

Impact of agriculture on exchange rates

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Introduction

Economists see the environment as a subset of the economy, while ecologists see the economy as a subset of ecology. Economic theory and economic indicators are unable to explain how the economy is disrupting and destroying the earth's natural systems. Economic theory cannot explain why grasslands are turning into deserts in parts of China and many such things. But as an economist, I argue that economics is essential in measuring the costs incurred by society for excessive abuse of the ecosystem.

Economists have great faith in the markets, while ecologists fail to appreciate the market adequately. Ecologists think in terms of cycles (cycles as in nature), while economists, more often than not, think linearly. Economists appreciate the growth of the global economy and the ever-increasing cross border trade, while ecologists look at this same growth and observe that it is produced at the cost of burning vast quantities of artificially cheap fossil fuels — thus destabilising the climate. Economists rely on the market to guide their decision-making. They respect the market because it can allocate resources with efficiency. Ecologists believe that the market does not tell the truth. They see the economic growth of recent times, but they also see an economy that is increasingly in conflict with its support systems, one that is fast depleting the earth's natural capital, moving all the global economy onto an environmental path that will inevitably lead to economic decline.

To put ecosystems in economic terms, a natural system, such as agriculture, comes as an endowment. The interest income from an endowment will continue in perpetuity as long as the endowment is maintained. If the endowment reduces, income declines. If the endowment is eventually reduced to a nought, the interest income disappears. And so it is with natural systems. If the sustainable yield of agriculture is exceeded, the productivity from soil begins to shrink. Eventually, as the fertility of the land reduces, the produce begins to shrink. Eventually stocks are depleted and agriculture collapses. The cash flow from this endowment disappears as well.

“Climate change is already having a severe impact on agricultural production, which will only aggravate in the coming decades. Heavy tornadoes lashed the Murray Valley (in the south) as recently as Feb. 4.¹”

A report² says how climate change in the next 50 years will decrease water resources, increase temperatures, reduce the total area of arable land, cut livestock output and affect crop quality. In short, the effects of climate change are very real and will affect people's everyday lives and livelihoods, experts say.

The general theory supported by economists is that the exchange rate fluctuations have an impact on the agricultural industry and influence agriculture and farm policies. This paper supports the antithesis: that the agriculture sector and farm policies have an impact on the exchange rates.

¹ As quoted by Tim Fischer, a federal member of Parliament from Farrer, Australia February 2001.

² Based on research by the Commonwealth Scientific and Industrial Research Organisation (CSIRO)

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The U.S.A is the current global economic leader and many countries are partially dollarized, thus making the U.S. dollar the most important currency. Hence this paper studies the role of the farming industry and its impact on the U.S. dollar.

Money

What is money? However magnificently a piece of paper may be engraved, it is not money if it is not accepted in payment. However unusual the material of which it is made, anything that is generally accepted in payment is money. There is thus an inherent circularity in the acceptance of money. Money is accepted in payment only because of the belief that it will later also be accepted by others in payment.

Money originated very largely from non-economic causes: from tribute as well as trade, from blood-money and bride-money as well as from barter, from ceremonial and religious rites as well as from commerce, from ostentatious ornamentation as well as from acting as the common drudge between economic men.

Even in modern circumstances money still yields powerfully important psychic returns such as in an individual's social rank and standing, or a nation's position in the GNP league table. All sorts of things have been used as money at different times in different places. All sorts of things from amber, beads, cowries to eggs, feathers and kettles, leather to oxen, pigs, quartz, rice, salt, and vodka have been used as money. It is almost impossible to define money in terms of its physical form or properties since these are so diverse.

Therefore any definition must be based on its functions.

Functions of Money

Specific functions (mostly micro-economic)

- Unit of account (abstract)
- Common measure of value (abstract)
- Medium of exchange (concrete)
- Means of payment (concrete)
- Standard for deferred payments (abstract)
- Store of value (concrete)

General functions (mostly macro-economic and abstract)

- Liquid asset
- Framework of the market allocative system (prices)
- A causative factor in the economy
- Controller of the economy

Gold Standard

The gold standard belongs to history but, even today, many rich people in different parts of the world would rather keep some of their wealth in the form of gold than in official, inflation-prone

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currencies. The attractiveness of gold, from an aesthetic point of view, and its resistance to corrosion are two of the properties which led to its use for monetary transactions for thousands of years. In complete contrast, a form of money with virtually no tangible properties whatsoever - electronic money - seems set to gain rapidly in popularity.

Although paper money obviously had no intrinsic value, its acceptability originally depended on its being backed by some commodity, normally precious metals. During the Napoleonic Wars, convertibility of Bank of England notes was suspended and there was some inflation which, although quite mild compared to that which has occurred in other wars, was worrying to contemporary observers who were used to stable prices so, in accordance with the recommendations of an official enquiry, Britain adopted the gold standard for the pound in 1816.

For centuries earlier silver had been the standard of value. The pound was originally an amount of silver weighing a pound. France and the United States were in favour of a bi-metallic standard and in 1867 an international conference was held in Paris to try to widen the area of common currencies based on coins with standard weights of gold and silver. However when the various German states merged into a single country in 1871 they chose the gold standard. The Scandinavian countries adopted the gold standard shortly afterwards. France made the switch from bi-metallism to gold in 1878 and Japan, which had been on a silver standard, changed in 1897. Finally, in 1900, the United States officially adopted the gold standard.

With the outbreak of the First World War in 1914, Britain decided to withdraw gold from internal circulation and other countries also broke the link with gold. Germany returned to the gold standard in 1924 when it introduced a new currency, the Reichsmark, Britain did so the following year, and France in 1928. However the British government had fixed the value of sterling at an unsustainably high rate and in the worldwide economic crisis in 1931 Britain, followed by most of the Commonwealth (except Canada) Ireland, Scandinavia, Iraq, Portugal, Thailand, and some South American countries, abandoned gold.

The monetary system of each nation was linked to gold. For example, the United States promised to buy and sell gold for dollars at the rate of one ounce for \$20.67 and Great Britain promised to buy and sell its currency at a rate of one ounce of gold for 77 shillings and 10 1/2 pence. After an adjustment for purity (the ounce of U.S. gold was defined as 90% fine while that of Great Britain as 91.7% fine), the value of a British pound was \$4.865.

The United States kept the link to gold and after the Second World War the US dollar replaced the pound sterling as the key global currency. Other countries fixed their exchange rates against the dollar, the value of which remained defined in terms of gold. In the early 1970s the system of fixed exchange rates started to break down as a result of growing international inflation and the United States abandoned the link with gold in 1973. Though one might call money by different names in the U.S.A. and U.K., they were linked together by their common link to gold, and one can think of gold as the universal money.

The monetary policy of any country on the gold standard was limited by the "rules of the game", or the actions necessary to keep each currency convertible into gold. Because this system was a bit less open than the economy of which the states are a part, some temporary monetary measures were

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possible. The government could temporarily increase or decrease the money stock, and it would take some time before the gold flows needed to offset these actions would happen. Or if a country had an inflow of gold, it could sterilize it by using tax proceeds to buy up the gold and thus not let it increase the money stock. Sterilizing gold inflows (or outflows) was considered a violation of the rules of the game, and was considered by other countries to be irresponsible.

The purchasing power of such an ill-defined unit depends on money-supply management the adequacy of which strains the expertise of central bankers and their insecure capacity to resist political pressures. Other circumstances contribute to the precariousness of this supply/demand situation, including the facts that much or most of U.S. base money (as stated above) is held abroad.

Exchange rate theories

According to a survey undertaken by the Bank of International Settlements, as at April 2001, the leading centres for foreign exchange market activity as measured by turnover per day were:

- United Kingdom: US\$504bn
- United States: US\$254bn
- Japan: US\$147bn
- Singapore: US\$101bn

The exchange rate is the price of one currency in terms of another. Exchange rates are important economic variables because they are used to convert foreign prices into domestic currency and *vice versa*. These relative prices determine which goods are traded and where they are shipped or sourced. Being able to convert one currency into another at the prevailing exchange rate is crucial to international business and decision-making.

An exchange rate appreciation occurs when the value of one currency increases relative to another. For example, if one United States Dollar (USD) is worth Great Britain Pound (GBP) 1.75 on August 15, 2002 and two weeks later USD 1 is worth GBP 2.00, the dollar has appreciated relative to the pound.

Governments try to influence their country's exchange rate by intervening in the foreign exchange market. A domestic currency can be traded against many different currencies. Hence they have to decide in which of the bilateral markets to intervene. This in effect determines the '*intervening currency*' (sometimes currencies). Immediately linked to intervention currency are '*reserve currency*' (or currencies) Central banks can intervene only in those currencies in which they hold some reserves. Even if they interfered in only one foreign currency, the central banks usually maintain a portfolio of reserve currencies in order to diversify risk³. Some countries maintain a fixed exchange rates (valid for a fixed time frame), these are called '*pegging currencies*'. Our prime focus is the '*vehicle currencies*'. Vehicle currencies are of two types — those that serve as the medium of exchange in goods exchange and those that serve as the medium of exchange in

³ Based on Portfolio Analysis Theories

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currency exchange⁴. Although there can be many *vehicle currencies*, for all practical purposes the United States Dollar (USD)⁵ can be considered as today's *vehicle currency*

Exchange rate depreciation is when one currency declines in value relative to another. If one euro is worth \$1.00 today, but worth only \$0.85 tomorrow, the euro has depreciated relative to the dollar.

Exchange rate devaluation represents action by a government monetary authority to decrease the value of its currency from a fixed level relative to other currencies. An exchange rate revaluation is a government action to increase the value of its currency from a fixed level. While devaluation (revaluation) is induced by a country's monetary authority, the subsequent depreciation (appreciation) of the currency is market driven as the currency declines (rises) due to the broad forces of supply and demand.

As the U.S. dollar depreciates in value, the importer's cost of foreign exchange will decrease leading to lower prices in the import market, an increase in the demand for the product being exported, and higher prices in the U.S. market. As the U.S. dollar appreciates in value, the foreign currency cost to the importer will rise, resulting in higher import prices, a fall in import demand, and lower prices in the U.S. market.

Exchange Rate Determination

Among the most important and well-documented determinants of exchange rates are:

- Currency supply and demand,
- Interest rates (Interest Rate Parity)
- Macroeconomic policies like inflation (Purchase Power Parity — PPP)
- Other macroeconomic indicators like balance of trade and payments, and expectations about future events or policies.

Market forces and governments are the most important forces influencing exchange rates, especially in the short term.

Supply and Demand of Currencies

Exchange rates are determined by the interaction of forces affecting the demand and supply for currencies on the foreign exchange market. More than 100 currencies are traded worldwide, with the values of almost half of them determined solely by market forces. The exchange rate of these currencies is considered flexible, or floating. The U.S. dollar, Japanese yen, Indian Rupee, Australian dollar, Canadian dollar, Mexican peso, and the British pound are among the currencies allowed to float independently of most government intervention.

Factors causing the supply of any particular currency (U.S. dollars in our case) to increase would result in the dollar depreciating, or falling in value, while factors causing the supply of dollars to decline would cause the dollar to appreciate relative to other currencies. The supply of U.S. dollars is generated by the desire of U.S. consumers and business houses to import foreign goods and services, to lend funds and invest in other countries, to repay debts owed outside the United States, and for transfer payments made to foreigners. The US dollars are offered on foreign markets in

⁴ Hartmann Philipp (1998)

⁵ The USD finds stiff competition from the Euro, but has not been unseated as the Euro is yet to prove its stability.

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settlement of these legal obligations of residents and government. This increases the dollar supply resulting in the depreciation of the dollar's value relative to other currencies.

On the contrary, any force resulting in an increase in the demand for U.S. dollar would cause the dollar to appreciate, while a reduction in demand would cause the dollar's value to fall. The demand for U.S. dollars results from U.S. exports of goods and services, and income received from foreign investment and investments in the United States by foreign entities. As foreign businesses and consumers buy U.S. foods, for example, the conversion of their currencies into U.S. dollars drives up the demand for dollars causing the rate of exchange to appreciate.

In currency markets, prices are determined by the supply and demand of any particular currency. As the supply of dollars increases (decreases), its price, or the exchange rate, depreciates (appreciates). As the demand for dollars increases (decreases), the exchange rate appreciates (depreciates). These results assume that other factors affecting the exchange rate remain unchanged.

Macroeconomic Policy

Monetary and fiscal policies are the major elements of macroeconomic policy. These policies influence the overall level of economic activity and affect incentives to export and import. The major linkages between macroeconomic policy, U.S. agriculture, and trade are interest rates and exchange rates. Government intervention to influence interest rates, therefore, takes on added importance. Several options exist when considering how and when to influence the exchange rate. One possibility is to use stocks of foreign currency held for currency intervention purposes, called international reserves, to purchase domestic or foreign currencies.

Another option is to print domestic currency in order to purchase foreign currency. Still another option is to issue government bonds to raise the necessary funds with which to purchase foreign currencies. Which option, or combination of options, is chosen will depend upon the financial strength of the country and its underlying policy objectives.

Fiscal policy adjusts government spending through tax regulation and expenditures. U.S. fiscal policies designed to reduce government spending, or a fiscal contraction, will reduce the aggregate demand in the economy, leading to reduced demand for money and lower interest rates. The result will be a lower valued exchange rate for the U.S. dollar, higher exports, and lower imports. A fiscal expansion will increase the demand for money, raise interest rates, and cause the dollar to appreciate.

While the short-run or direct effects of macroeconomic policy are clear, the interaction of fiscal and monetary policies is less clear, but of critical importance to interest rates, the value of the U.S. dollar, and agriculture. These two sets of policies can reinforce or offset each other and it is important to understand how this may occur. Contractionary fiscal policy, or a reduction in government spending, reduces demand for money and lowers the exchange rate of the dollar because interest rates fall. This will cause exports to rise and imports to decline. If at the same time, however, the money supply is restricted and interest rates rise, then there would be upward pressure on the value of the dollar to partially or completely offset the currency depreciation. This particular policy mix would not benefit export-oriented agriculture in the short run because it would result in relatively higher interest rates and a stronger dollar.

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Expansionary monetary policy coupled with less government spending would reinforce each other, resulting in lower interest rates, a weaker dollar, higher exports, and lower imports. The short run consequences of this policy mix would be beneficial to U.S. agriculture because it would reduce interest rates and lower costs to producers, while stimulating exports and reducing import competition.

Interest Rates (Interest rate parity)

The interest rate is one of the important determinants of the exchange rate. The linkage between the U.S. dollar and interest rates is one of primary importance, particularly for the short-term period (generally of six months to a year). Interest rates in the United States and other countries help determine the exchange rate of the U.S. dollar relative to other currencies. One of the major effects of an increase in U.S. interest rates is to increase the demand for U.S. dollars.

It is important to note that markets or policies in other countries can also influence the U.S. dollar exchange rate. If interest rates rise in another country and U.S. rates remain unchanged, it is likely that the U.S. dollar would depreciate in value relative to the other currency. This occurs because the interest rate differential between the two countries has changed, resulting in a higher expected rate of return on foreign assets when compared to U.S. assets. This outcome assumes that the other country has stable political and economic systems, and that inflation between it and the United States is similar. While interest rates are important, their impact can be offset by other factors. From July 2000 to August 2001, the Federal Reserve Bank reduced the U.S. federal funds interest rate from 6.54 percent to 3.65 percent while the U.S. dollar appreciated slightly (4.5 percent).

Investors, businesses and their likes would transfer funds into the United States to be placed in interest bearing securities, accounts, and other financial assets. This conversion of foreign currency into U.S. dollars drives up the demand for dollars, causing the exchange rate to increase. A decline in U.S. interest rates has the opposite effect, causing the dollar to depreciate.

Inflation (Purchase power parity – PPP)

Differing price levels or rates of inflation between countries are a key source of exchange rate changes. If U.S. inflation rises relative to inflation in other trading countries, for example, U.S. agricultural products would become more expensive. In response to these higher prices, other countries would increase their exports to the U.S. market. As U.S. purchases of foreign goods increased, the supply of U.S. dollars on world exchange markets would expand. Other countries would import less from the United States due to higher prices, reducing the demand for U.S. dollars. The combination of a greater supply of U.S. dollars, along with reduced demand, would cause the exchange value of the dollar to decline. The intermediate term consequences of inflation would be to stimulate U.S. exports and reduce imports. In the longer term of two to three years, relative exchange rates would rebalance unless the United States continues to pursue inflation.

Balance of Trade and Payments

The U.S. balance of payments represents the accounting record of all international transactions by private and public entities over a specified period of time - monthly, quarterly, or annually for example.

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An international transaction is a transfer of goods, services, or assets between residents of the United States and another country. The balance of payments links trade in goods and services to international capital flows and the exchange rate. Exports, income from foreign investment, and travel receipts from foreigners are credits in the U.S. balance of payments leading to the receipt of U.S. dollars from foreigners. Imports, travel expenses of U.S. residents, and income paid on foreign investment in the United States are debits in the U.S. balance of payments since they represent payments to foreigners.

The balance of payments is composed of three main accounts:

- The current account,
- The capital account, and
- The official settlements account.

The current account consists of merchandise and services trade, and investment income. The capital account includes all purchases and sales of foreign and U.S. assets, including transactions in international real and financial assets and the international activities of U.S. banks. The official settlements account represents government holdings of gold, international currency reserves, and reserve assets of the International Monetary Fund.

Since every international transaction involves an exchange of assets, the balance of payments utilizes the double-entry accounting system in which debits are balanced by credits and *vice versa*. In 1999, for example, the U.S. current account was in deficit by \$339 billion, while the U.S. capital account was in surplus by \$339 billion. The capital account surplus was primarily the result of international capital inflows into the United States equalling \$706 billion.

Net capital inflows into the United States are the result of relatively high real rates of return on fixed and portfolio investments, a large politically stable free market economy, and the need to service a growing deficit in merchandise trade. Capital inflows represent not only investment in assets to increase future productivity and incomes, but are a critical source of loan funds used to provide credit to finance business expansion and consumers' purchases, and to maintain U.S. interest rates at levels lower than would be expected without foreign capital.

The balance of trade is an important long-run force affecting the exchange value of the U.S. dollar. Since moving to a flexible exchange rate system in the early 1970s, however, it has become less clear whether the dollar causes changes in the balance of trade, responds to the trade balance, or both.

It is generally believed that large, chronic trade deficits and surpluses do affect exchange rates, but the timing and length of time over which the influence exists is less certain. For example, when the United States experiences a trade deficit, U.S. imports exceed U.S. exports for a given period of time. In this situation, U.S. dollars on the foreign exchange market exceed other foreign currencies and, as a result, the supply of U.S. dollars increases. This expanded supply of dollars causes their value, the exchange rate, to decline. At the lower exchange rate, U.S. exports are less expensive to foreign buyers while foreign imports are more expensive to U.S. consumers. Consequently, U.S. imports will fall and U.S. exports will rise, partially or completely offsetting the trade deficit.

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The rate of adjustment in the balance of trade depends on how responsive, or elastic, export and import quantities are to exchange rate changes. A more elastic export supply adjusts more quickly to exchange rate changes than a less elastic export supply.

It is also clear that this approach to exchange rate determination may not be the best predictor of changes in currency values. The United States is currently in a period with a trade deficit that is quite large by historical standards, but the value of the U.S. dollar has remained strong. In this case it is quite likely that more important short run determinants of exchange rates, such as interest rates and the demand to hold dollars as a store of value, were offsetting the effects of the trade deficit on the value of the U.S. dollar.

Expectations and market psychology

Rapid growth in information technology, electronic funds transfer, and near 24-hour money centre global trading operations, have revolutionized the speed with which money can be transferred among alternative uses to maximize returns to investors.

The role of expectations has taken on added importance in recent years. If foreign investors, for example, learn that U.S. monetary policy may be loosened, their expectations would be for lower U.S. interest rates and a weaker U.S. dollar. They might withdraw large sums of money from U.S. markets and convert them to yen or another currency, with the expectation that the U.S. dollar was going to decline in value. By selling dollars, the investors increase the supply of U.S. dollars and increase the demand for other currencies *vis-à-vis* the dollar, thereby causing the dollar to depreciate even before the policy is implemented.

If the United States has a large trade deficit, this suggests that the dollar should decline in value; consequently the investors may withhold their purchases of U.S. assets until after the depreciation of the dollar. This inaction on the part of market participants may actually cause a temporary shortage of U.S. dollars and an increase in the exchange rate, when the expectation was for it to decline in value.

International trade of agricultural commodities

The usual dictionary definition of trade includes dealings between persons or groups. It is also termed as the act or process of buying, selling, or exchanging commodities, at either wholesale or retail, within a country or between countries. The recent years have witnessed a phenomenal growth in trade.

The goods generally traded internationally include:

Office machines, computers, parts:	4.8percent
Passenger motor cars:	4.8percent
Crude petroleum:	4.7percent
Organic chemicals:	4.3percent
Clothing:	3.3percent
Iron and steels:	2.8percent

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Telecom equipments: 2.4percent

The contribution of agriculture is that it accounts for 5-6 percent of total world trade.

Share of agricultural products in world trade:

Fruit and vegetables: 1.4percent

Cereals and preparation: 1.3percent

Meat and preparation: 0.9percent

Oilseeds, vegetable oil, and oil cakes: 0.7percent

Coffee, tea, cocoa, and spices: 0.6percent

Milk and milk products and eggs: 0.6percent

Total: 5.5percent

Trade, as mentioned above, has existed for many years and it was the quest for markets that led to the discoveries of many nations. Trading has been one of the prime motives for ancient journeys; the British sojourn to India, the Spanish voyages to South America serve as examples. Money (or currency) can be termed as a recent instrument of trade. Barter, the nascent form of trade, was based on the coincidence of double wants, meaning that if the butcher wanted milk, he had to find a milkman who was in need of meat. Only in such an event could a transaction be effected. To eliminate this problem, man needed some form of measurement to standardise the trade, thus cowries were used as the form of money. As mankind developed, the 'standard of payment' (as explained in the above sections) was altered to meet the needs of the time, thus switching from cowries to horses to copper etc until it was standardised on gold. Gold met with universal acceptance and hence stayed as the standard of payment for a long time.

International trading became difficult due to the volatility of many currencies. Thus there was a search for a more stable currency for international trading. The U.S emerged as the world's economic leader, propelled by stable governments and a strong currency. Thus many economies adopted the U.S. dollar as their currency for trading. Today, the U.S. dollar is one of the most traded currencies worldwide. This has resulted in the U.S. dollar exerting a pseudo-monopoly. The euro, which many believe will replace the U.S. dollar, is yet to stabilise (the discussions are beyond the scope of this paper). The U.S.A is currently the world's largest economy.

The agriculture sector of the U.S.A has a prominent place in the country's balance sheet. The importance of trade to U.S. agriculture is outlined below.

- U.S. agricultural exports account for 30 percent of overall farm production.
- On average: 40 percent of wheat is exported.
- Roughly one third of rice, cotton, and soybeans are exported.
- 20 percent of coarse grains are exported.
- In terms of value, it has increased from 6 billion dollars in the 1970s to an all time record of 60 billion dollars in 1996. This sector has generated 1.4 million jobs.

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The prime contributor to international trade is the cross-border mobility of factors of production. Consequently the movement of goods has a decisive influence on the country's exploitation of resources, and countries are inclined to impose import restrictions in order to increase domestic production and employment. The international trade theory becomes indispensable in the light of the political interventions to protect domestic trade.

Demand for food is influenced by a number of forces, including population growth, income levels, urbanization, lifestyles, and preferences. Almost 80 million people are likely to be added to the world's population each year during the next quarter century, increasing the world population by 35 percent from 5.7 billion in 1995 to 7.7 billion by 2020⁶. More than 95 percent of the population increase is expected in developing countries, whose share of global population is projected to increase from 79 percent in 1995 to 84 percent in 2020. Over this period, the absolute population increase will be highest in Asia, but the relative increase will be greatest in Sub-Saharan Africa, where the population is expected to increase by 80 percent by 2020 in spite of the severe impact of HIV/AIDS

The International Food Policy Research Institute (IFPRI) projects global demand for cereals to increase by 41 percent between 1993 and 2020 to reach 2,490 million metric tons, for meat demand to increase by 63 percent to 306 million tons, and the demand for roots and tubers to increase by 40 percent to 855 million tons

Developing countries will drive increases in world food demand. With an expected 40 percent population increase and an average annual income growth rate of 4.3 percent, developing countries are projected to account for most of the increase in global demand for cereals and meat products between 1993 and 2020. Appendix –1 has some facts and figures of the various factors affecting one of the most important industries of world trade.

The demand for cereal shall have to be met, primarily, by productivity increases; increases in cultivated area will contribute less than 20 percent of the increase in global cereal production between 1993 and 2020. Most of the growth in the cereal area will be concentrated in the relatively low productivity cereals in Sub-Saharan Africa. There will be some expansion in Latin America but the cereal area will remain virtually stagnant in Asia.

Since growth in cultivated areas is unlikely to contribute much to future production growth, the burden of meeting increased demand for cereal rests on improvements in crop yields. However, the annual increase in yields of the major cereals is projected to slow down during 1993–2020 in both developed and developing countries.

Food production will not keep pace with demand in developing countries and an increasing portion of the developing world's food consumption will have to be met by imports from the developed world. The proportion of cereal demand that is met through net imports is projected to rise from 9 percent in 1993 to 14 percent in 2020. As a group, developing countries are projected to more than double their net imports of cereals (the difference between demand and production) between 1993 and 2020. With the exception of Latin America, all major developing regions are projected to increase their net cereal imports: the quadrupling of Asia's net imports will be driven primarily by

⁶ Source: U.N report 1996

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rapid income growth, while the 150 percent increase forecast for Sub-Saharan Africa will be driven primarily by its continued poor performance in food production.

Net imports are a reflection of the gap between production and market demand. **The United States is forecast to provide almost 60 percent⁷ of the cereal net imports of developing countries in 2020**, the European Union about 16 percent, and Australia about 10 percent.

Economics and agriculture

Food is the basic ingredient of human survival. Shortage of food will create competition in the long run for both cultivation and trade. Global excessive production looks a dream now, thus we may have few countries producing in excess while many countries are facing shortages and vying for the excess food traded in the global market⁸. The theory of supply and demand will mark the prices of these products in the global market.

Food and agricultural systems operate in a highly competitive global context, and the United States is a major player in these international markets—the U.S. share of the global market for agricultural goods averages just under 20 percent.

A report by the department of economic research for the U.S.A states that in the initial years, slow economic growth and a strong dollar provide a weak setting for the farming sector. Longer run developments reflect strengthening economic growth. While export competition and a strong U.S. dollar are projected to continue, improving world economic growth, particularly in developing countries, provides a foundation for gains in U.S. agricultural exports. The results are rising market prices and farm incomes as well as improvement in the financial condition of the sector. Retail food prices are projected to continue a long-term trend of rising more slowly than the general rate of inflation.

Strengthening world economic growth, particularly in developing countries, provides a foundation for gains in U.S. exports, even though competition in global markets remains strong. Much of the growth in high value product (HVP) exports is for animal feeds, dairy, and beef. Export growth for bulk products (grains, oilseeds, cotton, and tobacco) reflects expected price increases and some gain in bulk volume. U.S. agricultural exports rise more than imports, with the agricultural trade surplus rising to \$24 billion in the fiscal year 2011.

The economies of developing countries provide a foundation for growth in global trade. Developing countries' import demand is reinforced by population growth rates, which remain nearly double the rates of developed countries.

The RM theory

I propose a new theory (named RM theory) stating that the agriculture yield (gross value of agriculture output) has an impact on the exchange rate. The general theory is that the

⁷ Dr. Per Pinstrup-Andersen <http://www.apsnet.org/Education/feature/FoodSecurity/>

⁸ I am not trying to recreate a Malthusian scenario

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macroeconomic variables affecting agriculture are the exchange rate, consumer income and wealth, and interest and credit rates.

Land and labour are the primary inputs used in agricultural production. These two inputs are non-tradable, while, land is immobile (shortage of arable land by certain countries cannot be compensated by importing land from other countries), labour is mobile. The intermediate inputs are fertilizer, fuel and animal feed. These intermediate inputs can be imported in the event of shortages.

Many countries have utilized one of the most important primary inputs of agriculture — land (arable land). The country with enough stocks of this primary input has a great advantage. Land is the most critical input for the cultivation of both traditional crops as well as Genetically Modified (GM) crops (which are yet to get global acceptance)⁹.

I shall explain my theory in the form of a model (the model form is intended to provide a simplified explanation of the actually complex process, but nevertheless serves the purpose).

Consider the U.S.A. with a weighted exchange rate of 'X' in the year 2002 and agricultural trade for the year being U.S. dollar (USD) 100 million. The agricultural yield for 2003 is better than the previous year hence there is an increased trade in the international markets; let's say USD 110 million. This increase in trade causes a demand for the USD by the importing countries. With limited supply and increased demand, the value of the USD rises in the international market.

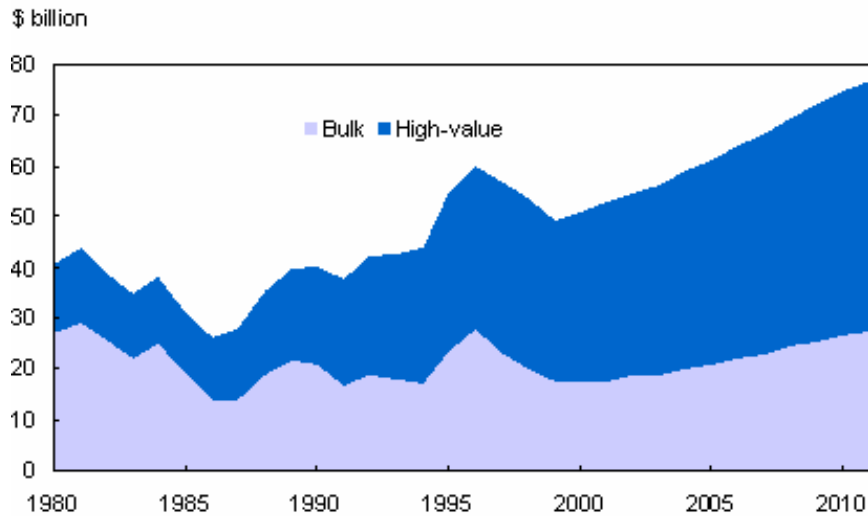
A better performance by the agricultural sector also prompts increased investment in the sector and overseas investment cannot be ignored. This overseas investment once again causes a demand for the USD, driving this up yet again. The upward trend due to the foreign investment is short-term in nature while the fluctuation in exchange rates due to increased trade is long term in nature. In the event of excess output from the farm sector, commodities like food grains can be stored in the granaries. This indirectly implies a higher GDP.

Figure 1 – U.S. Agricultural export value

⁹ The scope of discussions on GM is beyond the scope of this paper.

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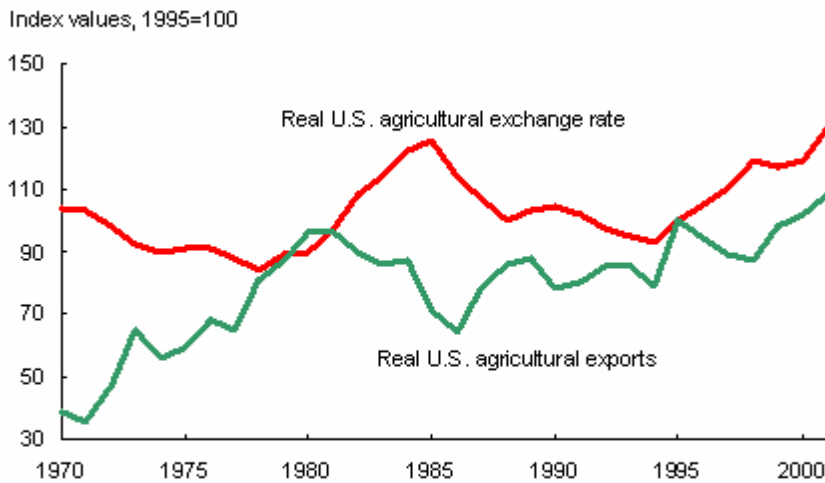
U.S. agricultural export value: bulk and high-value



Source: *USDA Agricultural Baseline Projections to 2011*, February 2002.
Economic Research Service, USDA

Figure 2 – Real U.S. Agricultural exchange rates

Real U.S. agricultural exports are sensitive to changes in real exchange rates



Note: 2001 numbers are estimates based on partial year data.
Source: *USDA Agricultural Baseline Projections to 2011*, February 2002.
Economic Research Service, USDA

We have a report that says that the Sahara-African countries will provide a bulk of cheap soybean in the future while at the same time the U.S will be one of the leading exporters of quality soybeans. Thus importers of soybeans can choose between producers such as the U.S.A, African nations and other countries. In the event of competition, the more economical producer will prevail (at the same time, we have markets for quality soybeans too). Thus the yield¹⁰ (in value) of crops from a nation gains more prominence in the international trade circuit.

¹⁰ The term yield is used to express the output in value terms in this paper while output shall express their quantum.

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The better the yield, the better for the country. This means an increase in the GDP and subsequently the GNP. The GDP is the indicator of the economic health of the country, thus a higher yield would contribute to a better GDP and subsequently a better international standing of the country. A higher yield also indicates higher exports. Exports in turn contribute to international trade. When the U.S.A has higher exports, the payments by the importing countries are made in U.S. dollar. This causes a demand for the U.S. dollar, which in turn increases the price of the U.S. dollar¹¹.

A comparison of figures 1 and 2 (as shown above) affirms my above stated theory. We can observe that whenever there is an increase in the value of U.S. agricultural exports, the real exchange prices have behaved in accordance to the direction of the exports — the higher the exports the higher the real U.S agricultural exchange rate.

The collateral advantage of having a better yield is that the sector gains foreign investment; this again adds to a change in the exchange rate as the capital account changes directions with the injection of foreign funds. Taking into consideration the effects of a supply of local currency injected by the foreign investment, we have a situation in which the economic indicators such as consumer spending and inflation come into action. This will trigger a more strict monetary policy from the government, which will consequently affect the exchange rate.

My other supposition is based on the findings of the various studies conducted by many organizations. These findings, which are stated above, say that the U.S will be the major exporter to the big Asian importers like India, China, Japan etc. The study indicates that the U.S. will cater for around 60% of the global requirement. In such an event, the U.S would have a virtual monopoly of many crops and the importers would have to pay through U.S. dollars for their various imports of food items. This would again trigger a cycle of increased trade balance; balance of payments surplus and the subsequent economic parameters would provide the U.S with a healthier dollar.

There shall always be a never-ending argument on the facts of whether the exchange rate impacts on the agricultural produce or whether the agriculture has an impact on exchange rates. Trade agricultural produce existed well before the existence of money. As we have seen above, money developed as a result of this trade and its initial value was bestowed by various parameters. The most important parameter on which the current values have evolved is the gold standard. The gold standard was initially based on the national stock of gold held by the various countries. Nations obtained gold through trade with each other and trade of agricultural items was prominent. The British journey to India, which was mainly to obtain spices, is a good example to prove my point. Thus one of the intrinsic features of the value of the current exchange rates is that of the agricultural prowess of nations.

I suggest that we go a step further by putting a country under the microscope. Every state contributes to the country and every county contributes to the state. For example – California, North Dakota, Illinois, Kansas are some of the states in the U.S. that contribute to the national agriculture output and yield in a major way. Assume that there is an earthquake in California, and the national agricultural yield is reduced as a result. There are provisions for some stored supplies to be made

¹¹ There is a time lag for the long-term increase to occur.

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available from the granary but there is still a national loss of production. This results in a reduced GDP and also a reduced export. The long run effects on the exchange rate are visible.

Conclusion

1. The agricultural yield has an impact on its exchange rate and not *vice versa*.
2. The exports by the U.S have an effect on its exchange rate in the form of its betterment (meaning — an increase in U.S. agricultural exports improves the exchange rate).
3. The U.S will be a major exporter of cereals for the developing countries.
4. All the developing countries have exhausted their arable land, which has reduced their opportunities for increasing agricultural production.
5. Governments of different nations should renew their farm policies.

Appendix – 1 -Some of fact and figures

Population growth

Between 1950 and 1990, the world's population doubled — to more than 5 000 million — and the global economy grew by more than 3 percent a year. It is said that if current trends continue, by the middle of the next century the Earth could be home to 10 000 million people and the global economy will have expanded five times over. This exponential growth is creating a critical demand for food, energy, income and services. But the shortfall in domestic cereal production in the developing world is expected to widen — from less than 100 million tons today to more than 250 million tons in the year 2025. Even if supplies were adequate, many people would not have the resources to buy all the food they need.

Mass migration

Poverty, unemployment and civil strife have spurred a mass movement of people from rural to urban areas — and from developing to developed countries — in search of a better life. More than 80 million people now live in foreign lands and an estimated two million emigrate permanently each year. Since 1970, the number of refugees world-wide has grown from 2.5 million to 20 million.

Land degradation

For thousands of years, people have modified, degraded and destroyed natural ecosystems. In 1950, some 115 million sq. km of the Earth's surface were un-degraded, vegetated land. Just 40 years later, almost nine million sq. km — an area as large as China — were classified as “moderately degraded”, with greatly reduced agricultural productivity. A further 3 million sq. km were “severely degraded”, having lost almost completely their original biotic functions. Almost 100,000 sq. km are beyond restoration and

5 800 000 sq. km degraded by deforestation

6 800 000 sq. km degraded by overgrazing

1 370 000 sq. km degraded for fuel wood

5 500 000 sq. km degraded by agricultural mismanagement

195 000 sq. km degraded by industry and urbanization

Desertification

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If degradation is the sickness of the land, desertification is its death. In arid areas of Africa and Asia, overgrazing and the relentless search for fuel wood have reduced large tracts of once productive land to desert. More than half a million square kilometres on the southern edge of the Sahara have become desert over the past half century. Desertification affects the livelihoods of some 850 million people worldwide.

Continued mismanagement of the Earth's natural resources can only lead to ever greater land degradation and human suffering. We urgently need a strategy that will permit both development and conservation. The starting point of that strategy is the land itself.

Factors that determine the use of the land

People determine how land is used. At one extreme, the objectives of the individual farmer and many other types of land user are to produce income by exploiting natural resources. As the population increases, there is a corresponding increase in the amount and intensity of exploitation, leading to modification and frequently degradation of the environment.

At the other extreme, the community as a whole seeks to conserve natural resources and the environment, including the range of natural species, for a wide variety of reasons. Each individual or group has particular needs, objectives and points of view. The resulting use of land is controlled by the interplay of many social and economic factors, and is ultimately driven by the objectives of innumerable "stakeholders"—people or groups who either directly exploit or in some way control the use of land resources.

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