International Agricultural Trade
Research Consortium

# The Export Enhancement Program: Prospects Under the Food, Agriculture, Conservation, and Trade Act of 1990

by

Stephen L. Haley*

Working Paper # 91-6



*Stephen L. Haley is an Assistant Professor, Department of Agricultural Economics and Agribusiness, Louisiana State University.

Correspondence on requests for additional copies of this paper should be addressed to:

Dr. Stephen L. Haley
Department of Agricultural Economics
and Agribusiness
Louisiana State University
101 Agricultural Administration Building
Baton Rouge, LA 70803-5604

August 1991

# The Export Enhancement Program: Prospects Under the Food, Agriculture, Conservation, and Trade Act of 1990

Stephen L. Haley

Department of Agricultural Economics and Agribusiness
Louisiana State University
Baton Rouge, Louisiana 70808
July 1991

ABSTRACT

According to provisions of the 1990 U.S. farm bill, the export enhancement program (EEP) will continue to be an important instrument in promoting U.S. agricultural exports and in challenging subsidizing competitors, like the European Community (EC), with funding levels set at a minimum of $500 million annually through 1995. This research, whose purpose is to evaluate the likely effectiveness of the wheat EEP through 1995, reaches several conclusions: (1) the EEP will have a significant effect on U.S. wheat exports, but will be subject to diminishing returns at levels higher than the annual minimums; and (2) the EC will only be marginally affected by the EEP, that is, it can effectively counter the effects of the EEP at low cost.

Keywords: export subsidies, export enhancement program, agricultural trade, simulation model, wheat, coarse grains

# THE EXPORT ENHANCEMENT PROGRAM: PROSPECTS UNDER THE FOOD, AGRICULTURE, CONSERVATION, AND TRADE ACT OF 1990

The Export Enhancement Program (EEP) is perceived by U.S. policymakers to be an important factor in expanding U.S. agricultural exports. Bonuses for sales of EEP commodities totaled $3.1 billion from September 1985 through January 1991. In writing the Food, Agriculture, Conservation, and Trade Act of 1990 (FACT), policymakers specified that the Commodity Credit Corporation (CCC) is to provide $500 million or more yearly in CCC funds or commodities to carry out the EEP in order to discourage unfair trade practices by making U.S. agricultural commodities competitive in world markets. In addition, the 1990 Budget Reconciliation Act requires an additional $1 billion in export programs (not necessarily the EEP) for the period beginning October 1993 through September 1995 if the United States fails to enter into a General Agreement on Tariffs and Trade (GATT) agreement by the end of September 1992.

Although favored by policymakers, the EEP has not received much support from economists. Writing in Choices R. Paarlberg has argued that the EEP has done more to displace U.S. commercial exports than it has to build exports. Coughlin and Carraro (1988) note ironically that it probably would have been as beneficial to farmers and certainly more cost effective in the shortrun to destroy "excess" wheat in U.S. government stocks than use it as in-kind bonuses in promoting exports. Other studies, surveyed by Seitzinger and P. Paarlberg (1989), indicate that the EEP expanded wheat exports between 10 and 30 percent for the 1986/87 crop year, and between 7 and 14 percent for the

1987/88 crop year.[1] These studies show only slight increases in the U.S. wheat price due to the EEP. After taking into consideration the value of commodities from government inventories awarded to exporters under the EEP, net export revenues due to the EEP increased less than one percent. More recently, Anania and others (1991) model the EEP as an in-kind, targeted subsidy program, constrained by available wheat stocks in CCC inventories. Their results show only a small increase in U.S. wheat exports due to the program. Further, they find the EEP to be very expensive, and that the European Community (EC) is only slightly harmed by the program.

Tracing the effect of the EEP is a complicated process. If the EEP were simply a cash export subsidy, then the predicted effect would be simple: the EEP would expand exports by raising the domestic price of wheat and lowering the world price. However, to the maximum extent possible, EEP is an in-kind subsidy program. Exporters are awarded EEP bonuses in the form of commodity certificates which may be sold or exchanged for CCC-owned commodities. Cash subsidies are authorized but have not been used. Released stocks expand available supply and have price-depressing effects. In this vein, Houck (1986) and more lately, Chambers and Paarlberg (1991), show that in-kind subsidies to middlemen (that is, exporters) have ambiguous price effects. If the excess demand is elastic, then the subsidy effect outweighs the stock-release effect, and the domestic price will rise.

An evaluation of the EEP is also complicated by the workings of U.S. commodity

---

[1]These studies include those by Bailey (1989), Haley (1989), and Hillberg (1988).

programs. A change in the domestic wheat price affects the incentive to participate in the government's commodity program. If the domestic wheat price were to rise, reduced program participation would imply less land diverted from wheat production under the acreage reduction program (ARP). Increased supply would lead to expanded exports and more private stocks. Also, as described below, the FACT explicitly relates ARP's and Findley loan rate adjustments to stock-to-use ratios. In-kind EEP bonuses directly reduce government stocks, but reduced ARP's and higher effective loan rates could mitigate or reverse this effect over time.

The purpose of this research is to analyze the probable effects of the wheat EEP over the course of the FACT, that is, 1991-95. The focus is on an evaluation of the EEP in meeting its explicit goals of promoting exports and challenging "unfair" competition. The effect on net export revenue will be considered as well. Net export revenue is interpreted as the increase in exports evaluated at world prices less the cost of the program, taking into account the effect on deficiency payments.

As seems evident above, evaluating the effect of the EEP is an empirical matter. The approach in this paper situates the EEP into a simple, yet thorough, modeling framework that accounts for the dynamics of U.S. and EC grain commodity programs in the context of production uncertainties. Detailed attention to policy mechanisms in a dynamic setting distinguishes this modeling approach from those described above except for that of Bailey. Unlike Bailey, however, the analysis is future-directed. Because variations in domestic and foreign crop yields (and hence production levels) can directly

affect U.S. wheat export performance, the model is in a stochastic framework that explicitly recognizes yield deviations from yield growth trends. This specification is discussed below.

This paper is organized into several sections. The next section discusses the background of the EEP, including the criteria by which policymakers meant for it to be judged. Because the operations of the EEP will take place in the context of other U.S. government commodity programs, the following section discusses major provisions of the FACT besides the EEP. Next, an outline of the model constructed for the analysis is presented. The base model run is then examined, and then results from various EEP scenarios are presented and discussed in order to reach some probabilistic conclusions about the EEP over 1991-95.

**The Export Enhancement Program**

Export subsidies have long been used to promote U.S. agricultural exports. Authorizations for export price subsidies came from Section 32 of the Agricultural Act of 1935 and the 1948 CCC Charter authority. Included in export price subsidies are: cash and in-kind payments to exporters and producers, and sales at "world market prices" from CCC inventories. Government-assisted commercial exports with an export payment averaged $980 million per year, or 24 percent of the value of total agricultural exports, during 1956-60. During 1961-65 these government assisted exports increased to an average of $1,144 million (21 percent of the total). The 1966-70 yearly

average was $1,087 million.[2] The highest yearly amount was $2,496 million in 1973 (about 17 percent of the total). After 1973 the subsidies dropped off markedly until the mid-1980's.

As part of its strategy to revive U.S. agricultural exports after significant declines experienced in the early 1980's, the United States established the EEP in May 1985 under the authority of the CCC Charter Act of 1948. The EEP was subsequently reauthorized by the Food Security Act of 1985. There have been a number of criteria which guide the administration of the program. Each EEP offer must have the potential to develop, increase, or maintain markets for U.S. agricultural commodities. EEP subsidies should help U.S. exporters displace the exports of subsidizing competitors in specific countries, but it should not have more than a minimal effect on nonsubsidizing competitors. Finally, the overall EEP program level and subsidies for individual EEP sales should be maintained at the minimum budget level necessary to achieve the EEP's trade policy and export expansion goals.

Wheat has accounted for over 80 percent of the value of all EEP-assisted sales. 80.7 million metric tons of wheat were sold under the EEP from September 1985 through the beginning of January 1991. Other commodities that have received export subsidies under the EEP include: barley, barley malt, wheat flour, semolina, sorghum, rice, poultry feed, vegetable oil, frozen poultry, dairy cattle, and table eggs.

---

[2]Export payments were also made to exporters on P.L. 480 Title I sales at world market prices. In some years these payments increase the "exports with payments" significantly. See appendix table 2 of Ackerman and Smith (1990).

## Food, Agriculture, Conservation, and Trade Act of 1990

Operations of the EEP will be conducted in a policy environment different from that which prevailed over 1986-90. The FACT, along the 1990 Budget Reconciliation Act, changes the ways some government policy parameters are set, and in general is designed to reduce government budget expenditure on commodity programs and introduce more flexibility into farmers' cropping choices. Although there are many facets to the FACT, only those major provisions which are actually included (or potentially could be included) in the model employed in this study are described below.

The main provisions of the FACT are summarized in table 1. Minimum target prices are frozen at 1990 levels through 1995. Deficiency payments are calculated as under the Food Security Act of 1985 (FSA). Program payment yields are set at the same levels as in 1990, although USDA is authorized to set them at the average of the preceding 5 years' harvested yield, excluding high and low years. Base acreage (BASE) is the average of acreage planted or considered planted for the previous five years.

As in the 1985 FSA, wheat and coarse grain base loan rates will be 85 percent of a 5-year moving average of market prices, excluding high and low years. Base loan rates cannot fall more than 5 percent from the previous year's base loan rate. The Secretary of Agriculture can reduce the loan rate up to an additional 10 percent in order to maintain market competitiveness of U.S. exports. (Under the FSA, the authorization level was 20 percent.) The loan rate can also be reduced if certain stocks-to-use ratios occur. For wheat, if

Table 1--U.S. Policy Parameters for Base FACT Model

**Target price (TP):**

Wheat = $146.97 per metric ton

Coarse grain = $108.26 per metric ton

**Loan rate:**

Base Loan Rate (LR) = Max (85% of 5 year moving average of market price, excluding high and low, 95% of previous year's loan rate)

Findley adjustment (FDLY)=

10% at the discretion of the Secretary of Agriculture;

plus 5% if stocks-to-use ratio exceeds 15% for wheat and 12.5% for coarse grain; and

plus additional 5% if stocks-to-use ratio exceeds 30% for wheat and 25% for coarse grain.

**Acreage reduction program (ARP):**

Wheat: if stocks-to-use ratio exceeds 40%, ARP = 20%, otherwise ARP = 10%, except for 1991, ARP = 15%;

Coarse grains: if stocks-to-use ratio exceeds 25%, ARP = 20%, otherwise ARP = 5%, except for 1991, ARP = 7.5%

**Flex acreage (FLEX):**

Wheat and coarse grains: 1991-95: 15%

**Export Enhancement Program (EEPTOT):**

CCC to provide $500 million or more (in CCC funds or commodities) annually (Model assumes that 75% or $375 million used for wheat exports annually.)

**Program Yield (PY):**

Wheat = 2.35281 mt/hectare, and coarse grain = 5.42300 mt/hectare.

the ratio falls between 15 and 30 percent, the loan rate may be reduced by 5 percent. If the ratio is over 30 percent, the loan rate may be reduced by as much as 10 percent. For coarse grains, the 5 percent reduction requires a stocks-to-use ratio between 12.5 and 25 percent. The 10 percent reduction is possible if the ratio exceeds 25 percent.

A new provision included in the FACT relates the size of wheat and coarse grain acreage reduction requirements, or ARP's, to carryover supplies in relation to use (that is, stocks-to-use ratios) at the end of the preceding marketing year. The wheat ARP can range from zero to 15 percent for a stocks-to-use ratio at or below 40 percent and from 10 to 20 percent for a stocks-to-use ratio above 40 percent. The coarse grains ARP (except for oats) can range from zero to 12.5 percent for a stocks-to-use ratio at or below 25 percent and from 10 to 20 percent for a ratio above 25 percent. Table 1 shows the ARP decision rules used in the model. Maximum ARP's for wheat and coarse grains are limited to 20 percent. Special rates apply for 1991. The 1991 wheat ARP cannot be less than 15 percent, and the corn ARP cannot be less than 7.5 percent.

Flex or triple base acreage are acres not eligible for deficiency payments. Fifteen percent of base acreage becomes flex acreage for each of the program crops. Flex acres are covered by special planting flexibility provisions. Any program crop, including the original crop to which the base applies, or oilseed can be planted on the flex acreage. Nonprogram crops, excluding fruits and vegetables, can be planted on the flex acreage. Price support loan loans, if available, can be received for the program crops grown on the flex acreage.

As along as only approved crops are planted on flex acreage, flex acreage is considered to be planted to the original crop for purposes of determining base acreage in succeeding years.

**The Model**

The model used in this study was created to analyze policy alternatives for grains in the United States and the EC. (A technical discussion of the modeling structure is in the appendix to this paper.) The model incorporates the major provisions of the FACT, including those that determine target prices, loan rates, acreage reduction requirements, flex acreage, minimum funding levels for the EEP, and other policy parameters. The EC model component incorporates intervention and threshold pricing mechanisms. The operation of these mechanisms in the model provide estimates of expenditures on export restitutions, and on import and producer coresponsibility levies. The model includes grain sectors for the Soviet Union (U.S.S.R.) and the Rest-of-the-World (ROW).

The model is synthetic in the sense that its structure and many of its parameter values are based on agricultural trade models that have been used at the Economic Research Service (ERS) of the USDA in examining the effects worldwide trade liberalization and other policy scenarios. Supply and demand elasticity values used in the model ($\sigma$ and $\eta$, respectively) are derived from those used in Roningen and Dixit's TLIB-SWOPSIM model (1989) and as documented by Sullivan, Wainio, and Roningen (1989). All model elasticities are shown in Table 2. The modeling structure of U.S. and EC policy is based on Magiera and

Table 2--Model elasticities

Acreage planted/harvested

| | United States | | | European Community | | | Rest-of-World | | |
|---|---|---|---|---|---|---|---|---|---|
| | WH[1] | CG | SB | WH | CG | SB | WH | CG | SB |
| WH | 0.57 | -.31 | .05 | .45 | -.21 | 0 | .37 | -.09 | .01 |
| CG | -.09 | .47 | -.07 | -.28 | .44 | 0 | -.09 | .40 | -.03 |
| SB | .03 | -.15 | .48 | 0 | 0 | .30 | .02 | -.07 | .39 |

Demand

| | WH | CG | SB | WH | CG | SB | WH | CG | SB |
|---|---|---|---|---|---|---|---|---|---|
| WH | -.35 | .25 | 0 | -.26 | .13 | 0 | -.30 | .06 | 0 |
| CG | .05 | -.17 | .02 | .14 | -.26 | .01 | .06 | -.34 | .01 |
| SB | 0 | .09 | -.31 | 0 | .01 | -.15 | 0 | .17 | -.50 |

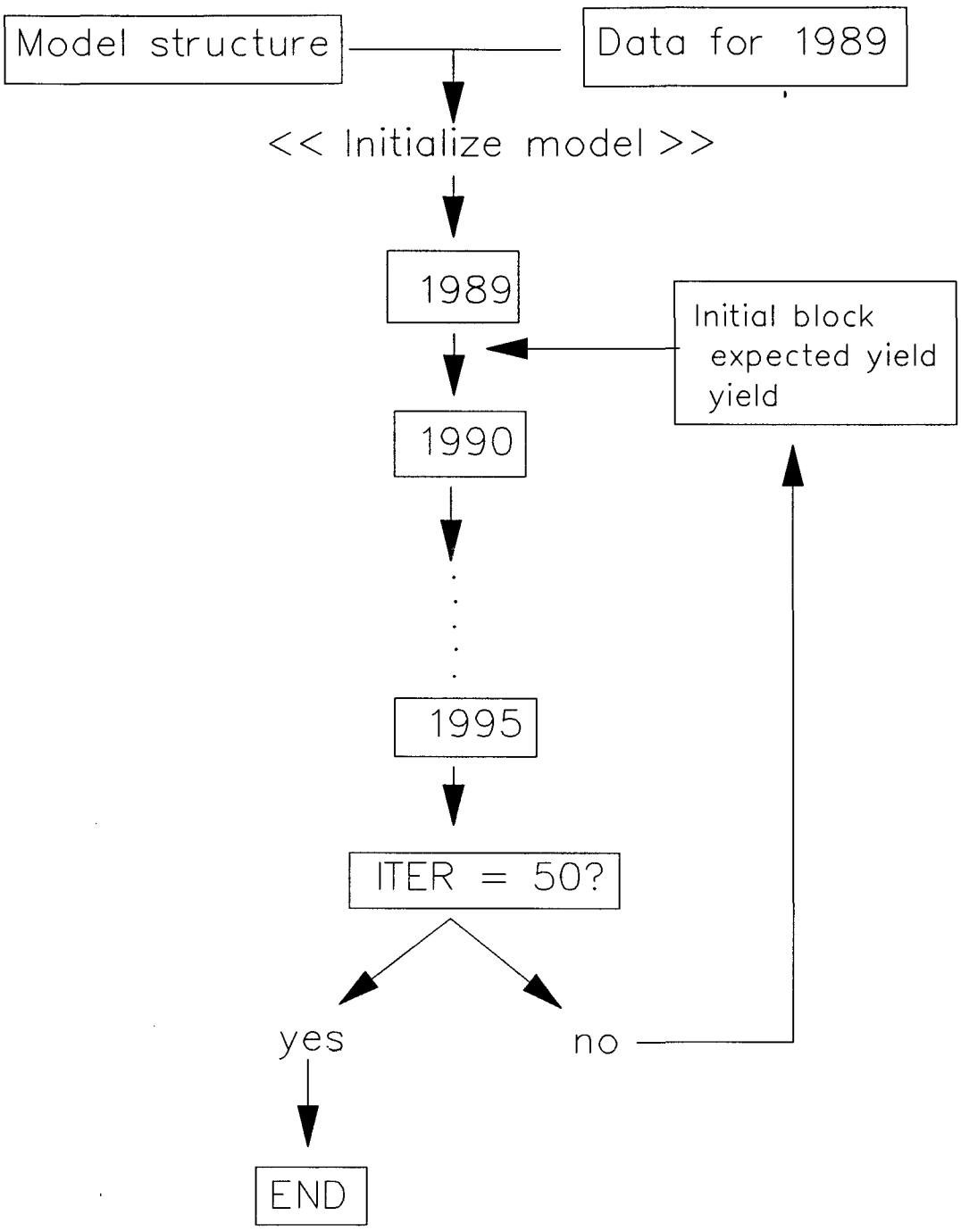
Private stocks[2]

| | WH | CG | SB | WH | CG | SB | WH | CG | SB |
|---|---|---|---|---|---|---|---|---|---|
| WH | -1.5 | | | -.5 | | | - | - | - |
| CG | | -1.5 | | | -.5 | | - | - | - |
| SB | | | -1.5 | | | -.5 | - | - | - |

[1] WH = Wheat, CG = Coarse Grains, and SB = Soybeans.
[2] Elasticity defined with respect to current price/expected price

Herlihy's refinement at the Economic Research Service (ERS) of an earlier model developed by Magiera for the Organization for Economic Cooperation and Development (1985). The model's dynamic and stochastic structure is based on the work of Holland and Sharples (1984). Stock elasticities ($\rho$) are from Holland and Sharples as well.

**Figure 1--Dynamic Structure of the Model**



The model tracks supply and utilization of wheat, major coarse grains (corn, sorghum, barley, and oats), and soybeans over the period 1989 through 1995.[3] The dynamic schema is shown in figure 1. Supply, utilization, price, and policy data from 1989 are used to calibrate the model so that the model will reproduce these variable values for 1989. Producers, consumers, and policy-implementers jointly determine the course of these variables through 1995. Consumers and policy-implementers follow complex but fixed decision rules represented as model equations. Consumption demand is specified to increase proportionally to projected increases in population. Producers follow a set of rules as well but are constrained by a lack of knowledge of prices to be received from the sale of their product each year. They form expectations based on previous years' prices. Based on these expectations, they decide how much acreage to plant and harvest.

Producers and policymakers form expectations regarding yields. In the United States, expected yields are important in determining participation in government commodity programs. Although program yields (upon which deficiency payments are determined) are fixed, actual yields influence per hectare market returns and the value of domestic price supports through nonrecourse loans. Expected yields in the model are projections from 1990 to 1995 based on linear regression equations in which actual yields from 1975 through 1989 were regressed on time.

Actual yields, along with acreage planted/harvested decisions made by

[3]Discussion of the soybean sector, except for presentation of model elasticities, is more or less suppressed in this report. Modeling results dealing with EEP scenarios have little effect on the supply and utilization of soybeans.

producers, determine actual production. Wheat yields over 1990-95 are generated from a normal distribution whose mean equals the expected wheat yield for a particular year and a standard deviation equaling the standard error of the corresponding regression equation from which the expected yield was derived. The same procedure is followed for coarse grains, but the correlation between coarse grain and wheat yields over 1975-89 is used to determine the coarse grain yields in the model. (See appendix for an explicit representation of the relationship). Each model iteration corresponds to a sequence of crop yields from 1990 to 1995 for all model regions.

There are two modeling aspects to the EEP. The first is its role as an export subsidy. What is presumed to be known at the beginning of the marketing year is how much is available to be spent on the EEP (that is, EEPTOT), and the extent of actual production (PR). This information is used to calculate a price wedge (EEPTOT/PR) which becomes the difference between the U.S. domestic wheat price and the world price.

The second aspect is related to the EEP's effect on government controlled CCC stocks. As discussed earlier, EEP is an in-kind subsidy program. The model calculates government wheat and coarse grain stocks available for in-kind payments at the beginning of the crop year. (There is a four million metric ton (mmt) emergency food reserve constraining the availability of wheat stocks.) If stocks are projected to be insufficient for the payments, cash subsidies will be paid (as the FACT specifies). The model assumes that commodity certificates are redeemed for wheat before being redeemed for the coarse grains. The model specifies that CCC stocks are replenished through an

equation relating the wheat price and loan rate to loan forfeitures to the CCC.

Other "blocks" of the model determine production in the other model regions. Table 3 summarizes key assumptions and relationships representing EC grain policies. The simultaneous model block includes equations determining consumption and carryover stocks. A region's commodity trade balance is calculated as a residual: beginning stocks plus production less consumption and ending stocks. Commodity prices are determined in world market clearing trade equations for each commodity.

**Base Run Results**

In order to analyze the effect of the EEP, several versions of the model are run. Each of these versions differ in their assumptions regarding the EEP funding levels over 1991-95. Model results from these several versions are compared to a base run of the model. These comparisons are closely examined in the next section of this report. The base run results are described in this section.

Table 4 shows average world prices for wheat and coarse grains. There is decidedly downward drift of wheat prices, while coarse grains prices fluctuate in the low $120/mt range. U.S. supply and utilization model results are shown in Table 5. Wheat exports lie in the low-to-mid 30 mmt range, while coarse grain exports show consistent growth (up to 77 mmt) throughout the period. A general tendency is a build-up in ending stock levels. The wheat stocks-to-use

Table 3--EC Common Agricultural Policy (CAP) for the model

Intervention price (guaranteed minimum EC price):

Wheat = 179.44 ecu per metric ton

Coarse grain = 170.47 ecu per metric ton

Threshold price (EC import price):

Wheat = 245.68 ecu per metric ton

Coarse grain = 223.38 ecu per metric ton

Coresponsibility levy rate:

Base = 3% of intervention price

Additional: if wheat and coarse grain grain production sum to over 160 million metric tons, additional percentage points added to base levy rate to produce maximum of 6% of intervention price for next crop year

EC producer incentive price =
Max[(1-coresponsibility levy rate)*intervention price, ecu world price]

Export refunds =
Exports to non-EC countries*[intervention price - ecu world price]

Import levy =
Imports*[threshold price - ecu world price]

Storage payments = f(production)

Gross budget expenditure = export refunds + storage payments

Net budget expenditure =
gross budget expenditure - [coresponsibility and import levies]

ratio grows from 26 percent in 1991 to 51 percent in 1995. Over the same period, the coarse grains ratio grows from 22 to 34 percent. Increased ARP's

Table 4--Model Results: World Grain Prices

| Year | Wheat | | Coarse Grain | |
|---|---|---|---|---|
| | Mean | Standard Deviation | Mean | Standard Deviation |
| | Dollars per metric ton | | | |
| 1991 | 162.91 | 17.53 | 123.86 | 13.35 |
| 1992 | 154.93 | 13.77 | 132.81 | 14.06 |
| 1993 | 154.94 | 9.56 | 123.73 | 10.73 |
| 1994 | 146.39 | 9.44 | 125.27 | 10.13 |
| 1995 | 147.43 | 9.79 | 121.41 | 11.41 |

do not curtail production sufficiently to limit the growth in stocks.

Table 6 shows EC supply and utilization, and table 7 shows results for EC wheat budget expenditures. The growth in EC production and exports (given fairly stationary demand) outstrips that of the United States. As mentioned above, the model assumes that average yields grow in line with trends from the 1975-89 period. EC growth trends are 3.46 percent for wheat, and 2.44 percent for coarse grains, while the corresponding trends for the United States are 1.14 percent for wheat, and 1.61 percent for coarse grains. EC coresponsibility levies do not effectively limit the growth of EC production. High budgetary exposure associated with production growth may be a force for EC reform independent of the EEP effect described below.

**Evaluation of EEP Alternatives**

Table 5--Base Run Results: U.S. Supply and Utilization

| Year | Prod | Cons | Exports | Stock Change | Ending Stocks |
|---|---|---|---|---|---|
| | | Million metric tons | | | |
| Wheat | | | | | |
| 1991 | 61.574 | 28.436 | 31.302 | 1.837 | 15.649 |
| 1992 | 66.186 | 29.855 | 31.138 | 5.193 | 20.842 |
| 1993 | 65.648 | 29.414 | 34.794 | 1.440 | 22.282 |
| 1994 | 68.507 | 30.440 | 31.189 | 6.878 | 29.160 |
| 1995 | 65.454 | 30.253 | 32.276 | 2.926 | 32.086 |
| Coarse Grains | | | | | |
| 1991 | 260.621 | 174.910 | 59.619 | 26.091 | 51.420 |
| 1992 | 242.160 | 173.103 | 70.669 | -1.612 | 49.808 |
| 1993 | 264.711 | 176.955 | 70.526 | 17.230 | 67.039 |
| 1994 | 260.177 | 177.123 | 76.410 | 6.643 | 73.682 |
| 1995 | 270.470 | 179.743 | 77.257 | 13.470 | 87.151 |

Prod = Production, and Cons = Consumption.

The effect of the EEP is analyzed by running the model for four alternative EEP specifications and examining model results for each of the scenarios relative to the base run. The base run assumes that the EEP is funded at the yearly minimum $500 million level and that 75 percent of available EEP funds are used to promote wheat. No EEP bonuses are used to promote coarse grains. The four alternative assumptions regarding the EEP are as follows:

Scenario A -- EEP funding is set at zero for 1991-95. Comparison with base results permits an analysis of the minimum EEP funding levels.

Scenario B -- EEP funding is assumed to increase to $900 million/year.

Table 6--Base Run Results: EC Supply and Utilization

| Year | Prod | Cons | Exports | Stock Change | Ending Stocks |
|---|---|---|---|---|---|
| | | | Million metric tons | | |
| Wheat | | | | | |
| 1991 | 82.893 | 58.809 | 23.429 | .655 | 14.180 |
| 1992 | 85.720 | 58.976 | 26.010 | .734 | 14.915 |
| 1993 | 88.533 | 59.230 | 29.441 | -.138 | 14.777 |
| 1994 | 91.470 | 59.395 | 31.745 | .330 | 15.107 |
| 1995 | 95.190 | 59.543 | 35.963 | -.315 | 14.792 |
| Coarse Grains | | | | | |
| 1991 | 80.609 | 76.633 | 2.487 | 1.489 | 10.424 |
| 1992 | 82.205 | 76.927 | 4.774 | .504 | 10.927 |
| 1993 | 84.259 | 77.107 | 7.363 | -.211 | 10.717 |
| 1994 | 86.302 | 77.287 | 8.668 | .347 | 11.064 |
| 1995 | 88.881 | 77.476 | 11.688 | -.283 | 10.781 |

75 percent is allocated to wheat exports.

Scenario C -- Same as scenario B except that there is assumed increased funding for crop years 1993 and 1994 due to a presumed inability to reach a GATT agreement by 30 September 1992. The billion dollar allocation is assumed applied to the wheat EEP equiproportionally over the two-year period.

Scenario D -- Same as scenario C, plus an elimination of wheat and coarse grains ARP's for 1993 and 1994 crop years. Before the FACT became law, there had been much discussion regarding the elimination of ARP's

Table 7--Base Run Results: EC Wheat Budget

| Year | Export Refunds | | Gross Budget | | Net Budget | |
|---|---|---|---|---|---|---|
| | Mean | Standard Deviation | Mean | Standard Deviation | Mean | Standard Deviation |
| | Millions of ECU's | | | | | |
| 1991 | 1,346 | 421 | 2,190 | 451 | 1,445 | 511 |
| 1992 | 1,640 | 405 | 2,513 | 446 | 1,696 | 530 |
| 1993 | 1,813 | 322 | 2,715 | 359 | 1,799 | 435 |
| 1994 | 2,157 | 419 | 3,089 | 465 | 2,111 | 490 |
| 1995 | 2,376 | 441 | 3,346 | 483 | 2,330 | 497 |

in these years in order to put additional budget pressure on the CAP.

Table 8 shows model results in terms of ratios relative to the base run for production, exports, prices, and EC budget components. Table 9 shows results for export revenue levels, and table 10 shows results for increases in EC restitutions in terms of levels and also relative to U.S. wheat EEP expenditure.

Model results: Scenario A and Base

Model results indicate that the base level of EEP funding increases U.S. wheat exports relative to no EEP as follows: 1991-7.4 percent, 1992-14.8 percent, 1993-15.1 percent, 1994-21.1 percent, and 1995-22.2 percent. First year effects are not as high as subsequent years because there is no first year

Table 8--Model results: EEP scenarios

| | Scenario A | Scenario B | Scenario C | Scenario D |
|---|---|---|---|---|
| Variable value:EEP scenario/variable value:base FACT scenario | | | | |
| U.S. Production | | | | |
| 1991 | 1.000 | 1.000 | 1.000 | 1.000 |
| 1992 | .985 | 1.011 | 1.011 | 1.011 |
| 1993 | .976 | 1.023 | 1.023 | 1.123 |
| 1994 | .971 | 1.018 | 1.032 | 1.095 |
| 1995 | .967 | 1.028 | 1.061 | 1.038 |
| U.S. Exports | | | | |
| 1991 | .931 | 1.041 | 1.041 | 1.041 |
| 1992 | .871 | 1.071 | 1.071 | 1.071 |
| 1993 | .869 | 1.069 | 1.130 | 1.213 |
| 1994 | .826 | 1.080 | 1.170 | 1.306 |
| 1995 | .818 | 1.106 | 1.103 | 1.140 |
| U.S. Prices | | | | |
| 1991 | .980 | 1.021 | 1.021 | 1.021 |
| 1992 | .977 | 1.022 | 1.022 | 1.022 |
| 1993 | .985 | 1.017 | 1.037 | 1.001 |
| 1994 | .981 | 1.022 | 1.054 | 1.032 |
| 1995 | .987 | 1.011 | 1.016 | 1.021 |
| World prices | | | | |
| 1991 | 1.019 | .989 | .989 | .989 |
| 1992 | 1.016 | .991 | .991 | .991 |
| 1993 | 1.024 | .987 | .969 | .946 |
| 1994 | 1.021 | .991 | .984 | .970 |
| 1995 | 1.027 | .981 | .987 | .990 |
| EC export restitutions | | | | |
| 1991 | .959 | 1.023 | 1.023 | 1.023 |
| 1992 | .969 | 1.017 | 1.017 | 1.017 |
| 1993 | .954 | 1.025 | 1.058 | 1.100 |
| 1994 | .963 | 1.017 | 1.032 | 1.058 |
| 1995 | .953 | 1.032 | 1.023 | 1.022 |
| Net EC budget | | | | |
| 1991 | .964 | 1.020 | 1.020 | 1.020 |
| 1992 | .972 | 1.016 | 1.016 | 1.016 |
| 1993 | .955 | 1.025 | 1.056 | 1.097 |
| 1994 | .963 | 1.017 | 1.032 | 1.058 |
| 1995 | .953 | 1.032 | 1.023 | 1.022 |

Scenario A=No EEP; Scenario B=Maximum EEP; Scenario C=Same as B plus $500 million in 1993 & 1994; and Scenario D=Same as C plus ARP=0 in 93 & 94

Table 9--Model results: effect of EEP on U.S. export revenue

| | Base | Scenario A | Scenario B | Scenario C | Scenario D |
|---|---|---|---|---|---|
| | | | Net export revenue for wheat[1] | | |
| | | | Billions of dollars | | |
| 1991 | 4.725 | 4.790 | 4.616 | 4.616 | 4.616 |
| 1992 | 4.449 | 4.201 | 4.497 | 4.497 | 4.497 |
| 1993 | 5.016 | 4.740 | 5.045 | 4.786 | 4.953[2] |
| 1994 | 4.191 | 3.852 | 4.192 | 4.119 | 4.615 |
| 1995 | 4.384 | 4.027 | 4.465 | 4.414 | 4.748 |
| Total | 22.765 | 21.610 | 22.815 | 22.432 | 23.429 |

Scenario A = No EEP
Scenario B = Maximum EEP payments
Scenario C = Maximum EEP payments plus $500 million in 1993 & 1994
Scenario D = Same as scenario C plus ARP = 0 in 1993 & 1994

[1] Net export revenue = Export revenue valued at world price + Deficiency payment savings relative to base - EEP cost
[2]Net export revenue for 1993 and 1994 = Export revenue valued at world price + Deficiency payment savings from scenario C - additional wheat deficiency payments due to ARP- EEP cost; Increased wheat deficiency payments due to ARP, 1993: $111 million, and 1994: $36 million.

production effect in the model. (Recall that production is a function of lagged prices instead of current prices. It is likely that farmers' expectations would adapt more quickly than what is specified; therefore, it could be argued that the first year export effect is lower than what it should be.)

Cumulative 1991-95 wheat exports are 22 mmt greater than without the EEP (161 mmt compared to 139 mmt). Yearly U.S. wheat prices average between 1 and 2.3

Table 10--Model results: effect of EEP on EC restitutions

| | Scenario A | Scenario B | Scenario C | Scenario D |
|---|---|---|---|---|
| | **Increased EC restitutions[1]** | | | |
| | Millions of dollars | | | |
| 1991 | -63.51 | 36.75 | 36.75 | 36.75 |
| 1992 | -65.41 | 41.04 | 41.04 | 41.04 |
| 1993 | -94.73 | 56.45 | 130.64 | 225.77 |
| 1994 | -92.79 | 50.87 | 98.87 | 180.07 |
| 1995 | 122.80 | 82.79 | 54.90 | 48.19 |
| | **Increased EC restitutions per EEP dollar** | | | |
| | Dollars | | | |
| 1991 | - 0.169 | 0.123 | 0.123 | 0.123 |
| 1992 | -.174 | .137 | .137 | .137 |
| 1993 | -.253 | .188 | .163 | .282 |
| 1994 | -.247 | .170 | .124 | .225 |
| 1995 | -.327 | .276 | .183 | .161 |

Scenario A = No EEP
Scenario B = Maximum EEP payments
Scenario C = Maximum EEP payments plus $500 million in 1993 & 1994
Scenario D = Same as scenario C plus ARP = 0 in 1993 & 1994

[1]Cumulative wheat and coarse grain export restitutions (million U.S. dollars): Base=$13,279.37, Scenario A=$12,840.39, Scenario B=$13,547.27, Scenario C=$13,641.57, and Scenario D=$13,811.19.

percent higher than what they would have been without an EEP. Likewise, world wheat prices are between 1.5 and 3.0 percent lower than without an EEP. Gains in net export revenue (export revenue plus savings from decreased deficiency payments due to higher EEP-induced U.S. wheat prices less the cost of EEP) are $1.155 billion for the base EEP. Considering that $1.875 billion is assumed

spent on the EEP in the base run, the program seems efficient in generating additional net export revenue: a return of $0.62 for each EEP dollar.

Model results: Base and Scenarios B, C, and D

Increased EEP funding above the minimum base levels produce wheat export gains, but these gains are less relative to those associated with going from the zero funding level to the minimum. Increasing EEP funding by 80 percent ($375 million to $675 million: scenario B) increases cumulative wheat exports by 12 mmt, (which is 54 percent of the 22 mmt gain of going from no EEP to the base level). The export gains measured yearly are fairly significant: between 4.1 percent (1991) and 10.6 percent (1995). U.S. wheat prices are in the area of 1.9 percent higher, while world prices are about 1.2 percent lower than in the base. Net export revenue increases by only $50 million. This increase represents a marginal return to additional EEP spending relative to the base of 3.3 percent.

Increased EEP expenditure in 1993 and 1994 produces an additional 4.9 mmt gain in U.S. wheat exports. Exports jump an additional 6.1 percentage points in 1993 and 9 percentage points in 1994. However, these gains come at considerable cost: net export revenue is less than in the base.

Setting the ARP to zero in 1993 and 1994 produces a rise in exports in those years slightly less than the effect of the EEP beyond the minimum levels assumed in the base. In 1993 ARP removal increases exports by 8.3 percentage points (expanded-EEP effect in 1993: 13.0 percent). In 1994 the ARP effect is

13.6 percentage points, compared to a 17.0 percent effect from the expanded-EEP. Over the entire time frame, exports are higher by over 8 mmt due to zero ARP's. U.S. prices decrease due to increased production on formerly diverted land, especially in 1993. A drawback to ARP elimination, all else constant, is that there is likely to be increased participation in government programs as a result of reducing the cost of program participation (that is, land diversion as a program requirement). The model predicts that wheat deficiency payments rise by $147 million, which offsets somewhat the two-year rise in export revenue. The net gain is likely to be over than $600 million, however. (Increased coarse grains deficiency payments are higher than those for wheat: $1.26 billion.)

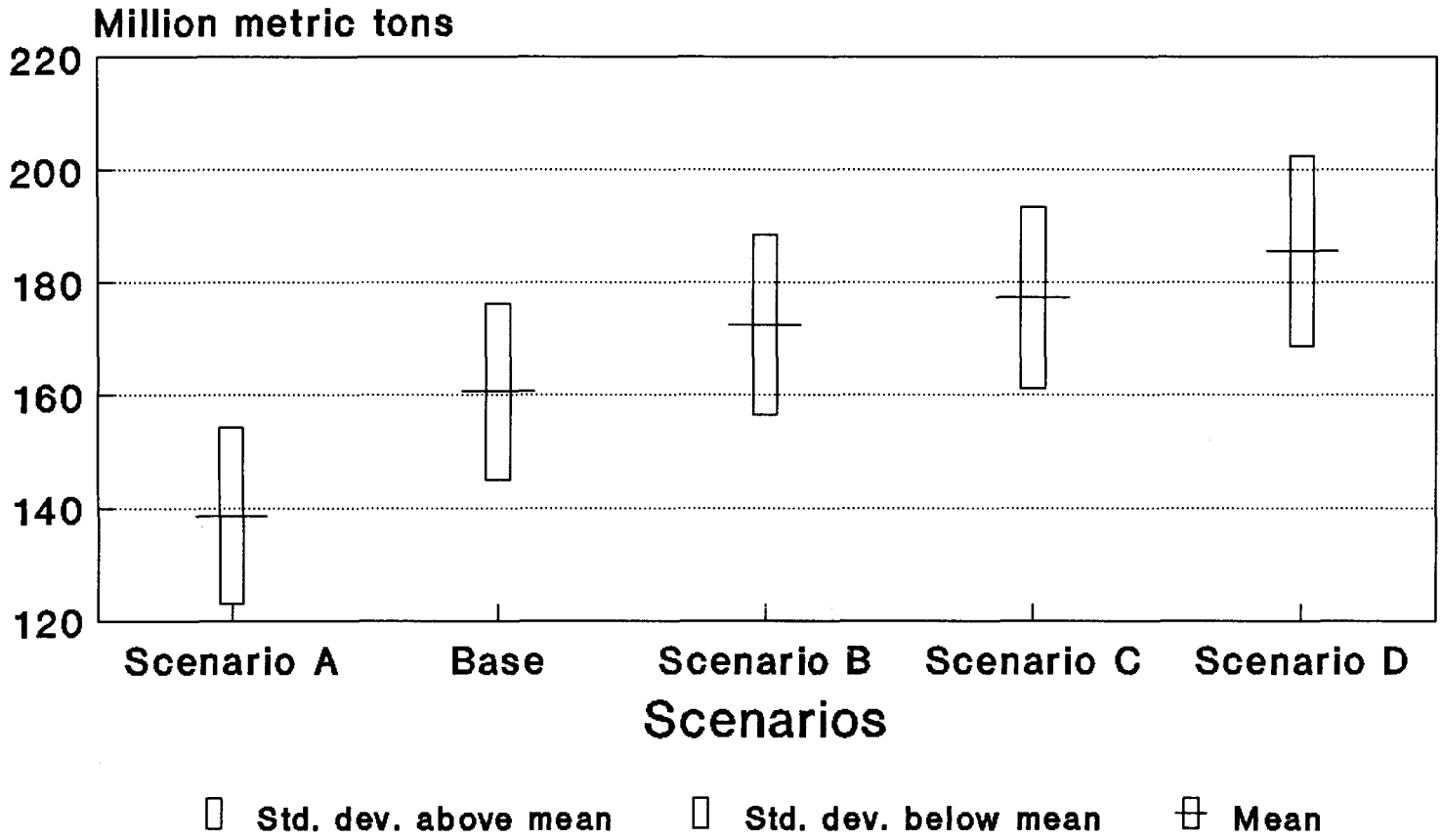
Figure 2 summarizes the effect of the various EEP funding levels on cumulative U.S. wheat exports. The results are presented in terms of ranges implied by iterative model solutions. As can be seen and as already discussed, increased EEP funding leads to increased export levels. The largest export increase is from a zero EEP funding level to the minimum base level. Increased funding clearly implies diminishing gains.

Effect of the EEP on the CAP

EEP is intended to place pressure on the EC to reform its system of subsidizing exports. As explained earlier, EC grain policies effectively cut EC prices from changes in world prices. Therefore, the primary way that EEP affects the EC is through increased budget exposure for the wheat and coarse grain components of the CAP. Model results indicate base level funding of EEP

Figure 2

# Effect of EEP on U.S. Wheat Exports
# Model results: cumulative total, 1991-95




Scenario A=No EEP;Scenario B=Max EEP
Scenario C=Max EEP plus $500 in 1993&4
Scenario D=same as "C" plus ARP=0 (93&4)

increases EC wheat and coarse grain export restitutions by $439.0 million or $0.23 per dollar expended on EEP. Increased funding of the EEP assumed in Scenario B increases restitutions by $267.9 million, or $0.18 per EEP dollar. Increased EEP funding in 1993 and 1994 of a total of a billion dollars increases restitutions by $94 million, or $0.09 per EEP dollar. These results indicate that the EC can counter the effect of the EEP relatively cheaply, especially for EEP expenditure levels above the base.

Base cumulative EC restitutions over 1991-95 are estimated at $13.3 billion. They rise to their highest level of $13.8 billion in Scenario D. These estimates imply that an aggressive EEP, along with a relaxation of acreage reduction requirements, can cause restitutions to rise by no more than 4 percent, a very modest amount.

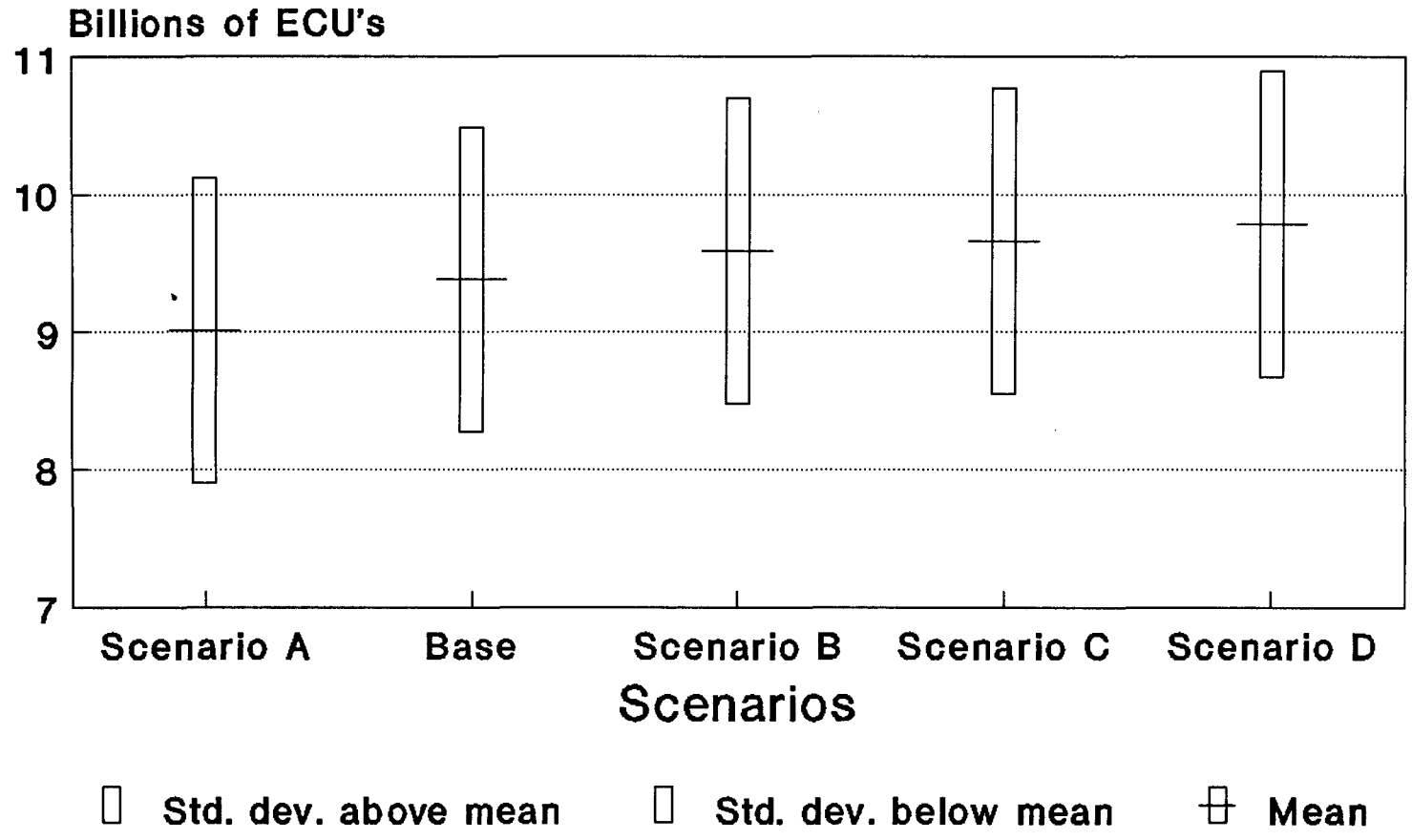
Figure 5 shows similar information diagrammatically: the range of model estimates for net EC wheat expenditure. As can be seen, there is very little differentiation between the scenarios. Again, the most discernable effect is between the scenario with zero EEP funding (scenario A) and the base.

## Conclusions

Model results indicate that EEP funding at minimum authorized levels can be an effective way to increase U.S. wheat exports over 1991-95. Funding at minimum levels set out in the FACT can be expected to increase cumulative wheat exports by 16 percent over that level likely with no EEP. However, the program will be subject to diminishing returns for levels higher than the minimum

Figure 3

# Effect of EEP on EC Wheat Expenditure
## Model results: cumulative total, 1991-95




Scenario A=No EEP;Scenario B=Max EEP
Scenario C=Max EEP plus $500 in 1993&4
Scenario D=same as "C" plus ARP=0 (93&4)

levels set in the FACT. An EEP used in conjunction with relaxed acreage reduction requirements has the greatest potential for expanding exports, but at the expense of increased deficiency payments ($1.4 billion for both wheat and coarse grains).

Results presented in this report are averages derived from model iterations, each of which differ according to underlying stochastic factors affecting crop yields. Other stochastic factors, such as exchange rates and general economic conditions, are not accounted for in this study. Also, in any particular year, market conditions may make an EEP a more or less efficient way of promoting exports. If such market variability is perceived to be an important influence, setting yearly minimum or maximum levels of EEP funding may not lead to the most efficient use of the EEP. A five-year funding level with flexibility on how to allocate across years may produce better results, although there is always the chance that the period constraint will not be taken seriously.

This report has analyzed the EEP only in terms of criteria established in the design of the program itself. There has been no attempt to account for changes in producer or consumer welfare resulting from the EEP. However, if producers were to gain as a result of EEP, it is likely that the welfare gain could have been achieved more efficiently in some other manner than through the EEP. It is useful to note that only under a very narrow set of conditions can it be shown that a targeted export subsidy program will produce gains sufficient to offset losses from the program (Abbott and others, 1987).

The marginal cost to the EC of countering the effects of the EEP will be

relatively low. Also, given likely EEP expenditure levels, it is unlikely that the EEP can cause the level of EC export restitutions to rise by more than 4 percent. Other wheat exporters will presumably bear the brunt of the program's effect on the world wheat market.

The goal of the EEP to prod the EC into making trade concessions is not likely to be met by use of the EEP alone. It may be that pressure for reform outside the agricultural sector will be needed to force EC agricultural reforms in the context of the GATT. Also, pressure internal to the EC from ever-rising crop yields and subsequent increased budget expenditure seems to be a more relevant factor in promoting EC reform than the EEP.

**References**

Abbott, P.C., P.L. Paarlberg, and J.A. Sharples. (1987) "Targeted Agricultural Export Subsidies and Social Welfare," American Journal of Agricultural Economics. Vol. 69(4), pp 723-32.

Ackerman, K.Z., and M.E. Smith. (1990) Agricultural Export Programs: Background for 1990 Farm Legislation. Staff Report No. AGES 9033, Econ Res. Serv., U.S. Dept. Agr.

Anania, G., M. Bohman, and C.A. Carter. (1991) "U.S. Export Subsidies in Wheat: Strategic Trade Policy or An Expensive Beggar-My-Neighbor Tactic?" International Agricultural Trade Research Consortium, Working Paper #91-3.

Bailey, K.W. (1989) Why Did U.S. Wheat Exports Expand? AIB No. 564, Econ. Res. Serv., U.S. Dept. Agr.

Chambers, R.G., and P.L. Paarlberg. (1991) "Are More Exports Always Better? Comparing Cash and In-Kind Export Sudsidies," American Journal of Agricultural Economics. Vol. 73, pp. 142-54.

Coughlin, C.C., and K.C. Carraro. (1988) "The Dubious Success of Export Subsidies for Wheat," Federal Reserve Bank of St. Louis Review. November/December, pp 38-47.

Haley, S.L. (1989) Evaluation of Export Enhancement, Dollar Depreciation, and Loan Rate Reduction for Wheat. Staff Report No. AGES 89-6, Econ. Res. Serv., U.S. Dept. Agr.

Hillberg, A.M. (1988) "The United States Export Enhancement Program for Wheat: A Simulation Model Employing Nash's Bargaining Solution," unpublished Ph.D. dissertation, Purdue University.

Hjort, K.C. (1988) "Class and Source Substitutability in the Demand for Imported Wheat," unpublished Ph.D. dissertation, Purdue University.

Holland, F., and J. Sharples. (1984) "Economic Analysis of the 1983 U.S.-U.S.S.R. Grain Agreement," Purdue University Station Bulletin No. 455.

Houck, J.P. (1986) "The Basic Economics of an Export Bonus Scheme," North

Central Journal of Agricultural Economics. Vol. 8, pp. 227-35.

Magiera, S.L. (1985) "U.S. Study: Grains Policy," unpublished manuscript written while author was economist with OECD, Paris, France.

Paarlberg, R.L. (1990) "The Mysterious Popularity of EEP," Choices. Second quarter, pp 14-17.

Roningen, V.O., and P.M. Dixit. (1989) How Level Is the Playing Field?: An Economic Analysis of Agricultural Policy Reforms in Industrialized Market Economies. FAER No. 239, Econ. Res. Serv., U.S. Dept. Agr.

Seitzinger, A.H., and P.L. Paarlberg. (1989) The Export Enhancement Program; How Has It Affected Wheat Exports? AIB No. 575, Econ. Res. Serv., U.S. Dept. Agr.

Sullivan, J., J. Wainio, and V.O. Roningen. (1989) A Database for Trade Liberalization Studies. Staff Report No. AGES89-12, Econ. Res. Serv., U.S. Dept. Agr.

## Appendix: Structure of the Model

This appendix describes some of the important equations constituting the model used in this research. It is not a complete model review. In particular, the Soviet component is not described because it has little bearing on the modeling of the EEP. (It is implicitly assumed that the EEP influences from whom the Soviets purchase, but not at what level.) See the longer version of this paper: ___ for a full model description.

United States Policy and Planted Acreage

U.S. producers form price expectations (EXPUS) based on prior years' prices (PUS):

$$EXPUS = MIN[PUS(-1), \frac{PUS(-1)+PUS(-2)+PUS(-3)}{3}]$$

Acreage planted is divided between participants and the nonparticipants in the government's commodity programs. The model calculates the returns of participating (EXP) vis-a-vis not participating (EXM), and calculates the rate of participation according to a logistic participation function estimated by Magiera:

$$PART = \frac{\alpha 1}{\alpha 2 + EXP[\alpha 3 + \alpha 4 * (\frac{EXP}{EXM})]}$$

where for wheat: $\alpha 2 = 0.97$, $\alpha 3 = 2.671$, $\alpha 4 = -2.415$; and for coarse grains: $\alpha 2 = 1.266$, $\alpha 3 = 7.071$, $\alpha 4 = -6.29$.

The expected return to participation includes price support protection offered by the nonrecourse loan mechanism and deficiency payments on eligible base acreage (PFREE = 1-[ARP+FLEX]):

$$EXP=[MAX(LR*(1-FDLY),EXPUS)*EXPECTEDYIELD*CONSTANT-EXPECTEDVARIABLECOSTS]$$

$$*(PFREE+FLEX)+(EXPECTEDDEF)*PFREE$$

The nonparticipating return is the market return:

$$EXM=EXPUS*(EXPECTEDYIELD)*CONSTANT-EXPECTEDVARIABLECOST$$

Target prices (TP), flex acreage requirements (FLEX), and program yield (PY) are exogenous and described in fuller detail in the text and table 1. ARP's and loan rates (base and Findley) are set as described in the text. It is assumed that the 10 percent discretionary portion of the Findley rate is used, that is MIN(FDLY) = .10.

Set-aside land, or land diverted from production (SETSD) is calculated:

$$SETSD=\tau*[ARP*BASE*PART]$$

where $\tau$ is a calibrating constant. U.S. planted acreage is therefore:

$$PL(i)=PART*[BASE*(1-FLEX)-SETSD]+$$

$$+(1-PART)*(1+\frac{FLEX*PART}{1-PART})*\phi*EXPUS(i)^{\sigma(i,i)}*EXPUS(j)^{-\sigma(i,j)}$$

i = WH,CG,SB

j = CG,WH,SB  j = i; and $\phi$ is a model constant.

Harvested acreage is a fixed proportion of acreage planted.

EC Policy and Planted Acreage

EC intervention prices are assumed to remain 179.44 ecu/mt for wheat and 170.47 ecu/mt for coarse grain throughout the simulation period. Threshold prices remain at 245.68 ecu/mt for wheat and 223.38 ecu/mt for coarse grains. EC grain producers are assessed a coresponsibility levy in order to help stabilize production. The base coresponsibility levy rate is 3 percent of the intervention price. Producers are assessed additionally if the sum of the previous year's EC wheat and coarse grain production exceeds 160 million metric tons. The percentage by which production exceeds the 160 million metric ton level is added to the base rate, up to a maximum of 3 additional percentage points. The EC incentive price becomes the maximum of the intervention price adjusted downward by the coresponsibility levy and the world price of the commodity expressed in ecu's. These incentive prices determine acreage harvested through a model supply function in constant elasticity format:

$$HR(i) = \phi * PEC(i)^{\sigma(i,i)} * PEC(j)^{-\sigma(i,j)}$$

where HR is acreage harvested, and PEC is the EC price.

Production

Actual production is subject to random yield variations about calculated, historically-based, trends. Yields are multiplied by the producer-determined acreage harvested to give production levels each year. Each model iteration is based on a sequence of crop yields over 1990 to 1995. As such, the model is stochastic. The model solves over 50 iterations as shown in figure 1.

Wheat yields are calculated:

$$YIELD(''WH'') = EXYD(''WH'') + \epsilon(''WH'')$$

$$\epsilon(''WH'')\ distributed: n(0, VAR(''WH''))$$

where EXYD = expected yield. Coarse grain yields are calculated:

$$YIELD(''CG'') = \alpha + \beta * YIELD(''WH'') + \epsilon(''CG'', ''WH'')$$

$$\alpha = EXYD(''CG'') - EXYD(''WH'') * P(''CG'', ''WH'') * \left(\frac{STD(''CG'')}{STD(''WH'')}\right)$$

$$\beta = P(''CG'', ''WH'') * \left(\frac{STD(''CG'')}{STD(''WH'')}\right)$$

$$\epsilon(''CG'', ''WH'')\ distributed: n(0, [VAR(''CG'') * (1 - (P(''CG'', ''WH''))^2)])$$

where VAR=variance, STD=standard deviation, and P=correlation coefficient.

Area harvested in the rest-of-the-world (ROW) is a function of the previous year's prices as follows:

$$HR(i) = \phi * PRICE(i,-1)^{\sigma(i,i)} * PRICE(j,-1)^{-\sigma(i,j)}$$

where PRICE(i,-1) is the world price for commodity i lagged one year. Production in each region is the product of acreage harvested and yield:

$$PR = YD * HR$$

Simultaneous Block: the United States

U.S. consumption is a function of prices (as well as an exogenous growth factor related to population growth --see text):

$$CN(i) = \phi * PUS(i)^{-\eta(i,i)} * PUS(j)^{\eta(i,j)}$$

Private ending stocks is a function of the ratio of the commodity's price to its expected price. Private stocks for either wheat or coarse grains cannot fall below pipeline levels: 10 mmt for both commodities:

$$ES(''PRV'') = MAX(\phi * (\frac{PUS}{EXPUS})^{-\rho}, 10)$$

$$CS(''PRV'') = ES(''PRV'') - BS(''PRV'')$$

where ES =Ending Stocks, PRV =Private, CS =Carryover, and BS = Beginning Stocks.

The government (GOVT) stocks equation consists of two parts:

$$CS(''GOVT'') = MAX[-EEPCERT + [\frac{e^{\mu * (1 - \frac{MAX(PUS - LR * (1-FDLY), 0)}{TP - LR * (1-FDLY)})} - 1}{e^{\mu} - 1}] * PART * PR, -BS(''GOVT'')]$$

where $\mu$ is a loan forfeiture coefficient.

The first part, EEPCERT, discussed in the text, represents the decrease in stocks due to in-kind EEP bonus payments. The second part represents the accumulation of stocks resulting from loan forfeitures in the government's nonrecourse loan program. The mathematical specification of the second part is highly nonlinear. In the numerator of the equation, a loan forfeiture

coefficient $\mu$ is adjusted by one less a fraction of the difference of the market price and loan rate over the difference of the target price and loan rate. This part of the equation cannot be greater than one (which it will be when the market price is less than or equal to the loan rate). When the market price is less than or equal to the loan rate, total production of those participating in the government's program is forfeited to the CCC; that is, 1*PART*PR. For a market price higher than the loan rate, only a fraction of participants' production will be forfeited. The loan forfeiture coefficient regulates the convexity of the forfeiture relationship. The larger the value of the coefficient, the less is forfeited at higher market prices above the loan rate. The value of $\mu$ has not been directly estimated; rather, various values of the coefficient have been used in model experiments. The resulting forfeiture relationships have been examined in order to select a reasonable coefficient value for model use. For both wheat and coarse grains, a coefficient value of 2.0 yielded reasonable results.

Carryover stocks equals the sum of private and government carryover. Trade (TD) is calculated as a residual:

$$TD=PR-CN-CS$$

Simultaneous Block: other regions and market clearing

EC and ROW consumption are determined by constant elasticity demand functions:

$$CN(i)=\phi*PEC(i)^{-\eta(i,i)}*PEC(j)^{\eta(i,j)}$$

$$CN(i) = \phi * PRICE(i)^{-\eta(i,i)} * PRICE(j)^{\eta(i,j)}$$

ROW carryover is constant. EC end period stocks are modeled as function of the ratio of the period's world price to last period's world price. (The stock elasticity is set low relative to the U.S. elasticity: -0.5 (Holland and Sharples, 1984)). EC and ROW trade are calculated as a residuals:

$$ES = \phi * \left(\frac{PRICE}{PRICE(-1)}\right)^{-P}$$

$$TD = PR - CN - CS$$

World market clearing conditions in which world excess grain demands are driven to zero determine world grain prices. U.S. grain prices are equal to world prices plus EEP price wedges, examined earlier, less fixed marketing margins, which were calculated on the basis of 1989 relationships. The world price in ecu's (ECU-P) is the world price in U.S. dollars divided by the ecu/U.S. dollar exchange rate (EXR). (The exchange rate itself is a constant. In the model, it has been held at its average 1989 value throughout the simulation period):

$$TD("US") + TD("EC") + TD("SV") + TD("RW") = 0$$

$$PUS = PRICE + EEP - TDMARG$$

where SV = Soviet Union, and TDMARG = fixed marketing margin.

$$ECU\text{-}P = PRICE / EXR$$

Residual block: budget calculations

After the model has been solved for a particular year, model-calculated supplies, trade, and prices can be used to calculate budget expenditures implied by policy parameter values set in the predetermined model block. U.S. deficiency payments fit into this area. More extensive calculations are required for EC budget estimates (Table 3). Part of the problem for estimating EC agricultural expenditures are that they are based on levels of exports (restitutions) and imports (variable levies) rather than the net exports the model solves for. Therefore, the model contains relatively simple linear wheat and coarse grain import (M) equations estimated by Herlihy as part of the Magiera-Herlihy ERS model described earlier. Wheat imports are a negative function of EC wheat production, and coarse grain imports are a negative function of production and a positive function of consumption. Exports (X) are calculated as the sum of net exports and imports:

$$M(\text{"EC"},\text{"WH"}) = CONSTANT - .11739 * PR(\text{"EC"},\text{"WH"})$$

$$M(\text{"EC"},\text{"CG"}) = CONSTANT - .50870 * PR(\text{"EC"},\text{"CG"}) + .87546 * CN(\text{"EC"},\text{"CG"})$$

$$X(\text{"EC"}) = TD(\text{"EC"}) + M(\text{"EC"})$$

Variable levies are calculated as the product of grain imports and the gap between the threshold price and ecu world price, all times a calibrating constant calculated from 1989 EC budget data. Export restitutions are calculated as the product of exports and the gap between the intervention price and an ecu world reference price. The reference price is the model world price multiplied by a constant which, when used with 1989 data, produces the

actual restitution level for 1989.

Estimates of coresponsibility levies and EC storage payments are based on model estimates of production. The coresponsibility levy is the product of the level of production, the intervention price, and the coresponsibility levy rate, all times a calibrating constant. Storage payments are the product of the level of production and the intervention price, all times a fixed storage payment per unit production coefficient.

The gross EC budget for a commodity, as reported by the model, is the sum of export restitutions and storage payments for that commodity. The net EC budget is the gross budget less import and coresponsibility levies extracted from imports and production, respectively.

Limitations of Modeling Approach

There are several limitations in using this model for EEP analysis. Because the model is highly aggregative, it is impossible to incorporate all significant features of the EEP. The EEP is a targeted subsidy program. It is intended that EEP subsidies should help U.S. exporters displace exports of subsidizing competitors in specific countries while having only minimal effects on nonsubsidizing competitors. The country/region coverage of the model is not wide enough to accomplish this. The model treats the EEP as though it were a uniform subsidy program. Even if the coverage were wider, the tracking of bilateral trade flows would be difficult because wheat is modeled as an undifferentiated good. Wheat could be differentiated according to

variety and/or country/region of origin, but the cost would be high in terms of added model complexity. Estimation of import demand relationships involving differing wheat varieties and origins has in general produced ambiguous conclusions that would prove hard to model in any event (Hjort, 1988).

Another consequence of the specification is the inability to explicitly account for strategic importer behavior. Large importers potentially exercise market power when making purchase decisions. In a market where supplies are plentiful, even small importers play exporters off against each other in demanding subsidies. Because an implied EEP intention is to direct bonuses to countries where the EC has a market presence, countries may be motivated to increase EC purchases just in order to become a more likely target for the EEP. Withholding bonuses from longstanding customers that may engender ill will from them as well.

The Soviet component of the model provides a good context for discussion of these problems. Although the Soviet Union is the largest EEP-assisted purchaser of U.S. wheat, its role in the model does little for understanding the dynamics of the EEP. Soviet import demand is not modeled as a function of price. Its demand is rather a function of deviations of production from trend growth and of share parameters which allocate the deviation among consumption, stocks, and imports. Implicitly, price might determine from whom the Soviets purchase, but this information in a net trade model where wheat is an undifferentiated good does not influence model results. An added area of research that could prove useful is the effect of foreign exchange constraints on Soviet wheat purchasing behavior. Currently this information is embedded in

the share parameters referred to above. Doubtlessly these parameters change through time. Parameter values could be influenced by the availability of price subsidies offered by exporters, as well as credit guarantees like those available in the U.S. GSM program.

August 13, 1991

INTERNATIONAL AGRICULTURAL TRADE RESEARCH CONSORTIUM*

Working Papers Series

| Number | Title | Author(s) | Send correspondence or requests for copies to: |
|---|---|---|---|
| 85-1 | Do Macroeconomic Variables Affect the Ag Trade Sector? An Elasticities Analysis | McCalla, Alex<br>Pick, Daniel | Dr Alex McCalla<br>Dept of Ag Econ<br>U of California<br>Davis, CA 95616 |
| 86-1 | Basic Economics of an Export Bonus Scheme | Houck, James | Dr James Houck<br>Dept of Ag Econ<br>U of Minnesota<br>St Paul, MN 55108 |
| 86-2 | Risk Aversion in a Dynamic Trading Game | Karp, Larry | Dr Larry Karp<br>Dept of Ag & Resource Econ/U of California<br>Berkeley, CA 94720 |
| 86-3 | An Econometric Model of the European Economic Community's Wheat Sector | de Gorter, Harry<br>Meilke, Karl | Dr Karl Meilke<br>Dept of Ag Econ<br>U of Guelph<br>Guelph, Ontario<br>CANADA N1J 1S1 |
| 86-4 | Targeted Ag Export Subsidies and Social Welfare | Abbott, Philip<br>Paarlberg, Philip<br>Sharples, Jerry | Dr Philip Abbott<br>Dept of Ag Econ<br>Purdue University<br>W Lafayette, IN 47907 |
| 86-5 | Optimum Tariffs in a Distorted Economy: An Application to U.S. Agriculture | Karp, Larry<br>Beghin, John | Dr Larry Karp<br>Dept of Ag & Resource Econ/U of California<br>Berkeley, CA 94720 |
| 87-1 | Estimating Gains from Less Distorted Ag Trade | Sharples, Jerry | Dr Jerry Sharples<br>USDA/ERS/IED/ETP<br>628f NYAVEBG<br>1301 New York Ave NW<br>Washington, DC 20005-4788 |
| 87-2 | Comparative Advantage, Competitive Advantage, and U.S. Agricultural Trade | White, Kelley | Dr Kelley White<br>USDA/ERS/IED<br>732 NYAVEBG<br>1301 New York Ave NW<br>Washington, DC 20005-4788 |

| Number | Title | Author(s) | Send correspondence or requests for copies to: |
|---|---|---|---|
| 87-3 | International Negotiations on Farm Support Levels: The Role of PSEs | Tangermann, Stefan<br>Josling, Tim<br>Pearson, Scott | Dr Tim Josling<br>Food Research Institute<br>Stanford University<br>Stanford, CA 94305 |
| 87-4 | The Effect of Protection and Exchange Rate Policies on Agricultural Trade: Implications for Argentina, Brazil, and Mexico | Krissoff, Barry<br>Ballenger, Nicole | Dr Barry Krissoff<br>USDA/ERS/ATAD<br>624 NYAVEBG<br>1301 New York Ave NW<br>Washington, DC 20005-4788 |
| 87-5 | Deficits and Agriculture: An Alternative Parable | Just, Richard<br>Chambers, Robert | Dr Robert Chambers<br>Dept of Ag & Resource Economics<br>Univ of Maryland<br>College Park, MD 20742 |
| 87-6 | An Analysis of Canadian Demand for Imported Tomatoes: One Market or Many? | Darko-Mensah, Kwame<br>Prentice, Barry | Dr Barry Prentice<br>Dept of Ag Econ & Farm Mgmt<br>University of Manitoba<br>Winnipeg, Manitoba<br>CANADA R3T 2N2 |
| 87-7 | Japanese Beef Policy and GATT Negotiations: An Analysis of Reducing Assistance to Beef Producers | Wahl, Thomas<br>Hayes, Dermot<br>Williams, Gary | Dr Dermot Hayes<br>Dept of Economics<br>Meat Export Research Center<br>Iowa State University<br>Ames, IA 50011 |
| 87-8 | Grain Markets and the United States: Trade Wars, Export Subsidies, and Price Rivalry | Houck, James | Dr James Houck<br>Dept of Ag Econ<br>Univ of Minnesota<br>St Paul, MN 55108 |
| 87-9 | Agricultural Trade Liberalization in a Multi-Sector World Model | Krissoff, Barry<br>Ballenger, Nicole | Dr Barry Krissoff<br>USDA/ERS/ATAD<br>624 NYAVEBG<br>1301 New York Ave NW<br>Washington, DC 20005-4788 |
| 88-1 | Developing Country Agriculture in the Uruguay Round: What the North Might Miss | Mabbs-Zeno, Carl<br>Ballenger, Nicole | Dr Nicole Ballenger<br>USDA/ERS/ATAD<br>624 NYAVEBG<br>1301 New York Ave NW<br>Washington, DC 20005-4788 |

| Number | Title | Author(s) | Send correspondence or requests for copies to: |
|---|---|---|---|
| 88-2 | Two-Stage Agricultural Import Demand Models Theory and Applications | Carter, Colin<br>Green, Richard<br>Pick, Daniel | Dr Colin Carter<br>Dept of Ag Economics<br>Univ of California<br>Davis, CA 95616 |
| 88-3 | Determinants of U.S. Wheat Producer Support Price: A Time Series Analysis | von Witzke, Harald | Dr Harald von Witzke<br>Dept of Ag Economics<br>Univ of Minnesota<br>St Paul, MN 55108 |
| 88-4 | Effect of Sugar Price Policy on U.S. Imports of Processed Sugar-containing Foods | Jabara, Cathy | Dr Cathy Jabara<br>Office of Econ Policy<br>U.S. Treasury Dept<br>15th & Pennsylvania Ave NW<br>Washington, DC 20220 |
| 88-5 | Market Effects of In-Kind Subsidies | Houck, James | Dr James Houck<br>Dept of Ag Economics<br>University of Minnesota<br>St Paul, MN 55108 |
| 88-6 | A Comparison of Tariffs and Quotas in a Strategic Setting | Karp, Larry | Dr Larry Karp<br>Dept of Ag & Resource Econ/U of California<br>Berkeley, CA 94720 |
| 88-7 | Targeted and Global Export Subsidies and Welfare Impacts | Bohman, Mary<br>Carter, Colin<br>Dortman, Jeffrey | Dr Colin Carter<br>Dept of Ag Economics<br>U of California, Davis<br>Davis, CA 95616 |
| 89-1 | Who Determines Farm Programs? Agribusiness and the Making of Farm Policy | Alston, Julian<br>Carter, Colin<br>Wholgenant, M. | Dr Colin Carter<br>Dept of Ag Economics<br>U of California, Davis<br>Davis, CA 95616 |
| 89-2 | Report of ESCOP Subcommittee on Domestic and International Markets and Policy | Abbott, P.C.<br>Johnson, D.G.<br>Johnson, R.S.<br>Meyers, W.H.<br>Rossmiller, G.E.<br>White, T.K.<br>McCalla, A.F. | Dr Alex McCalla<br>Dept of Ag Economics<br>U of California-Davis<br>Davis, CA 95616 |
| 89-3 | Does Arbitraging Matter? Spatial Trade Models and Discriminatory Trade Policies | Anania, Giovanni<br>McCalla, Alex | Dr Alex McCalla<br>Dept of Ag Economics<br>U of California-Davis<br>Davis, CA 95616 |

| Number | Title | Author(s) | Send correspondence or requests for copies to: |
|---|---|---|---|
| 89-4 | Export Supply and Import Demand Elasticities in the Japanese Textile Industry: A Production Theory Approach | Pick, Daniel<br>Park, Timothy | Daniel Pick<br>USDA/ERS/ATAD<br>1301 New York Ave. N.W.<br>Washington, DC 20005-4788 |
| 89-5 | The Welfare Effects of Imperfect Harmonization of Trade and Industrial Policy | Gatsios, K.<br>Karp, Larry | Dr. Larry Karp<br>Dept. of Ag & Resource Econ/U of California<br>Berkeley, CA 94720 |
| 89-6 | Report of the Task Force on Tariffication and Rebalancing | Josling, Tim<br>Chair | Dr. Timothy Josling<br>Food Research Institute<br>Stanford University<br>Stanford, CA 94305-6084 |
| 89-7 | Report of the Task Force on Reinstrumentation of Agricultural Policies | Magiera, Stephen<br>Chair | Stephen L. Magiera<br>USDA/ERS/ATAD<br>1301 New York Ave., Rm 624<br>Washington, D.C. 20005-4788 |
| 89-8 | Report of the Task Force on The Aggregate Measure of Support: Potential Use by GATT for Agriculture | Rossmiller, G.E.<br>Chair | Dr. G. Edward Rossmiller<br>Resources for the Future<br>Nat'l Ctr for Food/Ag Policy<br>1616 P Street N.W.<br>Washington, D.C. 20036 |
| 89-9 | Agricultural Policy Adjustments in East Asia: The Korean Rice Economy | Kwon, Yong Dae<br>Yamauchi, Hiroshi | Dr. Hiroshi Yamauchi<br>Dept. of Ag & Res. Econ.<br>University of Hawaii<br>3050 Maile Way<br>Gilmore Hall<br>Honolulu, Hawaii 96822 |
| 90-1 | Background Papers for Report of the Task Force on The Aggregate Measure of Support: Potential Use by GATT for Agriculture | Rossmiller, G.E.<br>Chair | Dr. G. Edward Rossmiller<br>Resources for the Future<br>Nat'l Ctr for Food/Ag Policy<br>1616 P Street N.W.<br>Washington, D.C. 20036 |
| 90-2 | Optimal Trade Policies for a Developing Country Under Uncertainty | Choi, E. Kwan<br>Lapan, Harvey E. | Dr. E. Kwan Choi<br>Dept. of Economics<br>Iowa State University<br>Ames, Iowa 50011 |
| 90-3 | Report of the Task Force on The Comprehensive Proposals for Negotiations in Agriculture | Josling, Tim<br>Chair | Dr. Timothy Josling<br>Food Research Institute<br>Stanford University<br>Stanford, CA 94305-6084 |

| Number | Title | Author(s) | Send correspondence or requests for copies to: |
|---|---|---|---|
| 90-4 | Uncertainty, Price Stabilization & Welfare | Choi, E. Ewan<br>Johnson, Stanley | Dr. E. Kwan Choi<br>Dept. of Economics<br>Iowa State University<br>Ames, IA 50011 |
| 90-5 | Politically Acceptable Trade Compromises Between The EC and The US: A Game Theory Approach | Johnson, Martin<br>Mahe, Louis<br>Roe, Terry | Dr. Terry Roe<br>Dept. of Ag & Applied Econ<br>1994 Buford Avenue<br>University of Minnesota<br>St. Paul, MN 55108 |
| 90-6 | Agricultural Policies and the GATT: Reconciling Protection, Support and Distortion | de Gorter, Harry<br>Harvey, David R. | Dr. Harry de Gorter<br>Dept. of Ag Economics<br>Cornell University<br>Ithaca, NY 14853 |
| 91-1 | Report of the Task Force on Reviving the GATT Negotiations in Agriculture | Trade Update Notes | Dr. Maury E. Bredahl<br>Center for International Trade Expansion<br>200 Mumford Hall<br>Missouri University<br>Columbia, MO 65211 |
| 91-2 | Economic Impacts of the U.S. Honey Support Program on the Canadian Honey Trade and Producer Prices | Prentice, Barry<br>Darko, Kwame | Dr. Barry E. Prentice<br>University of Manitoba<br>Dept of Ag Economics & Farm Management<br>Winnipeg, Manitoba<br>R3T 2N2 CANADA |
| 91-3 | U.S. Export Subsidies in Wheat: Strategic Trade Policy or an Expensive Beggar-My-Neighbor Tatic? | Anania, Giovanni<br>Bohman, Mary<br>Colin, Carter A. | Dr. Colin Carter<br>Dept of Ag Economics<br>Univ. California-Davis<br>Davis, CA 95616 |
| 91-4 | The Impact of Real Exchange Rate Misalignment and Instability on Macroeconomic Performance in Sub-Saharan Africa | Ghura, Dhaneshwar<br>Grennes, Thomas J. | Dr. Thomas J. Grennes<br>Dept of Economics & Business<br>North Carolina State Univ<br>P.O. Box 8109<br>Raleigh, NC 27695-8109 |
| 91-5 | Global Grain Stocks and World Market Stability Revisited | Martinez, Steve<br>Sharples, Jerry | Steve Martinez<br>USDA/ERS/ATAD<br>1301 New York Ave NW<br>Room 624<br>Washington, DC 20005-4788 |

| | | | |
|---|---|---|---|
| 91-6 | The Export Enhancement Program: Prospects Under the Food, Agriculture, Conservation, and Trade Act of 1990 | Haley, Stephen L. | Dr. Stephen L. Haley<br>Dept of Ag Economics<br>& Agribusiness<br>Louisiana State University<br>101 Ag Admin Bldg<br>Baton Rouge, LA 70803-5604 |

*The International Agricultural Trade Research Consortium is an informal association of university and government economists interested in agricultural trade. Its purpose is to foster interaction, improve research capacity and to focus on relevant trade policy issues. It is financed by the USDA, ERS and FAS, Agriculture Canada and the participating institutions.

The IATRC Working Paper Series provides members an opportunity to circulate their work at the advanced draft stage through limited distribution within the research and analysis community. The IATRC takes no political positions or responsibility for the accuracy of the data or validity of the conclusions presented by working paper authors. Further, policy recommendations and opinions expressed by the authors do not necessarily reflect those of the IATRC.

Correspondence or requests for copies of working papers should be addressed to the authors at the addresses listed above.

A current list of IATRC publications is available from:

Laura Bipes, Administrative Director
Department of Agricultural & Applied Economics
University of Minnesota
231g Classroom Office Building
1994 Buford Ave
St. Paul, MN 55108
U.S.A.