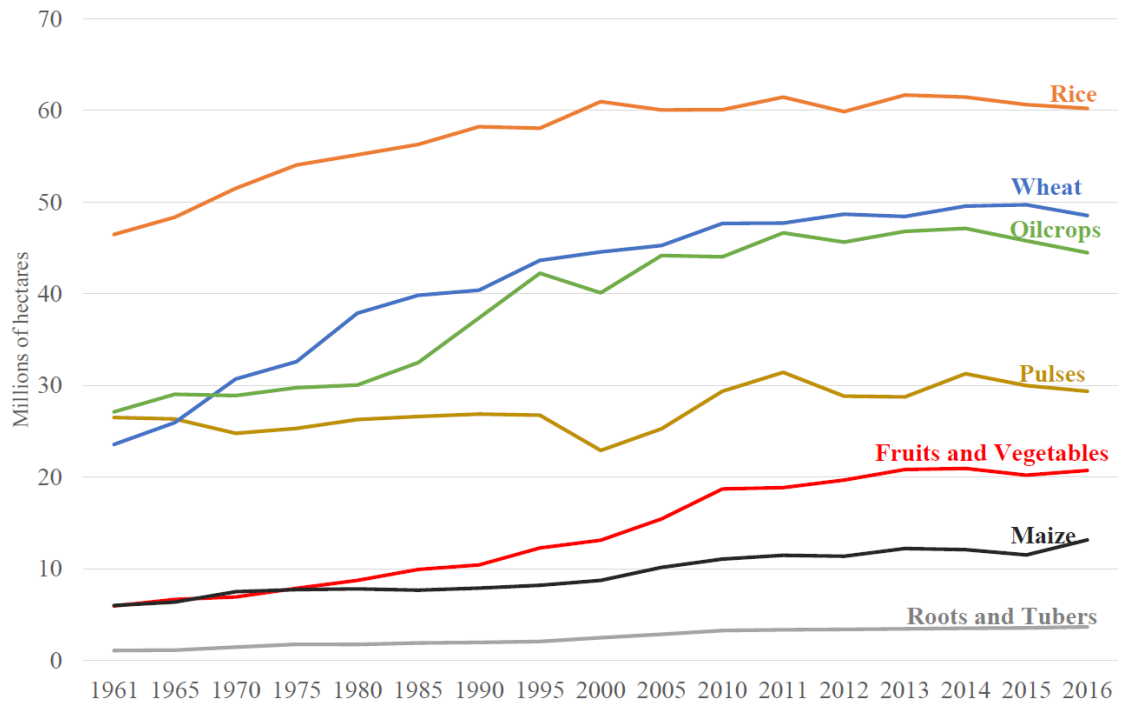


Source: FAO calculation based on FAOSTAT, Food Agriculture Organization of United Nations (accessed November 2017)



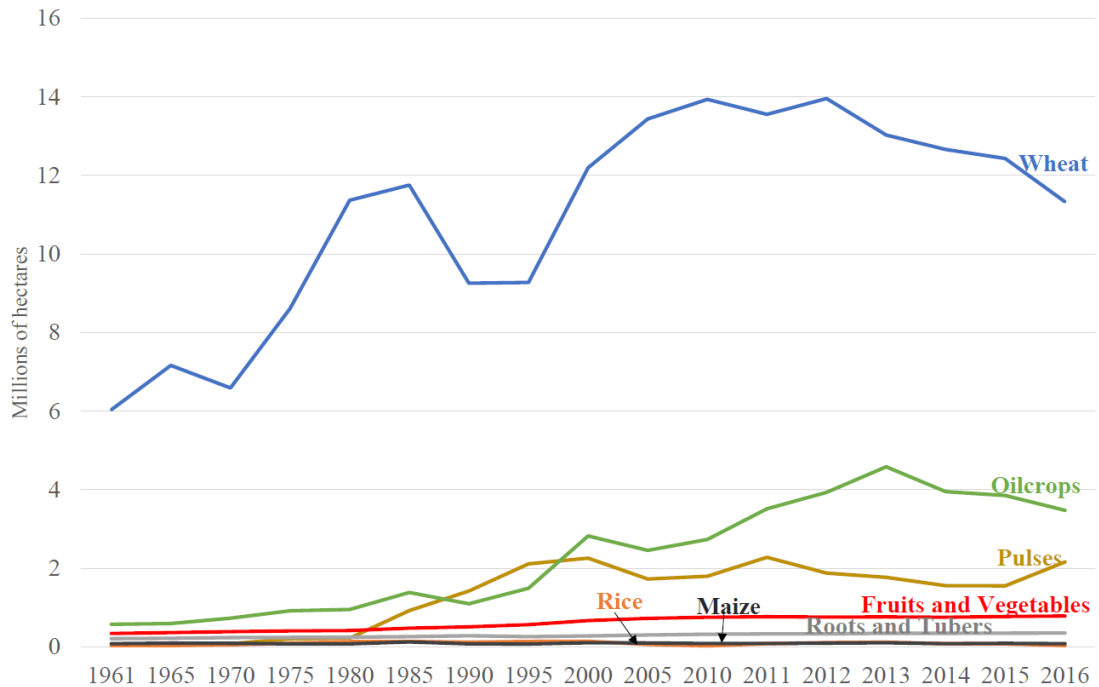
Source: FAO calculation based on FAOSTAT, Food Agriculture Organization of United Nations (accessed November 2017)

South Asia



Source: FAO calculation based on FAOSTAT, Food Agriculture Organization of United Nations (accessed November 2017)

Oceania



Source: FAO calculation based on FAOSTAT, Food Agriculture Organization of United Nations (accessed November 2017)

36. From Figures 13a to 13d above, it seems that crop agriculture in each subregion has changed in response to changes in the structure of food demand. In all four subregions, the area harvested for rice and wheat has either remained stable or decreased since 2010 (after increasing in earlier periods). In East Asia, consistent with the increased demand per capita for livestock and horticultural products and reduced demand for rice, the area harvested for maize (used as animal feed) and fruits and vegetables increased sharply from 1980 onwards. In South Asia, a similar pattern is observed, although on a much smaller scale. In Southeast Asia, the area harvested for oilcrops (mainly palm oil) and fruits and vegetables is still increasing, although more slowly since 2010. However, the area harvested for the other major crops is not increasing. In Oceania, the area harvested for wheat increased up to 2010 and then began to decline. Similarly, the area harvested for oilcrops increased up to 2013 and then began to decline. This raises the possibility that the total area harvested has actually declined slightly since 2010.

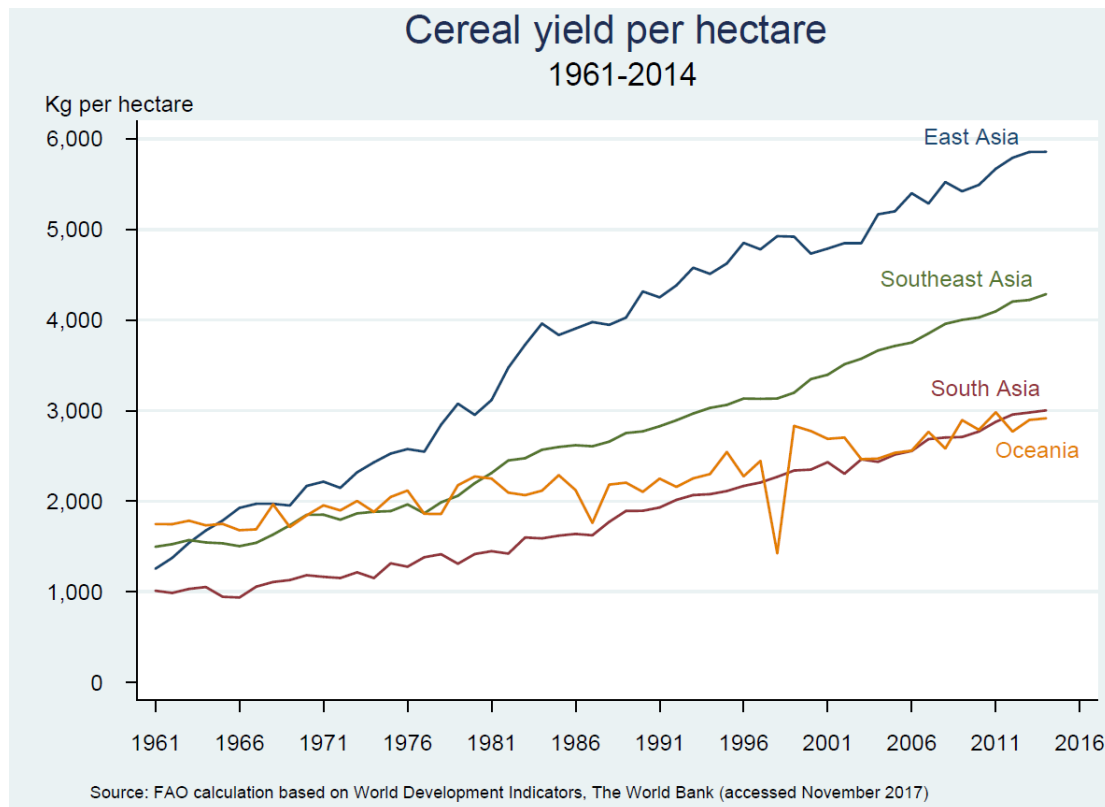
37. The general conclusion is that the structure of crop agriculture in the different subregions did change in response to changes in the structure of demand. It is particularly encouraging to see the increase in area harvested for fruits and vegetables and maize for animal feed in East Asia where, as was shown in Figure 6a, there has been a marked increase in demand for fruits and vegetables and for meat, which requires more animal feed to produce, potentially contributing to better nutrition in the subregion.

B. Crop yields and input use

38. Crop output growth results from growth in area harvested and yield growth. Growth in area harvested has been examined earlier in this document. Turning now to yield, this is a function of measurable inputs (e.g. soil quality, weather conditions, labour use per hectare, type of seed, fertilizer use per hectare, availability of irrigation and availability of tractors) and inputs that are difficult to measure, such as a farmer's ability and capacity to work.

39. How was the increase in agricultural production in each subregion achieved? The crucial difference between the periods before and after 1965 was that production increases before 1965 resulted largely from area expansion (bringing more land under the plough) but after 1965 were achieved largely through yield increases and to some extent increases in cropping intensity, as the possibilities for bringing more land under the plough became exhausted.

40. An examination of changes in cereal yields from the 1960s to the present illustrates this point. From Figure 14 below, it can be seen that, whereas in the early 1960s cereal yields throughout Asia averaged between 1 and 2 tonnes per hectare, by 2013 they had increased in all subregions, although the magnitude of the increase varied considerably across subregions. There was a sharp increase in East Asia to over 6 tonnes per hectare by 2013, while in Southeast Asia the average yield increased to over 4 tonnes per hectare, and about 3 tonnes per hectare in South Asia and Oceania.

Figure 14: Cereal yield per hectare

41. The increases in crop yields achieved over the past 50 years resulted from a number of factors, including new seed varieties, irrigation expansion, mechanization, pesticides and fertilizer. There is a close correlation between average cereal yield and average fertilizer use per hectare, in the sense that subregions where fertilizer use per hectare is high also tend to have high cereal yields. Until the invention of the Haber-Bosch artificial nitrogen fixation process just before World War I, the only way to provide nitrogen to the soil was through natural sources, the availability of which was limited. It can be argued that the increase in soil nitrogen through the application of inorganic fertilizer, in conjunction with the deployment of new seeds, was a key factor that made possible the dramatic increase in crop production and thus the dramatic increase in population that occurred in the twentieth century.

42. Fertilizer use per hectare is particularly high in East Asia at about 600 kg per hectare of arable land, followed by Southeast Asia at over 200 kg per hectare and South Asia at about 150 kg per hectare, with Oceania bringing up the rear at less than 100 kg of fertilizer per hectare. This matches fairly closely the increase in average crop yield, especially in the period 2002 to 2013 (unfortunately, data for fertilizer use for periods earlier than 2002-04 are not available).

43. The use of inorganic fertilizer at very high rates also imposes costs, such as: increased emissions of nitrous oxide, a potent GHG; nitrate contamination of groundwater at levels that are often above maximum containment limits; oxygen depletion in shallow bodies of water from excessive growth of plants and algae caused by nitrogen in the water; and the impacts of excessive deposits of ammonia and nitrates on ecosystem composition and diversity.

44. For these reasons, the excessive use of inorganic fertilizer (for example, through fertilizer subsidies) should not be encouraged. Such subsidies tend to be regressive, as the incidence of the subsidy depends on the relative elasticities of demand and supply, with the party less responsive to price changes, generally large farmers and fertilizer manufacturers, benefiting more from a subsidy

than small farmers. These subsidies also impose a fiscal burden on governments,¹³ potentially crowding out expenditures on public goods with high returns, such as agricultural research, rural infrastructure and education.

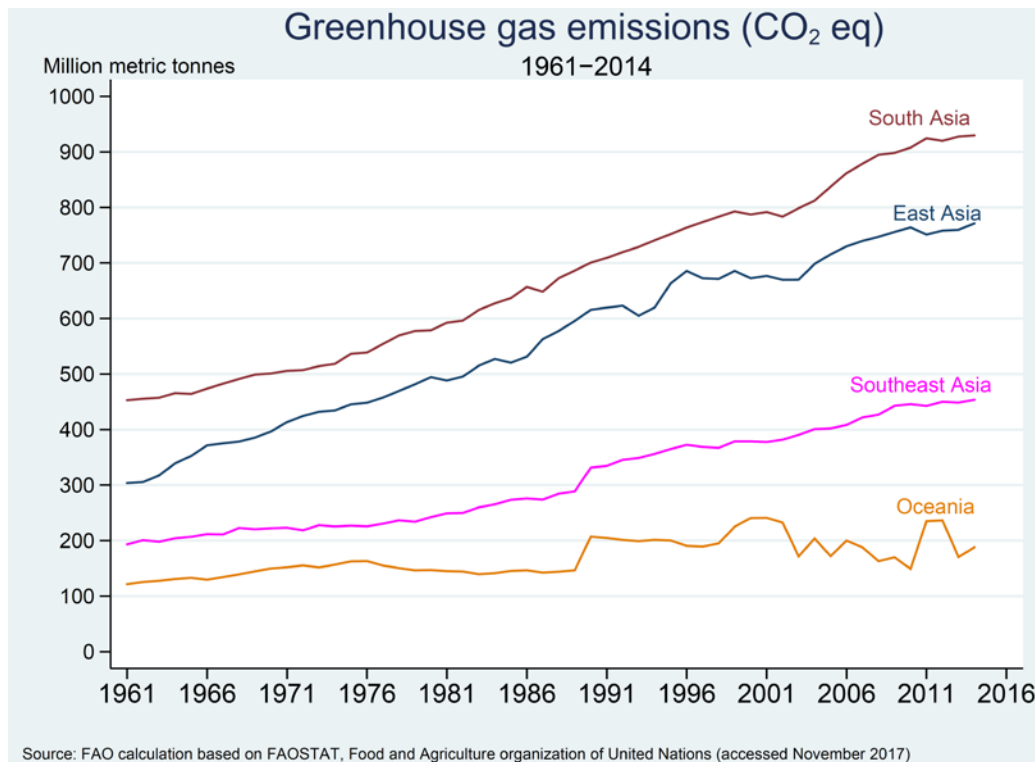
45. An important question is whether the process through which the increase in agricultural production was brought about is sustainable. A key aspect of sustainability is environmental sustainability, and here it is natural to ask about the impact of agricultural practices on GHG emissions. From Figure 15 below, the South Asia subregion is the largest emitter of GHGs, largely from enteric fermentation from the digestive systems of ruminants and some other animals, as well as from the application of synthetic fertilizer to the soil and for rice cultivation. East Asia is the second largest emitter of GHG, largely from the same sources. Southeast Asia emits less GHG than South Asia and East Asia, but the sources are largely emissions resulting from deforestation and from cultivated organic soils. As for Oceania, GHG emissions from that subregion's agriculture have increased only slightly since the 1960s.

46. Agriculture also competes with households and industry for water. Water withdrawals for agriculture typically account for 70 percent or more of total freshwater withdrawals in the countries of Asia. Yet as a result of climate change, freshwater availability is expected to decrease in countries in the low latitudes, including heavily irrigated areas in China and India. This is likely to exacerbate the competition of agriculture with industry and households for freshwater in some of the most densely populated regions of the world such as South Asia. Moreover, the adverse impacts of water stress and water scarcity on livelihoods and wellbeing can have implications for migration and shape its patterns, with final implications in terms of food security and nutrition.

47. More in general, the Asia and Pacific region has some of the world's largest migration corridors¹⁴ and has seen a rapid urbanization, driven in part by internal migration. Migration can reduce pressure on natural sources and impact positively on food access and utilization. However, if not supported by adequate policies, rural out-migration can also result in changes in labour allocation within the household which may lead to increasing time burdens for the household members left behind, which can lead to negative impacts on food utilization and nutrition. Moreover, migrants are among the most vulnerable members of society and likely to experience poor working conditions and human rights violations, which make them more vulnerable to food insecurity and malnutrition.

¹³ In India, for example, three major subsidies accounted for nearly 2 percent of GDP in 2014-15, with the fertilizer subsidy accounting for 0.6 percent of GDP (Government of India, Economic Survey 2014-15, Table 2.1).

¹⁴ At least 30 percent of all international migrants (74 million migrants) originate in the region and almost half of them are female (UN DESA, 2017).

Figure 15. Greenhouse gas emissions from agriculture (CO₂ equivalent)

IV. Meeting the Sustainable Development Goal (SDG) targets: opportunities and challenges

48. Even though the Asia and the Pacific region has made good progress in reducing malnutrition, a continuation of this trend will not be sufficient to eradicate hunger by 2030, as the region has a long way to go to meet the SDG targets (focusing, for the purposes of this paper, on SDG targets 2.1 to 2.4). As far as the reduction in undernourishment is concerned (SDG 2.1¹⁵), the region has made relatively good progress in the last 25 years, and it is reasonable to expect this progress to continue provided there is an enabling policy environment. However, should the pace of the present trend continue, it is unlikely to be sufficient to eradicate hunger by 2030.

49. As regards SDG 2.2 (“end all forms of malnutrition” by 2025), again the region has made good progress, even in subregions that are not usually considered outstanding performers. One of the most encouraging features of the decline in stunting in children is that in all subregions, the reduction achieved has been equal between boys and girls. However, despite the progress that has undoubtedly been made, malnutrition remains a serious problem in South and Southeast Asia, where roughly one in three children are stunted. Improved and more varied diets will play a crucial role in reducing this, along with the provision of safe drinking water and improved sanitation. As the latter fall outside FAO’s mandate, the paper focuses more on food-based inputs to nutrition, and thus the changes that will be required in agriculture.

¹⁵ SDG 2.1: “by 2030 end hunger and ensure access by all people, in particular the poor and people in vulnerable situations including infants, to safe, nutritious and sufficient food all year round”.

50. The rapidly growing problem of overweight and obesity, especially when it coexists with undernutrition, is another issue for which simple solutions do not exist. Public policies, regulatory frameworks and investments to spur food systems to be more responsive to nutritional needs, coupled with renewed agricultural research and nutrition education, will be important, but may not be enough.

51. At the same time, new and innovative policies and regulatory and investment frameworks are required if SDG targets 2.3 (“double smallholder incomes”) and 2.4 (“ensure sustainable food production systems and implement resilient agricultural practices”) are to be met.

52. To this end, government policies need to be reoriented away from maximizing production of foodgrains, to providing support to rural households, especially smallholders, for increasing their incomes and enhancing their well-being, while protecting them against risks of various kinds. The key point is that smallholders need to be empowered to take advantage of opportunities for increasing household income, and it is important that such interventions are age- and gender-sensitive, taking into account the different needs and opportunities of youth, women and men. Such opportunities include: the changing patterns of food demand towards consumption of high-value products (e.g. horticultural products, livestock products, oils and fats, sugar); the rising demand for more processed foods; using Geographical Indications (GI) and Globally Important Agricultural Heritage Systems (GIAHS) as instruments to generate more income on the farm; new technologies (e.g. biotechnology, e-agriculture); non-farm income-earning opportunities; and the growing trade in food products.

53. As regards sustainability, new technologies are emerging for reducing enteric fermentation from the digestive systems of ruminants and methane emissions from rice cultivation. Policies to promote the development of these technologies and their rapid uptake are essential for reducing GHG emissions from agriculture in the region. Reducing fertilizer applications where they are clearly excessive, increasing water-use efficiency and reducing deforestation are also vital in this regard. Applications of information and communications technology to agriculture (e-agriculture) are rapidly increasing in the region and open up the possibility of precision agriculture (for example, by determining which input use can be reduced).

54. Agricultural research has a key role to play in this regard. However, a recent International Food Policy Research Institute (IFPRI) study on agricultural research in Asia found that none of the 12 countries in the study were devoting even 1 percent of their agricultural GDP to publicly funded agricultural research, despite very high rates of return to such research. To compound the problem, in many countries, more than half the research budget goes toward salaries. As GDP growth rates in the region are relatively high, it should be possible to increase public spending on basic research on crops, livestock and fisheries, while encouraging the private sector to concentrate more on commercially oriented agricultural research.

55. Finally, there is the need to pay more attention to the complex relationship between migration, food security and nutrition linkages. Indeed, SDGs could not be achieved without addressing migration. Food insecurity and hunger are among the adverse drivers of migration. Migration in turn impacts on the nutrition and food security of migrants and their families, in terms of remittances, improvement in access to income and services, productivity improvements and skills development among others. Efforts are needed to systematically generate evidence on differentiated migration patterns and impacts and ensure decision-makers utilize it to promote a stronger coherence between migration, agriculture and food security and nutrition policies and programmes.

V. Conclusions and recommendations

56. The Asia and the Pacific region continues to suffer from the triple burden of malnutrition, undernutrition, obesity and overweight, and micronutrient deficiencies, despite the significant progress that has undoubtedly been made.

57. The major challenge for government policy is to reinforce the progress that has already been made and extend it by using policy changes, regulatory measures and public investments to make food systems more responsive to nutritional needs. Improvements in access to food and in nutritional status will not happen unless the incomes of rural households increase, prices of nutritious foods are kept affordable, and households are better informed about the nutritional content of and the need to diversify their diets. With pro-poor rural development policies, targeted nutrition initiatives and investments in social protection, smallholder farmers and other poor rural households can be helped to increase their incomes through more farm-level investments, improve the quality of their diets, and learn to better manage risks, with positive impacts on food production, nutrition and food security.

58. There are several challenges for public policy in this regard. First of all, there is a need to adopt pro-poor policies and provide public goods to make it possible for smallholders, especially women and other disadvantaged groups, to take advantage of income-earning opportunities such as those offered by the use of GIs. Secondly, the relative neglect of pulses, beans and other crops in agricultural policies in the region should be reversed so that the poor have access to relatively low-cost sources of protein and other micronutrients. Thirdly, sustainable intensification needs to be promoted through policies to equip smallholders to achieve increases in agricultural production in an environmentally sustainable manner that also reduces food losses. This may require implementing policies to promote technology development, including biotechnology (e.g. by creating a knowledge platform on agricultural biotechnologies), and promoting public-private partnership and South-South Cooperation for improving technology transfer. Policies to strengthen food safety, including measures to reduce the build-up of anti-microbial resistance, are also needed since intensification of livestock production through factory farming poses risks in this regard. This leads to the fourth point, which is that policies are also needed to manage new ways of organizing production (e.g. contract farming or factory farming in poultry, livestock, and aquaculture and fisheries operations) so that these new ways do not disadvantage smallholders. A key problem facing farmers in general and smallholders in particular, is that they are highly vulnerable to risks of many kinds, such as the risks posed by weather and pest infestations. Since risk protection requires resources that the poor do not always have, policies to strengthen social protection (particularly during economic crises and other hard times) are needed. Policies should also take account of the links between migration, food security and nutrition, and agriculture in order to tackle the challenges and harness the opportunities stemming from this complex relationship. This requires strong evidence generation on rural migration's drivers, impacts and trend to inform policy-making; and sharing of lessons learned and approaches at regional level, including on partnering with the private sector, financial institutions, civil society, migrants and diaspora communities,

59. If these challenges can be overcome by formulating and implementing the right policies, accompanied by investments and appropriate regulatory frameworks, the region can hope to eradicate hunger and malnutrition by 2030.