Alarm bells over rising food prices are sounding once more. In the summer of 2010, drought and fires in Russia’s wheat growing regions, and subsequent announcements of a Russian export ban and quotas on exports from Ukraine, sent wheat prices gyrating again. In early October, a United States Department of Agriculture corn stocks report sent corn prices plunging one week, but a week later an unexpectedly low harvest report caused jumps in the prices of corn, wheat and soybeans. Despite one of the highest aggregate grain harvest achieved in 2010, carry-over stocks—especially of corn—for 2011 are at precariously low levels and there is no sign of decreasing demand on the horizon. The market expects sustained upward pressure on grain prices in the global marketplace, and the FAO’s price for a basket of different food commodities deflated by the United States consumer price index, by January 2011 had already approached the levels reached in the 2007/08 food crisis as demonstrated in Figure 1 (see Appendix A for figures). Most experts are betting on not only more volatile, but also higher, real grain prices for the next half-decade at least, reversing the downward trends established over most of the twentieth century. Biofuels production from agricultural feedstocks has certainly been a factor in keeping aggregate cereal stocks low despite the large world grain harvest, and in keeping the market unusually vulnerable to supply and demand shocks.

While the economic and environmental case for biofuels remains controversial, many countries continue to pursue ambitious biofuels mandates and subsidies, supported by import tariffs on cheaper supplies that would be available from overseas, whereas other countries contemplate similar policies. Biofuels production is significant in the U.S., the European Union, Brazil and Argentina and is spreading to other countries in Latin America, as well as to some sub-Saharan African countries. The prospects of oil prices above $100 a barrel mean that even in the absence of mandates and subsidies, biofuels production may increase. If the pressure of energy demands on food supplies continues to increase, there will be a serious threat to the food security of the world’s poor. We believe, therefore, that serious consideration needs to be given to the establishment of “safety valves”—measures that allow the diversion of agricultural feedstocks from biofuel production into the food chain in times of acute need.

**Safety Valves to Protect the Poor**

Such safety valves are of greatest importance in those countries pursuing or contemplating ambitious biofuels programs that have large populations vulnerable to food shortages. They may also be important for developing countries with export-oriented animal feeding industries to facilitate the diversion of animal feed supplies to food uses in emergencies. It should be possible, for example, to use contracts to ensure diversion of some feed grains and oilseeds from use as biofuel feedstocks to domestic use as food distributed to vulnerable consumers, without undue hardship to the generally more prosperous consumers of substantial quantities of energy or meat. This substitution might be direct, or indirect via substitution of biofuels feedstock for grains fed to animals, and diversion of that grain to human consumption.

Governments wishing to protect the food consumption of the most vulnerable could purchase call options on grain from biofuel producers, with appropriate performance guarantees. This could be done by a sealed-bid auction, for example. Diversion could be triggered by specified indicators of food shortages, and the biofuels supplier would commit to making a corresponding reduction in output (rather than substitute other food grain as feedstock). Delivery specifications could be designed to help ensure the grain will get to where it is expected to be needed in a market emergency.

Various combinations of contingent contracts could be used to achieve the same end. Since participation would be entirely voluntary, they are no threat to biofuel producers, who by revealed preference gain
when they participate. Such contracts offer the additional advantage that they reduce the hazard, often non-negligible, that biofuels producers could have their stocks confiscated by the government or by a mob in a food crisis, especially if government stability and public security are compromised. These arrangements, like domestic storage, facilitate fast response to domestic food emergencies, and offer freedom from uncertainty about foreign transport availability, timeliness or cost. Governments might well find them cheaper in the long run than storage of an equivalent amount of emergency supplies. If acute food supply emergencies are infrequent, the annual cost of the option should be low, relative to the expected cost, including interest on the capital invested in grain, of holding a given level of stocks off the market until the emergency occurs.

The idea that fixed supply commitments might be modified by options to withdraw supply in specific circumstances is by now familiar in interruptible electricity supply contracts, typically offered by an electric power distributor to industrial users, with a lower supply cost as the incentive. These are imperfect analogies to what is proposed here, because the interruptions are generally brief, minutes or hours, rather than months or years. However, other more similar options, to increase security of water flow to hydropower generators using interruptible irrigation contracts, were discussed decades ago by Hamilton Whittlesey and Halvorsen (1989) and McCarl and Parandvash (1988). Similar options, to secure security of urban water supplies, were evaluated by Michelson and Young (1993). Farmers or their water districts in effect agree to accept the possibility of interruption of irrigation water by diversion to urban use via “dry year options.” Such options have been implemented to protect hydro electricity supplies and urban water supplies in the face of the prospect of a water shortage. These options can work to protect consumers’ access to essential water supplies, protection of endangered species, and other urgent or legally mandated requirements.

The analogy to food security options to protect the essential food supplies of consumers is clear. As with dry-year water options, success will depend on careful attention to the details of contract design. In particular, the design of the exercise price or other trigger needs careful consideration, and plans to ensure that the food released goes to the most vulnerable, for example via “food for work” programs or programs, require careful ex ante investment of attention and funds. For a program to protect the poor, the grain diversion trigger could, in principle, be related to a measure of the needs of the target population or the declaration of a regional food disaster. If necessary to assure that program decisions are less subject to manipulation due to pressure from interested parties, the trigger could be the local grain price. However, the program is not designed to stabilize the price, but rather to assure the needs of the poor and vulnerable consumers.

It is interesting to note that should future research successes mean that production of biofuels becomes dominated by cellulosic feedstocks, such as miscanthus or switchgrass, this potential flexibility provided through options could be lost. These second generation feedstocks cannot be economically diverted to food or feed uses to mitigate acute shortages. Reallocation of acreage to produce more food or feed would take too long to be useful in an acute food shortage. In the case of miscanthus, for example, planting is expensive since it involves rhizomes, not seeds, and establishment takes years, so a switch to such perennials is a relatively inflexible commitment.

**Safety Valves in the U.S.?**

In developing economies, the objective of the program should be to protect the food supplies of the most vulnerable; effects on food prices would be a secondary consideration. The establishment of similar safety valve type measures might also be sensible in developed countries pursuing ambitious biofuels policies, in order to safeguard access to agricultural feedstocks for emergency food aid purposes. A larger program might also serve to lessen pressure on global prices in tight markets, in particular if the country in question is a significant producer and exporter of a particular commodity, as is the case for U.S. corn production: the U.S. is both the world’s largest producer and exporter of corn.\(^1\)

\(^1\) It is worth noting that U.S. corn exports, sizeable as they are, only account for ca.15% of total demand for U.S. corn. As pointed out by ERS (2009), “this means that prices are largely determined by supply and demand relationships in the market and the rest of the world must adjust to prevailing prices.”
In the U.S., ethanol blending was initially pursued as an alternative to the carcinogen MTBE as a pollution-mitigating fuel additive. The ambitious plan implemented in 2007 under the Bush Administration to double the annual corn-based ethanol-mandate from 7.5 to 15 billion gallons by 2015, combined with the slowness of cellulosic ethanol to emerge as a significant source of biofuels, set corn demand on a predictable, sharply upward trajectory over the following three years. The production of U.S. corn-based ethanol has had two distinguishable effects. The first is to raise the level of prices by sustained diversion of supplies from food and feed consumption. This happens directly via competition between food and feed users and biofuel users for the same grain, but also indirectly, via substitution of one grain, such as corn diverted to biofuel feedstock from use as food or feed rations, leading to substitution of a food grain, such as wheat, into animal feed. The second effect is to make market prices more volatile. In the short to medium run, this can happen due to changes in mandates or variable subsidies, or changes in trade interventions, that are incompletely anticipated, and render biofuels demands unresponsive to price signals. In the longer run, volatility will continue to reflect shifts and shocks in energy markets due to policy changes and other unexpected events, which have hitherto been transmitted via input costs.

The expansion of ethanol caused a squeeze on corn supplies available for feed and food (Figure 2). Substitution of wheat for corn in feed, and rice for corn and wheat as food, sent the globally available stocks of calories from the three major grains sharply down towards to minimal levels necessary for efficient supply chain operation (Figure 3). Without the cushion of discretionary stocks, the market for grain calories was especially vulnerable to what would otherwise have been modest global disturbances. In 2008, the unprecedented extension of an Australian drought, and other disturbances induced a spike in price of major grains, severely exacerbated by panic of importer and exporter governments intimidated by the outcries of their politically powerful urban consumers. Key exporters banned or taxed their exports, pressuring others to do likewise. Importers reduced tariffs, relaxed quotas on grain imports or increased subsidies, boosting demand and reinforcing international price jumps. In the international market for the major grains, there was a scramble by importers to move all the grain that they might need behind their own borders as quickly as possible. Their panic level rose as suppliers of grain available for import became increasingly scarce. Prices paid by poor countries for their imported grain supplies surged, playing havoc with budgets of nations committed to insulating their consumers from price variation, or directly reducing the welfare of consumers forced to pay more, or cut back on consumption.

Biofuels policy in the United States (as elsewhere) uses quantitative measures as major instruments. Quantitative mandates have the highly undesirable quality that they eliminate the key advantage of free markets, which is to allocate goods to their most valuable uses. Around one third of the domestic supply of U.S. maize is now used for biofuels and mandates ensure that this biofuels demand is downward inflexible, not responsive to price signals, and sustained form year to year. Even if food and feed prices soar, biofuels demands will continue to make undiminished demands on aggregate calories available for food and feed on the world market via substitution of land and water from wheat and rice into production of maize and oilseeds, as well as by diverting maize and oilseeds from food and feed uses into biofuels, and by diverting wheat from food to animal feed to substitute for maize and oilseeds.

To address this inflexibility caused by mandates, De Gorter and Just (2010), among others, have suggested that mandates be conditioned on prices of food, so that the mandates can be reduced or eliminated if food prices rise beyond some trigger point. This type of proposal would introduce some flexibility into a rather inflexible policy.

However, one must also be prepared to ensure diversion of feedstocks when petroleum prices support biofuels production in excess of mandated levels, since under such circumstances, the energy market enters into direct competition with the food market. An options approach for ensuring diversion of agricultural feedstocks away from energy towards food uses should also be explored in this regard. Unlike variable mandates, options contracts would protect consumers not only from shocks to food supplies or changes in biofuels
mandates or subsidies, but also from shocks that increase petroleum prices, which have been newly linked to food market demands via the advent of biofuels.

Certainly, these options are not a universal solution to the food security challenge and the exact nature of such contracts and their implementation would need to be tailored to the needs of specific markets. If designed carefully and implemented before a new, possibly much more serious, grain price spike occurs, such contracts could facilitate a diversion of commodities away from energy use to maintain the consumption of vulnerable populations during times of scarcity. They might also help to reduce pressure on global prices when undertaken by wealthier countries with significant food or feed-based biofuels industries and thus mitigate price hikes.

Although the exact impact is debated, experts agree that an ongoing rapid expansion of biofuels from food and feed crops will increase the average cost of food consumption on the global market. In today’s climate of high commodity prices, we must bear in mind that the most desperately poor are not the commercial farmers, who might indeed benefit from the effect of biofuels on the prices of what they produce. Those with most to lose are typically landless, and higher food prices have the greatest proportional negative effect on them, because they spend the highest share of income on food. Expansion of biofuels that is unpredicted, or so rapid that it outpaces the ability of the economy to accommodate it, reduces carryover stocks of grains and oilseeds, raises food price levels, and increases the threat of further price spikes in response to any unforeseen short-run disturbance. Prudent humanitarian food policy would seek to mitigate the effects of such spikes to the well-being of poor grain consumers in affected developing countries, whether exporters or importers. Diversion option contracts for grains used as biofuels feedstocks could be part of such a policy.

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**Appendix A: Figures**

**Figure 1: Deflated Monthly Food Price Index**

*Note: The deflated food price index is calculated by deflating the FAO monthly food price index using the monthly US CPI, and then normalized such that 2002-2004=100.*
Figure 2: US Corn Total Supply Gross and Net of Fuel Use
Source: USDA, Feed Grain Database, accessed on October 10, 2010.
Note: total supply = beginning stocks + production; total supply net fuel use = total supply – fuel use.

US corn total supply gross and net of fuel use

Figure 3: World Stocks-to-Use Ratio

World stocks-to-use ratio (corn + wheat + rice) including China

World stocks-to-use ratio (corn + wheat + rice) excluding China
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Works Cited


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