A Review Of Perspectives And Policies On Food Security

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A Review Of Perspectives And Policies On Food Security

Abstract
There are only two parts of the developing world where a massive problem of food insecurity exists, namely South Asia and Subsaharan Africa. This is where a major portion of the poor in the world reside. Increased attention to the developments in Eastern Europe and the Soviet Union have however diverted attention from the problems of this poor humanity. The likely short term adverse effects of the proposed reduction in protection of the US and the EEC agriculture on the food importing developing countries through the increased cost of food imports has also not received the attention that it deserves. These adverse effects should not be interpreted to mean that reforms in the agricultural policies of OECD countries are not needed, but rather that they may call for special ameliorative actions in the short and medium run, especially in terms of assistance to Africa. My comments below explore these relationships.

Disciplines
Agribusiness | Agricultural Economics | Food Security | Health Economics
A REVIEW OF PERSPECTIVES AND POLICIES
ON FOOD SECURITY

Compiled by
Paul Gallagher

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Introduction

Perspectives on food security problems and policies seem to depend on a country's position in the agricultural trading system (importer/exporter) and their wealth. The following reports were presented in a Discussion Group on Food Security which met at the International Conference of Agricultural Economists in Tokyo, Japan during August 1991. Each presenter identifies a unique food security perspective for developing countries, developed importing countries or developed exporting countries.

The participants in this discussion are grateful for the contributions of the following people:

Uma Lele (University of Florida, U.S.A.)
Shoichi Ito (Tottori University, Japan)
Ryohei Kada (Kyoto University, Japan)
P. Michael Schmitz (University of Frankfort, Germany)
Harald Von Witzke (University of Minnesota, U.S.A.)
O.L.E. Mbatia (University of Nairobi, Kenya)

These discussions were organized under the auspices of NCR-151, a group of economists interested in dialogue on food and agricultural policy. The helpful comments of members, especially Carl Zulauf and Milt Hallberg, are appreciated.
Session 1: Food security issues in developing countries

Presenter: Uma Lele, University of Florida, U.S.A.
Food Security: A developing Country Perspective

Uma Lele.

A presentation made at the Food Security Group

There are only two parts of the developing world where a massive problem of food insecurity exists, namely South Asia and Subsaharan Africa. This is where a major portion of the poor in the world reside. Increased attention to the developments in Eastern Europe and the Soviet Union have however diverted attention from the problems of this poor humanity. The likely short term adverse effects of the proposed reduction in protection of the US and the EEC agriculture on the food importing developing countries through the increased cost of food imports has also not received the attention that it deserves. These adverse effects should not be interpreted to mean that reforms in the agricultural policies of OECD countries are not needed, but rather that they may call for special ameliorative actions in the short and medium run, especially in terms of assistance to Africa. My comments below explore these relationships.

Whereas the number of the poor in South Asia is estimated to be nearly 300 million according to the World Bank's 1990 World Development Report due to overall economic growth it is estimated to decline by year 2000. The number of poor in Sub-Saharan Africa is by contrast estimated to be around 165 million by the same WDR, but if the past economic growth trends continue that number is expected to increase by year 2000 to nearly 200 million. To the extent that the problem of food insecurity is closely related to the problem of poverty—a point now generally acknowledged—the incidence of food security is thus the greatest in these two continents of the world. India which constitutes a major element of the picture in South Asia is marginally surplus in food production. Notwithstanding the fact that much of the growth in food production in India has come from considerable amount of subsidization of fertilisers, irrigation water and support for output prices, even after withdrawal of subsidies proposed as part of the reform program, India is expected to continue to be marginally surplus in food production. The problem of food insecurity in India is largely a problem of inadequate demand resulting from a skewed income distribution and inadequate growth of employment. India and South Asia have the necessary human and institutional capital and the knowhow to pursue employment oriented policies. The problem in India and South Asia is largely one of inadequate political will and increased political instability that has diverted attention from the pursuit of growth oriented economic policies that will also increase incomes and employment of the poor.

The problem of food insecurity in subsaharan Africa is more complex. It could be characterised as a classic problem of inadequate supply as income and employment in most African countries including in the nonfarm sector is still largely determined by the development of agriculture. Furthermore the food
sector constitutes a large portion of the agricultural sector in Africa in terms of value added, employment, income etc.

Rapid urbanization and changing consumption patterns in Africa have resulted in the substitution of rice and wheat in place of the traditional food crops. Policies of import substitution including in the agricultural sector until about 1985 resulted in a decline in the volume of exports and a shift in emphasis in food production from traditional crops to rice, wheat and sugar. Since international food prices declined more rapidly than international prices of many of the crops Africa exports, Africa would have clearly been better off promoting the production of export crops and meeting the growing demand for rice and wheat in which it does not have a strong comparative advantage through imports while encouraging the production of traditional food crops. The policies pursued on the other hand increased demand while reducing import capacity.

The developments in the international market including in particular the proposed reforms of agriculture in OECD countries on the other hand are expected to increase international prices of cereals which Africa imports. This should increase the cost of food imports. This should not pose a serious problem provided the structural adjustment efforts which have been aimed to shift price incentives from nontraded to traded goods sector result in a strong supply response, increase agricultural exports and import capacity while expanding domestic income and employment. However the evidence to date indicates that essential as structural adjustment measures are they are not sufficient to achieve a rapid supply response. There is a tremendous deterioration of agricultural research, extension, infrastructure, credit and input supply facilities that is limiting the supply response that price reforms should prompt. Indeed if there is a major drought, food exports to Eastern Europe and the Soviet Union continue together with reform of the policies in OECD countries a situation similar to that in 1974 could well repeat itself for Africa with high World Food prices, shortage of stocks and low import capacity to command them.

A review of the World Bank's various food security reviews carried out in many African countries also suggest that with the exception of Zimbabwe, Madagascar and Burkina Fasso food crop production performance according to the World Bank's assessment has not been rapid enough to compensate for the rapid growth in population and the consequent movement to marginal lands associated with a decline in food productivity.

There is no question that apart from an emphasis on increasing export crop production Africa needs to give urgent attention to increasing food crop production. The past experience suggests that these food crop policies should focus on Africa's traditional food crops, i.e. Sorghum, millets, cassava, yams and maize rather than rice and wheat--although real depreciation of currencies could result in increased comparative advantage in these crops. Policies
for food crop production also need to emphasize production in the areas of greatest physical potential, emphasis on research, extension, input supply and a price policy.

finally the growing numbers of the poor dependent on the market call for targeted food subsidies to alleviate their food insecurity and real income.
Session 2: The perspective of a developed importing country

Presenters: a. Shōichi Ito, Tottori University, Japan

b. Ryohei Kada, Kyoto University, Japan
HOW CAN JAPAN SECURE FOOD?

Shoichi Ito*
(August 19, 1991)

Discussion Group D-1
The 21st International Conference of Agricultural Economists
Tokyo, Japan
August 22-29, 1991

*Shoichi Ito is an associate professor in the Department of Information Science, Faculty of Agriculture, Tottori University in Tottori, Japan.
Introduction

The food security issue has been a long time major concern for the Japanese. Recently, whether Japan should open the closed rice market is under serious debate outside and inside the country. In the current Uruguay Round of GATT negotiation, Japan has been pushed in the corner to open it, although there are unprecedented movements from both producer and consumer organizations against opening the market (Yamaji and Ito, 1991).

Japan, which is one of the most economically advanced nations in the world, has the lowest self-sufficiency rate at 48% among the G7 nations. How can a developed country such as Japan secure food? In this paper, some future perspectives for an economically developed country to secure food supplies are suggested using rice in Japan as an example.

Real Rice Prices of Japan and the World

Japan has achieved dramatic economic advancement since World War II. The economic development of a country account for differences in domestic prices relative to world prices over time. First, changes in exchange rates, in particular, usually create advantages for the economically advanced countries in purchasing foreign products. Second, inflation rates are generally under control in developed countries more so than underdeveloped countries. World rice prices fluctuate much more widely than wheat or corn (Ito, 1990). However,
it is important to investigate the real rice prices of domestic and world markets taking domestic inflation rates and exchange rates into consideration.

Table 1 shows inflation rates of the U.S. and Japan, exchange rates of the U.S. dollar to the Japanese yen, and nominal Japanese government rice purchasing prices and U.S. medium rice export prices. Also showed in Table 1 are the real rice prices in terms of 1990 U.S. dollar and Japanese yen values. Regarding real rice prices, Japanese government rice purchasing prices declined over time, from 398,000 yen per ton (brown rice) to 306,000 yen per ton between 1960 and 1990, in terms of 1990 yen value. However, world prices, such as U.S. medium rice prices (FOB, New Orleans), declined more sharply from 330,000 yen per ton to 48,000 yen during the same period. While there was not much difference in the real prices between the two nations in 1960, Japanese rice became six times as expensive as U.S. rice in 30 years. In other words, U.S. rice became relatively cheaper over time.

Production Instability

Agricultural production often fluctuates due to weather and/or government policies. Yields are affected by adverse weather, while yields generally increase due to technological advancement over time. On the other hand, production can be controlled by the government; typically, acreage reduction programs implemented during years of low market prices and excessive stock. Acreage reduction is manipulated by the government, but the weather is beyond human control. Weather may be the largest factor for crop failure. Unexpected continuous poor crops due to bad weather eventually forced Japan to import rice
from S. Korea in 1984. Accordingly, there is a fear of food insecurity due to low yields resulting from bad weather.

If yields in the world fluctuate more than Japan, Japan may increase the level of insecurity by depending upon foreign products. If, however, yields in exporting countries are no less stable than Japanese yields, Japan may be able to increase the level of food security by opening the closed market. While Fig.1 shows rice yields and trends for Japan and the U.S., Table 2 shows some results of statistical analyses on the yields during 1964 and 1987. The results indicate that situations between Japan and the U.S. are quite similar to each other. Average yields are 5.6 tons and 5.2 tons of roughrice per hectare (ha) for Japan and the U.S., respectively. Standard deviations of the yields are 0.469 and 0.445 for Japan and the U.S., respectively, both of which appear to be statistically indifferent from one another. Further, correlation coefficient between residuals of trend lines were not significant, indicating no bad/good weather happening during the same year in the different regions. The results suggest that opening the rice market may bring more stability in food supply as long as the weather factor is concerned.

Are Rice Exporters Oligopolistic?

It is of interest to compare the concentration ratio of rice exports relative to other grains such as wheat and coarse grains. Concentration of exporters can be expressed as the ratio of the suppliers of the largest four suppliers relative to total supply in the market (CR4) such as Marion (1986) and Scherer (1980) for domestic industry studies. In this research, one and two country concentration ratios (CR1 and CR2) are reported as well. According
to the results for 1987 and 1990, CR1 for rice and wheat are quite similar, while CR1 for coarse grains is much greater. Regarding CR4, however, wheat is nearly 90% while rice and coarse grains are at around the 70% level. Oligopolistic power of large exporters in rice should be much weaker than that of wheat, if any. Recalling that even wheat exporters have failed to organize an export cartel despite such a high concentration ratio, it would be unrealistic to expect rice exporters to exercise oligopolistic power.

Fear from Distrust

Some major concerns of the Japanese regarding opening the rice market have been incurred from suspicion of the exporting countries. One is food safety related to chemical application on the food during production and after harvest. There are abundant reports on the danger of the residues of chemicals for human beings. Another is whether exporting countries will actually export food during a food-shortage period and whether they will use food as a weapon. A food embargo strategy is still one of the strongest choices of measures used by the U.S. and other nations during the recent era.

While these concerns become larger as a dependency on imported food increases, concerns are also augmented by an increase in distrust between exporting and importing countries. The magnitude of such concerns may be perceived by an importing country as shown in Fig. 2. The curve may be called the "food-import-insecurity curve." At 0 on the horizontal axis, there is no imports, and all food consumed is imported at Qf. The level of food insecurity increases as food imports increase. In this figure, it is assumed that the level of the insecurity concern is measurable in terms of monetary
value. There may be curves with different slopes and shapes such as (a) and (b) in Fig.2. The curve (b) indicates that food insecurity increases sharply at a small amount of imports.

On the other hand, the domestic supply cost curve in the importing country is drawn as shown in Fig.3. As domestic production increases, total production costs increase at an increasing rate due to less productive land brought into production. Imagine that cost per unit at a level being completely self-sufficient, Qf, is much higher than world prices.

Now, put the two figures together and draw the total cost curve, which is a vertical addition of the production cost curve and the food-import-insecurity curve. This method was once designed for a pollution control model by Freeman et al. (1973). The model in Fig.4 describes the current situation of the Japanese rice market. The total cost is the lowest at Qt, where there are not imports but exports as much as Qt - Qf. Namely, Ct, the lowest total cost, is achieved when the country is not only completely self-sufficient but exporting some extra amount. The food-import-insecurity curve has to be shifted downward and be more L-shaped, before Japan can open the market and eventually increase imports. Given that the insecurity curve shifted downward and L-shaped as shown in Fig.5, the total cost curve declined reaching the lowest point at Qt as imports increased. And the total cost Ct at Qt was even smaller than Cp indicating that some imports would cost Japan less in production per se than being completely self-sufficient. In this situation, Japan would be willing to import as much as Qf - Qt of food.

Implications for the Future Directions
The food-import-insecurity curve in Japan appears to be shaped with a steep slope like curve (b) in Fig. 2 indicating no imports acceptable despite the high domestic production costs. Now, the question is how to shift the insecurity curve downward and make more L-shaped. There may be several ways to realize it, such as development of new technology which would not require chemical application in exporting countries, and improvement of mutual understanding and enhancement of economic ties between exporting and importing nations. One future direction to take might be agricultural cooperation between producers from exporting and importing nations. Consumers tend to trust producers in their own country. Taking this into consideration, the Japanese producers should be encouraged to open up farms in an exporting country jointly with producers in the exporting country. This would allow for a transfer of agricultural technology that the producers in importing country are using. If food is produced by cooperative efforts in the exporting country, people in the importing country would have more trust in the imported foods. Further, a closed market is a type of producer behavior protecting one's benefits established in the past. If Japanese producers expand domestic business to overseas, the closed market system would turn out to be a barrier against themselves.

In the U.S., agricultural operation is becoming more international. U.S. agricultural land owned by foreign people are shown in Table 3. While Canada, Germany, the Netherlands, and Great Britain account for large shares, Japan holds only a few percents of the total despite increases during recent years (USDA, November 1990). In addition, these Japanese ownership is mostly engaged with
business investors and food processing companies from Japan. The point is that Japanese agricultural producers should be encouraged to become actively involved with the development of new agricultural production in exporting countries so that they would take the initiatives to smooth international agricultural trade.

References


International Monetary Fund: International Financial Statistics.


Ministry of Agriculture, Forestry and Fisheries (MAFF), Food Agency: Data Related to Rice Prices, several issues.


Table 1. Real rice prices of Japan and world, 1960 - 1990.

(A) World prices (U.S. dollars/ton, milled)

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<tbody>
<tr>
<td>World rice prices¹</td>
<td>179</td>
<td>183</td>
<td>190</td>
<td>419</td>
<td>496</td>
<td>383</td>
<td>344</td>
</tr>
<tr>
<td>CPI in the U.S.</td>
<td>36</td>
<td>38</td>
<td>47</td>
<td>65</td>
<td>100</td>
<td>131</td>
<td>160</td>
</tr>
<tr>
<td>Real world rice prices (in 1990 dollar)</td>
<td>796</td>
<td>771</td>
<td>647</td>
<td>1,031</td>
<td>794</td>
<td>468</td>
<td>344</td>
</tr>
</tbody>
</table>

¹FOB prices at New Orleans.

(B) Japanese prices (yen/ton, milled basis)

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</thead>
<tbody>
<tr>
<td>Gov't. procurement prices, 1000 yen</td>
<td>77</td>
<td>84</td>
<td>153</td>
<td>288</td>
<td>327</td>
<td>346</td>
<td>306</td>
</tr>
<tr>
<td>CPI in Japan</td>
<td>24</td>
<td>32</td>
<td>42</td>
<td>73</td>
<td>100</td>
<td>115</td>
<td>124</td>
</tr>
<tr>
<td>Real Japanese prices (in 1990 yen, 1000 yen)</td>
<td>398</td>
<td>326</td>
<td>452</td>
<td>489</td>
<td>405</td>
<td>373</td>
<td>306</td>
</tr>
<tr>
<td>Exchange rates (Yen/dollar)</td>
<td>360</td>
<td>360</td>
<td>360</td>
<td>297</td>
<td>227</td>
<td>239</td>
<td>140</td>
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<tr>
<td>World prices in yen (1,000 yen)</td>
<td>64</td>
<td>66</td>
<td>68</td>
<td>124</td>
<td>113</td>
<td>92</td>
<td>48</td>
</tr>
<tr>
<td>Real world prices in 1990 yen (1,000 yen)</td>
<td>330</td>
<td>255</td>
<td>200</td>
<td>210</td>
<td>140</td>
<td>99</td>
<td>48</td>
</tr>
</tbody>
</table>

Ministry of Agriculture, Forestry and Fisheries (MAFF), Food Agency: Data Related to Rice Prices, several issues.

(Metric tons per ha, roughrice)

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. dev.</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>5.63</td>
<td>0.469</td>
<td>4.77</td>
<td>6.41</td>
</tr>
<tr>
<td>U.S.</td>
<td>5.21</td>
<td>0.445</td>
<td>4.59</td>
<td>6.33</td>
</tr>
</tbody>
</table>

Correlation coefficient: 0.191

\(^1\)This coefficient was estimated based on residuals of yield trends in the two countries.
Table 3. Concentration ratio of exporters for rice, wheat, and coarse grains in 1987 and 1990.

<table>
<thead>
<tr>
<th></th>
<th>1987 (%)</th>
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<th></th>
<th>1990 (%)</th>
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<tbody>
<tr>
<td></td>
<td>Rice</td>
<td>Wheat</td>
<td>Coarse grains</td>
<td>Rice</td>
</tr>
<tr>
<td>CR1</td>
<td>34</td>
<td>31</td>
<td>57</td>
<td>CR1</td>
</tr>
<tr>
<td>CR2</td>
<td>53</td>
<td>54</td>
<td>65</td>
<td>CR2</td>
</tr>
<tr>
<td>CR4</td>
<td>71</td>
<td>89</td>
<td>78</td>
<td>CR4</td>
</tr>
</tbody>
</table>

1: Countries in CR1 include Thailand for rice and the U.S. for wheat and coarse grains. Countries in CR2 add to those in CR1 the U.S. for rice and Canada for wheat and coarse grains. Countries in CR4 add to those in CR2 Pakistan and China for rice, EC-12 and Australia for wheat, and EC-12 and Argentina for coarse grains.

2: Calendar year 1987 for rice and crop year 1986/87 for wheat and coarse grains.


(1,000 ha)

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<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Canada</td>
<td>628</td>
<td>296</td>
<td>801</td>
<td>781</td>
</tr>
<tr>
<td>Germany</td>
<td>301</td>
<td>192</td>
<td>295</td>
<td>173</td>
</tr>
<tr>
<td>Netherlands</td>
<td>269</td>
<td>229</td>
<td>198</td>
<td>224</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>154</td>
<td>1,429</td>
<td>126</td>
<td>999</td>
</tr>
<tr>
<td>Switzerland</td>
<td>96</td>
<td>112</td>
<td>120</td>
<td>117</td>
</tr>
<tr>
<td>Panama</td>
<td>76</td>
<td>23</td>
<td>78</td>
<td>51</td>
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<tr>
<td>Liechtenstein</td>
<td>73</td>
<td>27</td>
<td>59</td>
<td>94</td>
</tr>
<tr>
<td>Japan</td>
<td>46</td>
<td>12</td>
<td>71</td>
<td>147</td>
</tr>
<tr>
<td>France</td>
<td>30</td>
<td>122</td>
<td>36</td>
<td>421</td>
</tr>
<tr>
<td>Others</td>
<td>479</td>
<td>431</td>
<td>428</td>
<td>626</td>
</tr>
<tr>
<td>Total</td>
<td>2,152</td>
<td>2,874</td>
<td>2,212</td>
<td>3,634</td>
</tr>
<tr>
<td>Japanese share</td>
<td>2.1%</td>
<td>0.4%</td>
<td>3.2%</td>
<td>4.0%</td>
</tr>
</tbody>
</table>

Source: DeBraal (1987 and 1990)
Figure 1. Rice yields in Japan and the U.S. from 1964 through 1987.
Fig. 2. Food insecurity curve in Japan.

Fig. 3. Production cost curve in Japan.
Fig. 4. Current situation in Japan.
Costs ($) \[ Ct < Cp \]

Total cost curve

Food-import-insecurity curve

Production cost curve

Food insecurity ($)

0 \( Qt \) \( Qf \)

Production/imports

Fig. 5. Situation for opening rice market
Introduction

Trade policy is not made in the ivory towers of academia, nor do arguments grounded in economic logic always hold sway in trade negotiations. Political, cultural, sociological and other considerations may be very often of equal or greater importance.

In recent years, Japanese agricultural policy has come under increasing criticism from both external and internal sources. In September 1986 and November 1988, actions were brought by the U.S. rice millers to open Japanese rice markets. This occurred after general public opinion in Japan had turned against Japanese agricultural policy because of the continuation of unreasonably high price supports for rice in 1986.

Since 1986, major Japanese consumer groups have focused attention on broader trade-related problems and solutions for Japanese agriculture. Producer and consumer differences have narrowed. Producers have begun to consider the real needs of consumers to gain a better understanding of what kinds of products are desired and in what ways, they should produce and market them. Consumer groups have come to question their earlier notion that rice trade should automatically be liberalized if rice imports are much cheaper than Japanese production.

In the current Uruguay Round of the GATT negotiations, the Japanese proposal stresses the significance of "food security," based on the idea that at least "basic foodstuffs" should be domestically produced. Some countries basically agree with the Japanese proposal, accepting the idea of food security. But many others, particularly the United States and the Cairns Group countries, are strongly against it.

Focusing on the food security issues, this paper addresses the question of why Japan insists on food security, and why farmer and consumer groups have reconciled their positions. Using rice as an example, the influence of non-economic factors on trade policy is evaluated. The intent is to demonstrate that agricultural trade liberalization, particularly of rice, will be difficult because of widely-held and deep-seated cultural, social and environmental values in Japan, while the benefits to the economy of exporting countries are rather limited.
import prices are cheaper than those in Japan” (See Figs. 3 & 4).

The same public opinion poll indicated that about two-thirds of the Japanese people feel “insecure” about the future Japanese food situation. These results suggest that a country which is heavily dependent upon food imports tend to be concerned about food security.

I would like to stress, therefore, that the rationale for protecting domestic agriculture in food importing countries might be quite different from that in food exporting countries. In the former case, the supporting of domestic agriculture would not directly distort the already existing international trade market. Exporting countries, on the other hand, have recently faced a shrinking international agricultural market due mainly to increased food production among developing and planned-economy nations.

It is true the level of price support in Japan is much higher that many other OECD countries, as measured by the OECD's PSE (producer subsidy equivalent) and CSE (consumer subsidy equivalent) estimates. But when other aspects of agricultural support by individual countries are compared, a different picture may emerge. The current agricultural trade “war” is largely a fight over keeping market shares, with combatants using direct and indirect export subsidies. One could argue that export subsidies for the purpose of export expansion should be as strongly criticized as protectionism in food importing countries.

Rice in Japan: A Multiple-Function Commodity

Major arguments have recently been raised in Japan for and against rice trade liberalization. Some have strongly argued that Japan should open the rice market to imports, at least for processing and industrial uses. Many others, including agricultural cooperatives (producers) and consumer groups, positioned strongly against market opening. The following are the most important points...
Fig. 3. Opinion about Desirable Food Supply Sources for Japan

Source: Prime Minister's Office: Public Opinion Poll on Food, Agriculture and Rural Societies (Surveyed in September, 1984)

Fig. 4. Opinion about Japan's Food Situations in the Future

Source: Prime Minister's Office: Public Opinion Poll on Food, Agriculture and Rural Societies (Surveyed in September, 1984)
offered in this debate:

(1) Price and Quality of Rice

A major argument of those who favor rice trade liberalization is based on the economic theory of comparative advantage, which posits that cheaper rice is beneficial to Japanese consumers and that free trade yields better resource allocation for the country as a whole. Those who oppose rice trade liberalization have emphasized that imported rice is not necessarily much cheaper when eating quality of rice is taken into account. Opponents also suggest that international rice markets might not be able to guarantee an adequate and stable supply of quality rice which Japanese people prefer, since the international rice market is very “thin”. Specifically, the amount of tradable world rice is very small compared to total world production.

(2) Safety of Imported Agricultural Products

A question raised by many consumer groups in Japan is whether or not imported foods are truly safe; how could safeguards against chemical components that might be hazardous to human beings be maintained for imported agricultural products? These questions are raised by consumer groups that are very sensitive to the safety and quality of food. It should be noted, however, that they have also criticized domestic products which might also be contaminated by residual chemicals.

(3) Trade Friction Problems

The huge annual trade deficit of the United States to Japan, which has amounted to over 50 billion dollars in recent years, is a major reason for the increased U.S. pressure for greater liberalization of trade. But as I have argued earlier, even if Japan would open the market of all import-
restricted farm commodities; the problem of a huge trade deficit would not disappear. Consequently, I very much doubt that trade frictions between the United States and Japan would be eliminated by Japan allowing unrestricted imports of U.S. agricultural products.

(4) Impacts upon Rice-based Agriculture in Japan

Naturally, Japanese farmers opposed the idea of trade liberalization for rice from the beginning. They know that Japan cannot compete with the United States or any other exporting countries in terms of efficiency and cost of rice production, due to its disadvantageous farmland conditions and high input costs. They believe that if rice trade were totally liberalized, significant portions of paddy fields in Japan would be idled. This would most seriously affect medium and larger rice farmers, the most important policy target group in Japan. Those who would survive in this competition, would likely be the so-called hobby farmers and/or part-time rice farmers who obtain stable off-farm incomes.

(5) Impacts on Regional Economies

Agriculture and its related infrastructure play an important role in regional economies. In relatively remote rural areas such as those in Hokkaido and Kyushu, where nonfarm employment opportunities are relatively limited, the role of agriculture in overall economic activity is very significant. Since most every region of Japan includes rice farming, the impact of rice trade liberalization would be widespread. At the international price level of rice, even if rice quality is taken into account, very few Japanese rice farmers would be willing to continue rice production on a commercial basis. Furthermore, the impact of the expected rice price reduction would have serious implications not only for agriculture per se, but also for the agriculture-related service industries. Given the increasing unemployment rate in the industrial and service sectors, the Japanese economy seems to have limited capacity to absorb those persons from the farm labor force, mostly elderly and female, who might be squeezed out from the
agricultural sector. Probably for this reason, business and industry interests in rural regions of Japan tend to oppose rice import liberalization. (See Fig. 6)

(6) External Functions of Paddy and Rice Cultivation

Paddy fields under the monsoon climate in Japan play a significant role in protection from floods and the conservation of soils by holding water. Such conservation of natural resources has economic value beyond the monetary gains from production. If most of the paddy fields were to be abandoned due to a sharp decline of rice prices, the environmental cost would be enormous.

(7) Food Security Aspects

The self-sufficiency ratio of grains in Japan is only 30 percent, the lowest level among major developed countries. Most Japanese believe in self-sufficiency for rice, especially under the present situation where most other grains and pulses are imported.

Some argue, however, that it is nonsense to speak of self-sufficiency of rice production because the petroleum supply in Japan is totally from overseas. But my opinion is that rice (as a staple food) and petroleum are fundamentally different items even if the present agricultural production system in Japan is heavily dependent on petroleum. Paddy fields in Japan, which have been utilized for thousands of years, possess essential values to society as one of the most precious natural resources in Japan.

(8) Aspects of Rice Culture and Traditions in Japan

Though obscure, a very strong uneasiness about rice market opening is related to the deeply-rooted rice-based culture and traditions in Japan. Most of the thanksgiving festivals all over Japan and other cultural activities are even now connected with the people’s desire for a good harvest of rice. The value of cultural heritage, based on rice, paddy field and rural communities, is still alive and vital to contemporary Japan, in spite of visible modernization.

In summary, a discussion over the issue of rice import liberalization reveals the following points: those who oppose rice import liberalization emphasize the significant values played, directly and indirectly, by rice and paddy fields, such as the importance to the regional economy, external benefits, food security, and other environmental and cultural reasons. Those who favor opening the rice market tend to emphasize narrowly defined economic benefits, for reasons of solving trade friction problems and increasing consumer benefits. As time has passed, more and more people have been inclined to support the former position. Today, the discussion appears to relate more to socioeconomic and political elements than narrowly defined economic benefits.

The Size of the Japanese Agricultural Market

One of the more debatable issues in agricultural trade dispute is how much U.S. or Australian agricultural sales to Japan would increase if Japan opened its markets. This question becomes even more important in light of the new trade agreement signed in Tokyo on June 20, 1988, by the United States and Japan. In the agreement, Japan consented to end all quotas on imports of beef and fresh oranges in three years, and on fresh orange juice in four years.

The real impact of the agreement is questionable. A careful examination of both short-run and long-run export prospects, taking into account Japanese food habits and likely U.S. shares of the Japanese imported food marketplace, indicates that U.S. sales revenues may increase about $1 billion. While this would expand U.S. farm imports to Japan by almost 20 percent, it would do little to balance the overall Japanese trade surplus with the United States, which ran at $52 billion in 1987.

Consequently, the Japanese position is that further trade liberalization has more of a symbolic than a substantive meaning. While this does not deny the need for the Japanese government to make further efforts toward the reduction of import barriers, the potential benefits to the United States must be placed in the proper perspective.

U.S.-Japan agricultural trade has been and will continue to be very sizable, stable and complementary. Japan is the largest customer for U.S. agricultural exports. During Fiscal Years 1985-87, U.S. farm exports to Japan averaged nearly $5.5 billion annually, 19 percent of total agricultural exports.
Presently, Japan draws about one-third to one-half of its total domestic use of grains and pulses from the United States. The Japanese people sometimes overlook this fact. On the other hand, it seems that U.S. people often presume that, due to exceptionally high protection of Japanese agriculture, only very small amounts of agricultural products are exported to Japan. Effects to minimize the perception gap between the two countries appear to be essential to improve trade relationships.

The new U.S.-Japan trade agreement does not affect Japanese restrictions on rice imports. Gains to the United States from liberalized Japanese rice trade are potentially greater than from expanded beef and citrus trade. But potential gains are often overstated.

Professor C. Pearson estimated the expected impacts of U.S. rice exports to Japan under an assumption that the Japanese eliminated rice trade restrictions (i.e., complete liberalization of the Japanese rice market). His estimates show that (1) U.S. rice exports would increase by 2.45 million tons, and the export value would increase by $655 million. (2) Japanese rice production would fall by 3.87 million tons and imports from the United States would rise to 4.60 million tons. These estimates have been subjected to considerable criticism because the price elasticity values used in the model are questionable.

There is little reason to expect that the United States would capture most of the Japanese rice market with trade liberalization. The United States is a relatively high cost producer of rice compared to Thailand, China, and other potential rice exporters in Asia. In recent years, the U.S. government has guaranteed its rice producers a support price that is two to three times the world market price. This means that, without large amounts of government support, the United States could not win the game of international rice market competition.

The U.S. position is stronger in the case of beef. This is partly because Japanese beef demand is expected to increase more than the demand for other meats. It is also because the United States can supply relatively "high quality" beef to Japan.

Oranges could be even more easily liberalized than beef. This is because the Japanese tangerine (Mikan) is considered a differentiated product from U.S. Naval and Valencia oranges, and the present level of imports is believed to be close to what would be expected under free trade.

The United States is pushing hard for the complete, immediate liberalization of 22 items currently subject to residual import quotas in Japan. However, compared with beef and oranges, most of these are relatively minor items (except for starch and dairy products) in terms of their relationship to food security. Therefore, if liberalization could be adopted simultaneously with domestic farm policy reform, the elimination of current trade restrictions for these commodities would not be strongly resisted.

Seeking Global Solutions

The history of agricultural production in the last several decades seems to be characterized by overreaction, over-production and over-expectations. National domestic agricultural policies, on the other hand, have usually attempted to avoid adjustments to changing world market conditions. They are still geared to encouraging output expansion, even though additional output is not needed. As world trade growth has slowed, over-capacity has erupted into trade disputes as each country has attempted to avoid adjusting its own agricultural system to meet the changing international market situation.

Hence, in order to tackle current world-wide overproduction and financial problems in agriculture, solutions must focus on how to reduce the structural imbalance of supply and demand existing in the world market. A reduction of the disequilibrium and instability prevailing on the current world agricultural market is imperative.

Concerted and harmonious joint efforts are needed among both exporting and importing countries. Efforts must be made to decrease the current stocks of major agricultural commodities in the short run, and then to prevent the resurgence of these imbalances in the long run.

To this end, new international trade rules must include: (a) a better system to prevent overproduction; (b) a change in income support measures (for disadvantaged areas and/or countries); and (c) improved domestic production systems, more
sensitive to world market forces.

In particular, the following three general principles should provide a basis of achieving such viable new trade regulations: First, the new rules should not attempt to impose a uniform agricultural system, since many countries will insist on individual systems for legitimate reasons. Secondly, farm output should not be further increased in response to artificially supported prices, particularly those elevated by export subsidy programs. And thirdly, programs which seriously distort domestic consumption and production patterns should be altered.

Since current overproduction and world disequilibria are mainly caused by high subsidies in exporting countries, the coming GATT negotiation should discuss means of reducing export subsidies. First of all, member countries should have an agreement on the freezing of subsidies at current levels. The next step should be the gradual reduction of remaining subsidies, say in five to ten years. Multilateral action on production quotas may be necessary to achieve a healthy world grain market.

As for Japan in particular, there are many things to be done as well. In addition to the existing policy reforms of 1986 to revitalize and restructure Japanese agriculture, Japan should also bear part of the cost to reduce huge surpluses and to construct international food security system. One means of accomplishing this would be a temporary measure under which Japan purchases some amount of surplus grains to use either as food aid to needy LDCs or to augment government reserves of grains (which could eventually be used as feed grains). In any event, Japan cannot assume a position of “this is none of my business.”
Session 3: Viewpoints of developed exporting countries

Presenters: a. P. Michael Schmitz, University of Frankfort, Germany
b. Harald Von Witzke, University of Minnesota, U.S.A.
DO DEVELOPED EXPORTING COUNTRIES CONTRIBUTE TO FOOD SECURITY?

THE CASE OF THE EC

by

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Do Developed Exporting Countries Contribute to Food Security?

The Case of the EC

1. INTRODUCTION

The representatives and advocates of the Common Agricultural Policy (CAP) of the European Community (EC), a major exporter of food and agricultural commodities, claim that (a) food security has already been achieved domestically for a long time as an unambiguous result of a well-defined and successful agricultural policy design, and that (b) their countries even provide abundant food for needy regions in the developing world, thus alleviating food insecurity abroad. Looking at the tremendous production, export, and stock volumes in these countries this statement seems to be supported at a first glance. In this paper it is argued that EC's agricultural policy has, in fact:

- contributed little if at all to domestic food security and is obviously not able to avoid newly arising poverty and hunger for some minorities;
- aggravated the efforts of providing people with enough food at reasonable prices in the developing world.

Before starting the discussion on these hypotheses in Sections 3 and 4, it is worthwhile to give a precise definition of what is meant by food security, to develop an indicator with which one can measure food security, and finally to derive a conceptual framework for evaluating different degrees of food security (Section 2). All three aspects will be discussed and analyzed as general as possible in order to make the food security approach applicable for rural and urban poor in both developing (LDCs) and developed countries (DCs). The paper does neither provide any quantitative estimations of food
security levels, nor does it discuss policy options for coping with the food security issue. Rather, it attempts to improve the theoretical foundation, to develop some alternative indicators, and to apply both to the mentioned hypotheses. More specifically, some more recent developments in the field of applied welfare economics are introduced which, in the author's view, have been underutilized in food security research. This kind of analysis might especially be useful for comparisons of food security levels between households, regions, and countries as well as for giving a basis on which national and supranational funds can be allocated to the poor.

2. DEFINITION, MEASUREMENT, AND EVALUATION

"Food security is access by all people at all times to enough food for an active and healthy life" (World Bank, 1986). This definition which seems to reach the highest rate of acceptance among concerned researchers implies that (see Phillips and Taylor, 1990, p. 1304):

-- food is available, accessible, affordable -- when and where needed -- in sufficient quantity and quality;

-- an assurance is given this state of affairs to be reasonably expected to continue.

Moreover, this widely accepted definition reflects the shifts from

-- a production orientation to a consumption and health focus;

-- country-level to household- or individual-level analysis;

-- a solely quantity point of view to both quantity and quality issues;

-- static or cross-section analysis to dynamic analysis over time;
merely transitory to transitory and chronic malnutrition.

It has been noted that national food security does not imply household or individual food security (Staatz, D'Agostino and Sundberg, 1990, pp. 1312-1316) and that food security today does not imply food security tomorrow. The most important result from previous research, however, has been the observation that not an inadequate level of food supply causes hunger but a lack of individual purchasing power or real income (see also Chisholm and Tyers, 1982, p. 5). Hence, individual poverty is the driving force behind hunger and malnutrition. This makes clear, why food insecurity is not restricted to poor countries. Even in rich countries a small but growing group of the population do not have access to sufficient food (Allen and Thompson, 1990, pp. 1162-1163; Phillips and Taylor, 1990, p. 1304) because their real income falls below the poverty threshold.

With this causal relationship in mind, the question arises under which preconditions individual real income or real household income could be an adequate basis for the measurement of food security. Obviously, a minimum of that income is required to meet individual's needs. A minimum level of real income can also be interpreted as a minimum right to resources in the sense of Atkinson (1991, p. 8) which enables individuals to participate in a particular society, as a guarantee of "positive freedom." As a rule of thumb the poverty or the food security line in developed countries is estimated to be that disposable household income which is less than 40 to 50 percent of the national average, thus implying a relative measure. In Developing Countries it would make more sense, however, to define a fixed amount of real purchasing power which enables individuals to have access to enough and healthy food.
When calculating this real purchasing power it has to be kept in mind that income in-kind has to be added (i.e., home produced goods and services) and a discount for non-available or rationed food should be subtracted. But even when these problems are solved three additional aspects warrant further attention: the relevant time period considered, the choice of equivalence scale in case of different household sizes, and how food intake corresponds to income. Whereas the measurement of poverty is generally based on cross-section analysis per year (Atkinson, 1991, pp. 5-17), the proposal here is to use time series analysis of real household income in order to capture seasonal variability and life cycle variations including complete breakdowns of income (see also Ravallion and Huppi, 1991, pp. 57-82). The choice of the time unit (daily, weekly, monthly, annually) should depend on whether different options of dissaving, borrowing or participating in income streams of related people are available. If there aren't any risk sharing private or official institutions, then a daily-based income report would be the best. Depending on the size of the household, the age structure of its members, the distribution between male and female, the degree of handicaps of people, and their nutritional and health status, the required minimum household income (food security line) differs widely. Buhmann and others (1988, pp. 115-142) therefore propose an adjusted income indicator \( y_{adj} \) to make food security or poverty levels of households comparable and to take into account the above mentioned aspects:

\[
y_{adj} = \frac{\text{total real household income}}{n^s}
\]

where \( n \) denotes the number of members of the household and \( s \) is the elasticity of family need with respect to family size. The equivalence scales are based on subjective
evaluation and in the poverty literature this ranges from 0.25 to 0.72 (Atkinson, 1991, p. 15). Finally, what can be said about the correlation of real income with food intake and the nutritional and healthy status of individuals? Fortunately, recent contributions in the literature show a strong positive relationship between income and nutrition implying that nutrition and health are improving with income growth (Schiff and Valdés, 1990, p. 1320; Von Braun, 1990, p. 1323). Faced with a lack of data concerning the determinants of the nutrition and health production functions, the real household income might therefore provide an acceptable basis for the measurement of food security (an example of how to calculate this real income indicator for Sub-Saharan Africa is given in Sahn and Sarris, 1991, p. 262).

So far only the level aspect of food security has been addressed. The level of real household income should not fall below a certain target or minimum level. However, food insecurity reflects the adverse effects of an uncertain world as well. Hence, we should also look at the fluctuations of real household income around its mean trend. Formally, this is the probability distribution of real income over time that matters and it should be the objective of any food security policy to keep the probability of real income falling below the target level as low as possible at reasonable opportunity costs. Then one can measure food insecurity as the probability (α) of real income falling below the critical level $y^*$ (see Figure 1 for illustration). The food security level (FS) is then:

$$(1) \quad FS = 1 - \text{Prob} \left[ F(y) \leq \frac{y^* - E[y]}{(\text{var}[y])^{0.5}} \right] \quad \text{or} \quad 1 - \alpha \text{ in Figure 1}$$

where
Prob $\text{probability}$

$E$ $\text{expectation operator}$

$\text{var}$$\text{variance}$

$y = y_{\text{adj}}$$\text{adjusted real income}$

$y^*$$\text{minimum income}$

$F(y)$$\text{standard normalized cumulative distribution function}$

For practical purposes the first (mean) and second (variance) moments of the probability distribution can be used to calculate the degree of food insecurity which ranges from zero to one. In that case the implicit assumption is made that real income fluctuations are normally distributed.

Figure 1. Measurement of Food Insecurity
So far we have only addressed the positive questions of measurement. Nothing has been said on the evaluation of different probability distributions in welfare terms or how food security does correspond to individual welfare measures. Normatively speaking, i.e., does the individual prefer the probability distribution B over A (Figure 1) although food insecurity increases (a plus shaded area)? The answer to this question depends on the weights the individual gives to mean, variance, skewness, and other moments in his/her preference function. Hence, an economic agent would prefer B over A if and only if the level increasing benefit outweighs the risk loss neglecting higher moments. The most common practice of economic analysis in such cases has become to apply the expected utility approach or the stochastic dominance approach (see Dillon and Anderson, 1990, pp. 120-157). In the following we’ll use the former assuming a normal distribution of real income which leads to a simple mean-variance formula of expected utility of income (Newbery and Stiglitz, 1981, p. 85):

\[ E[U(y)] = E[y] - \frac{1}{2} \cdot A \cdot \text{var}[y] \]

A coefficient of absolute risk aversion

U utility

This equation is especially useful as a complementary tool for evaluation of food security because it contains both mean and variance of income as arguments, thus considering the stochastic nature of the problem;
can be applied to producers, consumers, and other agents such as taxpayers and politicians;
- contains the risk attitudes of market agents;
- allows comparisons over time and among agents of situations with a different extent of food insecurity;
- provides a reasonable money measure of food security costs and benefits.

We are now in a position to define, to measure, and to assess food security or food insecurity, respectively. Hence, the question can be answered: What is the contribution of the CAP to domestic food security?

3. COMMON AGRICULTURAL POLICY AND DOMESTIC FOOD SECURITY

Agricultural Price Policy in the EC implies an average increase of producer prices over their free market levels, a considerable stabilization of prices compared to the world market (see Table 1), and finally a distortion of the price pattern in favor of grains, milk, beef, and sugar beets. These market interventions will be evaluated from a producer's and consumer's point of view.

3.1 Producer's Welfare and Food Security

The impact of this price policy on producer's welfare can be measured by the expected utility of an indirect profit function (see Just, Hueth and Schmitz, 1982, p. 349):

\[ E[U(\pi)] = E[\bar{U}(\pi (p, v, K))] \]
Table 1. Variability\(^a\) of German Food Import Prices -- 1970-1985

<table>
<thead>
<tr>
<th>Products</th>
<th>Price Variability (%)</th>
<th>Imports from EC-Member Countries</th>
<th>Imports from Third Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aggregates</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grains and Cereal Products</td>
<td>5.6</td>
<td>17.9</td>
<td></td>
</tr>
<tr>
<td>Milk and Dairy Products</td>
<td>3.4</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>Swine and Pork</td>
<td>9.5</td>
<td>7.7</td>
<td></td>
</tr>
<tr>
<td>Cattle and Beef</td>
<td>7.3</td>
<td>16.4</td>
<td></td>
</tr>
<tr>
<td>Poultry and Poultry Meat</td>
<td>6.0</td>
<td>4.9</td>
<td></td>
</tr>
<tr>
<td>Eggs and their Derivatives</td>
<td>11.5</td>
<td>17.2</td>
<td></td>
</tr>
<tr>
<td><strong>Single Products</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>5.8</td>
<td>24.5</td>
<td></td>
</tr>
<tr>
<td>Barley</td>
<td>6.4</td>
<td>21.3</td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>6.1</td>
<td>17.9</td>
<td></td>
</tr>
<tr>
<td>Soymeal</td>
<td>18.3</td>
<td>21.4</td>
<td></td>
</tr>
<tr>
<td>Rice</td>
<td>9.3</td>
<td>21.6</td>
<td></td>
</tr>
<tr>
<td>Raw Sugar</td>
<td>4.3</td>
<td>62.2</td>
<td></td>
</tr>
<tr>
<td>Cattle</td>
<td>6.2</td>
<td>13.5</td>
<td></td>
</tr>
<tr>
<td>Swine</td>
<td>8.1</td>
<td>14.4</td>
<td></td>
</tr>
<tr>
<td>Butter</td>
<td>4.3</td>
<td>32.3</td>
<td></td>
</tr>
</tbody>
</table>

*Source:* Own Calculation on Basis of German Agricultural Statistics (see Schmitz, 1987, p. 366)

\(^a\) Measured as Trend-Corrected Coefficient of Variation Following the Approach of Cuddy and Della Valle, 1978, pp. 79-85.
which is homogenous of degree 1 in prices and has the following properties (Hoteling's Lemma):

\[ \frac{\partial \pi}{\partial p} = q_a > 0; \quad \frac{\partial^2 \pi}{\partial p^2} > 0; \quad -\frac{\partial \pi}{\partial v} = x_D > 0; \quad \frac{\partial^2 \pi}{\partial v^2} > 0 \]

where

\( \pi \) indirect profit
\( p \) producer prices
\( v \) factor prices
\( K \) quantity vector of fixed inputs
\( q_a \) output supply
\( x_D \) input demand

Using the simple mean-variance approach of equation (2) and the approximation procedure for both moments following Mood, Graybill and Böes [1974, p. 181, see equations (19) and (20)], one can easily derive a money measure (= certainty equivalent indirect profit) for the expected utility of profits leaving the variance of input prices unaffected by policy:

\[ E[U(\pi)] \approx \pi(p, v, K) + \frac{1}{2} (cv)^2 \cdot \epsilon \cdot (Rev) - \frac{1}{2} \cdot R \cdot cv^2 \cdot \frac{Rev^2}{\pi(p, v, K)} \]

where

\( p, v \) mean prices
cv coefficient of variation  

ε supply elasticity  

Rev Revenue  

R coefficient of relative risk aversion  

The first term on the RHS of equation (4) is that level of profit where prices are at their mean. A mean preserving spread of producer prices, however, creates two additional terms in equation (4). The second term on the RHS is equivalent to an increase of the expected profit under fluctuating prices from which the producer obviously benefits, whereas the third term addresses the producer’s risk attitude. A risk averse producer, i.e., would face a loss of welfare under fluctuating prices. The producer gains from pure price stabilization under the Common Agricultural Policy if, and only if

\[ R > \epsilon \cdot \frac{\pi}{\text{Rev}} \]

which is likely the case assuming plausible parameter values.

Since the mean profit change is also positive, the producers welfare position has been clearly improved by the CAP.

Referring to the food insecurity status of producers under the CAP, it has to be stated that the probability (Prob) of real profit (π) to fall below the critical level (\( \pi^* \)) has unequivocally been decreased since the mean is up and the variance is down:

\[ \text{Prob} \left[ F(\pi) < \frac{\pi^* - E[\pi]}{\sqrt{\text{var} [\pi]}} \right] \]
Hence, price support as well as price stabilization under the CAP have improved both the welfare position and food security of farmers although the benefits seem to be very unevenly distributed among different farms and regions (see von Witzke, 1979; Tarditi and Croci Angelini, 1982).

3.2 Consumer’s Welfare and Food Security

Analogous to the producer case, the impact on consumers should be measured as the expected utility of equivalent income or money metric (MM):

\begin{equation}
\text{E}[U(MM)]
\end{equation}

Money metric itself can be defined as that level of income needed at some vector of reference prices \(p_0\) in order for the consumer to attain the same utility level he/she enjoys from income \(y_0\) when faced with price vector \(p_t\). In other words money metric is the sum of the initial income \(y_0\) and the equivalent variation (EV). Since the equivalent variation from a pure price change can be derived from an expenditure function \(e[\cdot]\) as (see Boadway and Bruce, 1989, p. 205):

\begin{equation}
\text{EV} = e(p_0, u_t) - e(p_t, u_t).
\end{equation}

for the money metric it follows:

\begin{equation}
\text{MM} = y_0 + \Delta e(p, u)
\end{equation}

where the expenditure function is increasing with prices and utility, is homogeneous of degree 1 in prices, is concave in \(p\), and has the following property (Shepard’s Lemma):

\[
\frac{\partial e(p, u)}{\partial p} = q_p^c
\]

(compensated demand function)
Using again the simple mean-variance approach of equation (2), the Mood, et. al. approximation procedure for the mean and the variance of the money metric, and rearranging some terms, yields:

\[
(10) \quad E[U(MM)] \approx Y_0 + \frac{1}{2} \sigma^2_y \ln \frac{EX}{Y_0} - \frac{1}{2} R \sigma^2_p \frac{EX^2}{Y_0}
\]

where

- \( \eta^c \) compensated demand elasticity \( ( = \eta + s \lambda ) \)
- \( s \) budget share of products with fluctuating prices
- \( \lambda \) income elasticity
- \( \eta \) (uncompensated) demand elasticity
- \( EX \) mean expenditures for products with fluctuating prices

The interpretation of equation (10) is analogous to that of equation (4) for the producer. In accordance with the considerations of Helms (1985, pp. 93-100), the expression in (10) could be called the ex-ante equivalent income. The consumer finally gains from pure price stabilization if and only if:

\[
(11) \quad R > \frac{|\eta^c|}{s}
\]

which is again likely to be the case as Turnovsky, et. al. (1980) state, although the relative gains seem to be negligible (Wright and Williams, 1988, pp. 616-627) due to the low food share in consumer's budget. Thus, even with equal coefficients of risk aversion, producers might be more heavily affected by fluctuating prices than consumers.

However, the central question of how the CAP affects mean and variance of consumer prices has been left unanswered so far. The answer very much depends on the
transmission of price impulses from the wholesale to the retail level. Empirical studies show the EC consumers to shoulder the full burden of the price support at the wholesale level because the potential for replacing price increasing intermediate food or for substituting final food consumption is very limited (i.e., Schmitz, 1987, pp. 368-370) and the CAP covers nearly the whole range of food items. In addition, the CAP contributes little to consumer's price stability. The statistically observed stability already exists due to high proportions of stable non-food inputs in food value added, to partly anticyclical margin behavior over time, and to risk transferring mechanism for which consumers are obviously willing to pay. Surprisingly, the level of stability of final food prices hardly differs among products, irrespective of the fact that some wholesale prices or producer prices are subject of the CAP and others not (see Table 2). Hence, the CAP has not only weakened the welfare position of consumers but has also increased the level of food insecurity. This is in contrast to policymakers' claims. It holds especially for those consumers who spend a large portion of their budget on food, namely the older generation, families with many children, and unemployed people. The low real income of those minorities is eroded further by the CAP.

Nevertheless, some advocates might still argue that for a vast majority of people food security has already been provided. That is true. But this has not been caused by the food and agricultural policy. Rather, it originates from the overall performance and efficiency of the economy. Thus, it is fair to say that food security for most people exists despite the CAP.
Table 2. Variability\textsuperscript{b} of German Food Prices at Different Stages in the Food Chain 1970-1985

<table>
<thead>
<tr>
<th>Product</th>
<th>Price Variability (%)</th>
<th>Product</th>
<th>Price Variability (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swine</td>
<td>8.1</td>
<td>Cattle</td>
<td>6.2</td>
</tr>
<tr>
<td>Roast Pork</td>
<td>9.4</td>
<td>Roast Beef</td>
<td>4.2</td>
</tr>
<tr>
<td>Lard</td>
<td>3.1</td>
<td>Fillet of Beef</td>
<td>4.1</td>
</tr>
<tr>
<td>Ham</td>
<td>2.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calf</td>
<td>6.5</td>
<td>Poultry</td>
<td>5.3</td>
</tr>
<tr>
<td>Veal Cutlet</td>
<td>8.4</td>
<td>Broiled Chicken</td>
<td>3.6</td>
</tr>
<tr>
<td>Eggs from Producers</td>
<td>6.4</td>
<td>Raw Milk</td>
<td>4.8</td>
</tr>
<tr>
<td>Eggs Packing Incl.</td>
<td>5.7</td>
<td>Fresh Milk</td>
<td>4.4</td>
</tr>
<tr>
<td>Wheat</td>
<td>5.8</td>
<td>Butter</td>
<td>4.3</td>
</tr>
<tr>
<td>Wheat Flour</td>
<td>3.2</td>
<td>Cheese</td>
<td>4.6</td>
</tr>
<tr>
<td>White Bread</td>
<td>3.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rye</td>
<td>6.4</td>
<td>Sugar Beets</td>
<td>6.9</td>
</tr>
<tr>
<td>Rye Bread</td>
<td>2.5</td>
<td>White Sugar</td>
<td>4.3</td>
</tr>
<tr>
<td>Potatoes from Producer</td>
<td>42.2</td>
<td>White Cabbage</td>
<td>33.1</td>
</tr>
<tr>
<td>Potatoes Packing Incl.</td>
<td>24.5</td>
<td>Cabbage with Trade-Mark</td>
<td>14.0</td>
</tr>
<tr>
<td>Potato Salad</td>
<td>5.0</td>
<td>Cabbage in Cans</td>
<td>4.9</td>
</tr>
<tr>
<td>Potato Chips</td>
<td>2.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apple from Producers</td>
<td>36.6</td>
<td>Must</td>
<td>20.3</td>
</tr>
<tr>
<td>Apple with Trade-Mark</td>
<td>15.2</td>
<td>Red Cabbage</td>
<td>42.8</td>
</tr>
<tr>
<td>Apple Juice</td>
<td>7.2</td>
<td>Cabbage with Trade-Mark</td>
<td>15.5</td>
</tr>
<tr>
<td>Apple-Purée</td>
<td>5.6</td>
<td>Cabbage in Cans</td>
<td>4.8</td>
</tr>
</tbody>
</table>

Source: Own Calculation on Basis of German Agricultural Statistics (see Schmitz, 1987, pp. 363-364).

\textsuperscript{b} Measured as Trend-Corrected Coefficient of Variation Following the Approach of Cuddy and Della Valle, 1978, pp. 79-85.
4. COMMON AGRICULTURAL POLICY AND FOOD SECURITY IN LDCs

A vast literature exists on the impact of the CAP or similar agricultural policies of other industrialized countries on world markets and on developing countries (i.e., Anderson and Tyers, 1990; Hartmann and Schmitz, 1991). The focus has been on price level induced welfare effects in the third world. However, only few studies have addressed the question of how to evaluate the price transmission with respect to variability of certain domestic variables, such as welfare or food security. A model is developed which allows us to analyze different kinds of stochastic disturbances.

Although in an uncertain world dozens of sources of real income fluctuations exist, we will confine ourselves to only two sources which are claimed to be the most important in food security issues: (1) fluctuations in domestic food production and (2) external fluctuations coming from the world market or from developing countries' food production (Valdés, 1981, pp. 4-5). The following simple stochastic partial equilibrium model is used including one commodity (i.e., grains), two countries (developed country, developing country) and four agents (domestic consumers and producers, domestic government, foreign export demand). The model is formulated in general terms and is especially useful to reveal the determinants of mean and variance of world market prices and their interaction with certain price transmission policies.

\[
\begin{align*}
q_s &= f(P_s, \theta) \quad \text{domestic supply function of the EC} \\
q_d &= g(P_D) \quad \text{domestic demand function of the EC} \\
q_{ED} &= h(P_w, \phi) \quad \text{export demand function of the LDC} \\
P_s &= k(P_w) \quad \text{world price transmission concerning EC producer prices}
\end{align*}
\]
(16) \( P_D = I \left( P_w \right) \) — world price transmission concerning EC consumer prices

(17) \( q_s = q_D - q_{ED} = 0 \) — equilibrium condition

where

\( q_{SD} = \) domestic supply, demand;

\( q_{ED} = \) export demand;

\( P_{SD,w} = \) producer price, consumer price, world market price;

\( \Theta, \phi = \) stochastic disturbance terms related to domestic supply and export demand;

\( f, g, h, k, l = \) functional parameters

Substituting equations (12), (13), (14), (15) and (16) into equation (17) yields:

(18) \[ f [ k \left( P_w \right), \Theta] - g \left[ l \left( P_w \right) \right] - h \left[ P_w, \phi \right] = 0 \]

Following Mood, Graybill, Boes (1983, p. 181) one can derive approximations for the mean \( E[\cdot] \) and the variance \( \text{var}[\cdot] \) of world market prices from such an implicit stochastic equation. Thus we have:

(19) \[ E \left[ P_w \left( \Theta, \phi \right) \right] \approx P_w \left( \Theta, \phi \right) + \frac{1}{2} \text{var}[\Theta] \cdot \frac{d^2}{d\Theta^2} \cdot P_w \left( \Theta, \phi \right) \]

\[ + \frac{1}{2} \text{var}[\phi] \cdot \frac{d^2}{d\phi^2} \cdot P_w \left( \Theta, \phi \right) \]

\[ + \text{cov}[\Theta, \phi] \cdot \frac{d}{d\Theta} \cdot \frac{d}{d\phi} \cdot P_w \left( \Theta, \phi \right) \]
\[
\text{(20) } \text{var} [P_w (\theta, \phi)] \approx \text{var} [\theta] \cdot \left[ \frac{d}{d\theta} P_w (\theta, \phi) \right]^2 \\
+ \text{var} [\phi] \cdot \left[ \frac{d}{d\phi} P_w (\theta, \phi) \right]^2 \\
+ \text{cov} [\theta, \phi] \cdot \left[ \frac{d}{d\theta} P_w (\theta, \phi) \cdot \frac{d}{d\phi} P_w (\theta, \phi) \right]
\]

Using the implicit function rule for derivations of \( P_w \) with respect to the stochastic disturbances \( \theta \) and \( \phi \), one gets:

\[
\text{(21) } E [P_w (\theta, \phi)] \approx P_w (\theta, \phi) + \frac{1}{2} \text{var} [\theta] \cdot \left[ - \frac{f(\theta) \cdot DN - f(\theta) \cdot f(\phi) \cdot kP_w}{DN^2} \right] \\
+ \frac{1}{2} \text{var} [\phi] \cdot \left[ - h(\phi) \cdot DN - h(\phi) \cdot hP_w \phi \right] \\
+ \text{cov} [\theta, \phi] \cdot \left[ - \frac{f(\theta) \cdot hP_w \phi}{DN^2} \right]
\]

\[
\text{(22) } \text{var} [P_w (\theta, \phi)] \approx \text{var} [\theta] \cdot \left( - \frac{f(\theta)}{DN} \right)^2 \\
+ \text{var} [\phi] \cdot \left( + \frac{h(\phi)}{DN} \right)^2 \\
+ 2 \text{cov} [\theta, \phi] \cdot \left( - \frac{f(\theta) \cdot h(\phi)}{DN^2} \right)
\]

where \( DN = fP_s \cdot kP_w - gP_D \cdot lP_w - hP_w \) > 0

\( fP_s \) = marginal supply response to producer price changes

\( gP_D \) = marginal demand response to consumer price changes
kP\textsubscript{w} = marginal producer price response to world market price changes

IP\textsubscript{w} = marginal consumer price response to world market price changes

hP\textsubscript{w} = marginal export demand response to world market price changes

Hence, expected mean and variance of world market prices depend on:

-- the variances of both stochastic disturbance terms;

-- the interaction of those terms (related, unrelated);

-- the nature of the stochastic impact (additive, multiplicative);

-- various response variables of the agents.

To illustrate this, consider a model which seems to be most plausible in agricultural production. It is characterized by loglinear functions, multiplicative disturbance terms, and all second derivatives to be sufficiently small. In that case, one can arrive at:

\[
(23) \quad \text{cv}_{Pw}^2 = \frac{\text{cv}_e^2 \cdot q_s^2 + \text{cv}_d^2 \cdot q_{ED}^2 - 2 \cdot \text{cv}_e \cdot \text{cv}_d \cdot r \cdot q_s \cdot q_{ED}}{[\epsilon \gamma q_s + |\eta| \beta q_d + |\omega| q_{ED}]^2}
\]

where

\( \epsilon \) = supply elasticity

\( \eta \) = demand elasticity

\( \omega \) = export demand elasticity

\( \gamma \) = price transmission elasticity with respect to producer prices

\( \beta \) = price transmission elasticity with respect to consumer prices

\( r \) = coefficient of correlation

\( \text{cv}_{(\cdot)} \) = coefficient of variation of the relevant variable
From equation (23) one can derive some interesting results. All other things being equal, world market prices are the more volatile, the

- higher domestic production fluctuations;
- higher export demand fluctuations;
- more disturbance terms are negatively correlated;
- less elastic all responses of private agents;
- less world price changes are allowed to be transmitted into the domestic market.

In addition, it has to be noted that in case of multiplicative stochastic terms even the absolute levels of production and export demand matter, to the extent that they affect the instability of world market prices as weights of the disturbance terms. If a country completely insulates its domestic market, as the EC does, and the stochastic disturbances are unrelated \( (r = 0) \), then equation (23) reduces to:

\[
(24) \quad cv_{pw}^2 = \frac{cv\theta^2 \cdot q_s^2 + cv\phi^2 \cdot q_{ED}^2}{|\omega|^2 \cdot q_{ED}^2},
\]

showing an increasing variability of world market prices compared to open markets, unless price transmission elasticities are negative in the initial situation. The price transmission elasticities in equation (23) allow to include all kinds of trade and domestic policies (i.e., producer subsidies, quotas, stock policies, import levies, etc.) and their values and signs are most important for the impact the EC has on the world market.

Whereas uncertain world market prices affect other exporting and importing countries' border prices more or less equally, the domestic price, welfare, and food security effects differ largely depending on how LDCs transmit those fluctuations to their
own domestic markets, how risk averse consumers, producers, and taxpayers are, and how the world market price risk interacts with other risk sources within the country. Obviously, LDC's can generally not be considered either as passive actors, completely insulating their national economy, or as enthusiastic adherents of liberalized trade. Rather, they react similarly to what politicians in developed countries do pursuing their individual objectives. Assume a policymaker in an LDC who seeks to maximize utility from net government receipts (GR) and foreign exchange earnings (FE) (see Hammer and Knudsen, 1990, p. 392):

\[
U = U (FE, GR) \rightarrow \text{Max.}
\]

under the constraint:

\[
FE (P_d, P_w) - GR (P_d, P_w) - X (P_d) \cdot P_d = 0,
\]

where

- \( P_d, P_w \) domestic and exogenous world market price
- \( X \) net export quantity

then the optimal level of domestic prices (control variable) chosen is:

\[
P_{d, \text{opt}} = \frac{\frac{MV_{FE}}{1 + \frac{MV_{GR}}{MV_{GR, GR}}}}{P_w}
\]

where

- \( MV_{FE, GR} \) marginal value of foreign exchange earnings and net government receipts, respectively
- \( \omega^* \) export supply elasticity with respect to domestic prices
(For a simultaneous estimation of multiple price transmission equations of type (27) see Hausner, Schmitz, and von Witzke, 1991, forthcoming.)

Assuming a relative high preference for budget receipts and an export supply elasticity of one, implies the typical discrimination policy against agriculture which is found in most LDCs.

In order to get reasonable price transmission elasticities for individual countries, the basic constrained maximization approach in (25) to (27) has to be extended to consider the dynamic nature of policy decisions as well as the cross price effects among commodity markets (see Hausner, et. al.). Only in that case the welfare and food security effects of individual agents within the Developing Countries can be properly derived.

Moreover, it is especially worth noting that external risks (i.e., world market price risks) do not simply disappear even if trade policy completely isolates the domestic market. Although consumers and producers are then prevented from facing external price risks, risk is nevertheless reflected in the government budget in that case, thus throwing the burden on taxpayers. Hence, market insulation generally implies simple redistribution of risk. In order to evaluate both the mean and variance effect of prices on welfare, including the risk aversion component, a group-wise accounting could be used following the equations (4) and (10) and extended by an equivalent taxpayer’s term. (28) \[ \hat{\omega} \approx E[U(\pi)] + E[U(MM)] + E[U(GR)] \]

\( \omega \) Sum of terms of certainty equivalent real incomes

GR Net Government Receipts including the costs of the stabilization policy
This indicator can be used to calculate the welfare and food security effects when world market prices are changed with respect to both their mean and their variance. The impact of changes in the price variance on agents' welfare has been mostly neglected in the literature although the price variability has proven to be very sensitive to agricultural trade policies (Anderson and Tyers, 1990). The EC's agricultural and trade policy contributes a lot of the price variability on world agricultural markets and thus at least potentially aggravates the LDC's food security issue. Moreover, it increases the costs of protecting LDC's domestic consumers and producers from the volatile world market and where this is not sufficiently successful it might have severe adverse long-term effects on production and investment decisions in agriculture. Compared to the impacts of the EC's commodity programs on LDCs the efforts in EC's food aid policy (Franco, 1988) have only negligible positive effects if at all.

5. CONCLUSIONS

Although the food security discussion has given more emphasis on the individual (household) level as the proper unit of analysis, it still suffers from applying inappropriate indicators, which are mostly quantity oriented, instead of relying on more recent results of the literature that it is purchasing power or real income that matters. In addition, it has not been made clear so far how food security corresponds to the welfare status of agents. Since food security can more or less be associated with an uncertain world this should at least be reflected in the value function of individuals who are generally risk averse.
Therefore, it is proposed in the paper that the measurement of both food security and welfare should be based on the probability distribution of adjusted real household income over time on a daily basis. Food security can then be defined as the probability of any agent's real income exceeding a critical level, whereas the welfare status is measured as the agent's expected utility of this real income. Special formulas are developed in this context [equations (4) and (10)] which allows one to calculate producer's and consumer's welfare under price uncertainty and risk aversion separating the risk response effect as well as the mean income moving effect of price fluctuations. All these indicators should be used when comparing and evaluating food security or food insecurity of any agent in whatever region.

Applying this concept to the paper's question of how the EC contributes to food security one can conclude that:

-- EC-producers are affected directly by higher and stabilized producer prices inducing an improved welfare and food security position of the small group of farm households;

-- EC-consumers, as a large group, suffer from EC's price policy in welfare and food security terms because the price increasing effect is fully transmitted from the wholesale to the retail level and stable consumer prices for food occur even without any producer price stabilization;

-- the CAP with its strongly isolating character (low price transmission elasticities) has decreased and destabilized world market prices of agricultural commodities eroding at least potentially the most important source of real income earnings in
LDCs, namely agricultural production;

-- the CAP-induced negative income and food security effects for producers have been even aggravated by the fact that most LDCs apply sector-specific and macroeconomic policies which, in addition, heavily discriminate against agriculture and severely endangers the access to enough and healthy food;

-- the potential welfare and food security gains of price level reductions for consuming and for importing agents are probably compensated by increasing price and income risks.

However, the real effect of the CAP on individual domestic agents in LDCs very much depend on how the distorted probability distribution of world market prices is transmitted into the country and how this affects agent's real income probability distribution. Also in that context the paper stresses the importance of the nature of price transmission and a brief indication is given on how to derive multiple price transmission equations empirically based on a theoretically reasonable optimization behavior. The knowledge of vertical, interregional and intertemporal price transmission seems to be crucial for the analysis of food security issues.
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The Growing Demand for Food Quality: Implications for Agricultural Trade and Policy

Harald von Witzke
and
Ian Sheldon

Introduction

Throughout history, the prime concern of mankind has been to assure the supply of a sufficient quantity of food. Quality considerations played only a secondary role. However, by the early 1980s the fear of persistent food scarcity had dissipated and was replaced by concerns over food surpluses in the developed world (von Witzke and Ruttan, 1989). This switch in the perception of food scarcity has been paralleled by a growing emphasis on food quality.

The growing demand for many food quality components is usually expressed in the form of a growing demand for food quality standards. Such standards represent public goods and thus involve a market failure. The general focus of this paper is on both the nature of this market failure and its central implications for agricultural and trade policy.

The paper is outlined as follows: in Section 1, a theoretical model of the market for food quality components is presented. In Section 2, the implications of this model for international trade and agricultural policy are discussed. The paper concludes in Section 3 with some thoughts on the methodology of trade and policy analysis in the presence of food quality standards.
1. Theoretical Background

There appears to be general consensus that many quality components can be left to market forces. A growing demand for quality will eventually be met through free contracting between private agents both domestically and internationally. However, there is also a consensus that certain quality components require regulation as a result of irreversible health consequences of consuming food with negative quality components and because of asymmetric information on those quality components (Kinsey, 1990; Kramer, 1990).

In examining the nature of market failure in the provision of food standards, it is useful to outline a model of contractual performance originally suggested by Klein and Leffler (1981). Consider a situation where, each period, consumers purchase a food product $x$ which embodies a level of quality $q$. Prior to consumption, individuals are uncertain about the actual quality of the good but are able to ascertain, by pre-purchase inspection, that it meets a minimum standard, i.e. fruit is unblemished. Over the consumption period, as the good is experienced, consumers are able to costlessly communicate information to each other about the good's actual quality. If the quality is lower than claimed, the seller is punished by non-repeat purchase.

Assume many firms can supply the market with identical technology. Further, assume that the cost function is given as:

$$C = c(x,q) + F(q)$$

where $c$ and $F$ are variable and fixed costs respectively. Higher quality and quantity generate higher production costs. Marginal costs increase with quality.
Focusing on Figure 1, $MC_{q_{\text{min}}}$ and $AC_{q_{\text{min}}}$ refer to the costs for a good of minimum quality, whilst $MC_{q_{h}}$ and $AC_{q_{h}}$ refer to costs for a high-quality good, $P_0$ and $P_1$ being the relevant competitive prices. Given that consumers can only observe that a good is of minimum quality pre-purchase, sellers will always have an incentive to cheat by selling $x_2$ of the low-quality good at the high-quality price, as the one-period quasi-rents from cheating outweigh the zero quasi-rents of being honest. Rational consumers will realize this, and because of the moral hazard, will only be willing to pay $P_0$. Therefore, only low-quality goods will be produced.

However, there may exist a price above the competitive price $P_1$ that will motivate firms to supply high-quality goods, i.e. $P_2$ which generates a price premium such that the perpetual quasi-rents from supplying high-quality outweigh the one-period rents from cheating\(^1\). In a competitive equilibrium, firms cannot earn positive profits, hence entry would force the market price below the quality assuring level. In order to generate an equilibrium, Klein and Leffler argue that firms will compete such profits away by investing in firm-specific assets that incur non-salvageable costs, e.g. brand names, logos and advertising. This shifts up the cost curve for high-quality goods to $AC_{q_{h}}$. Firms will not cheat by selling low-quality at the high price $P_2$ as they will lose future sales and incur a capital loss. Also, investment in specific assets acts as a signalling device to consumers where they are uncertain about firms' cost structures\(^2\).

\(^1\) See Klein and Leffler (1981) for the precise technical condition.

\(^2\) Allen (1984) argues that the Klein and Leffler proposition does not hold if consumers can observe the price and output of firms and have information on costs.
Given this analysis, how robust is it when the quality index for a product is a vector of characteristics? As Kinsey notes, food quality is a continuum of characteristics ranging from the very negative such as unsafe food to positive in terms of taste and convenience. The combination of the price premium and the repeat-purchase mechanism would likely generate a Pareto optimum for positive quality characteristics such as taste, and we certainly observe food processing firms investing in non-salvageable, firm-specific assets such as brand names.

However, it seems less likely that contractual assurance can be assured in the case of negative characteristics. The repeat-purchase mechanism is based on the idea that consumers can evaluate quality immediately after consumption. When consumption of a
good bears a health risk, markets fail to achieve a Pareto optimum. Honest firms may invest in firm-specific assets concerning food safety, but because the repeat-purchase mechanism is undermined by consumer uncertainty, dishonest firms have an incentive to free-ride and cheat. Hence the moral hazard problem remains in the case of negative quality characteristics, and a competitive market will not provide the necessary quality information. Of course, information itself has the characteristics of a public good (Stiglitz, 1985).

Even if the repeat-purchase mechanism works, it will tend to be sub-optimal in terms of known risks. For example, salmonella poisoning from eggs was not widely known to UK consumers until a government minister publicly claimed that all eggs sold in the UK were affected by salmonella, generating an almost immediate boycott by consumers, i.e. all eggs were assumed to be of low quality.

2. Implications for Trade and Policy

The demand for food quality, as well as for food safety and health standards, is a function of a number of variables. Both food quality and standards represent luxury goods (Falconi and Roe, 1990). Growing incomes, together with improved knowledge about health risks have led to a significant growth in demand for food quality in the last decade. Of course, the demand for food quality and food quality standards is also a function of other environmental hazards that consumers are exposed to and of (nationally divergent) preferences.

*See Falconi and Roe (1990) for analysis of incentives to firms to distort safety information.*
Moreover, the demand for food safety and health standards is driven by the growing opportunity cost of human time. Food components are frequently not easy to recognize. The cost of information on food quality components tends to rise with increasing opportunity costs of time. In addition, rising opportunity costs of time stimulate increased demand for food away from home (Senauer, 1979) and, thus, lead to a growing intake of food for which there is uncertainty about the quality components (Falconi and Roe, 1990).

As the variables determining the demand for food quality and food safety and health standards are different from one country to another, there will be differences in each country's optimum quality standards (in terms of positive as well as normative analysis) in the absence of international policy coordination. Such nationally divergent standards obviously represent barriers to trade. In terms of the previous analysis of contractual enforcement, this has a number of implications for policy and welfare evaluation.

Barriers to trade in the form of food quality standards could be removed through international harmonization of food quality standards. An international agricultural trading system which is free of barriers to trade represents an international public good. A single country cannot supply itself with such a good except in cooperation with other countries (Runge, von Witzke and Thompson, 1989). To the extent that a country can be made better-off by removing barriers to trade, there is an incentive for each country involved to pursue political strategies which could lead to harmonization of food quality standards among countries.
However, international harmonization of food quality standards may be very difficult to achieve for a variety of reasons. First, the general problems of public goods provisions have to be solved. As is well known, public goods are difficult to provide efficiently because of incentives for free-riding by the agents involved, and agreement has to be achieved over the distribution of contributions to the cost of providing the public good.

Second, the international distributive problems are aggravated in the case of food quality standards by the fact that the demand for both food quality and food quality standards is a positive function of income. However, incomes tend to be unequally distributed among countries making it more difficult to agree on uniform food quality standards.

Third, the growing importance of food quality standards will also re-define trade relations between the developed and the developing world. Food exporting countries are likely to face more barriers to trade, as developed countries introduce additional and tighten existing food safety and health standards. Less developed countries may have problems meeting standards set by wealthy countries because, in many cases, new production techniques are human capital intensive; human capital, however, is scarce in most low income countries. Moreover, production technologies that meet the standards developed in wealthy countries, may not be efficient under either the climatic conditions or relative factor prices in developing countries. A further dimension of this problem is that some developed food exporting nations may opt to constrain domestic sales of foods
to those that meet domestic standards but allow the production of below-standard foods for export to other countries with less restrictive regulation.

Fourth, the growing demand for food quality tends to favor political coalitions between farm interest groups and consumers. In developed countries, the influential minority of agricultural producers, seeking protection from foreign competition may find increasingly attractive coalition partners in consumers seeking protection from food and related health risks via food quality standards.

Finally, (nationally divergent) food quality standards may gain in importance as a substitute for more traditional tariff and non-tariff barriers to trade. Progress in international negotiations on a more liberal international agricultural trade, such as those in the GATT, may have been slow but they have contributed to significant policy adjustments both in the United States and the European Community (EC). In both countries, agricultural price supports have been reduced in real terms in recent years. Of course, if one instrument is taken away from an influential interest group, such as farmers in developed countries, its political power is usually not broken. If traditional forms of agricultural income support continue to lose their importance, agricultural interest groups will find substitutes. Again food quality standards and a coalition with consumers is likely to be an attractive option.

For the reasons outlined, it is expected that food quality standards will play an increasingly important role as non-tariff barriers to international trade (see also Runge, 1990). Recently, there has been a growing incidence of international disputes over food quality and food quality standards. There was disagreement between the EC and the
United States over the use of growth hormone in beef production and the Community threatened to ban the import of all beef from the United States for this reason. Also, the EC now requires that foreign meat processing plants meet EC standards. Recently, the EC significantly reduced the number of certified plants, causing the United States to threaten retaliation.

In reality then, there are apparently serious impediments to the harmonization of food quality standards which are likely to prove difficult to overcome. This can be demonstrated by the experience over time of both the United States and the EC. In the case of the United States, despite being a nation state for 200 years, there are still numerous interstate trade barriers. Many of them are based on differences in food quality and related standards.

In the case of the EC, one of the central objectives of the scheduled completion of the internal market by the end of 1992 is to remove all internal barriers to trade. It has now become apparent that the Community will fail to adopt a uniform set of standards before the 1992 deadline. It seems (Swinbank, 1990 and Gray, 1990) that the EC has in fact adopted the principle of "mutual recognition" in its approach to food standards harmonization. Products manufactured and sold within a particular EC country, and those imported from a non-EC country, are subject to that country's set of quality standards, whilst products imported from other member states only have to meet the standards set by their relevant governments. Therefore, the EC Commission appears to be following a policy of minimum standards.
In terms of the previous analysis of contractual enforcement, if the concept of "mutual recognition" were applied to trade between a wider set of countries than the EC, it would have a number of implications for welfare evaluation. First, if individual countries set differing food safety and health standards which translate into sunk costs for firms, there will be a range of qualities of goods that can be freely traded. This may be beneficial if there is a non-uniform distribution amongst consumers of the willingness to pay for quality. It also means that price differences for a particular food product will be observed for reasons other than transport costs. However, a range of differing product standards for the same type of product may interfere with the signalling mechanism of a particular country's set of standards and serve to increase consumer uncertainty.

Second, if the process of harmonization of international food quality standards focusses on a minimum set of standards, those firms from countries with higher standards may have an incentive to demand that domestic standards be lowered in order to allow them to compete with imports that embody a lower set of standards.

3. Summary and Conclusions

Using a simple model of contractual enforcement, it has been shown in this paper that asymmetric information on quality components is sufficient for a market determined, quality-enforcement mechanism not to work in the case of food safety, and hence safety standards may have to be set by public institutions. In this context, an attempt has been made to analyze the implications for international agricultural trade and policy of the
growing demand for food quality. This demand will result in a growing abundance of (nationally divergent) food quality standards. Many of them will act as barriers to trade. Political coalitions between consumers and agricultural producers demanding protection are likely to gain in importance, which will add a new dimension to attempts at international agricultural and trade policy coordination such as those in the GATT.

The growing demand for food safety and health standards also raises new methodological problems for which, as yet, there are no agreed answers. Specifically, the following issues are mentioned:

- If a Pareto optimum for each country requires them to set nationally divergent standards (public goods), free trade may have to be abandoned as the reference situation for trade and policy analysis, so what is it replaced by?

- If harmonization of standards is desirable for at least some countries, how should and how will countries cooperate in this regard?

- As the units of analysis are not individual economic agents, the political economic process needs to be understood both at the domestic and international level.
References


Session 4: Overview

Presenter: Paul Gallagher
Food security refers to a country's ability to provide food and avoid critical shortages even under the most adverse conditions. Indeed, some form of public intervention is justified when an individual's market purchases will not satisfy basic human needs. Sometimes, it is useful to view food security as an income problem. In particular, consumer demand at a low income level \( D(p,y_1) \) may not satisfy a minimum level \( D^* \) at a normal price \( P_n \) (see figure 1). In wealthy countries, food security might usefully be defined as a price, or supply instability, problem. In figure 1, a consumer with sufficient income \( Y_e \) will consume in excess of the minimum level except at an extreme price level \( P_e \). Most participants and presenters seem to agree with these basic ideas.

However, diverse means of achieving food security goals have been proposed during these discussions. In particular, targeted subsidies or income augmentation for low income groups were favored for developing countries with adequate total market supply, such as India. In Africa, production increases through research and subsidy were mentioned for rising incomes and economic development. High production levels and self-sufficiency rates were also advocated for Japan, mainly on concern that the trading system could break down. Improvements in the trading system were emphasized by exporting country participants. CAP reform would improve stability and the risk of using world markets. Improved standards could improve market access for developing countries and assure safe food for developed countries.
Overall, trade-minded analyses of a domestic policy concern for importing and developing countries have been provided. Yet trade talks typically emphasize other policy instruments for food security improvement: diversification, stocks and long term trade agreements. There are differing perceptions concerning the severity of past trade interruptions. For instance, price variation was much more extreme within Japan than on the world market during the U.S. soybean embargo of the early seventies (see figure 2). Formal research might shed some light on the prospects for a trade-based solution to the food security problem. The trading system probably will not fail if economic conditions improve and all countries share in this improvement. Energy should be devoted to improving the performance of the trading system and reducing the chance that it fails instead of planning for its failure.
Figure 1. Food Insecurity for an Individual Consumer

**Variable Definitions**

- \( D(P,Y) \): food demand for a representative consumer
- \( D^* \): minimum acceptable level of food consumption
- \( P_n \): normal price
- \( P_h \): high price
- \( P_e \): extreme price
- \( Y_s \): sufficient income
- \( Y_m \): marginal income
- \( Y_l \): low income
Figure 2. The Price of U.S. Soybeans at Various Locations