Canadian Foodgrains Bank Occasional Paper

Protecting the Food Insecure in Volatile International Markets

food reserves and other policy options

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March 2011

Canadian Foodgrains Bank
A Christian Response to Hunger

Forward

In the wake of the 2007-8 Food Price Crisis the Canadian Foodgrains Bank, a coalition of all the major Canadian churches, was alarmed at the realization that sudden food price spikes had the potential to cast millions of people into chronic food insecurity. Certainly such price induced food crises quickly overwhelm any of the gains made by the recent decades of effort to reduce hunger in developing countries.

The many analyses which were made in the years following have underlined the complexity of factors which contributed to the crisis but it was also clear that some factors built on others and that it may be possible to address several of the causes by looking at a single aspect – in this case the exceptionally low stock-to-use ratio for major cereals (i.e. low food reserve levels) in the period leading up to the crisis.

Accordingly, we saw the need to research the issue of reserves, in particular, the history of cereal stock levels since the Second World War. Early in this sixty year period there were deliberate food reserve policies in place, initially as part of the International Wheat Agreement, and later as part of the domestic policies of the US and the European Community. In addition, many developing countries also maintained food reserves. All of these policies were changed in the 1980s and it had been widely accepted that such policies are no longer appropriate. Without prejudging the case, we have sought to re-examine the issue in the light of the 2007-8 price spike and the subsequent developments leading up to a second price spike in early 2011.

The report which follows, prepared by Mr. Ian McCreary, an economist and former director of the Canadian Wheat Board, follows on a recent work prepared by Sophia Murphy of the Institute for Agriculture and Trade Policy[1]. It proposes, in addition to other complementary policy measures, a new possibility for a multilateral food reserve policy suited to our current predicament. We look forward to the discussion which we hope it will generate.

The views contained in this report are not necessarily endorsed by the Canadian Foodgrains Bank.

Stuart Clark, Canadian Foodgrains Bank
March 2011

[1] Murphy, S. "Strategic Grain Reserves In an Era of Volatility", Institute for Agriculture and Trade Policy, October 2009

Acknowledgements

The author wishes to thank Mary Smillie, Stuart Clark, Sophia Murphy, Dr. Daryll E. Ray and Dr. Murray Fulton for providing comments on the earlier drafts. Barb Godfrey and the market analysis department at the Canadian Wheat Board were very helpful in accessing historical data. Luke McCreary provided much needed assistance with the graphics.

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Executive Summary

Food markets have always been recognized as distinct. Food is required daily by everyone while production patterns are seasonal. For wheat which is overwhelmingly produced in the Northern Hemisphere, seasonal production patterns are annual events. Corn and soybeans have a larger Southern Hemisphere component but production responses remain concentrated.

In economic terms, the distinct nature of agriculture markets is expressed as inelastic supply and demand. This means that, in the short term, the quantity produced and the quantity demanded does not change significantly with the price. It also means that, if there is a shift in available supply, prices can vary dramatically. The short term measures of supply and demand are not straight lines. Rather, both supply and demand are curves which become steeper as prices increase. In the long term, quantity supplied does respond to increases in prices. Supply responds much more to price increases than price declines.

Markets operate with imperfect information and 'stock to use' ratios are one of the most important pieces of information determining prices. Since the Second World War, markets have been heavily influenced by public sector stocks. The international wheat agreements, US agriculture policy, European agriculture policy, and stocks held in a number of importing countries all provided a buffer to give everyone security that food would be available in international markets. With the exception of the large price spike in 1972-4, prices were relatively stable throughout this period. In the last two decades, there were profound structural shifts in trade patterns and a gradual reduction of stocks. The collapse of the Soviet Union; import growth in Asia, and production growth in South America each represented significant shifts to global agriculture. These dramatic shifts in grain trade were all absorbed without significant increases in price volatility. However, the rapid growth of biofuel production in the last decade ultimately drove stock levels to record lows which in turn drove the recent price volatility.

Markets have become more integrated. Trade in agriculture has been brought under the WTO and some of the rules are more clearly defined. Trade is important to food security as production shortfalls in one area are offset by surplus production in other areas. However, trade and market integration also creates risks for food security. Integrated markets mean that poor households must bid against western demand for biofuels when supplies are tight. As production and consumption increases, poor and vulnerable people become the buffer for an ever larger pool of cereal production and consumption. The dynamic is unacceptable. World trade talks have stalled; and confidence in international markets is in decline. To renew confidence in international markets, importers need assurances that supplies will be available. Stock policy is thus an important component of market integration.

Stock-related policy responses need to be different for each of the commodities.

1. **Maize/Corn** - a biofuel set aside program is suggested. Either through variable mandates or by bidding production off the market, assurances must be provided to the global economy that biofuel production will be adjusted when food supplies become critically tight.

2. **Wheat** - a coordinated fixed quantity multilateral reserve representing 1-2% of global use is recommended.

3. **Rice -** small regional reserves are recommended. Rice is thinly traded and there would not be confidence that a reserve centrally held by exporters would be available to all in the event of tight supplies.

Stock policy and biofuel set asides need to be driven by supply information and not be based on price bands. The market prices need to find new levels and price band approaches are not sustainable

Better information is required on global production and stocks. This information will itself reduce market volatility. The proposals in this paper which recommend biofuel set asides, international buffer stocks for wheat, and regional rice reserves will each require improvements in market and stock information to succeed.

Reserve policy, improved information and transparency, and fair trade rules are only a subset of the planks required to improve global food security. A new Food Assistance Convention will still be required to guarantee a minimum amount of food for emergencies and other settings where food assistance is appropriate. Donors should continue to accept the price risk of commitments under a new Food Assistance Convention and support stockholding to cover their risks. Public sector investment in productivity for smallholder agriculture is also required to increase the resilience of agriculture globally. However, none of these food security programs can be expected to be successful if cereal prices continue the erratic volatility of the past four years.

Introduction

In the 2007/08 crop year cereal stocks as a percentage of global consumption fell to levels not seen for more than 30 years. As a result, by March 2008 the monthly average price for wheat was more than three times the ten year average price for the decade leading up to the price spike.[2] Following the price spike, there was a flurry of research and discussion. The price spike of 2007-8 had a number of parallels to the experience of 1972-74. In that price spike, production responded very quickly and within a very short period of time, prices stabilized. In fact, for the two decades from 1985-2005, prices were very stable and well below costs of production in many areas. However, it is now clear that the rapidly growing demand for biofuel is keeping grain stocks low by historic standards and prices are experiencing ongoing volatility.

This paper reviews grain markets at a very basic conceptual level and provides a historic context for our current market setting. It will be argued that stock levels are a key determinant of price volatility.

With increased globalization over recent decades, a significant portion of the global adjustments to price volatility falls on those who can simply not afford to purchase the food required for a healthy and dignified life. Households who achieve some level of stability prior to a price spike but are spending 60 to 80% of total income on food will be very vulnerable. Vulnerable people are forced into coping strategies which can disrupt development for sustained periods of time. In the last price spike, international organizations estimate that the number of people who face inadequate nutrition globally increased by approximately 200 million. In one specific research paper,[3] which tracked households in Bangui in Central African Republic, it is reported that the number of households who ate two or more meals per day fell from 50% to 24% as a result of the rise in food prices. This was in an area where only a small portion of total food was imported so prices rose by only 20%. However, the percent of income spent on food was 80% of total income.

The dramatic results reported by ACF International are consistent with what one would anticipate. As prices rise to ration tight stocks, the demand by low income consumers is most likely to be the one which is rationed. The impact was greatest for those who were most integrated into the global economy and felt the full impact of the price spike. Through the price spike and in the time period since, there has been renewed interest in global grain reserves as a way to reduce grain price volatility. Interest was expressed by the leaders of the OECD nations and work has been done by IFPRI, World Bank and many NGOs. The G20 Agriculture Ministers meetings in June of 2011 will include the issue on their agenda. The need for action is clear. Confidence in the international market as a reliable source of food has been reduced, leading some importing countries to invest directly in farms and farming in other countries and to ship the production to their own domestic markets. This international land contracting has raised other serious concerns about the negative impact on vulnerable rural people.

[2] Basis US Hard Red Winter Ordinary FOB US Gulf ports as recorded by the International Grains Council. The actual price peak is masked by the monthly averaging so actual prices on some days were well above these levels.
[3] "Feeding Hunger and Insecurity", ACF International Network,

Interest in revisiting the need for reserves represents a course change from the path of an unregulated international market as a sole method of setting prices. However, in a world where unregulated financial markets led the world into near complete economic collapse, there is a renewed appetite to look at a more balanced approach to international markets, especially for food.

Food is a particular candidate to treat differently from other products which are traded internationally. Everyone requires enough food every day regardless of price. Production is seasonal and varies with the weather. Nations who have experienced hunger will not leave the outcome to chance. Food riots were seen on the streets in many countries, leading to political unrest and threats to global stability.

Western nations who depend on exports need to recognize how the events of 2007/08 have contributed to erosion of trust in the international market. Some importing nations are making moves to arrange long term contracts for land in other countries. Others are returning to more protectionist agriculture policies. The WTO talks are completely stalled. Importing nations are simply not prepared to continue to trust international markets for food imports in a world where there is a considerable risk that supplies may fall short and vulnerable importers will be the ones forced to make the adjustments.

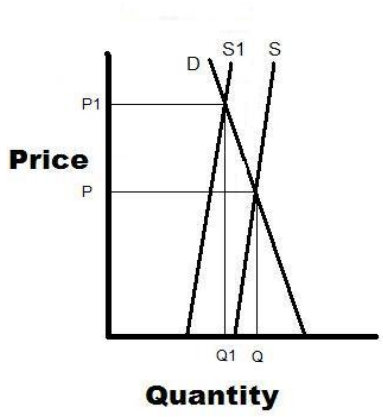
The rapid expansion in biofuels coupled with the policy decisions to move from production supports to biofuel supports in Europe and the USA has resulted in lower stocks. The dramatic reduction in stocks leads to higher prices and more volatile prices. Higher prices are required to attract new commitments to agriculture, a largely positive influence for stalled agricultural development in African countries and elsewhere. Volatile prices conversely create tremendous insecurity for consumers while creating a dramatic increase in risks for producers.

The work to address food security has focussed on providing support to the purchasing power of vulnerable people. It is recognized that in a market economy, if people have adequate purchasing power, food has historically been available. However, with very low stocks and dramatic fluctuations in price levels income safety nets alone cannot be expected to be effective. The degree of insecurity and the number and location of those who are insecure changes daily with the price of food. To continue to make improvements in food security, it becomes necessary to address the issue of price volatility.

Economics of Cereal Markets

Price volatility is inherent in agriculture commodity markets such as the cereal grains . The recent price spike in the first half of 2008 is evidence of this volatility. Price volatility is considered by economists to be caused by inelastic supply and demand relationships. This means that for basic food within a single growing season, in the absence of stocks, once a crop is produced, the amount which is available is set and does not vary much with price. Similarly, for demand, everyone would like to have enough to eat and will pay whatever price necessary to achieve that end. Thus, the quantity demanded does not vary dramatically with a change in the price of food commodities. This relation is depicted graphically in figure 1.

Figure 1 – Inelastic Supply and Demand

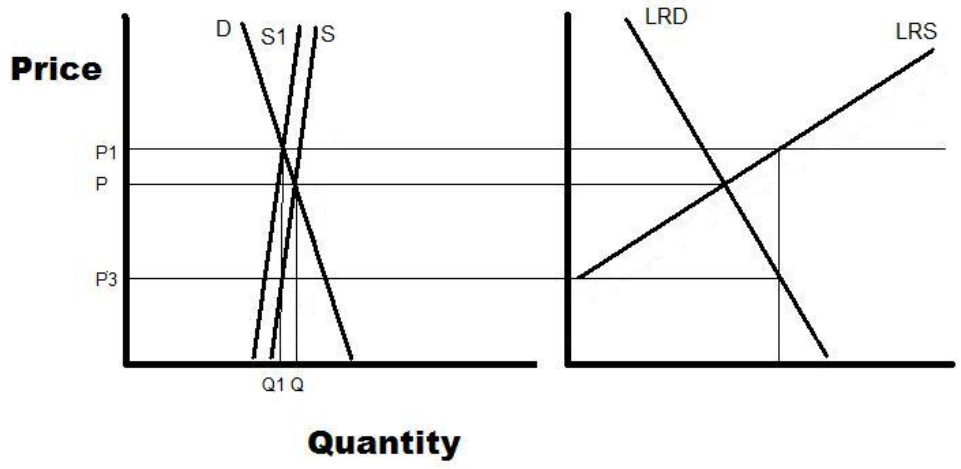


Volatility is caused when there is a sudden shift in either supply or demand. If, for example, weather problems reduce the supply in one growing season, prices have the potential to increase dramatically. Consider in figure 1 the move from a supply of S to S1. Alternatively, above average yields or a change in government policy to release stocks onto the market has the potential to increase supply and drive prices well below the cost of production.

Over a longer time period, supply is considered to be much more responsive to price. If farmers receive prices well above costs of production, additional fertilizer is applied, acreage shifts from other uses, and additional management practices are applied to capture the higher prices. Thus from season to season, commodity supply becomes more "elastic" and a supply response to the higher price is created. The longer the time period that prices are above costs, the greater the supply response. Over time agriculture research increases and more institutional response to supply is created. With no corresponding shift in demand, the supply will overshoot demand and short term over supplies will be created pushing prices down and often well below production costs. Figure 2 outlines the relation between short and longer term supply and demand graphically[4]. Short term(S and S1) would be considered a growing season and long term (LRS = long run supply; LRD = long run demand) would include the response in a following growing season or the affect on plans for future growing seasons.

[4]The slopes in this graph are for illustration only. The long run supply has more elasticity than the short term supply. When considering the response for a single crop, the supply is quite elastic. However, when considering the total cereal supply, the slope in the graph likely overstates the potential response in a single season. Some economists would also place a kink in the long run supply to show that production responds to higher prices but is not as quick to respond to lower prices.

Figure 2 – Long Run Supply and Demand



The above model is useful to understand the background to agriculture markets and lay the foundation for reserve discussions. However, it is necessary to introduce a number of complexities to understand cereal markets in any given context. For simplicity, only a few of the complexities are outlined. In specific settings, other factors may need to be considered.

1. Multiple Commodities

While one food product is preferred by a specific household over alternative products, price differences may encourage different commodities to be used. For example, rice is a preferred staple of many households. However, each of the coarse grains (maize, millet, sorghum) and wheat may be prepared to make "rice extender" if price differences between rice and wheat or one of the coarse grains are large enough. Similarly, many products can be made with wheat or maize and substitution happens between these two cereals as the relative prices change. Also, large amounts of wheat and corn are used for ethanol and animal food. This opportunity for substitution creates a link between prices of the two commodities. If corn prices rise as they did in the summer of 2007, larger quantities of wheat will be fed to hogs and chickens. The impact of multiple commodities and the substitution between commodities will affect the basic model in at least three ways. First, substitution will increase the elasticity (the change in quantity demanded with a change in price) of demand for any single commodity. Second, if adequate stocks exist for one of the cereals to meet demand, this will have a mitigating effect on price volatility for the other key commodities. Finally, volatility can be expected to be amplified in the event that supplies tighten simultaneously in all three main staple cereal crops (wheat, corn, and rice).

The 2008 price spike was a case of all commodities hitting supply issues concurrently. Corn and rice stocks were actually lowest a year earlier causing an incentive to increase wheat feeding in the livestock industry in developed countries. Corn became less competitive relative to wheat as a feedstock for ethanol. Wheat supplies fell and wheat prices rose dramatically making wheat products much more

expensive as a rice extender. Rice consuming nations feared food insecurity and engaged a number of trade restricting practices which exacerbated the food insecurity in some other parts of the world.

2. Multiple Production Areas – Price Transmission

When prices rise due to supply shortfalls in one country or region, it is generally considered that supply is available from other suppliers. The price of "imported supply" will be the price in a country or region with surplus plus transportation and other costs to import the food. This price is known as *import parity price* and sets a ceiling on how far prices can rise in one area. Similarly, if an area has excess supply, prices will only fall to a point where the food can be exported to another area with a deficit. This price is known as *export parity price*. The flow of food between regions thus creates a tie in the prices between different regions.

For commodities which are heavily traded, the prices at ocean ports of major exporters are tied very closely. These prices are frequently referred to as the international price. The degree to which importer prices track international prices is determined by the degree of dependence on imports, the rules of trade, and the risks and costs associated with importing. The magnitude of price change in any importing region relative to a change in international prices is referred to as price transmission.

There are a number of implications of multiple production areas on price volatility and its impact on vulnerable peoples. First, for countries with large transportation costs, currency risks, or other forms of insecurity which create large costs for trade, the spread between import and export parity prices may be very large. In this case, *local* price volatility needs to be considered distinct from volatility in the larger marketplace.

Headey and Fan (IFPRI 2010) identify a high price transmission in Sub Saharan Africa during the 2007-8 price spike which they consider an anomaly. "The large price rise in Africa is somewhat surprising as is the 33.5 percentage points extra rise in landlocked countries relative to coastal countries." This price increase can be explained through risk premiums. Countries which have high transaction risks due to currency, payment, logistics, or political concerns of international traders, pay a risk premium in purchase prices. In times of large stocks and very low prices, risk premiums will be discounted. In times of tight supplies and many possible buyers, full risk premiums will be charged. It is thus expected that price volatility for low income vulnerable countries is higher than for relatively more secure higher income importers.

Second, prior to the last four years of international price volatility, international prices had a stabilizing impact on local prices and efforts were made to reduce the costs of trade to reduce local volatility.

Third, the increased integration has meant that in recent years, increasing international price volatility has become a source of increased local volatility and insecurity rather than having a stabilizing impact.

Finally, for insecure vulnerable areas, this volatility can be expected to be exacerbated. As stocks become tight internationally, exporters are able to be more selective and can be expected to charge relatively more for the *risk premiums* associated with dealing with relatively more insecure countries or regions. These risk premium increases add directly to the costs for these importing nations or regions. Thus, in periods of tight stocks and strong prices, the prices in vulnerable areas depending on imports can be expected to increase more than the average increase in prices. (see text box)

3. Imperfect Knowledge and the Role of Expectations

In any marketplace, agriculture (food) commodities are traded continuously. At the time of exchanges, neither the seller nor the buyer has full information on supply or demand. Each of these players must use the information available to agree on a price. In a local street market, the number of other sacks of grain relative to normal at this time of year will be one important factor. A second factor will be the prices which were received or paid the previous week. The "stock" levels are an indication of the balance between supply and demand. Thus, stocks relative to total use becomes a key determinant of prices.

When you move from local markets to international markets, the process is much the same. Trades happen through telephone or other electronic communication with neither party having full knowledge of supply and demand. The buyer and seller will discuss recent prices, recent changes in prices and the available information on supply and demand. Central to the discussion is available stocks and anticipated stocks available to the market. Stocks are the firmest proxy for the current difference between supply and demand. It is important to understand how stock levels affect the relative bargaining position of the buyer and seller. For the buyer, stocks held by other exporters are a clear alternative to completing this sale whereas stocks in other importing nations are not available to them so these stocks provide no leverage in the negotiation. For the seller, other

Seasonal versus Short Term Volatility

Volatility in the opening section of the conceptual framework of this paper referred to prices which move to adjust to seasonal changes in supply and demand. As we move to include a discussion of futures markets which trade continuously for a number of hours per day, volatility within a day or a week becomes an important consideration. Many factors affect this volatility. The increasing importance of day traders and the introduction of hedge funds and index funds are important considerations. The impacts of these factors have been dealt with by other papers. It is important to note the profound growth in short term price volatility as exporter stocks fell. Prior to 1994, exporter stocks as a percentage of total usage were more than 7%. Trading ranges for futures markets were very narrow. With the exception of the events around the Chernobyl nuclear disaster and the changes which followed US policy, markets rarely moved outside of a price range of +/-US $20/metric tonne for months and at times years. In the 1995-96 crop year when exporter stocks fell to 5.2% and US stocks as a percentage of total use fell to less than 2 % for the first time since the Second World War, Kansas wheat prices rose and fell by more than US $70/metric tonne all within three months.

The dramatic increase in short term volatility is an important consideration. Given the difference in access to derivative markets and imbalance in access to timely information, it can be expected that the costs of short term price volatility are not evenly distributed between vulnerable peoples and the large merchandising companies which handle the majority of global cereal trade.

exporter stocks are direct competition and affect the negotiation. Importer stocks may affect alternative possibilities for sales so they play a secondary role in decision making. Thus, there is an important difference between importer and exporter stocks on their impact on prices.

Agriculture commodity trades (sales) in which money is exchanged for food *today* are known as 'spot 'or current trades. Much of agriculture exchanges are for 'forward' contracts. A seller agrees to sell and a buyer agrees to purchase food for delivery *in two, three, six, or even twelve months time*. There are many reasons for the forward contracting. Farmers incur many expenses to grow crops and need the opportunity to manage their risk by fixing a price for the crop which will be grown. Processors often have narrow margins and need to know the cost of raw product at the time that sales are contracted for processed goods. Shipping food around the world takes time and it is important that the price is established before the food is shipped. Government importers need the ability to feed the people to whom they are accountable. They in turn manage risks by forward pricing grain.

To facilitate forward markets, publicly traded futures markets have been established. In these markets, buyers agree to buy or purchase the *option* to buy grain in a forward position. Sellers agree to sell or purchase the option to sell. These markets are publicly traded and are key to price discovery for global food markets. The markets are known as *futures or derivative markets* as their prices are derived from the price of the commodities for which the contracts are traded. In daily trading, both commercial and speculative traders exchange contracts continuously. Commercial traders are those who intend to buy or sell the physical commodity and use the markets to manage risk. Speculative traders are those who have a view on future prices and whose primary goal is to make money through price volatility. The role of the speculator in the market is to own the product for periods of time as sellers may wish to price in different time periods than buyers wish to purchase. They have the beneficial effect of improving the working of these markets by increasing liquidity.

Futures markets trade using the existing information on supply and demand and forecasts of future supply and demand. The level of uncertainty is higher than that on spot markets as much less is known about the future than the current situation. Traders look to whatever information is available. Fundamental information is all the information about anticipated supply and demand. Examples of this include weather information, seeded area for different crops, national surveys of stocks, the pace of export sales, and anticipated stock to use ratio. Chart or trend information is a category of information in which traders look at what is happening as a trend which indicates other traders' expectations and knowledge of market pressures. Thus, with each trader thinking someone else has better information, people buy when the trend is up and sell when the trend is down. The use of "trend proxies" thus may amplify the volatility which is already inherent in the inelastic supply and demand for agriculture markets.

It is important to note that given the volumes of information which affect price discovery on a daily basis, an imbalance can be expected between large firms and smaller players in the market. Individual farmers, small processors, and individual consumers will hold a smaller subset of available information so will bear a disproportionate share of the costs of price volatility. Although research is required in this area, the imbalance in market information would be expected to mean that low income vulnerable

countrues would have reduced capacity for risk management and bear a disproportionate share of the cost of volatility.

Imperfect information and expectations are thus a source of volatility in markets. Recording trades and making information generally available has been used in Western nations to combat a portion of this uncertainty. However, in spite of this, day to day and month to month volatility tends to be the highest in periods when stocks are low. Stocks are one of the few pieces of market information which is possible to observe and are very powerful in their role in reducing the "jitters" in food markets. Good information on available stocks is central to stocks having a stabilizing role on prices in the markets.

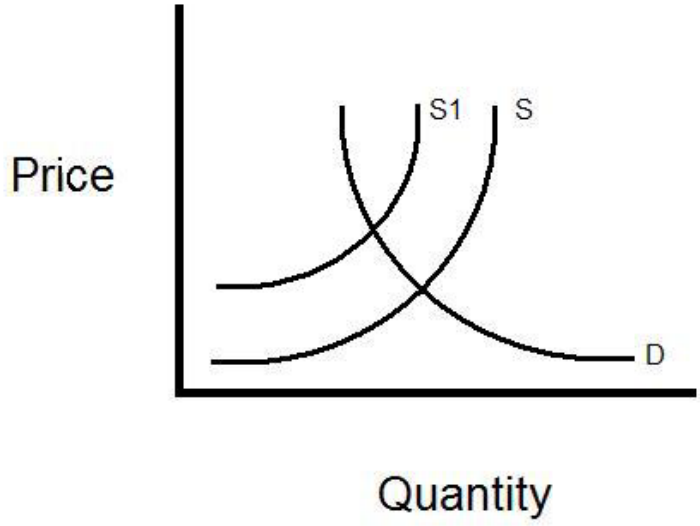
4. Asymmetric Outcomes

The general framework outlined above used straight lines to describe the relationships between supply and demand and the long term relations between price and supply and price and demand. In reality, none of these relationships are as simple or as linear as these graphs depict. Two of the anomalies important for agriculture markets are outlined below. First, both short term supply and demand are relatively more responsive to price at low price levels than at higher prices. Second, long run supply increases relatively quickly with price increase but falls very slowly with price declines and may in fact increase for a time while prices fall.

The degree to which quantity demanded becomes more responsive to price at low price levels and less responsive as prices increase is caused by a number of factors. First, consider the demand for cereal grains for ethanol production. Legislated minimum ethanol uses are in place in many jurisdictions. In these cases, minimum ethanol levels must be produced regardless of cereal prices and the additional costs are simply passed on to consumers. As cereal prices decline, ethanol becomes competitive with gasoline and the quantity demanded increases. Second, for feed uses of cereals, lower prices make cereals competitive with forages which lead to cattle being fed grain at younger ages. At high cereal prices, the minimum volumes of grain are still required to finish existing stock and maintain the herd. Third, for consumers who spend a large proportion of their income on food, a drop in cereal prices adds more to total food demand than a similar increase in price reduces their demand.

Consider the example of an Ethiopian household which is purchasing 100 kg of cereals at 600 Birr (local currency). If the price were to fall to 400 Birr, the household could and likely will purchase 150 kg with the same amount of income. However if the price rose by an equivalent amount to 800 Birr, the household would have to accept a decline in consumption to 75 kg. Thus, the price decline added 50kg to demand while the price rise subtracts only 25 kg from demand. The fourth reason for changes in the relation to price is the private demand for stocks. Farmers hold more stocks as prices fall and consumers may stock up on supplies as prices drop. Figure 4 shows the relation between supply and demand graphically. Note that small decreases in supply will have the potential to move prices up much more than increased supply will push prices down.

Figure 3 – Asymmetry of Supply and Demand



The stock demand by consumers is handled similarly to work done by Wright (p20). In this graphic, stocks held by producers are built in to the supply curve thus giving both supply and demand more elasticity as prices fall.

The changing relation to supply and demand as price increases has a number of implications for developing a stock policy. First, if stock policy is developed to provide equal short term benefits to producers and consumers, more public stocks will be purchased from the market than will be required to stabilize prices for consumers. Alternatively if bands are adjusted to result in a balance of purchases and release from the reserve, prices will trade in a lower range than would have been the case without the band.

The second asymmetric relation is the relation between long term supply and price. If prices are above costs of production, resources move relatively quickly into production. However, in periods of low prices, the excess capacity is retained. Consider the example of grasslands being broken in Brazil. When prices are adequate to encourage breaking the ground, the investment is made and the ground is prepared for annual crops. Once this change takes place, continuing to use the land is often the best alternative even when prices fall below the total cost of production.

The impact of asymmetric long run responses to price is that periods of high prices are often much shorter than periods of low prices. Market cycles are often characterized by very dramatic price spikes followed by relatively longer periods of lower prices. Market price spikes in 1973 and 1995 follow this anticipated pattern.

The long run response to supply changes the benefits of reserve policy for producers. By eliminating the extremes of the price cycle on the high side, the creation of excess capacity which results in sustained periods of lower prices will be moderated, reducing the risk of long periods of below cost of production prices.

Historical Perspective

Public concerns with production and price volatility date back almost as far as civilization itself. Early administrators recognized that food was required every day in reasonably equal time periods. Weather, pests, and other production risks were high. To avoid social upheaval, stocks were held by the state to ensure continuous food supply.

Over the past 65 years, there have been many approaches to stabilizing food availability and prices. This paper reviews the International Wheat Agreements (IWA) and the stock holding which was necessitated to execute these agreements. Following the collapse of the IWA, and the dramatic price spike in 1972-74, prices became dominated by US and European agriculture policy. The agriculture policies of these two western powers drove the marketplace for the next decade. From the early 1990's to the present the world went through an unprecedented period of change in the flows of cereal grains. Four of the key drivers of change are outlined briefly in this paper as a lead up to the price spike: the collapse of the former Soviet Union, the demand growth in East and South East Asia, the production growth in South America, and the explosive growth in the biofuel demand for cereals.

The price spike in 2007-8 had a number of underlying causes. There is a significant amount of research available on the causes of this price spike. This paper will briefly review the pressures which were identified for this price spike. The collapse of prices following the 2008 price spike and the price spike in 2010/11 will also be reviewed to provide insight into possible solutions for the future.

1. The International Wheat Agreements (1949-1969)

Following the Second World War an International Wheat Agreement (IWA) was negotiated among major wheat exporters and major importers. The purpose of the agreement was to stabilize markets for wheat which was a key food staple for participating nations.[5] Exporters agreed to sell specific quantities of wheat to importers for not more than a set maximum price. Importers in turn agreed to purchase specific quantities for not less than the contract minimum price. A price band was thus established for wheat traded under the agreement. Wheat trades beyond the quantities defined in the agreement were to be priced at prevailing market prices.

The success of the first IWA is well documented.[6] [7] The volume of wheat traded under the agreement ranged from a high of 65% of world trade in 1952-53, to a low of 52% in the year it was signed.[8] The commitments made under the agreement were executed by the marketing organizations in Australia, France and Canada and by the Commodity Credit Corporation in the USA. Prices remained above the contracted range for the four years of the first agreement so exporters were called upon to sell at the upper band of the agreement. Wheat prices experienced greater stability than had been the case prior

[5] A complete list of participating nations and their commitments are outlined in Appendix 1
[6] Harbury,C.D.,"An Experiment in Commodity Control-The International Wheat Agreement, 1949-53",Oxford Economic Papers, Vol.6No.1(Feb1954)PP82-97.
[7] Joseph Lerner, "Average Prices Under the International Wheat Agreement" The Quarterly Journal of Economics, Vol. 67, No.2, May 1953, pp.298-305
[8] Harbury, 1954, p86

to the war. Wheat prices were also more stable than other commodity prices in the post war period and were much more stable than the general food price index for consumers in the UK.[9]

The political climate which made this type of international market stabilization possible is important to note. First, there was concern that food price instability would limit growth and reconstruction in Europe. Second, the US was concerned about the expanding influence of the USSR and instability in the market economies was thought to be a risk to the US international agenda. Third, non US exporters all operated through national orderly marketing organizations and many of the importers used state importing organizations. As a result, in the post war period, 39% of world wheat trade was bilateral between state trading organizations. With the US at 50% of world trade this meant that 78% of non US trade was state to state. 25% of world trade was under multi year contracts. The US felt that to participate in international trade with any potential for growth, it was necessary to get a multilateral contract.[10]

The IWA was renegotiated successfully in each of 1953, 1956, 1959, 1962, 1965, 1966, and 1967. Modest changes were made in the price limits. However, in 1954 the price dropped below the maximum and from that point onward the only limit which was relevant was the lower bound. Canada and the US met quarterly to review the pressures on the agreement. Through a system of differential export subsidies in the US and the Canadian Wheat Board (CWB) export monopoly, prices were maintained at or above the defined minimum for the 15 years to follow. As a result, the market no longer fluctuated to price levels below the minimum specified in the agreement. In Canada, the cost of stock holding was born by farmers as the grain which was not sold was not accepted by the CWB and farmers simply had to deal with the surplus. In the US a system of non-recourse loans meant that a considerable cost of the surplus was born by the US treasury through the Commodity Credit Corporation. Total stocks in Canada and the US were large relative to total world stock holding. By the conclusion of the 1968/69 year, Canadian and US wheat stocks were 37% and 39% of the total for exporter stocks. To place this in perspective, Canadian and American sales were only 18% and 33% of world wheat trade that year.[11]

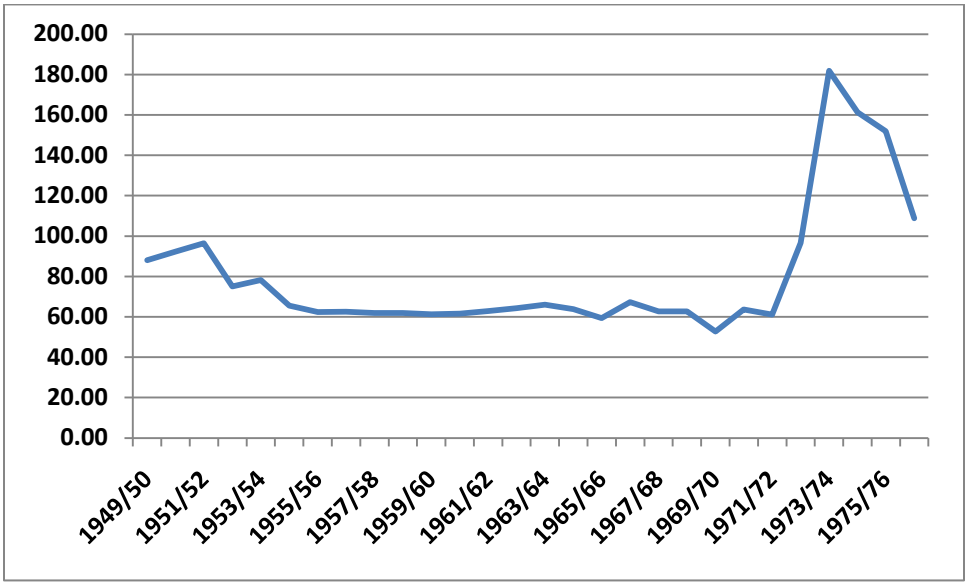
Throughout the 1960's a number of changes in the international markets pulled at the seams of the IWA. First was the entry into the market of China as a major importer. Canada felt that this was a new market and the US was welcome to participate if it chose. The US refused to deal with China and wanted Canada to give up other commercial markets to maintain historic overall market shares. Second, US began to aggressively use long term credit and program food aid to move exports and reduce domestic stocks. By 1964-65 there were 16 million tonnes of wheat exported as food aid in a year in which total world wheat trade was only 51 million tonnes.[12] Finally, the market participation of other exporters was growing while Canada and the US managed the stock which was stabilizing prices.

[9] Harbury 1954,
[10] Frank H. Golay, "The International Wheat Agreement of 1949",The Quarterly Journal of Economics, Vol64No3, Aug1950,pp.442-463
[11] International Grains Council, World Wheat Statistics, Canadian Wheat Board Annual Report1975-6 and USDA
[12] International Grains Council, World Grain Statistics, 1997-8

For the first three months of 1969 Canada made virtually no grain sales. In that year grain producers were only given a 3 bushel per acre quota compared to average yields of 21 bushels per acre that year[13] and on farm stocks grew to 23 million tonnes at the end of the 1968/69 crop year.[14] US continued to export through concessionary terms and other exporters ignored the agreement. Canada then gave notice in the House of Commons that it would no longer abide by the terms of the IWA. The agreement had collapsed and Canada was the only nation to formally announce it was withdrawing.

There were two attempts to renew the negotiations in 1971 and 1974. No price bands could be agreed. The price spike of 1973 had raised producer and marketing board expectations to the point that price ranges which were negotiable with importers were not politically palatable during the 1974 negotiation. The 1971 text was agreed to without a price range. In the end, there was simply agreement that parties would share information and would reconvene in the event that price spikes rose to the point of being destabilizing.[15]

Figure 4 – Wheat Prices 1949/50 to 1975/76



The graph tracks US Hard Red Winter FOB Gulf. Note the stability of prices through the entire period of the International Wheat Agreement followed by the price spike as USSR entered the market .

Source: International Grains Council/International Wheat Council

The experience of the IWA is interesting from a grain reserve perspective. The original agreement had no provision for stock holding. In fact, proponents of the contractual arrangement noted the value of this approach versus an international stocks policy. However, to give the agreement stability for fifteen years, major exporters – primarily Canada and the United States – had to engage in a coordinated stocks policy. The costs of this policy were born by US taxpayers and Canadian farmers while the benefits of the stable environment were generally available world wide.

[13] Yield is not directly comparable to sales quotas as the sales base differs from the area seeded to wheat.
[14] Canadian Wheat Board Annual Report 1975-76.
[15] International Wheat Agreement 1971, Article 6, Consultations on Market Conditions, Clause (1).

2. US Agriculture Policy and Stock Holding – Pre 1985 Farm Bill

Throughout much of the twentieth century, US agriculture developed under the stabilizing influence of a public sector stocks policy. The US government set a floor price through a "loan rate" in which farmers received a loan of a set price per bushel once the grain was harvested. If prices did not rise above the loan rate, the grain was turned over to become a public sector stock. The grain was held by the Commodity Credit Corporation or in Farmer Owned Reserves and was available to the market at prices which were equal to the loan rates plus the cost of storage. To complete the "stabilization", direct payments were made to US farmers to compensate for changes in market prices.

Following the collapse of the IWA, prices remained stable and tracked US loan rates until 1973 when the USSR became a large importer causing demand to exceeded supply and prices to increase dramatically. The shock was similar in effect to the emergence of biofuel demand in the second half of the last decade. World stocks dropped and a dramatic price spike happened in 1973-74 similar to the shock which happened in 2007-8.

By 1977-8 supply again outpaced demand and prices fell to the US loan rate. With no international agreement in place, the US share of stocks began to increase. Domestic pressure in the US for increased farm support intensified. The US increased both the loan rates and the target price in the 1980 Farm Bill. The US introduced acreage set asides and long term conservation reserves in an attempt to curb the increase in stocks. With no international agreement in place and domestic supports well above market prices, US ending stocks grew to 51.8 million tonnes of wheat by 1985 which represented 61% of the exporter stocks held globally.[16] Similar stock policy was in place for the other cereal grains as well.

The decade from 1975 to 1985 saw no interest in international food stock policy. The US had put a floor on world prices and was unilaterally holding the stocks to support that floor. Other exporters had no incentive to push for a broader based sharing of these responsibilities. Excess capacity in agriculture existed relative to market demand so commercial importers had limited incentive to build stocks.

3. US and Global Recession in Agriculture – The 1985 Farm Bill

US agriculture policy changed dramatically with implementation of the 1985 Farm Bill. The loan rate was reduced in regular intervals for the next five years. Following these reductions, loan deficiency payments were introduced to allow US farmers to sell at "market" and receive the difference between sales price and the loan rate from the government. Target prices were sustained to maintain domestic US farm incomes. An export subsidy program was introduced to further drop the world price of cereals and to try to market US reserve stocks into the international market. The stated objective internationally was to break the European Common Agriculture Policy (CAP). In a public presentation, USDA officials stated that US was entering a trade war with Europe and that there would be "friendly fire" casualties.

[16] USDA

The result of the 1985 Farm Bill for global agriculture was catastrophic.[17] The public sector stock was added to total supply and prices were pushed below virtually everyone's cost of production for the next two decades. Agriculture became unprofitable. Western nations provided some support to domestic farmers but low income countries were forced to make very costly adjustments. Aid budgets for agriculture were slashed. Public sector research on plant varieties slowed. Food security reserves were deemed uneconomic in some of the most vulnerable nations and structural adjustment to these new market realities was imposed.[18] Global wheat production over the two decades grew by only 1.13% annually compared to an average annual increase in wheat production globally of 3.56% over the two decades leading up to the implementation of the 1985 Farm Bill.[19] Income support to agriculture in the developed world became necessary to avoid complete financial collapse. As a globe, we weathered a perverse period in which public sector support to commercial agriculture in the western world rose by billions of dollars while funding for aid projects for smallholder agriculture development virtually dried up.

The experiences of the 1985 Farm Bill and the time period leading up to its formation have direct implications for the debate around food reserves. First, the US is unlikely again to place itself in a position where it is stabilizing world prices as it did in the 1980 Farm Bill while the rest of the world captured the price support and market stability but bore none of the costs. Second, other nations will have no interest in allowing stock policy to develop if there are no multilateral controls to prevent the stock from being used to destabilize rather than stabilize prices. Finally, it may not be possible to deliver producer support and consumer protection through one reserve policy and it may be necessary to be explicit on the specific goals required to get the conversation started again.

4. European Community and the Common Agriculture Policy

Europe was transformed in the period following WWII from a continent at war to one which is rapidly erasing the boundaries for commerce. A key aspect of the economic agenda in Europe was the development of a Common Agriculture Policy (CAP). Like US policy, the CAP included a floor price at which the European Commission intervened in the market to buy up supply (intervention price). Products were sold into international markets through an export restitution (subsidy) program in which the Commission determined the prices required to make European foodstuffs competitive in international markets.

The capacity of the European Commission to adjust export restitutions (subsidies) was part of the frustration which led the US to introduce the 1985 Farm Bill. European production, exports and market

[17] The global price decline which followed the 1985 farm bill had at least two additional pressures which sustained the low prices for almost 20 years. First, the European domestic supports and export subsidies were administered in a manner which tracked US prices. Second, the collapse of the former Soviet Union resulted in that region of the world changing from the largest importer of cereals to becoming a major exporter in the decade which followed.

[18] In early 1993 the author met World Bank officials in Harare who were interested in the dismantling of the food security reserve stocks in Zimbabwe. The stated defence was that imports were cheaper. The author querried as to whether Harare or Washington was out of line with "markets"!

[19] Growth rates for world wheat production are based on USDA estimates of world wheat production.

share had grown with no relationship to cost of production or comparative advantage. In addition, the structure of the CAP was one of the factors which made the impact of the US 1985 Farm Bill so deep and so sustained. The US was attempting to increase exports by subsidizing production, subsidizing exports, and lowering the price at which historic public stocks were released into the market. Concurrently, the European Commission maintained price support to domestic agriculture and raised exports to sustain their market share. The result was that all of the "adjustment "caused by the brutal trade war had to be made by other agriculture producers in both importing and exporting nations.

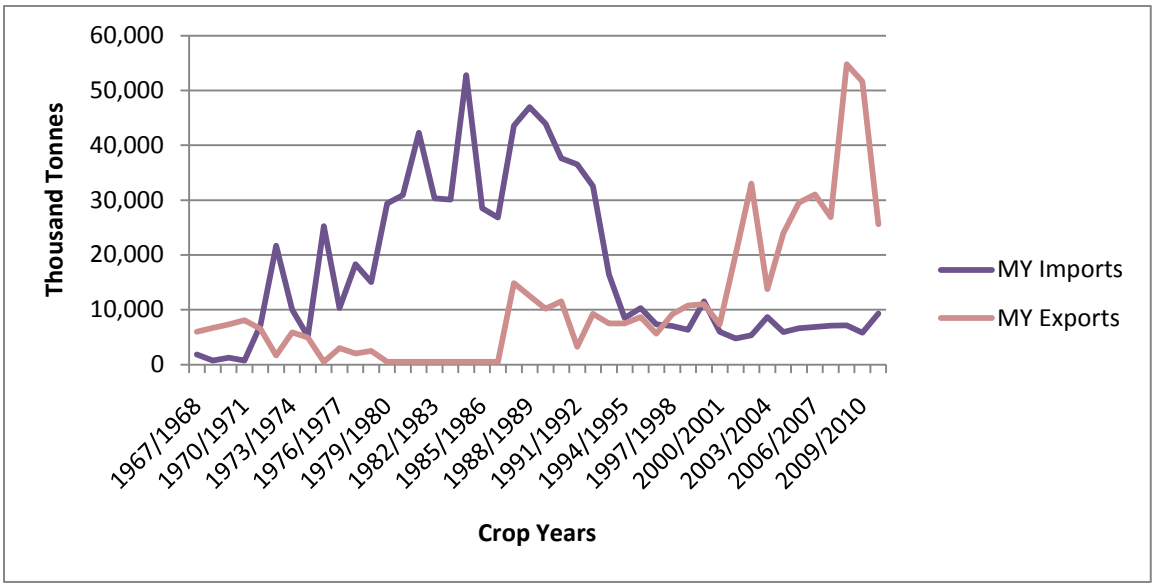
5. The Collapse of the Union of Soviet Socialist Republics

The Union of Soviet Socialist Republics (USSR) was the largest single importer of cereal grains from the price spike of 1972 to its collapse in 1991/2. These imports reached a peak in 1988/9 of 47 million metric tonnes of wheat, barley and corn imports. In that year, total global wheat and coarse grain trade was only 203.3 million tonnes which meant that the USSR imported 23% of total world trade in wheat and coarse grains. For wheat alone, the numbers are even more startling. The USSR imported 26.8 % of world wheat trade in 1984/5 when wheat imports reached their peak of 28 million tonnes.

The collapse of the USSR in 1991 started a transition for that entire region of the world. Total regional cereal consumption had reached a peak in 1990/1 of 182 million tonnes. Ten years later this consumption had fallen by half to 91 million tonnes. The result of the collapse in domestic consumption was that the largest importer became one of the world's largest exporters of cereal grains. One decade following the collapse, in 2002/3, the area comprised of the former Soviet Union exported 33 million tonnes of cereal grains.[20] In addition to the profound growth in supply available to the rest of the world as a result of the transition of the former Soviet Union, a new volatility factor was introduced. Production volatility throughout this region was much higher than volatility in the more developed markets such as the European Union and the United States. The result has been a new force on the export market with highly variable exportable supplies. World prices, which had been pressured by the trade war between United States and Europe, were further pressured by the events in the former Soviet Union resulting in increased volatility.

[20] The table shows graphically the dramatic change in the former Soviet Union trade position for wheat, corn, and barley. MY refers to marketing year for imports and exports. Note that the marketing years for wheat and corn do not correspond however, the data file is created by adding the imports and exports for each crop in each marketing year. Source: USDA

Figure 5 – Wheat, Barley and Maize Trade – former Soviet Union



Source: USDA

6. South American Production of Corn and Soybeans

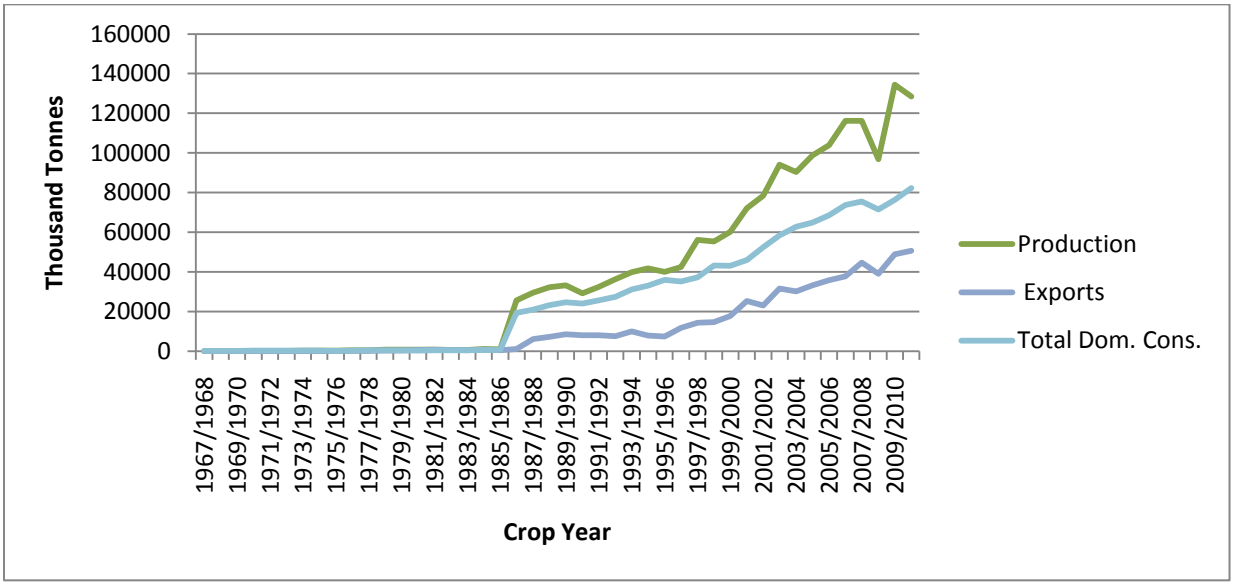
While the USSR created new exportable supplies primarily through a collapse in domestic consumption, growth in exportable supplies in South America came through a rapid expansion in production. Corn production was significant throughout much of history in South America. However domestic consumption was also significant so, prior to 1990, South American corn exports were modest. From 1990 to 2005, corn production on the continent doubled from 35-40 million tonnes to over 80 million tonnes. The production increase was driven by bringing 5 million additional acres into production and dramatically increasing yield. In many ways, the changes in corn production paralleled the "green revolution" in south Asia in the 1960's. Domestic consumption did not increase as rapidly so exports grew dramatically. South American corn exports had been in the range of 4-6 million tonnes for three decades. These exports grew to more than 25 million tonnes by 2006.

The second important South America factor to understand in the decade leading up to the price spike is soybean production. Soybeans are a legume crop often grown in rotation with corn. Soybeans fix nitrogen and have similar heat unit requirements to corn. The crop is an oilseed which produces approximately 20% oil and 80% meal. The meal is used for animal feed. For food security, soybeans are important for two main reasons. First, vegetable oil is a very important component of diets for many vulnerable households. Second, soybeans compete directly for land which would otherwise be available for cereal production.

Soybeans are a relatively new crop to South America. Prior to 1985, soybean production in South America had not exceeded 1.5 million tonnes on an annual basis. In the second half of the 1980's, production levels exploded. By 2005, soybean production in South America had risen to exceed 100 million tonnes. The new production met local requirements for increased vegetable oil in human diets,

and increased livestock production for both local demand and export. However, the majority of this new production found its way into international markets primarily in East and South East Asia. Thus, in a period of 20 years, South America had moved from virtually no soybean crop to being half of the global production of soybeans and half of global export supplies.

Figure 6 – South American Soybeans

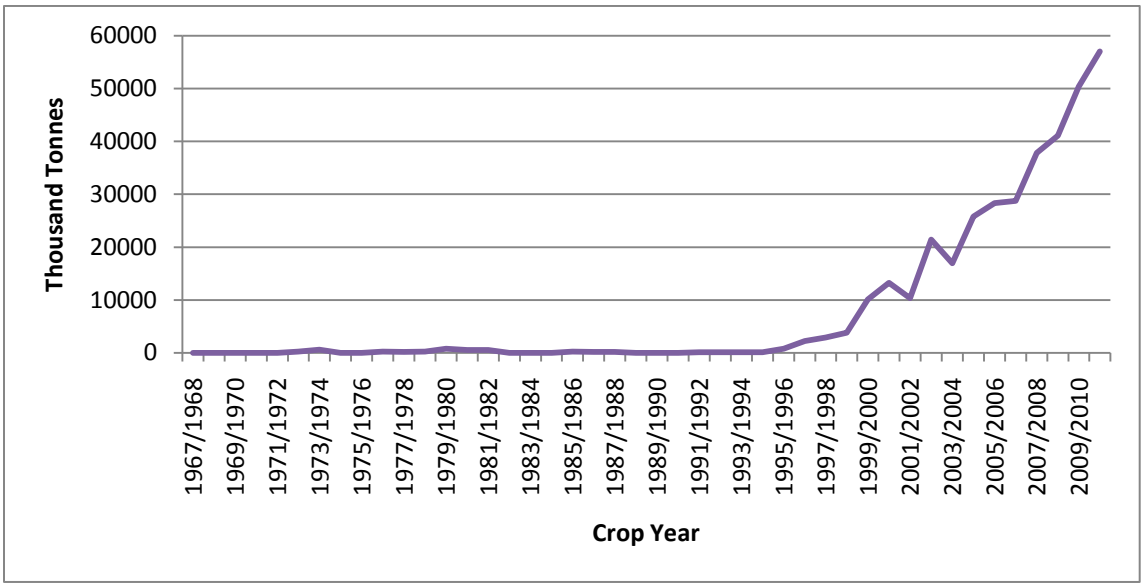


Source: USDA

7. Import Growth in Asia

India, China, and much of South East Asia experienced income and population growth through the period from 1985-2005. Income growth increases demand for meat products whose production requires cereals and a protein source. Population growth alone simply increases the demand for food arithmetically. For India, increased domestic demand has been largely met by increases in domestic production. Similarly in China, increased cereal demands were met by higher domestic production. However, two important changes took place resulting in new trade pressures. China began to rely heavily on imports of soybeans to meet demands for vegetable oil and livestock demands. Chinese imports were consistently less than 1 million tonnes prior to 1995/6 but grew to more than 37 million tonnes by 2007/8. The rapid and unanticipated growth in soybean imports by China was an additional pressure in the price spike of that year. In the current year, as prices again reach record levels, China is forecast to import 57 million tonnes of soybeans.

Figure 7 – Chinese Soybean Imports



Source: USDA

The remainder of South East Asia experienced import growth to meet rising domestic consumption for wheat and corn. Although production of corn increased in this region, it was not adequate to keep pace with consumption so corn imports increased modestly. Similarly for wheat, a significant portion of the new consumption was met through increased imports which raised imports from 8 million tonnes to 13 million tonnes annually.

Consumption growth, although most pronounced in Asia, was a factor throughout the world outside the boundaries of the former Soviet Union. However, throughout the 1990's, this increase in consumption did not keep pace with the structural changes which had taken place in the former Soviet Union and South America. The result was that agriculture prices remained below full cost of production throughout much of the decade in many production regions. Public research investments in agriculture were modest and foreign aid contributions to agriculture were very low. Political pressure mounted in the USA and other relatively high cost exporters to increase demand for cereal grains and oilseeds.

8. Biofuels

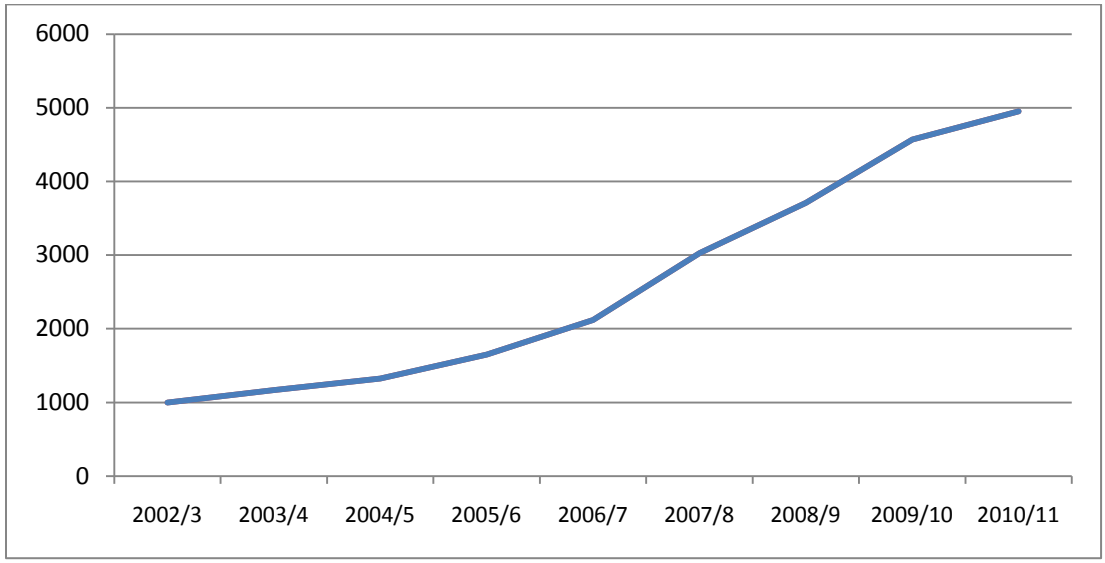
Biofuels in the current context refer to the production of fuel products from agriculture commodities. Ethanol is made from the energy component of sugar cane and cereals – primarily corn and wheat. Biodiesel is manufactured from vegetable oils.

The start of the twenty first century saw a massive move to encourage biofuel production. In the USA, farm gate cereal prices had remained at levels which triggered large government payments directly to farmers for fifteen years; there was growing concern about the security of supply of petroleum based fuels; and tremendous pressure from the domestic agriculture industry to reduce the reliance on unprofitable cereal exports. Public policy was introduced in the USA and other jurisdictions to provide

financing, direct support and minimum use requirements for ethanol production. The result was a new demand which dwarfed previous demand increases for cereal grains.

It is important to understand the scale of the new biofuel demand. In 2001, corn used for ethanol in the USA was not significant. This demand grew from less than 12 million tonnes at the start of the decade to an estimated 120 million tonnes in the current year. Thus, corn used in ethanol in the USA now exceeds total world trade in all coarse grains.

Figure 8 – Corn used for Ethanol in the United States (millions bushels/yr)



Source: USDA, World Agricultural Supply and Demand Estimates, various issues

In Europe, the trend favoured biodiesel. Minimum requirements for biodiesel have dramatically increased European vegetable oil imports .

The increase in biofuel production is an important backdrop to the 2007-8 price spike and the current volatility for a number of reasons. First, the accumulated stocks, both public and private, were exhausted. Similarly, the latent capacity of the global agriculture sector was brought into production. This included reserve lands which had been set aside to limit production. Finally, demand for cereal grains were now tied to petroleum prices. When ethanol or biodiesel can be produced at prices which are equal to or less than petroleum based diesel and gasoline, demand for increased use of cereals is directly tied to any increases in petroleum pricing.

9. Price Volatility – A New Norm?

The underlying causes of the 2007-8 prices pike have been rigorously analysed.[21] Five of the factors identified in previous research warrant additional comment.

[21] This section draws heavily on the work of Headey and Fan IFPRI 2010

a. A number of supply and demand shocks of which the dominant demand change was increased biofuel production

b. The fall in value of the US dollar

c. Trade restrictions – particularly for rice.

d. A spike in petroleum prices

e. Productivity decline and falling research and development in agriculture

While it is not useful to redo the econometric modelling which has been done elsewhere to work out how much each of the causes affected prices, a number of observations are warranted. The fall of the US dollar is considered important in some papers that review the price spike. The cheaper US dollar reduces the impact of price escalation when denominated in other currencies. Thus, any reduction in demand due to higher prices is reduced for those consumers whose incomes are not directly tied to the US dollar. The difficulty with this argument is that the US dollar is the currency for international trade so much of Africa and the developing world experienced the crisis in US dollars. Further, in terms of price impact on demand, the virtual inelasticity of demand would make any price impact on the quantity demanded very small.

The petroleum price spike affected the issue in at least two ways. Clearly demand for biofuel goes up as petroleum based gasoline and diesel fuel prices jump. Second, in terms of impact on developing countries, the increases in petroleum prices affected foreign currency reserves for low income oil importing countries. This in turn affected the financial capacity of these nations for cushioning their populations from the shock of higher prices.

Supply and demand shocks such as the production shortfalls in 2007 and the profound growth in biofuel demand only have an effect on prices when stock levels are driven below the threshold levels with which the market is comfortable. As identified by Dr. Darryl Ray at University of Tennessee, "Those unfamiliar with the data would do well to review the role of reserve stocks in smoothing commercial market operations in 1983 and 1988, when US reserve programs were in effect. Had even a moderate-size reserve been in place in 2006, livestock and ethanol producers, other demanders of grains, and participants in international trade would have faced a less daunting reality, and billions of dollars that were lost or foregone from the disrupted economic activity could have been avoided. "[22]

The idea that trade restrictions were a cause of the price spike is a curious idea of causality. It is certainly true that for rice, prices spiked when export restrictions were put in place by key exporters. However, it is important to ask if export restrictions were caused by a profound nervousness about the stock levels in wheat which serves as a substitute. This connection is recognized by Headley and Fan when that rice exporters resorted to restrictions, "possibly because of substitution effects from the

[22] Ray, Darryl and Shaffer, Harwood, Policy Pennings #544, January 2011.

ensuing crisis in international wheat markets."[23] The second question which needs to be asked is, "If trade restrictions are to be avoided in the future, is it not better to have modest international stocks in place to provide vulnerable nations assurance that food supplies are available rather than writing up another non enforceable trade agreement which would ask governments to continue to export when nervous populations may be ready to rally in the streets?" The widespread confirmation trap[24] that trade restrictions rather than stock policy was at fault needs to be revisited. Stock to use ratios for wheat fell to 19.8% in 2007/8 – the lowest level in recorded history. Coarse grain stocks fell to 13.7% the previous year, the lowest level since the global food crisis in 1972. These core facts would have been front of mind for every trader involved in sales negotiations and every analyst who was providing information to governments for policy development. If there is a desire to have international markets relied upon as a source of supply, that supply must be reliable.

In the two years following the 2008 price spike, production levels for all cereals increased. In two years, wheat stocks returned to exceed 30% of use and coarse grain stocks increased by 40 million tonnes to 178 million tones or 16.6% of global use. Prices dropped as quickly as they had increased and many in the international community saw the event as a blip in the market rather than a move to a new level of global price and supply volatility. By March of 2011, it has become clear that the 2007/8 marked a transition to new levels of price volatility rather than being a blip in an otherwise stable market as happened in the 1972-74 price spike. Corn stocks are projected to drop below the low levels reached in 2006/7. Soybean supplies are now lower than they have been in recent history. Although wheat and rice supplies appear adequate, concerns with the quality of existing supplies and concerns for the winter wheat crops in China and the USA are pressuring prices higher. By mid February, winter wheat prices are now approaching the levels reached by the same time in 2008. Any production shortfalls in the coming growing season have the potential to create a food crisis which is more severe than the one experienced three years ago. Alternatively, seeded acreage is projected to increase in key production regions and, with favourable weather, the potential exists for supply to again exceed demand and cause a precipitous fall in prices.

While many were prepared to dismiss the 2008 price spike as a blip or bubble in a food market which is by its nature stable, it is now clear that this is not the case. Agriculture markets are inherently unstable and, in the absence of intelligent international policy to improve stability, the profound volatility of the past four years will become the new reality. Political instability, economic losses, and human tragedies are all huge risks if action is not taken to curb the volatility in the international markets for primary agriculture commodities.

[23] Headey, Derek and Fan, Shenggen, Reflections on the Global Food Crisis: How did it happen? How has it hurt? And how can we prevent the next one?, IFPRI Research Monograph #165

[24] A confirmation trap is a term used to describe a natural tendency to take in only information which agrees with a position which was held prior to the new information.

Issues to Move Forward

1. Types of Reserves and Stocks

Grain stocks are generally understood to be that amount of grain in storage at the end of the marketing year which becomes part of the supply for the following year. However, there are many types of grain stocks. Similarly, in the discussions on solutions to the international food crisis, a number of different stocks or reserves are considered. Grain stocks will have an impact on prices in two significant manners. First, a large carryout stock provides more supply for the following year so it will have a downward pressure on prices. Second, physical stocks are generally possible to observe so in a market where much of the information is uncertain, stocks add a degree of certainty which has a stabilizing impact on prices. The degree to which stocks stabilize prices through assuring buyers and lower prices through improved supplies depends on the nature of the stocks. A number of different types of stocks are outlined below.

The first important distinction, which was discussed earlier in the paper, is exporter versus importer held stocks. Importer stocks are held to buffer importing nations in the event of supply shortfalls in that country. As such, in the event of supply and demand shocks in the rest of the world, these stocks will not have a significant price effect in a food crisis unless the nation chooses to reduce imports or re-exports in the face of the crisis. Exporter stocks are available to all different areas which need supply so are much more important in price formation.

The second distinction is private versus public stocks. Private stocks are those stocks held by private companies or individuals. Private stocks are held for a number of reasons. The grain may be carried forward into the next crop year on the expectation that prices will increase by more than the cost of storage. Alternatively, the grain may simply be a residual stock held by producers because adequate sales are not available.

Public stocks or grain reserves are those held as a result of public policy. Frequently these reserves are owned by public sector organizations and may be held for a variety of reasons. Historically, the common reasons were price stabilization, producer support, or food security. Frequently, reserve policy has elements of each of the three purposes in mind.

In the discussions on food reserves, three distinct reserve approaches have been proposed. Emergency food reserves are generally understood to be prepositioned food in areas which regularly require food aid imports. The primary purpose of this policy intervention is to improve the timing of a food assistance response. In addition, donors gain increased control of prices paid as a result of having increased flexibility on the timing of food aid purchases. Recipient countries improve risk management as the volume of food available in country is increased regardless of donor responses in the event of a food emergency. These reserves have a limited effect on markets. In the event that the reserve is drawn down during price spikes where food aid purchases would have been required, some limited international demand side pressure is alleviated in the price spike.

The second type of reserve is frequently referred to as a national food reserve. These stocks are held by importing nations or nations who want to avoid significant imports such as India and China. These reserves are designed primarily to buffer domestic markets from changes in international prices. The reserve is intended to affect price transmission – the degree to which changes in international prices cause a change in local prices. The impact of these stocks on international markets is limited. For all buyers outside of the market where the stocks are held, the stocks are not accessible. The only effect on markets is if the stocks are required by the host country in times of extreme price spikes.

The third type of reserve, international food reserves has been exemplified by stocks held by individual exporting countries to be made available when prices are above specific values or when supplies are considered too tight for reasonable markets to function. These reserves have traditionally been developed for producer support in times of excess supply. Reserves held under the IWA, US agriculture policy, and the Common Agriculture Policy in Europe would all be examples of this type of reserve policy.

The failure of the international community to develop a modern form of international food reserves will result in the proliferation of emergency food reserves and national reserves to insulate individual markets or groups of consumers from market volatility. This approach will be very expensive as vulnerable households and consumer groups exist in every nation and the volume of reserves required in this form will be much larger and more expensive than a coordinated system of international grain reserves.

2. Politics and Governance of Reserves

Establishing reserves by the public sector will create benefits and losses among different groups and a discussion of reserves needs to include a discussion of the potential impacts on markets and market participants. The objective needs to be to reduce market volatility while still allowing market prices to develop in a manner which encourages investment in agriculture when supplies are required. It is market volatility, not high prices, which is the overriding concern for food security. Income support and income generating approaches can be developed to address high prices but will not deal effectively with the volatility.

Developing reserve approaches which alleviate volatility while allowing the market to adjust to long run economic pressures is at best an imperfect science. Historically, the IWA which was discussed earlier used a wide price band approach. The price bands were set at levels which by historic standards were extreme and it was felt that equilibrium price levels would fluctuate between these levels. Initially, it also allowed for volumes to trade outside the agreement to signal to negotiators if the price band was consistently out of line. New market entrants and the expensive supply required to sustain the lower bound eventually brought the agreement to its knees.

Similarly, European and US agriculture stock policies developed using price bands. The primary purpose of these policies was domestic farm support. More grain was purchased from the market than was required to maintain the lower bound price and public stocks grew. These stocks provided assurances to importers and prices stayed at or near the lower bound. In the end, the stocks were dumped onto

the market forcing prices below the cost of production for a decade following the policy change. The policies which were designed for farm support thus ended by having a negative impact on farmers outside of USA and Europe while providing assurances of supply to the importing nations.

Any attempt to rebuild reserve policy based on price bands is unlikely to succeed. The asymmetric nature of supply and demand mean that those who benefit in the short term would be expected to be hurt in the long term. Agriculture policies would have to be coordinated beyond a level that neither national governments nor the international community have the capacity to govern.

An alternative to a price based approach is to develop a reserve of a defined size, termed a *Fixed Quantity Reserve* (FQR). Although producers in export regions would not gain a price floor (procurement up to the defined maximum would be triggered by stock to use levels above a specified limit), additional demand would be created in years of excess supply. In addition, confidence could be restored in the international market allowing some assurance that exporters would have long term market opportunities. Importers would have assurances that supplies were available and would be made available if supplies were excessively tight.

3. Free Trade and Stocks

The last two rounds of international trade discussions have focussed on bringing agriculture under tight rules governed by the World Trade Organization. The move is extremely contentious. Proponents point to the trade benefits experienced by other products and commodities. Opponents of free trade point to the many national instruments which have been developed to recognize that food and agriculture are distinct and require distinct treatment. The debate has become visceral. The discussion of agricultural stocks has been caught in the crossfire of the debate. Proponents of free trade argue that trade will solve the issue of volatility if it were only more free. The events of the 2007-8 crop year suggest otherwise. Wheat prices in March 2008 were three times the average prices of 2004/5 which in turn were above the previous ten year average.[25] There were no trade restrictions causing this volatility and producer supports in Europe and US likely created production capacity which would not have been in place in an unfettered agriculture market, a move which should have moderated the price spike. For rice, it is difficult to fathom that in a world of imperfect information any nation would *not* have placed export bans when it appeared their domestic supplies were not adequate to meet local needs. These restrictions would likely be made regardless of the international trade rules.

Trade does alleviate supply restrictions in situations where one area is short and supplies are available in other areas. Trade rules which are clear and enforceable are important for the execution of this trade. However, there are two difficulties with relying on trade to solve supply imbalances in the global marketplace. First, harvests are seasonal. For wheat which is overwhelmingly grown in the Northern Hemisphere, supply responses take a year. The crop is largely harvested from May to September and if supplies are short, it will be next May before there is a supply response possible. This concentration of harvests is compounded by corn which the US dominates and the US corn season is similar to wheat

[25] Basis Hard Red Winter Ordinary average monthly prices FOB Gulf. If daily prices were looked at, the volatility was actually higher.

although new crop is not available until Oct-Dec. Second, global markets increase the size of adjustments which must be made, usually by those who can not afford to buy food. As we move toward a world where cereals are consumed by ethanol plants, livestock for relatively wealthy consumers, and for direct consumption by people with a wide range of income levels, the risk is that poor and hungry consumers become even more the 'adjustment factors' for a larger pool of consumers than would have been the case historically.

The trade model of global agriculture requires confidence of all participants to succeed. The global shortfall and price spike have shaken that confidence for many importing nations. Recent moves by China and Middle Eastern importers to look for regions in Africa where land can be contracted for long term production is a sign of this loss of confidence in international markets. All importers need to know that the international marketplace will be there with adequate supplies if they are to move away from the self sufficiency policies. Given that food is required daily and produced seasonally, it is difficult to understand how international trade proponents can expect a food trading system to work without adequate stocks. Private stock holding will not be adequate.[26] By definition, demand must adjust in the event that there are supply shortfalls. In the absence of adequate stocks, this means that people need to eat less. For Western consumers, many of whom may need to eat less for health reasons, the relative price change will be negligible relative to income levels. The consumption drop will be borne by those who can not afford to purchase enough food. No rational nation will agree to a world trading system in which it is known in advance that they will either need to bear the costs alone of carrying stocks or accept their citizens will go hungry when supplies are tight.

3. Income Based Approaches

One argument which is raised as an alternative to stocks policy is an income support for people who are hungry. The argument is that if food price spikes cause an additional 200 million people to go without food then it may be less expensive to provide support to these people than to store reserves. It is certainly the case that income and entitlement shortfalls are central to food insecurity and where these conditions are chronic, the best response is often to focus on income based solutions. However, it is not reasonable to expect income supports to be available and respond to the need in the event of a price spike such as occurred in 2007-8.

The first challenge to income supplement approaches to price spikes is in identifying the new vulnerable households. Doubling world food prices in a short time frame will result in a new set of vulnerable households emerging in many countries around the world. Targeting income support is a challenge even for Western nations where only relatively small numbers of people require assistance and complex bureaucracies already exist. To expect multilateral agencies, international NGOs and national

[26] The only positive reason for the private sector to hold stocks is if prices are expected to increase by more than the costs of carrying the grain. In the event that stock information is that others are holding stocks, prices will not be expected to increase and the demand for stocks is very low. Thus, there will never be adequate stockholding to avert a potential price spike. Conversely, there is an incentive to hold stocks if supplies are very tight as there is the potential of additional production shortfalls and prices would rally dramatically. Thus, tight stocks actually are expected to increase the private demand for stocks and thereby add to the volatility rather than moderate the volatility..

governments to quickly identify vulnerable households and support their incomes in a timely manner to respond to sudden price spikes is unrealistic.

The second challenge to using income to respond to an imbalance in supply and demand is that it is a circular argument. If it were to be successful, in a sufficiently timely manner, it would simply add to demand. The world's population is not divided into discreet groups who are vulnerable or not. There is a continuum. If income supports shore up the incomes of the people who were vulnerable prior to the price spike and find the newly vulnerable households, the market will respond to ration supply at some higher price. Consequently, a new group of households will become vulnerable.

Income generating opportunities are central to improved long term food security. However, to expect these approaches to buffer vulnerable people from rich country-based market volatility is not reasonable.

4. Derivative Market Proposals

Derivative or futures markets are forward traded markets whose values are derived from the underlying market, or the expected market for the commodity. These markets are traded on a continuous basis and prices are publicly available. As such, contracts for trade in the actual commodities use the traded futures prices as part of the price discovery process. Policy proposals have been made to try to stabilize futures prices as a way to affect contract prices with no proposed changes in the fundamentals of food produced or food used. Two of these proposals are discussed below.

The first approach to "controls" in derivative markets is proposals to limit speculation. Hedge funds and index funds take positions on commodities with large sums of money. The result on a daily basis can be to move the market prices more than the fundamental changes in information on supply and demand would justify. On this basis, a portion of the volatility is considered to be caused by the very large positions of fund traders. While econometric analysis tends to discount the impact of speculators in the 2007-8 price spike, people who trade in the market on a regular basis will support that the swings are amplified by fund activity. However, it is important to reflect on causality. If food supplies were considered adequate and buyers felt that supplies would be available in the event that their requirements increased, would the market attract large speculative funds? Similarly, if the funds speculate on supply shortages which do not exist, markets will adjust and the speculators will experience a loss. Thus, it is likely more prudent to find solutions which ensure adequate supplies to limit excessive speculation than to try to improve food security by imposing regulation on speculation.

A second derivative intervention is a proposed virtual stock designed to take the opposite position of speculators to minimize their impact on volatility. The virtual stocks proposal was made by International Food Policy Research Institute (IFPRI) in 2008.[27] This paper proposes strategic stock holding in vulnerable import regions. This is likely to be a part of any realistic solution. However, also included is a proposal for virtual stocks which involves a rolling short position in the derivative markets to offset

[27] Von Braun,J. And M Torero "Implementation of of Physical and Virtual Food Security Reserves to Protect the Poor and Prevent Market Failure", International Food Policy Research Institute, October 2008.

speculative long positions.[28] To intentionally take a short position in the face of a rising market is a very high risk venture. Further, the position will need to be covered at some point at an inevitable loss and the move will be anticipated by others in the market. A more complete review is provided by Wright for The World Bank and concludes, [IFPRI]"makes no real case for suspecting a negative role of speculation, provides no evidence of (unspecified) market failure, and offers no reason to believe that the proposed intervention will have any desired effect at all."[29]

A central issue which must be understood is that the futures markets are derived from the changes in the supply and demand for the commodity. While negotiations for actual grain purchases use the futures markets for price discovery, policy intervention in these markets may simply create a wider basis or spread between futures prices and the prices on the physical trades.

5. Price Volatility and Food Aid

One contractual commitment which should be part of the solution is for donor nations to agree to take on the price risk for the food aid commitments. Historically, food aid commitments in the Food Aid Convention were in tonnage as public sectors held large stock positions and the price risk was small due to the existence of these stocks. In the current environment, there is discussion by donors to commit to money rather than tonnes to avoid this risk. This change would transfer all price risk to food aid recipients. Two concurrent contracting arrangements are required to avoid transferring this price risk to vulnerable households. First, donors need to agree to commit to tonnages. Second, donors require a risk management strategy to cover this risk which should include stock holding – either directly or contractually. If donors accept the price risk and do not respond by developing risk management or stock positions, the effect will be the same as the income response to price spikes outlined above. Donors will simply add to demand during price spikes. If, however, risk management is developed by donors, additional stocks will be carried and the policy has the possibility to have a stabilizing impact while protecting consumers depending on food aid through price spikes.

6. Price Band Approaches

Many reserve proposals suggest a price band in which the public sector stands ready to buy all stocks below specific prices and release the stocks if prices try to rise above specific levels. In their recent working paper, the World Bank argues that these approaches will gravitate towards the upper bound of the band. The Bank's critique appears to fail to take into account the relationship between the price band and long term supply responses (i.e. long term supply tends to overshoot and hold prices low for an extended period). If the equilibrium in the market is at the midpoint of the market, any tendency to reach the upper price of the band will quickly be offset by increased production. The experience of the IWA after the first three years also demonstrated that the only band which came into effect was the lower price limit of the band.

[28] A short position is an agreement to sell at a future time at a fixed price. A long position is an agreement to purchase at a predetermined price.

[29] Wright, Brian, "International Grain Reserves: and Other Instruments To Address Volatility in Grain Markets", Policy Research Working Paper #5028, The World Bank, August 2009.

Once a price band system is introduced, the asymmetric nature of markets will mean that more grain is purchased during low price periods than is required in time periods of tight supplies. Additional policy instruments such as land set asides or constantly lowering the lower bound would be required. To ensure that stocks are available to the market only in specified time periods would require international commitments to governance which would need to be very dynamic. In addition to the logistical hurdles, the political resistance in the USA is likely to be very strong. The US has gone through a process of moving aggressively away from market management strategies in agriculture. In addition, the US has always been very reluctant to submit national policies to international disciplines. Thus this price band approach to market management is not likely achievable in the current climate and the economic costs and risks would probably outweigh the benefits.

7. Cost of Reserves

Opponents of reserves quote costs as a barrier to establishing reserves. While history has shown that the costs of price stabilization were much lower than the direct income payments as a tool to support farmers in the USA, the cost issue is important and must be understood in the context of all reserve discussions.

The costs of a reserve (CRS) include the cost of money required to purchase the grain (i), the costs of storage, and any change in value of the stored grain during the time it is stored. Storage costs include the capital costs of the building used to store the grain and the annual management fees associated with keeping the grain in good condition. Capital costs need to be amortized over the life of the storage facility. Storage costs can thus be expressed as follows:

$$CRS = i*PP + (PP-PR)/n + AC + MF$$

Where CRS is equal to the cost of reserve storage, i is the cost of money, PP is the procurement price, PR is the expected release price, n is the number of years that the reserve is expected to be required before supplies are withdrawn, AC is an annualized cost for capital components for storage, and MF is the annual management fee for storage. Within North America and Europe there is a considerable volume of storage capacity which is not used due to the decline in public sector stocks in the US and Europe and the decline of the seaway shipping system in Canada. This should result in capital costs well below the costs of new facilities. If a reserve is built on the basis of purchasing quantities while stocks to use ratios are high and releasing them in times of very tight stock positions, the factor (PP-PR) can be expected to be negative. Thus, even if this factor is set to zero, annualized capital costs are estimated for new facilities, and the interest and management costs are added, it is possible to estimate the upper bound for storage costs.

Based on steel construction of 60,000 mt silos, capital cost estimates are available from industry of $212/mt[30] . Using a conservative life expectancy of 40 years and a capital cost of 5%, this results in annual capital costs for the storage of $12.35/mt/yr if new construction proves necessary. Assuming the same cost of money for the purchase costs of the grain of 5%, a $300/mt purchase price will result in

[30] Personal industry contacts

cost of money for grain purchased of $15/mt. Assuming $8/mt/yr for management, the total annual costs would be $35.35/mt/yr (15+8+12.35). This compares favourably to the recent OECD study[31] on grain reserves which suggests a $36/mt based on Canadian Grain Commission storage rates. It is important to note that Canadian Grain Commission storage rates are for grain stored in a facility built for handling rather than storing grain so it is expected that OECD numbers are also above actual costs.

8. Transparency of Grain Stocks and Reserves

As discussed earlier, grain stocks and reserves have an impact on prices for two reasons. First, the additional supply means that demand surges can be met and the supply and demand stay in some level of balance. Second, buyers can expect that supplies will be adequate so the uncertainty is reduced and an element of calm is provided to the market. In order for stocks to have the stabilizing impact on markets, it is necessary for the volume of stock held to be publicly understood and to be accurate. Similarly, any reserves held by public policy will provide improved stability only if there is complete transparency on the rules for purchase and release of stocks by the reserve.

Many nations do not have complete information on the volumes of stock held in their borders and/or do not release this information. The USDA, IGC, and FAO provide estimates of supply, disposition, and stocks by country. This information is estimated based on observed production, estimated consumption, and trade. There is considerable room for error in the estimates and numbers need to be adjusted periodically. In order to operate any type of new reserve system, or simply to make the current market work better, requires improved information systems to provide more certainty on stock, supply, and disappearance estimates which are made.

Improving Food Security in a Volatile World Market - Proposals for Discussion

International markets for agricultural commodities are at a historic cross roads. Integration of global markets has meant that nations are able to focus their resources on those activities and outputs that create the most value. However, the last three years has shattered that confidence for food commodities. After three decades of subsidizing the production of agricultural commodities, a shift has been made in the Western world to, in effect, subsidize the consumption of grains and oilseeds through biofuel. Prices and supplies are unacceptably volatile. Poor consumers face the prospect of having price ration access to food when supplies are tight. This now means that vulnerable households and poor countries must bid against a subsidized ethanol and biodiesel demand to get this food.

In the absence of a solid international plan to address the volatility and uncertainty, nations can be expected to step away from the global market and develop individual solutions. Contracting large blocks of land in Africa, developing inefficient reserves in each nation, increasing trade barriers are all

[31] Thompson, W. and G. Tallard (2010), "Potential Market Effects of Selected Policy Options in Emerging Economies to Address Future Commodity Price Surges", *OECD Food, Agriculture and Fisheries Working Papers*, No. 35, OECD Publishing. doi: 10.1787/5km658j3r85b-en

starting to emerge. The world has the opportunity to address the issue in a multilateral context and save a tremendous amount of resources.

A proposal for establishing an international reserve has a number of challenges. First, as outlined earlier in the paper, wheat, rice, corn, and oilseeds markets each have very different structures and each affects the other markets. Wheat and corn require different stocks to use ratios for their markets to function so ending stocks cannot be simply added for one common total. A single policy instrument is probably not appropriate for the major food commodity markets.

Second, international governance and cooperation appears to be at a low ebb with countries increasingly focussed on domestic concerns and protectionism on the rise in many countries. Policy instruments need to recognize the limited commitment to multilateralism and limit the degree to which national policies will be affected by multilateral agreements.

Outlined below are five elements which have the potential to improve food security and to add a certain amount of stability to an otherwise unacceptably volatile global marketplace. The five components are distinct but each is set to address primarily the issues in one of the commodity groups.

Three of the components require bidding grain or grain capacity into a reserve for use in times of shortfalls. It is proposed that this be done multilaterally either through an existing organization or through a new one specifically tasked with oversight on the global marketplace similar to the mandate of the IGC following the collapse of the IWA. Funding would need to be multilateral and all market activity would need to be transparent and predictable.[32] Funding requirements are modest. A formula similar to that used for the UN or World Bank could be considered. Note that using a central organization to build a volume limited policy reserve or reserve capacity on a contractual basis removes the many governance issues of the traditional price band international commodity reserves of the past.

1. Biofuel – A New Potential for Reserve Capacity

There are two lenses with which to look at the profound growth of biofuel demand over the last decade. First, biofuel demand was central to the price spike in 2007-8 and it is central to the volatility in 2010-11. There is widespread recognition[33] that biofuel demand is a central cause of the current volatility. In this regard, biofuel is part of the problem. However, biofuel demand has created an incentive for agriculture production. The new demand has renewed the call for appropriate investment in agriculture in vulnerable areas. This new demand ended three decades in which many producers faced prices which fell short of the full value of production, thereby blunting agricultural development.

The current rebuilding of agriculture capacity creates the opportunity for a public policy which uses ethanol as reserve capacity which could be scaled back in the event that supplies are excessively tight

[32] For biofuel set-asides, bilateral discussions among the key players may be more likely to succeed than multilateral approaches. There are very few major biofuel producers and the US is central to the debate. The US will need to see specific commitments from other key players to enter discussions on biofuels. This may include transparency with the BRIC countries and comparable commitments on biofuels from other major producers. Multilateral funding may be possible.

[33] Heady and Fan 2010, Wright, 2011

and food security is threatened. By having a transparent policy which pulls biofuel capacity out of production in times of excessively tight stocks to use ratios, it will be possible to assure food and feed users that supplies will be available.

There are a number of possible approaches to scale back biofuel in the event of supply shortages threatening food security. The simplest policy approach is to reduce the biofuel mandates when stocks are projected to fall below threshold levels. Currently many western nations have implemented minimum biofuel requirements in diesel and gasoline. These requirements sustain a policy demand for biofuel regardless of price. By rolling these mandates back in times of tight cereal stocks, ethanol and biodiesel producers would be expected to reduce production and free up supplies for food and feed. This approach has the advantage of not requiring any public funds to be effective. The challenge is that mandates are national in scope and the benefits of variable mandates would be expected to be international in scope. The primary benefactors would be corn and oilseed importers while much of the biofuel production is in exporting nations. International agreements or treaty arrangements would be required and it is likely that other provisions need to be part of the solution to make the package equally attractive to all potential participants in a negotiation.

A second limitation of a variable mandate proposal is that there are times when biofuel is competitive with gasoline and diesel without the mandate. With this type of oil/cereal price relationship, mandate reductions would have no impact on biofuel production.

One contractual approach to scaling back biofuel production when food security is threatened is proposed by Wright.[34]He suggests that governments "could purchase call options on grain from biofuel producers , with appropriate performance guarantees. " The contract is similar to the stand down contracts for electricity in which an industrial user agrees to reduce or discontinue use of a specific volume or during a specific time period. The performance guarantee is considered to include agreement that the option includes a commitment to reduce output rather than simply purchasing other cereals to produce the ethanol. The options could be priced on an auction. This approach would have the effect of a government or international organization paying a regular fee to biofuel producers for a commitment to reduce output when specified conditions are met. Bids would be expected to be based on expected foregone profits for that volume of reduced output. Fees would be paid regularly regardless of the number of times that the option needs to be exercised. One advantage of using a contract option is that the volumes of reductions would be known to the market and expectations would be formed accordingly.

An alternative to the option contract proposed by Wright would be to have specific defined conditions in which governments (or a multilateral organization) would bid to pull a specific volume out of biofuel production. This type of auction would be triggered when transparent preannounced conditions were met which signalled excessively tight supply demand situations. This would only require payments in times that supplies were actually required and the conditions could be similar to the ones proposed for the option contract. It is anticipated that the costs of an as-needed auction would be less as there is no

[34] Wright,B., "Biofuels and Food Security: A need to Consider Safety Valves?",IPC Policy Focus, February 2011.

uncertainty in the forgone opportunities. Given a competitive bidding process total costs would be contained.

It is important to note that regardless of the nature of the contracting approach, two elements are essential for success. First, the process must be predictable and transparent. Second, if biofuel production is at the mandated minimums, a concurrent reduction in the mandate is required. If the mandate is not reduced, biofuel prices will escalate and it is likely that other producers will add a shift or find other ways to backfill the production which has been pulled off the market.

It is expected that by using biofuel as a reserve capacity ('biofuel set aside'), the volatility which originates from corn and oilseeds can be scaled back to levels which will not threaten food security or overflow to other food markets. Given the scale of the biofuel industry, it is likely that any attempt to reduce the volatility of international markets without tackling the biofuel question will either fail to meet expectations or will prove to be extremely expensive.

2. A Fixed Quantity Wheat Reserve – Smoothing Supply Volatility

Wheat stocks to use ratios were central to the 2007-8 price spike. The wheat market functions in price ranges which trigger modest expansion and contraction in supply when total stocks to use ratios exceed 20%, with exporter stocks approximately one third of these levels. When stocks fall below these levels, the international wheat market becomes a source of insecurity rather than a food security source.

Historically, wheat supplies have been buffered by large public sector stock policies. Both the international approaches and the national policies of stock holding by exporters ended by the 1980s. However, with climate change, there appears to be a dramatic increase in supply side volatility in both Western Canada and Australia. The former Soviet Union, once an importer which held national reserves, is now an exporter with even more dramatic supply side fluctuations.

To smooth the supply, it is necessary to create an international wheat reserve. One approach to creating a reserve is to bid a fixed quantity, 1 to 2 % of global use (6-12million tonnes), off the market in time periods when stocks are projected to exceed 27% of global use and make these stocks available in times when stocks fall below 20% of global use. The size of the stock is based on the observation that, in the absence of such stocks over the past decades, stock to use ratios have not fallen below 18.9%. Bids could be received from exporters to purchase and store the grain and a transparent auction developed to release the grain based on a clear set of criteria concerning global stocks.

Cost estimates to carry such a fixed quantity reserve (FQR) are difficult to calculate precisely. Based on the OECD calculation and trade estimates received, an upper bound for the costs would be $35-$36/mt/yr. There is considerable infrastructure in North America and Europe from times when stock levels were much higher so bids would be expected to be well below these levels. Using the upper range of cost estimates, a reserve of 6 Million tonnes would carry an annual cost of $210 million.

As with bidding biofuel off the market when supplies are tight, importers will gain more than exporters. It is thus necessary that a multilateral approach be developed to fund an FQR. A multilateral approach with a single defined set of operating criteria has a number of advantages. First, is that one

international auction will be the most efficient and ensure that grains are held where it is the most cost effective to do so. Second, any reserve approach requires clear and defined criteria to purchase and release grain. By having one international auction, many of the international governance and coordination issues are removed. Finally, one reserve which is developed and released on clear commercial criteria removes many of the concerns of distorting commercial trade.

To make a global wheat reserve which is centrally managed effective, better information and forecasting would be required for stock levels in a number of countries whose total production and usage of wheat is very large. The proposed wheat reserve would require the biofuel set aside program to be in place for the modest reserve size to be effective. It is important to note that a biofuel set aside for wheat is not as likely to be effective as wheat volumes used in ethanol are small and the quality of wheat used in ethanol would likely flow into the feed market as a corn substitute if it is not consumed for biofuels.

3. Regional Rice Reserves

For rice, small, decentralized rice reserves are likely to be the most effective. Trade in rice represents a small portion of total consumption. Exporters are also large domestic users and rice exporters are not high income nations. The exporters themselves need to be in a position to assure domestic consumers that food is available. As a result, rice trade is more vulnerable to export embargoes and other limits to trade. A reserve model to provide assurances of adequate food supply for rice consumers is therefore more complicated than for wheat. A single, exporter based reserve would either be subject to the same trade restrictions or be perceived to be vulnerable to these restrictions. Thus, a single reserve approach will not be expected to gain the confidence of importers. Wherever possible, regional reserves would reduce costs relative to the alternative of individual country reserves. For rice markets to attain a reasonable period of stability, it will be necessary for wheat and corn markets to attain some level of stability.

4. Market Information – Improving Transparency

Any discussion or market report on current markets quickly moves to one of two topics – future production or anticipated Chinese purchases. There is very limited opportunity to improve the information on the size of next year's production. However, there is considerable room for increased information on the situation in China and a number of other large production or trading regions. As outlined above, information on stock levels in China are only estimates based on observed behaviour. Yet, Chinese stocks often represent overwhelming influence on the global stock position. Similarly, the former Soviet Union has the potential to be a key driver in the balance between supply and demand yet the level of uncertainty on production, consumption and stocks in these regions continues to be very high. Market participants struggle to understand the magnitude of production shortfalls in the former Soviet Union in a timely manner.

Any move to increase the level of stability in international markets is likely to be a net benefit to all importers and China has the potential to benefit in a major way. In a current market of historic volatility, China has a vested interest in maintaining a level of confidentiality on stock levels. The proposals on building reserves and reserve capacity through biofuel offsets require increased

transparency by all major global participants. A negotiated solution which ties increased transparency to improved stability will be required. Given the interest by Brazil, Russia, India, and China in improved stability at their 2010 BRIC meetings, progress appears possible in this area.

Given the very concentrated trade in soybeans, the transparency work will be particularly important to improve the function of the oilseed market. However, to make any other policy instruments effective for the other crops, increased transparency is required for other crops as well.

5. Public Sector Reinvesting in Primary Agriculture

The two decades from the introduction of the 1985 farm bill in the USA until the lead up to the price spike in 2007, saw a significant decline in the investment in smallholder primary agriculture. Prices were forced below the cost of production and the economic incentives and structural adjustment programs forced an artificial decline in agriculture investment. Aid programs for agriculture were cut. Agricultural development focussed on resilient and sustainable systems represents an excellent opportunity to improve the entitlement set for vulnerable households, increase agricultural productivity and, to some extent, reduce the volatility of agricultural production. It is important that the investment made is suitable for improving the entitlement set of people who are earning their livelihood from agriculture. There is huge risk with some recent large scale investments that the farmland resource will be redirected to centralized ownership and managed without regard for the impact on the entitlements of vulnerable peoples. If this happens, vulnerability could in fact be increased as production increases.

Conclusion

Price volatility is the new reality. Following the price spike in 2007-8, some observers felt that we had observed another historic price spike similar to the one in 1972-4. However, the volatility has been sustained through to the present (March 2011). The new biofuel demand, the reductions in grain stocks, and the apparent increase in volatility in weather patterns appear to be sufficient cause to leave markets in a continuing state of extreme volatility.

This volatility threatens the food security of ever increasing number of vulnerable households. Also at risk is the confidence of importers in the reliability of the international market as a dependable source of supply. In the absence of well developed international approaches, individual countries and regions will attempt to find unilateral solutions. Wealthier importers are moving to contract for land use beyond their borders. Countries will move to national reserves or expensive programs of self reliance. There is an opportunity to solve the volatility issues at modest cost if the international community is prepared to work together in their search for solutions.

In any discussion on volatility it is important to distinguish between volatile prices and high food prices. Agriculture prices were held below production costs for much of the two decades leading up to the price spike. Markets need to reflect the current tight supplies and the signal to reinvest in agriculture needs to remain in place. Prices well above the levels experienced from 1985-2005 will be expected to improve food security for many rural regions. However, the volatility is a cost to both consumers and

producers. Given differential access to risk management, a disproportionate share of the volatility costs will be borne by vulnerable households and poorer countries.

Policy options are available to significantly reduce price volatility. Biofuel production can serve as a type of reserve capacity and biofuel mandates can be reduced in times of tight supplies. Alternatively, biofuel production could be bid off the market in times of tight supplies of corn. A modest international wheat reserve is required to provide supply in times of production shortfalls. Rice reserves are already being established and are probably best implemented as national or regional reserves. Improved information on production, consumption and stocks will increase market confidence and reduce volatility. This information is also required to make biofuel set aside and wheat reserve policy effective.

Using ethanol production as reserve capacity, improved information on stock levels and a multilateral wheat reserve are not a threat to the attempts to develop fair international trade rules for agriculture. In fact, it is probably a necessary step to provide importers with the necessary assurances to be willing to have confidence in international markets.

Policies to address price volatility are important to improve food security but they are not a panacea. For twenty years prior to the price spike in 2007-8, international food prices were below the cost of production in many areas and there was inadequate investment in primary agriculture. A renewed investment in smallholder primary agriculture will be required. Food security remains an issue of income and entitlements for many households. The income generating programs and income support will be a necessary part of the mix. However, income support and investment in agriculture will both be much less effective if price volatility is not addressed.

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March 2011

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Appendix 1 - International Wheat Agreement Annexes[35]

9. Annex B to Article II — Guaranteed Sales per Crop Year. (bushels)

Country	1949 Agreement 1949–53	1948 Agreement 1948–53
Australia	80,000,000	85,000,000
Canada	203,069,635	230,000,000
France	3,306,934	Importer in 1948
United States	168,069,635	185,000,000
Uruguay	1,837,185	Non-participant
Total	456,283,289	500,000,000

1. Annex A to Article I — Guaranteed Purchases per Crop Year. (thousand bushels)

Country	1949 Agreement 1949–53	1948 Agreement 1948–53	Country	1949 Agreement 1949–53	1948 Agreement 1948–53
Afghanistan	0	735	Italy	40,418	36,743
Austria	11,023	18,739	Lebanon	2,388	2,756
Belgium	20,209	23,883	Liberia	37	37
Brazil	13,228	19,290	Mexico	6,246	7,349
China	7,349	14,697	Netherlands	25,721	30,680
Colombia	735	2,205	El Salvador	404	0
Cuba	7,423	8,267	Panama	625	0
Czechoslovakia	0	1,102	Paraguay	2,205	0
Denmark	1,617	1,470	New Zealand	4,953	5,511
Dominican Republic	735	735	Norway	7,716	7,532
Ecuador	1,102	1,102	Peru	7,349	4,042
Bolivia	2,776	0	Philippines	7,202	6,246
Ceylon	2,940	0	Poland	0	1,102
Saudi Arabia	1,837	0	Portugal	4,409	4,409
Egypt	6,981	6,981	South Africa	11,023	6,430
France	exporter	35,824	Sweden	2,776	2,776
Greece	15,726	18,739	Switzerland	6,430	7,349
Guatemala	367	367	United Kingdom	177,068	179,930
India	38,287	27,557	Venezuela	3,307	2,205
Ireland	10,105	13,227	Nicaragua	294	0
			Totals	456,283	499,997

2. Article VI — Prices.

Crop Year (Aug. 1/July 31)	Maximum Price 1949 Agreement	Maximum Price 1948 Agreement	Minimum Price 1949 Agreement	Minimum Price 1948 Agreement
1948–49		2.00		1.50
1949–50	1.80	2.00	1.50	1.40
1950–51	1.80	2.00	1.40	1.30
1951–52	1.80	2.00	1.30	1.20
1952–53	1.80	2.00	1.20	1.10

Prices are in current United States dollars or predevaluation Canadian dollars. The Canadian dollar was devalued on September 19, 1949 from parity with the United States dollar to $.90 (U. S.).

[35] Reprinted from F. Golay 1950 p444

Appendix 2 – World and Exporter Stocks: 1960-2009[36]

	Exporter Stocks ('000 metric Tonnes)								Stocks to Use Ratios		
Year	Argentina	Australia	Canada	EU-15	EU-25	EU-27	United States	Total 5-Major	Exporter	USA	Global
1960/61	764	989	16556	9259	0	0	40878	68446	29.94%	17.88%	36.22%
1961/62	243	807	10643	8796	0	0	38673	59162	25.48%	16.66%	30.10%
1962/63	504	959	13261	11351	0	0	34564	60639	25.51%	14.54%	31.89%
1963/64	2213	880	12504	9139	0	0	27052	51788	22.10%	11.55%	30.00%
1964/65	3340	989	13962	9082	0	0	25066	52439	20.89%	9.99%	31.27%
1965/66	175	774	11434	11221	0	0	17962	41566	15.05%	6.51%	21.98%
1966/67	245	2516	15561	9450	0	0	13962	41734	15.29%	5.11%	32.09%
1967/68	1008	1737	18303	10364	0	0	17146	48558	17.31%	6.11%	34.82%
1968/69	850	7586	23183	11490	0	0	24603	67712	22.69%	8.24%	40.65%
1969/70	780	7545	27452	7477	0	0	26752	70006	22.06%	8.43%	32.61%
1970/71	675	3665	19980	7177	0	0	22398	53895	16.39%	6.81%	24.48%
1971/72	370	1584	15887	9483	0	0	26807	54131	16.12%	7.99%	26.57%
1972/73	269	565	9945	7976	0	0	16248	35003	9.93%	4.61%	21.24%
1973/74	1026	1982	10089	10190	0	0	9253	32540	9.25%	2.63%	23.52%
1974/75	714	1658	8038	12754	0	0	11839	35003	9.91%	3.35%	23.04%
1975/76	742	2665	8222	10679	0	0	18115	40423	11.66%	5.22%	25.00%
1976/77	1600	2137	13318	10986	0	0	30298	58339	15.79%	8.20%	34.48%
1977/78	1176	780	12115	8308	0	0	32055	54434	13.64%	8.03%	27.37%
1978/79	1103	4646	14909	12253	0	0	25150	58061	14.33%	6.21%	33.27%
1979/80	428	4268	10721	10611	0	0	24548	50576	11.80%	5.73%	28.11%
1980/81	413	2044	8510	12580	0	0	26919	50466	11.38%	6.07%	25.42%
1981/82	775	4776	9713	10794	0	0	31553	57611	13.04%	7.14%	25.46%
1982/83	1056	2285	9973	13309	0	0	41233	67856	15.15%	9.21%	29.00%
1983/84	1259	7518	9190	9832	0	0	38065	65864	14.16%	8.18%	31.26%
1984/85	451	8584	7598	17875	0	0	38789	73297	15.14%	8.01%	34.72%
1985/86	251	5865	8569	18051	0	0	51845	84581	17.53%	10.75%	36.99%
1986/87	220	3772	12731	18980	0	0	49557	85260	16.77%	9.75%	37.62%
1987/88	815	2750	7305	17451	0	0	34315	62636	11.80%	6.47%	29.98%
1988/89	481	2600	5032	13283	0	0	19095	40491	7.79%	3.68%	25.93%
1989/90	31	3035	6442	14106	0	0	14600	38214	7.19%	2.75%	25.71%
1990/91	822	2823	10285	17936	0	0	23627	55493	10.01%	4.26%	30.90%
1991/92	345	2870	10066	24035	0	0	12928	50244	9.11%	2.34%	29.53%
1992/93	45	5017	12193	22269	0	0	14442	53966	9.84%	2.63%	32.23%
1993/94	449	3710	11118	15540	0	0	15472	46289	8.38%	2.80%	32.97%
1994/95	150	2405	5680	11156	0	0	13787	33178	6.12%	2.54%	30.10%
1995/96	150	1975	6727	9379	0	0	10234	28465	5.23%	1.88%	28.57%
1996/97	1000	2395	9046	10753	0	0	12073	35267	6.15%	2.11%	28.51%
1997/98	820	2320	6009	11889	0	0	19663	40701	7.05%	3.41%	34.01%
1998/99	720	2838	7425	16011	0	0	25744	52738	9.11%	4.45%	35.91%
1999/00	615	4585	7299	0	0	16279	25848	54626	9.34%	4.42%	35.81%
2000/01	589	5507	9658	0	0	17483	23846	57083	9.76%	4.08%	35.43%
2001/02	1139	8042	6549	0	0	18349	21150	55229	9.41%	3.60%	34.60%
2002/03	1530	3185	5725	0	0	18491	13374	42305	7.00%	2.21%	27.56%
2003/04	1395	5411	5985	0	0	11514	14872	39177	6.65%	2.53%	22.42%
2004/05	739	6672	7922	0	0	27496	14699	57528	9.47%	2.42%	24.73%
2005/06	871	9365	9698	0	0	23384	15545	58863	9.45%	2.50%	23.69%
2006/07	1367	3953	6865	0	0	14075	12414	38674	6.28%	2.02%	20.73%
2007/08	3067	3651	4406	0	0	12343	8323	31790	5.15%	1.35%	19.63%
2008/09	426	3144	6556	0	0	18345	17867	46338	7.24%	2.79%	25.63%
2009/10	1051	3644	6856	0	0	16988	27234	55773	8.64%	4.22%	30.34%

[36] International Grains Council, World Wheat Statistics, selected years