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The Saga of Rising Food Prices

Introduction

The twenty first century is likely to witness an unprecedented escalation in food prices. This can be attributed to a sharp rise in the demand for food due to rapid economic growth in many developing countries accompanied by a decline in supply fuelled by climate change due to global warming and the diversion of farm produce to the manufacture of crude oil substituting biofuels. This rise in prices will undoubtedly wreak havoc on the poor in developing countries on either side of the threshold of subsistence. To ward off this impending doom, developing countries need to invest in rural infrastructure and marketing institutions and international organisations need to support research in the area of agricultural science and technology. Developed nations should also be willing to exploit their potential to augment global food supplies.

Since 2002, the simultaneous occurrence of several phenomena has affected food availability and prices. Many food-insecure countries in Asia and sub-Saharan Africa have attained rapid and sustained growth averaging more than 5 percent per annum without matching agricultural growth. Diet globalisation has led to a shift in the composition of the food basket in favour of temperate vegetables, grains like wheat and wheat-based products. At the same time, economic growth has resulted in an increasing demand for energy. Due to a shortage of fossil fuels, agricultural products have been diverted for use as fuel. At the same time, climate change brought about by global warming is affecting yields in tropical countries, thus escalating the scarcity of food supply.

These factors, through their impact on the demand or supply side of food, have affected prices and availability. This study examines such factors and the gains and losses they generate for different national economies and individual actors within these economies, including the impoverished. Next section analyses the impact of change in the major determinants of food demand and supply. Following that predictive models of price change are looked at to identify the gainers and losers from the recent change in the food demand and supply situation, with specific emphasis on poverty and hunger. Finally, certain recommendations are made.

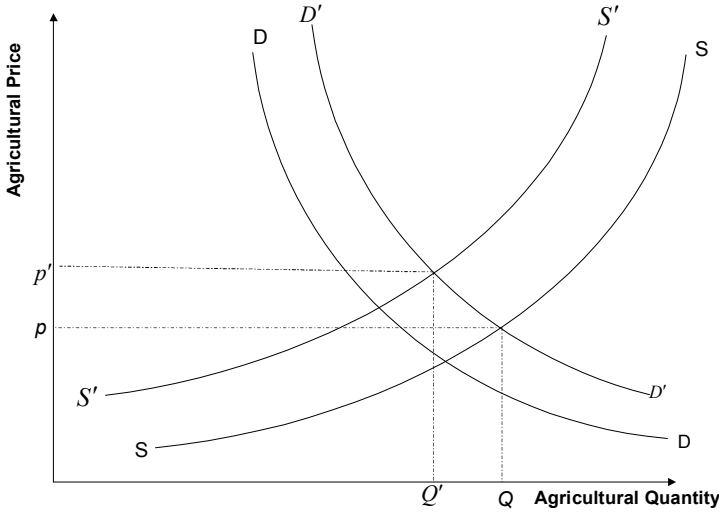
Food Situation: Demand and Supply Side Factors

As in all markets, prices in agriculture are determined by the relative strength of demand and supply side factors. Incomes are a very important factor as their increase leads to a rightward shift in the demand for agricultural products (DD to $D'D'$ - See Fig. 1) and a consequent increase in agricultural prices. Such an increase in demand in the international market can also come about if import dependent agricultural countries suffer yield losses which cause domestic supply to contract. On the other hand, agricultural prices in the international market might also increase if supply falls i.e. the supply curve shifts leftwards from SS to $S'S'$. This may happen due to two reasons: yields falling, or crops being diverted to non-food use such as biofuels.

Assume initially that the demand curve and supply curve are given by DD and SS, which implies that the agricultural price is given by the intersection of the two curves at p. Due

to the factors explained below, demand increases to $D'D'$ and supply decreases to $S'S'$; the point of intersection of supply and demand curves now shifts to p' which is higher than p. Moreover, the quantity bought on the international market shrinks from Q to Q' which implies that developing countries characterised by shrinking domestic supplies buy lower amounts even in the international market – their aggregate consumption shrinks.

Fig. 1: Interaction between Increasing Demand and Shrinking Supply



We now look at the demand and supply side factors which can bring about such an increase in agricultural prices.

Demand Side Factors

As mentioned, many food-insecure countries have experienced economic growth with the result that food demand and therefore food deficits have increased. The items for which demand has increased vary from country to country depending on tastes and existing levels of affluence. For example, during 1990-2005, India witnessed an increase of around 70 percent in the demand for oil crops and moderate increases of 20-30 percent in the demand for cereals, meat, milk and vegetables. In China, cereal demand actually decreased by 20 percent in the same period whereas demand for oil crops, meat, fruits and vegetables increased by more than 140 percent each. In Brazil, on the other hand, cereal and meat consumption increased significantly while consumption of fruits fell. As evident from the study of food consumption bundles over this period, the positive thrust given to food consumption under various heads is stronger than the negative impact under other heads.

Table 1: Direction of Food Consumption Change in Developing Countries, 1990-2005

Type	India	China	Brazil	Nigeria	Kenya
Cereals	-	X	√	-	-
Oil Crops	√	√	-	-	*X*
Meat	√	√	√	-	-
Milk	√	√	√	√	-
Fruits	√	√	X	-	-
Vegetables	√	√	√	√	-

Note: √ denotes increase of 20 percent or above; X denotes decrease of 20 percent or above; - denotes rest of the cases.
Source: Based on data from FAO (2007)[i]

Table 1 lists five developing countries which together constitute around 40 percent of the world population. Consider the case of the fast growers (countries with an annual rate of growth of per capita income exceeding 3 percent): India and China. Only one subcategory, that of cereals, shows negative or insignificant (less than 20 percent) growth in consumption. If we consider the rectangles formed by the intersection of crop types and countries as individual data points, then in the case of India and China, only 2 out of 12 data points (16 percent) imply insignificant positive growth or worse. If we club the fast growers with Brazil and Nigeria (moderate growers with an annual growth of per capita income of around 1 percent) even then 7 out of 24 data points (less than 30 percent) imply insignificant positive growth or less.

Addition of a poor performer like Kenya (slightly negative per capita income growth during this period) to this group yields a total of 13 such data points out of a grand total of 30 – less than 50 percent of "insignificant positive growth or worse" cases. For individual sub-categories, consumption of milk and vegetables show a significant increase in 4 out of the 5 countries (except Kenya) whereas meat and oil crops show an increase in 3 and 2 cases respectively.

Note that all the mentioned food sub-categories are derived from land either directly or indirectly. Direct land based products include fruits, vegetables, oil crops and cereals while those based indirectly on land are meat and milk. In fact, the latter are high-end products which are extremely land intensive as fodder input to meat/milk conversion ratio is very high. With some developing countries experiencing rapid growth, consumption of these items has gone up drastically.

Summing up, it can be concluded that a simultaneous increase in the demand for a majority of food items, which is presently the case, would drive up the value of land and cause an increase in the prices of all food items.

Supply Side Factors

Demand for Biofuels: Increasing demand for crude oil coupled with an absence of increase in its supply in the international market has spurred an escalation in oil prices. It is seen that when oil prices range from US$60 to US$70 per barrel, biofuels become competitive with petroleum, even with existing technologies. With the international price of oil currently exceeding US$100 a barrel, biofuels are more than competitive with oil. This might result in the diversion of food grains and edible oil seeds to the production of biofuels rather than to food markets. The corresponding decrease in supply to these markets should drive prices of food grains, feedstock and oilseeds up, which in turn would increase the derived demand for land and push up the price of all land based products.

With fossil fuels becoming scarce, it is possible that governments have started to subsidise the production of biofuels, given that biofuels are associated with certain positive environmental externalities. Such subsidies also help to check the prices of fossilised energy fuels by providing an alternative. For example, consider the process of harvesting crops to produce biofuel for transport and other uses. The resultant emissions can subsequently be captured by the next crop of plants, constituting an input into biofuels, during their growth cycle. In this way, it is possible to recycle carbon –- a mechanism which makes biofuels environmentally superior to fossil-based crude oil. However, any subsidy, which is justified on these grounds, also implies that diversion of crops for the production of biofuel becomes more attractive than supply to food markets. This in turn leads to an increase in the price of

food and thus, the subsidy for the production of biofuel effectively becomes a tax on the poor who spend a large chunk of their income on food.

With technology changing, two distinct developments with opposite consequences are likely. The first enables better utilisation of waste biomass which implies that tradeoffs between food and fuel consumption might be weakened and it would be possible to have more of both in the future. However, second and third generation technologies for biofuel production should be more efficient than first generation technologies. Consequently, as the competitiveness of biofuel rises, there will be a tendency to divert more land, water and other resources to biofuel production. Thus, food prices will rise further unless there is more food and agricultural science-related investment -- for instance, in technologies that enable the production of more food with less land and water. Such technological changes would arrest the widening of the gap in competitiveness between biofuel and food and thus check the diversion of land to the production of inputs for biofuel generation.

Climate Change: The risk of climate change is likely to have a negative impact on food production. Rising temperatures will be associated with increased risks of floods and droughts and, therefore, crop yield losses. A study by Fisher et al (2005)[ii] reported that in more than 40 developing countries, mainly in sub-Saharan Africa, predicted a 15 percent decline in cereal yields. Projections also show that land might become totally unsuitable for wheat cultivation in Africa. Other estimates include large reductions in yield of up to 22 percent in South Asia.

Thus, global warming might lead to a 16 percent decline in world agricultural GDP by 2080. This decline will be associated with a 20 percent decrease in the agricultural output of developing countries and a 6 percent decrease for developed ones. With yields and production diminishing, the import dependency of developing countries is bound to rise. The increase in demand for food from these countries in the international agricultural market coupled with a fall in supplies by developed countries will result in an increase in the prices of agricultural items. A study by Easterling *et al* (2007)[iii] predicts that global warming resulting in temperature increases of more than 3^{o}Celcius may cause agricultural prices to rise by up to 40 percent.

The adverse impact of climate change on crop yields can be checked by carbon fertilisation (the beneficial effect of high atmospheric concentrations of carbon dioxide on crop yields). However, the salutary effect of this on crop yield is not entirely going to arrest its decline. As mentioned earlier, with demand from developing countries rising, food prices will continue to rise in the foreseeable future.

Models of Price Prediction: Distribution and Poverty Effects

The various models of price prediction are summarised below. The IFPRI (International Food Policy Research Institute) Impact Model shows that the forecasted price changes are extremely sensitive to the underlying assumptions of biofuel production. Consider a person who earns US$100 a month. If he spends $50 on maize, the purchasing power of this US$50 will be 36.5 percent [(1.72/1.26) -1)] higher in the case of Scenario 1 as compared to Scenario 2. Given that the person spends half his income on maize, his total purchasing power corresponding to Scenario 1 will be 18.25 percent higher than Scenario 2. Note that the results of both scenarios concur with the above-mentioned diagrammatic intuition – which predicts the impending decline in the availability of food.

Other projections differ on details and forecasted magnitudes. For example, FAPRI

(Food and Agricultural Policy Research Institute), 2007[iv] predicts that corn and palm oil prices will rise, but not wheat. EIU's (Economic Intelligence Unit) predictions[v] (EIU, 2007) are no less forbidding – an 11 percent increase in the prices of food grains over the next two years actually gives a higher trend rate of growth (5.4 percent per annum) of food grain prices than that corresponding to the 72 percent increase (4.6 percent per annum) by 2020 forecast by Scenario II of IFPRI's Impact model (See Table 2).

All price prediction models show significant price increase in one or the other type of agricultural product. It is obvious that an increase in cereal prices will impact all countries – net cereal exporters will benefit and net cereal importers will find it more costly to meet their demand. The incidence of loss will be more common than gains – 70 percent of the countries in the world are cereal importers. Rising prices imply that the shrinking food aid (2006 level was 40 percent lower than the 2000 level) has to be targeted to fewer countries, mainly in sub-Saharan Africa and to only impoverished groups within these countries.

The effect on individuals mirror the case of countries – net sellers should gain and net buyers should lose out. Here again, a distinction has to be made between sellers at the farm, wholesale or retail level. In many developing countries, agricultural markets are segmented because of poor infrastructure and long intermediary chains are the only links between the farmers and consumers. Given this state of affairs, the increase in farm gate prices will only be a small fraction of the increase in retail prices. In many cases, falling yields would imply lower production by net sellers and therefore, lower surplus for sale. With only a negligible increase in prices at the farm gate, the income of the net sellers (usually medium or large farmers) might well decline. This is not true in the case of net sellers from developed countries who almost capture the entire benefit of an increase in retail price and therefore enjoy an increase in total revenues. Such increase will also be facilitated by the fact that decline in yields due to global warming will be relatively negligible in developed countries.

As far as net buyers are concerned, the effect will be similar in developed and developing countries as higher prices would lead to a loss in purchasing power. However, the percentage loss in purchasing power will be higher for net buyers from developing countries as they spend a greater proportion of their income on food.

Thus, a larger chunk of population in the developing countries, particularly the poor and net buyers of food, will have to bear the brunt of the price rise. This is true not only of the urban poor who have no land but also the rural poor who are either landless labourers or farmers with plots of land so small that even means of subsistence cannot be generated. For example, two thirds of rural households in Java own between 0 and 0.25 hectares of land, which would make them net buyers.

Table 2: Price Prediction Models

Study	Special Assumptions, if any	Results
IFPRI Impact Model	Scenario 1: Actual biofuel expansion plans for countries that have them and assumed plans for countries that do not	26 percent price rise for maize, 18 percent for oilseeds by 2020; net decrease in availability of food and calorie consumption
	Scenario 2: Double the Scenario Levels	72 percent price rise for maize, 44 percent for oilseed by 2020; net decrease in availability of food and calorie consumption
FAPRI (Food and Agricultural Policy Research Institute) Model, 2007		No large impact on wheat prices due to falling per capita demand; palm oil (biofuel feedstock) prices to increase by 29 percent by 2009-10; corn prices to also increase till 2009-10
Economic Intelligence Unit, 2007		11 percent increase in the price of grains in the next 2 years; 5 percent increase in the price of oilseeds
OECD-FAO Outlook[vi], 2007 (Organisation for Economic Cooperation and Development, and United Nations Food and Agriculture Organisation)		Price of coarse grains, wheat and oilseeds to increase by 34, 20 and 13 percent respectively by 2016-17

Statistically, the number of hungry in the world has been rising. FAO's (United Nations Food and Agriculture Organisation) estimates[vii] (FAO, 2006) suggest that between 1990 and 2004, the number of undernourished rose by around 1 percent, i.e. from 823mn to 830mn, though their share in total population declined by three percentage points from 20 to 17 percent. The number of ultra poor (those living on less than half a dollar a day) has actually increased in sub-Saharan Africa and Latin America.

The Global Hunger Index (a weighted average of the incidence of under nourishment and low weight among children and the under-five mortality rate) improved significantly in South and Southeast Asia between 1990 and 2007 but not in the Middle East, North Africa and sub-Saharan Africa. Moreover, in recent years, measures to alleviate hunger have slowed down in countries like India and China but have accelerated in Brazil and Ghana. By lowering yields, climate change might negatively affect food security and reverse or slow down alleviation of hunger.

A 2007 study by F. N. Tubiello and G. Fisher[viii] foresees a decline in the number of undernourished people in different parts of the world. It states that in developing countries, the number of undernourished will decrease from 885mn in 1990 to around 579mn in 2050 – a decline of approximately 35 percent. However, this net change masks the prediction of an even bigger net decline in developing Asia from 659mn to 123mn during the same time period (81 percent decline) and a rise in sub-Saharan Africa from 138mn to 359mn (160 percent increase). Middle East and North Africa will witness a milder increase of around 70 percent – from 33mn to 55mn. There will be a gradual decline in Latin America from 54mn to 40mn.

Another point of concern is that in Asia the decline in the number of under-nourished will taper off – developing countries in this continent will have around 73mn under-nourished people even in 2080. Latin America will see a slight acceleration in hunger alleviation between 2050 and 2080, with the number of hungry touching 23mn by 2080. Another heartening feature is the

reversal of the trend of increase in under-nourishment in the Middle East – the study predicts a decline from 56mn to 48mn over the period 2050-80.

But despite these positive developments, African hunger is likely to assume grave proportions – the number of hungry would increase by a further 51mn during this period to touch 410mn in 2080.

Conclusion

A simultaneous occurrence of several phenomena will stimulate a rise in the price of food at unprecedented rates in the course of this century. Food demand will rise because of rapid economic growth in many developing countries but at the same time, supply will fall because of the impact of climate change and the diversion of farm produce for the production of biofuel which will increasingly be used as a substitute for crude oil.

In spite of the rapid growth in many developing countries such as India, Pakistan, Bangladesh, China and some in Africa, a large proportion of the population still lives perilously close to the threshold of subsistence and even below it. These poor households will be the hardest hit by the food price increase. In sub-Saharan Africa the number of destitute and undernourished people will increase.

Action needs to be taken immediately to prevent these adverse events. To step up the world supply of food developed countries should dismantle programmes that preserve agricultural resources except in specific conservation areas. Developing countries should step up investment in infrastructure and marketing institutions so as to stall or reverse the decline in yield that climate change might bring about and to overcome other supply-side constraints. International organisations should invest in agricultural science and technology so as to increase yields. Social safety nets need to be expanded with the help of resources generated through economic growth in order to provide succour to the undernourished and poor.

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[i] FAO (2007), FAOSTAT database, Available at www.faostat.fao.org/default.aspx

[ii] Fischer, G et al (2005), "Socio-economic and climate change impacts on agriculture: An integrated assessment, 1990–2080," *Philosophical Transactions of Royal Society* B 360: 2067–83.

[iii] Easterling, W.E., et al. (2007), "Food, fibre and forest products," In *Climate change 2007: Impacts, adaptation and vulnerability. Contribution of working group II to the fourth assessment report of the intergovernmental Panel on Climate Change*, ed. M.L. Parry et al Cambridge, U.K.: Cambridge University Press.

[iv] FAPRI (2007), *U.S. and world agricultural outlook*. Ames, Iowa.

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[vi] OECD and FAO (2007), *OECD-FAO agricultural outlook 2007–2016*, Paris.

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[viii] Tubiello, F. N. and G. Fischer. (2007), "Reducing climate change impacts on agriculture: Global and regional effects of mitigation. 2000–2080,"*Technological Forecasting and Social Change* 74: 1030–56.

This Briefing Paper is based on a comprehensive study entitled," The World Food Situation: New Driving Forces and Required Actions," authored by Joachim von Braun and published by the International Food Policy Research Institute (IFPRI), Washington DC in December 2007, Some of the arguments here, however, can be attributed to CUTS and are not covered in the mentioned study. It has been compiled by Siddhartha Mitra and Ravi Kiran Naik of CUTS International.