12-1983

Returns To U.S. Soybean Export Market Development

Gary W. Williams
Iowa State University

Follow this and additional works at: http://lib.dr.iastate.edu/econ_las_staffpapers

Part of the Agribusiness Commons, Applied Statistics Commons, Economic Theory Commons, and the Statistical Models Commons

Recommended Citation
http://lib.dr.iastate.edu/econ_las_staffpapers/48

This Report is brought to you for free and open access by the Economics at Iowa State University Digital Repository. It has been accepted for inclusion in Economic Staff Paper Series by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.
Returns To U.S. Soybean Export Market Development

Abstract
Public and private investment to enhance agricultural output and revenue can be classified as either supply- or demand-oriented. Supply-oriented investments have concentrated on research to improve agricultural productivity. Demand-oriented investments, on the other hand, have attempted to shift the demand schedules for agricultural commodities through promotional activities, thereby enhancing price and stimulating output. While researchers have long debated the sociological implications, economic impacts, and returns to supply-oriented investments (see, for example, (1), (2), (3)), and (4))1, less concern has been directed at the farm-level impact and returns to demand-oriented investments.

Disciplines
Agribusiness | Applied Statistics | Economic Theory | Statistical Models
RETURNS TO U.S. SOYBEAN EXPORT

MARKET DEVELOPMENT

Gary W. Williams
Assistant Professor

Staff Paper 136
December 1983
ACKNOWLEDGEMENTS

The economic models used in this study were developed at Purdue University, Economic Research Service (ERS) of the U.S. Department of Agriculture (USDA), and Chase Econometrics. Funds were also provided by the American Soybean Association (ASA). The author gratefully acknowledges the support of the Foreign Agriculture Service, U.S. Department of Agriculture, and Dr. Robert Acton of ASA, Dr. Jerry Sharples and Philip Paarlberg in ERS, and Dr. Les Myers at Chase Econometrics who provided many useful comments and criticisms. The author also appreciates the helpful comments of a panel of experts that reviewed this study including E. M. Babb, Purdue University; Leo Polopolus, University of Florida; Vern McMinimy, A. E. Staley Co.; James Culver, Commodity Futures Trading Commission; Ed Rossmiller and Phil Mackie, Foreign Agriculture Service, and R. Eddleman, Mississippi State University.

CONTENTS

Summary .......................................................... iii

Introduction ...................................................... 1
Historical Perspective .......................................... 3
Economic Model and Statistical Results ....................... 8
Simulation Analysis ............................................... 14
  The U.S. Soybean Industry .................................. 15
  U.S. Agriculture ............................................. 15
  Returns per Dollar Invested ................................ 19
  Variability in the Level and Commodity
    Emphasis of Funding ....................................... 24
The Brazilian Soybean Industry ............................... 27
Concluding Comments and Implications for Future Funding .. 32
Methodological Appendix ....................................... 36
ECONOMIC EFFECTIVENESS OF FOREIGN MARKET DEVELOPMENT PROGRAMS:

THE CASE OF SOYBEANS AND SOYBEAN PRODUCTS*

Gary W. Williams**

INTRODUCTION

Public and private investment to enhance agricultural output and revenue can be classified as either supply- or demand-oriented. Supply-oriented investments have concentrated on research to improve agricultural productivity. Demand-oriented investments, on the other hand, have attempted to shift the demand schedules for agricultural commodities through promotional activities, thereby enhancing price and stimulating output. While researchers have long debated the sociological implications, economic impacts, and returns to supply-oriented investments (see, for example, (1), (4), (5), (6), (12), and (13)), less concern has been directed at the farm-level impact and returns to demand-oriented investments.

Most demand side studies have considered the impact of generic advertising in the United States on domestic sales of agricultural commodities (3), (7), (11), (14), and (15). Since the early 1950's, the Foreign Agricultural Service (FAS) of the U.S. Department of Agriculture, cooperating with commodity organizations and industry cooperators (third-party contributors), has invested in the creation, expansion, and maintenance of foreign demand for U.S. produced agricultural commodities. Since the early 1950's, over $666.5 million has been invested by all parties in the development of foreign markets for U.S. produced agricultural products. In 1981 alone FAS accounted for $21.2 million of the total $72.5 million invested by all parties in the development of foreign markets for U.S. cotton, wheat, tobacco, soybeans, and products, feed-grains, rice, poultry, fruits, vegetables, and other commodities. While the amounts invested are a matter of public record, little is known about the returns or the impact on U.S. agriculture from such investments.

*The research reported here was completed under a contract between the American Soybean Association (ASA) and Chase Econometrics (CE). The original work on the model utilized here was completed while the author was employed in the International Economics Division of the Economic Research Service of the U.S. Department of Agriculture and while at Purdue University. The views expressed and conclusions reached are solely those of the author and do not necessarily represent those of ASA, CE, or the U.S. Government.

**Gary W. Williams is Senior Economist, Chase Econometrics, Bala Cynwyd, Pennsylvania.

1/ Underlined numbers in parentheses refer to references listed at the end of this report.
Some work has been done by the Florida Department of Citrus to measure the effect of foreign market development expenditures on U.S. exports of orange juice (9) and (10). Lacking alternative measures for other commodities, however, Federal program evaluators and program cooperators generally have had to rely on a simple comparison of gross investments in market development and gross changes in exports to measure program effectiveness and thereby justify continuing investment. Such a comparison is obviously inadequate since many other factors have also affected the volume and value of U.S. agricultural exports over the years, including relative price changes, currency exchange rate fluctuations, trends in livestock and meat production, changes in GNP and personal disposable income, population growth, and changes in government policies around the world. Particularly during the current period of concern over Federal deficits and intense scrutiny of Federal programs, adequate justification for continuing public investments requires a measure of returns per dollar invested and of the unique contribution of foreign market development activities to the observed growth in exports and farm output.

One of the oldest and largest of the foreign market development programs is cooperatively funded by FAS and the American Soybean Association (ASA). Since 1956 when the program was established over $92 million has been invested by all parties in the development of foreign markets for U.S. soybeans and soybean products. Only investments for cotton ($158 million) have been larger. In recent years 15 to 20 percent of total market development investments have been for soybeans and soybean products. This paper presents the results of a quantitative study designed to isolate and measure the net impact of the ASA and FAS cooperative foreign market development program on the U.S. soybean industry in particular and on U.S. agriculture in general. After a brief discussion of the history of the program, the economic model utilized in the quantitative analysis and the statistical results are presented. The economic impact of the program on U.S. agriculture is then evaluated through simulation analysis. The final section provides implications for current funding activities.

HISTORICAL PERSPECTIVE

Expenditures to develop foreign markets for U.S. soybeans and products are financed by soybean growers out of legislated check-off contributions, by FAS, and by third party contributors in the countries of investment. Currently 23 states have legislated check-off requirements of 1/2 to 1 cent per bushel. Recently Wisconsin growers voted for a 2 cent per bushel check-off. Several other states including Indiana and Ohio periodically consider such legislation.

Funded market development activities have tended to fall into the following four general categories: (1) trade servicing, (2) technical servicing, (3) generic or identified soybean product promotion, and (4) administration. Trade servicing includes those activities specifically intended to facilitate or expand U.S. exports of soybeans or soybean products. These include sponsoring trips to the United States by soybean study teams from foreign countries to demonstrate U.S. productive capacity and the reliability of the United States as a soybean and soybean product supplier. Also included under trade servicing for a particular country are
trade press announcements and conferences, advertising in trade periodicals, distribution of promotional material to food buyers and other trade related promotional activities.

Technical servicing encompasses a wide range of activities designed to create and/or expand the type, quality and number of uses of soybeans and products in the countries of expenditure. These include such activities as technical assistance to soybean crushes and oil refiners to improve crush efficiency and the production, handling, and marketing of soybean products, feeding trials and demonstrations, animal nutrition seminars, soybean product research, short courses by U.S. experts on feed technology, and general nutrition seminars.

Generic and identified promotion activities are specifically designed to promote the use of soybean products or manufactures, soybean-based commodities such as formulated feeds or margarine. Generic promotion is intended to foster the use of these commodities by manufacturer and consumers without specifically identifying them as soybean or soybean-based products. Identified soybean product promotion activities, on the other hand, attempt to create or enhance demand for soybean products by differentiating them from their competitors in the market place. Examples of generic promotion include margarine and tofu sales campaigns and consumer education seminars in Japan. Identified promotion activities include baking and cooking seminars and demonstrations for institutional nutritionists, cooks and food buyers to illustrate the quality and versatility of soybean oil, distribution of booklets featuring soyoil and soyfood consumer and institutional recipes, and sharing expenditures related to the sales and marketing of salad oils, margarine and other commodities specifically identified as soybean oil products with third party cooperators in the countries of expenditure.

Administration includes only those activities by each contributor in support of activities in the other three categories. These include, mainly overseas office and clerical staff support and related activities.

Before 1970, market development activities occurred almost entirely in Japan. Data for the pre-1970 period is also rather sketchy. Therefore, the following analysis of the soybean market development program focuses on the period between 1970 and 1980. Total expenditures for market development activities by contributor are given in table 1. Expenditures in North America are not incorporated into the analysis and thus are not included in the totals. Expenditures in North America began only about 1976 and amounted to about 2% of total expenditures.

Figure 2 illustrates that third party contributors have provided the largest share of market development funds since 1971. ASA contributed the smallest share of funds between 1970 and 1974. By 1980 the ASA share had jumped to 34%, surpassing FAS with 28%, but still under the 38% of third-party contributors.

Figure 3 illustrates the regional emphasis of market development expenditures between 1970 and 1980. While Japan accounted for nearly 60% of all expenditures in 1970, its share declined steadily over the period to about 22% in 1980. The European Community share of total expenditures fluctuated
Table 1—Market development expenditures by contributor, 1970-1980

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>ASA Thousand U.S. $</th>
<th>FAS Thousand U.S. $</th>
<th>Third Party Thousand U.S. $</th>
<th>Total Thousand U.S. $</th>
<th>Annual Growth Rate Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>130.0</td>
<td>670.6</td>
<td>457.0</td>
<td>1,257.6</td>
<td>89.2</td>
</tr>
<tr>
<td>1971</td>
<td>197.0</td>
<td>769.9</td>
<td>1,412.0</td>
<td>2,378.9</td>
<td>41.3</td>
</tr>
<tr>
<td>1972</td>
<td>359.0</td>
<td>962.1</td>
<td>2,040.0</td>
<td>3,361.1</td>
<td>11.9</td>
</tr>
<tr>
<td>1973</td>
<td>703.0</td>
<td>1,297.5</td>
<td>1,761.0</td>
<td>3,761.5</td>
<td>23.1</td>
</tr>
<tr>
<td>1974</td>
<td>1,115.0</td>
<td>1,132.1</td>
<td>2,383.0</td>
<td>4,630.1</td>
<td>12.8</td>
</tr>
<tr>
<td>1975</td>
<td>1,575.0</td>
<td>1,495.4</td>
<td>2,152.0</td>
<td>5,222.4</td>
<td>1.2</td>
</tr>
<tr>
<td>1976</td>
<td>1,890.0</td>
<td>1,336.0</td>
<td>2,060.0</td>
<td>5,286.0</td>
<td>1.2</td>
</tr>
<tr>
<td>1977</td>
<td>1,988.0</td>
<td>1,534.3</td>
<td>2,357.0</td>
<td>5,879.3</td>
<td>11.2</td>
</tr>
<tr>
<td>1978</td>
<td>2,628.0</td>
<td>2,052.7</td>
<td>3,300.0</td>
<td>7,980.7</td>
<td>35.7</td>
</tr>
<tr>
<td>1979</td>
<td>3,397.0</td>
<td>2,737.3</td>
<td>3,265.0</td>
<td>9,399.3</td>
<td>17.8</td>
</tr>
<tr>
<td>1980</td>
<td>3,441.0</td>
<td>2,817.1</td>
<td>3,856.0</td>
<td>10,114.1</td>
<td>7.6</td>
</tr>
<tr>
<td>Total</td>
<td>17,423.0</td>
<td>16,804.9</td>
<td>25,043.0</td>
<td>59,270.8</td>
<td></td>
</tr>
</tbody>
</table>

1/ Excludes expenditures in North America. Totals may not add due to rounding errors.

Source: (2).

somewhat but remained between about 30% and 40%. Other Asia and Oceania accounted for 10% to 18% of total expenditures. Expenditures in Africa occurred only in 1979 and 1980 and amounted to less than 1% of the total in those years. The Rest-of-the-World (excluding North America) share of total expenditures grew from about 4% in 1970 to about 20% in 1980.

Figure 4 illustrates the commodity emphasis of expenditures between 1970 and 1980. In the early years funding was almost entirely for the promotion of soybeans. However, the soybean share declined rapidly from nearly 80% in 1970 to 26% in 1973. The emphasis of funding shifted to soybean oil during that period. The share of expenditures for soybean oil jumped from 11% in 1970 to nearly 50% in 1974. The gain in the soybean meal share was more modest, from 6% in 1970 to 16% in 1974. The increase in the soybean meal share between 1974 to 1980 from 16% to 26% pulled down the soybean oil share to about 33% in 1980. The share of expenditures for soyfood has remained between 10% and 15% since about 1972.

While nominal expenditures have trended upwards over time, inflation in the countries of expenditure and changing currency values have seriously eroded the real purchasing power of the expenditures over time. Nominal and real expenditures in the European Community and Japan are compared in figures 5 and 6. The figures show that while nominal expenditures in both countries trended upward between 1970 and 1980, real expenditures peaked in 1972 in Japan and in 1973 in the EC and trended downward until 1978 or 1979. A relatively large increase in funding in 1978 pushed real expenditures up temporarily in Japan. In the EC, a relatively large increase in funding pushed real expenditures up in 1979 and 1980.
Figure 2: Share of Market Development Investment by Contributor

- Foreign Agriculture Service
- American Soybean Association
- Third Party Contributions
FIGURE 3--SHARE OF MARKET DEVELOPMENT INVESTMENT BY REGION

---

PER CENT

EUROPEAN COMMUNITY
JAPAN
OTHER ASIA AND OCEANIA
REST OF THE WORLD
FIGURE 4--SHARE OF MARKET DEVELOPMENT INVESTMENT BY COMMODITY

PER CENT

70 71 72 73 74 75 76 77 78 79 80

SOYBEANS
SOYBEAN MEAL
SOYBEAN OIL
SOY FOOD
Figure 5—Nominal and Real Market Development Investment in the European Community

Nominal: Million US Dollars
Real: Million Deflated DM
FIGURE 6—NOMINAL AND REAL MARKET DEVELOPMENT INVESTMENT IN JAPAN
The basic tool of analysis is a 96-equation econometric model which allows for simultaneous determination of the supplies, demands, prices, and trade of soybeans and soybean products in the major trading regions of the world. These regions include: the United States, Brazil, the European Community (nine members), Canada, Japan, Other Asia and Oceania, Africa, and a Rest-of-the-World region.2/

Market development expenditures are incorporated into the world soybean model as additional explanatory variables in the demand relationships in the five regions where expenditures occurred: the European Community, Japan, Other Asia and Oceania, Africa, and the Rest-of-the-World region. Expenditures for soybean activities are included in the regional soybean crush equations, soybean oil expenditures in the oil demand equations, and soybean meal and soyfood expenditures in the meal demand equations. The soybean meal and soyfood expenditures are added together since a soyfood sector is not explicitly included in the model and since meal is used not only as a livestock feed supplement but also to produce soy protein and other derivatives used in soyfood products.

Before including the expenditure data in the appropriate demand relationships in each region, the expenditures were adjusted for changes in the value of the U.S. dollar abroad and deflated by an index of inflation for the region. The adjusted data thus represent the real purchasing power of expenditures in each region. Because expenditures can be expected to have an impact on demand beyond the expenditure year, a three-year moving average of real expenditures was used in the demand relationships.

An initial attempt was made to use a polynomial distributed lag (PDL) structure of expenditures in the demand equations. Two problems arose which ultimately led to the less sophisticated, three year moving average specification. First, since only 11 years of expenditure data were available, the PDL specification used resulted in degrees of freedom problems for several equations. Second, the PDL regression results were quite inconsistent across regions in the model. It was felt that with the PDL specification, we were attempting to exact rather sophisticated information from a fairly unsophisticated set of expenditure data. The alternative three-year moving average specification, in contrast, produced consistent and reasonable results across regions.

The estimated elasticities of demand with respect to changes in market development expenditures are given in table 2. Each elasticity measures the average percent response of the appropriate demand variable to a one percent change in the three-year moving average of real purchasing power of the

2/ See the methodology appendix for more detail concerning the structure of the model.
Table 2—Estimated expenditure elasticities of demand

|                      | Soybean Demand | Meal Demand | Per Capita Oil Demand  
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>European Community (9)</td>
<td>0.029</td>
<td>0.061</td>
<td>0.042</td>
</tr>
<tr>
<td>Japan</td>
<td>0.041</td>
<td>0.047</td>
<td>0.033</td>
</tr>
<tr>
<td>Other Asia and Oceania</td>
<td>NA</td>
<td>NA</td>
<td>0.017</td>
</tr>
<tr>
<td>Africa</td>
<td>0.045</td>
<td>0.037</td>
<td>0.080</td>
</tr>
<tr>
<td>Rest-of-the-World</td>
<td></td>
<td></td>
<td>0.080</td>
</tr>
</tbody>
</table>

NA = Not applicable.

1/ All elasticities are significant at the 5% or 10% level except the expenditure elasticity of African per capita oil demand which is significant at the 40% level.

2/ High protein meals including soybean, cottonseed, peanut, and rapeseed meals as appropriate in each region.

3/ Major edible vegetable oils including soybean, cottonseed, peanut, and rapeseed oils as appropriate.

4/ Expenditures for soybean, soybean meal, and soyfood market development in this region were included in the Rest-of-the-World region (see methodology appendix).

5/ Gross demand for oil rather than per capita.

The highest estimated expenditure elasticity is for oil demand in the rest-of-the-world and the lowest is for per capita oil demand in Africa. The latter result is not surprising since expenditures in African countries occurred only in fiscal years 1979 and 1980 and represented less than 1% of worldwide expenditures in those years.
Care must be taken in interpreting and using these elasticities since in a simultaneous system the concept of a partial derivative is not strictly valid, i.e., "all else" cannot be considered to be held constant given a change somewhere in the system. For example, market development expenditures designed to increase the demand for soybean meal in a given region will also likely have an impact on the world demand and price of soybeans. Consequently, it is more meaningful to consider the responses of demand to changes in market development expenditures in a simulation context.

SIMULATION ANALYSIS

The measurement of the impact of the ASA and FAS foreign market development program on the U.S. soybean industry and on other sectors of U.S. agriculture is accomplished through iterative simulation of the Chase World Soybean Model and the Chase U.S. Agricultural Model. After obtaining a baseline solution which closely represents actual data for the historical period, market development expenditures are removed from the world soybean model. The resulting iterative simulation solution values are then compared to the baseline solution values.

Four sets of simulations were done: (1) removal of expenditures for all commodities by all contributors in all regions in all years (1970-1980) (one simulation), (2) removal of expenditures for all commodities by all contributors in each region in all years (four simulations—one for each region where expenditures occurred), (3) removal of expenditures for all commodities by each contributor in all regions in all years (three simulations—one for each contributor), and (4) removal of expenditures for soybeans and for soybean products by all contributors in all regions in 1971 (two simulations—one for soybeans and one for soybean products).

THE U.S. SOYBEAN INDUSTRY

The simulated impacts on the U.S. soybean industry attributed to market development expenditures are summarized in tables 3 and 4. These results indicate that market development expenditures between 1970 and 1980 were responsible for increasing U.S. soybean acreage by an average 1.23 million acres (2.3%), production by 34.7 million bushels (2.3%), soybean crush by 12.8 million bushels (1.4%), the farm price of soybeans by 8 cents/bushel (1.7%), the wholesale prices of soybean meal and oil by $4.17/ton (3%) and 0.2 cents/lb. (1.2%), respectively, and cash receipts by $301.9 million (4.0%). U.S. exports of soybeans average 21 million bushels (4.1%) higher, soybean meal exports 665 thousand tons (11.6%) higher, and soybean oil exports 176 million lbs. (11.7%) higher, reaching over 30% higher in 1976. Total soybean, soybean meal and soybean oil export revenues increased by an average of over $342 million (7.5%).

3/ For more detail, see the methodology appendix.
Table 3—Impact of market development expenditures on the U.S. soybean industry, 1969/70 - 1979/80

<table>
<thead>
<tr>
<th>Marketing Year</th>
<th>Soybean Harvested Acreage</th>
<th>Soybean Production</th>
<th>Soybean Crush</th>
<th>Soybean Farm Price</th>
<th>Wholesale Soybean Price</th>
<th>Wholesale Soymeal Price</th>
<th>Wholesale Soy Oil Price</th>
<th>Soybean Cash Receipts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969/70</td>
<td>0.00</td>
<td>0.00</td>
<td>-10.02</td>
<td>0.03</td>
<td>0.35</td>
<td>0.00</td>
<td>37.89</td>
<td></td>
</tr>
<tr>
<td>1970/71</td>
<td>0.37</td>
<td>9.94</td>
<td>-16.19</td>
<td>0.07</td>
<td>1.42</td>
<td>0.00</td>
<td>106.19</td>
<td></td>
</tr>
<tr>
<td>1971/72</td>
<td>0.79</td>
<td>21.62</td>
<td>-13.45</td>
<td>0.12</td>
<td>2.31</td>
<td>0.44</td>
<td>201.20</td>
<td></td>
</tr>
<tr>
<td>1972/73</td>
<td>1.51</td>
<td>42.13</td>
<td>4.32</td>
<td>0.13</td>
<td>4.20</td>
<td>0.81</td>
<td>347.55</td>
<td></td>
</tr>
<tr>
<td>1973/74</td>
<td>1.82</td>
<td>50.65</td>
<td>23.71</td>
<td>0.11</td>
<td>4.29</td>
<td>1.06</td>
<td>456.05</td>
<td></td>
</tr>
<tr>
<td>1974/75</td>
<td>1.72</td>
<td>40.83</td>
<td>22.23</td>
<td>0.10</td>
<td>6.69</td>
<td>0.37</td>
<td>388.23</td>
<td></td>
</tr>
<tr>
<td>1975/76</td>
<td>1.76</td>
<td>50.90</td>
<td>28.08</td>
<td>0.02</td>
<td>5.66</td>
<td>-0.18</td>
<td>277.25</td>
<td></td>
</tr>
<tr>
<td>1976/77</td>
<td>1.19</td>
<td>30.90</td>
<td>20.79</td>
<td>0.08</td>
<td>8.21</td>
<td>-0.19</td>
<td>313.20</td>
<td></td>
</tr>
<tr>
<td>1977/78</td>
<td>1.49</td>
<td>45.55</td>
<td>25.04</td>
<td>0.05</td>
<td>6.34</td>
<td>-0.07</td>
<td>349.70</td>
<td></td>
</tr>
<tr>
<td>1978/79</td>
<td>1.48</td>
<td>43.48</td>
<td>27.11</td>
<td>0.04</td>
<td>5.17</td>
<td>0.12</td>
<td>358.31</td>
<td></td>
</tr>
<tr>
<td>1979/80</td>
<td>1.43</td>
<td>45.81</td>
<td>28.03</td>
<td>0.09</td>
<td>7.23</td>
<td>0.27</td>
<td>464.84</td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>1.23</td>
<td>34.71</td>
<td>12.77</td>
<td>0.08</td>
<td>4.17</td>
<td>0.24</td>
<td>391.85</td>
<td></td>
</tr>
</tbody>
</table>

---percent change---

| 1969/70        | -1.4                      | 1.4                  | 0.4           | 0.0               | 1.4                    |
| 1970/71        | -2.1                      | 2.4                  | 1.8           | 0.0               | 3.3                    |
| 1971/72        | -1.9                      | 3.9                  | 2.6           | 3.9               | 5.6                    |
| 1972/73        | -0.6                      | 3.0                  | 1.8           | 4.9               | 6.3                    |
| 1973/74        | -2.9                      | 2.0                  | 2.9           | 3.4               | 5.2                    |
| 1974/75        | -3.2                      | 1.5                  | 5.1           | 1.2               | 4.8                    |
| 1975/76        | -3.2                      | 0.4                  | 3.8           | -1.0              | 3.6                    |
| 1976/77        | -2.6                      | 1.2                  | 4.1           | -0.8              | 3.6                    |
| 1977/78        | -2.8                      | 0.8                  | 3.9           | -0.3              | 3.4                    |
| 1978/79        | -2.7                      | 0.6                  | 2.7           | 0.4               | 2.9                    |
| 1979/80        | -2.5                      | 1.4                  | 4.0           | 1.1               | 3.4                    |
| Average        | -2.3                      | 1.4                  | 1.7           | 3.0               | 4.0                    |
The emphasis of funding on soybeans in the early 1970s led to larger U.S. exports in soybeans but some reduction in the level of soybean crush. Consequently, U.S. production and exports of soybean meal and oil dropped during that period. The switch in the emphasis of funding to soybean products in the mid-1970s, however, boosted U.S. production and exports of both soybean meal and oil as well as the level of soybean crush.

U.S. AGRICULTURE

The ASA and FAS foreign market development program indirectly affects other sectors of U.S. agriculture through its impact on the U.S. soybean industry. Table 5 shows that these indirect effects have been small and spread over a large number of commodities. In the crop sector, the 1.23 million increase in soybean harvested acreage results in some shifting of acreage among crops with a small net decline of about 80,000 acres in crops other than soybeans. The remainder of the soybean acreage increase comes from set aside (about 20,000 acres), new land, and more intensive use of land such as an increase in double cropping of wheat and soybeans. Both average prices and cash receipts of crops other than soybeans increase by less than 1%.

In the livestock sector, the slightly higher cost of feedstuffs as a result of the program contributes to a small decline in meat production and about a 1% increase in livestock prices at the farm level. Livestock cash receipts also increase by about 1%. High protein consuming animal units decline marginally.

The measured net impact of the program on the consumer price index (CPI) for food and consequently on the CPI for all goods and services is extremely small. Both the index of prices received and paid by farmers increase by less than 1%.
Table 4—Impact of market development expenditures on U.S. exports, 1969-70 - 1979/80

<table>
<thead>
<tr>
<th>Marketing Year</th>
<th>Soybean exports</th>
<th>Soybean Meal exports</th>
<th>Soybean Oil exports</th>
<th>Export revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Million bushel</td>
<td>Million tons</td>
<td>Million lbs.</td>
<td>Million U.S.$</td>
</tr>
<tr>
<td>1969/70</td>
<td>11.35</td>
<td>-213.67</td>
<td>-73.04</td>
<td>20.31</td>
</tr>
<tr>
<td>1970/71</td>
<td>25.20</td>
<td>-254.25</td>
<td>-141.60</td>
<td>74.18</td>
</tr>
<tr>
<td>1971/72</td>
<td>35.06</td>
<td>-105.82</td>
<td>-28.29</td>
<td>163.12</td>
</tr>
<tr>
<td>1972/73</td>
<td>33.04</td>
<td>412.57</td>
<td>123.00</td>
<td>407.47</td>
</tr>
<tr>
<td>1973/74</td>
<td>25.15</td>
<td>860.24</td>
<td>327.72</td>
<td>473.07</td>
</tr>
<tr>
<td>1974/75</td>
<td>19.14</td>
<td>972.62</td>
<td>269.81</td>
<td>396.88</td>
</tr>
<tr>
<td>1975/76</td>
<td>18.25</td>
<td>1,128.54</td>
<td>331.66</td>
<td>354.66</td>
</tr>
<tr>
<td>1976/77</td>
<td>16.99</td>
<td>1,083.65</td>
<td>296.79</td>
<td>483.70</td>
</tr>
<tr>
<td>1977/78</td>
<td>17.63</td>
<td>1,115.57</td>
<td>286.24</td>
<td>424.48</td>
</tr>
<tr>
<td>1978/79</td>
<td>15.85</td>
<td>1,068.55</td>
<td>259.15</td>
<td>445.32</td>
</tr>
<tr>
<td>1979/80</td>
<td>13.36</td>
<td>1,243.55</td>
<td>287.16</td>
<td>514.22</td>
</tr>
<tr>
<td>Average</td>
<td>21.00</td>
<td>664.67</td>
<td>176.24</td>
<td>341.58</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percent change</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1969/70</td>
<td>2.6</td>
<td>-5.2</td>
<td>-5.0</td>
<td>1.3</td>
</tr>
<tr>
<td>1970/71</td>
<td>5.8</td>
<td>-5.5</td>
<td>-7.9</td>
<td>3.9</td>
</tr>
<tr>
<td>1971/72</td>
<td>8.4</td>
<td>-2.7</td>
<td>-2.0</td>
<td>8.7</td>
</tr>
<tr>
<td>1972/73</td>
<td>6.9</td>
<td>8.6</td>
<td>11.3</td>
<td>9.5</td>
</tr>
<tr>
<td>1973/74</td>
<td>4.7</td>
<td>15.4</td>
<td>22.4</td>
<td>10.3</td>
</tr>
<tr>
<td>1974/75</td>
<td>4.5</td>
<td>22.4</td>
<td>28.4</td>
<td>11.1</td>
</tr>
<tr>
<td>1975/76</td>
<td>3.3</td>
<td>21.7</td>
<td>32.1</td>
<td>9.2</td>
</tr>
<tr>
<td>1976/77</td>
<td>3.0</td>
<td>23.5</td>
<td>18.5</td>
<td>8.9</td>
</tr>
<tr>
<td>1977/78</td>
<td>2.5</td>
<td>18.1</td>
<td>13.4</td>
<td>7.3</td>
</tr>
<tr>
<td>1978/79</td>
<td>2.1</td>
<td>16.0</td>
<td>10.8</td>
<td>6.2</td>
</tr>
<tr>
<td>1979/80</td>
<td>1.5</td>
<td>15.6</td>
<td>10.4</td>
<td>6.6</td>
</tr>
<tr>
<td>Average</td>
<td>4.1</td>
<td>11.6</td>
<td>11.7</td>
<td>7.5</td>
</tr>
</tbody>
</table>
Table 5—Average impact of soybean market development expenditures on U.S. agriculture, 1970-1980

<table>
<thead>
<tr>
<th>Crop</th>
<th>Average change in:</th>
<th>Percent change in:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acres harvested</td>
<td>Farm prices</td>
</tr>
<tr>
<td></td>
<td>Million</td>
<td>$/bu.</td>
</tr>
<tr>
<td>Corn</td>
<td>-0.06</td>
<td>0.01</td>
</tr>
<tr>
<td>Wheat</td>
<td>0.06</td>
<td>0.01</td>
</tr>
<tr>
<td>Cotton</td>
<td>-0.02</td>
<td>0.07</td>
</tr>
<tr>
<td>Barley</td>
<td>-0.03</td>
<td>0.02</td>
</tr>
<tr>
<td>Oats</td>
<td>-0.08</td>
<td>0.01</td>
</tr>
<tr>
<td>Sorghum</td>
<td>0.02</td>
<td>0.01</td>
</tr>
<tr>
<td>Soybeans</td>
<td>1.23</td>
<td>0.08</td>
</tr>
<tr>
<td>Average principal crops</td>
<td>1.15</td>
<td>--</td>
</tr>
<tr>
<td>Set aside</td>
<td>-0.02</td>
<td>--</td>
</tr>
</tbody>
</table>

CROP SECTOR

<table>
<thead>
<tr>
<th>Crop</th>
<th>Average change in:</th>
<th>Percent change in:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Production</td>
<td>Farm prices</td>
</tr>
<tr>
<td></td>
<td>Million</td>
<td>$/Cwt</td>
</tr>
<tr>
<td>Beef</td>
<td>-155.30</td>
<td>0.46</td>
</tr>
<tr>
<td>Pork</td>
<td>-28.36</td>
<td>0.38</td>
</tr>
<tr>
<td>Poultry</td>
<td>-28.82</td>
<td>0.34</td>
</tr>
<tr>
<td>All livestock</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

LIVESTOCK SECTOR

<table>
<thead>
<tr>
<th>Crop</th>
<th>Average change:</th>
<th>Percent change:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPI (all goods and services)</td>
<td>0.09</td>
<td>0.05</td>
</tr>
<tr>
<td>CPI (all food; 1967=100)</td>
<td>0.45</td>
<td>0.25</td>
</tr>
<tr>
<td>High protein animal units (million)</td>
<td>-0.58</td>
<td>-0.25</td>
</tr>
<tr>
<td>Prices paid by farmers (1967=100)</td>
<td>0.27</td>
<td>0.20</td>
</tr>
<tr>
<td>Prices received by farmers (1967=100)</td>
<td>0.90</td>
<td>0.55</td>
</tr>
</tbody>
</table>

1/ Cents/lb

2/ Corn, sorghum, oats, barley, wheat, rice, rye, soybeans, flaxseed, peanuts, sunflowers, popcorn, cotton, hay, edible beans, edible peas, potatoes, sweet potatoes, tobacco, sugarbeets, and sugarcane.
RETURNS PER DOLLAR INVESTED

Two sets of returns per dollar invested for market development are discussed below: returns to exports (defined as the change in U.S. soybean, soybean meal, and soybean oil export revenue per dollar invested) and returns to growers (defined as the change in soybean cash receipts per dollar invested). The average returns per dollar expended by all contributors over the period 1970 to 1980 are provided in Table 6. Export returns to all contributors average about $62 per dollar invested while grower returns average slightly lower at $58 per dollar invested.

The returns realized by each individual contributor are measured in two ways. First, the return to each contributor is derived by dividing the revenue gain from the sum of expenditures of all three parties by the expenditure of each respective contributor. This method of calculating returns assumes that each individual contributor can take credit for the total increase in revenues from the expenditures by all parties. This amounts to assuming that the program would not exist if any one of the three contributors pulled out of the program. This method of calculation, however, provides no indication of the returns generated by each contributor alone.

Second, since the shares of total expenditures accounted for by each contributor changed considerably in total and by region and commodity over the period, it is interesting to consider the returns generated by each contribution alone. This is done by dividing the revenue gain from each individual contributor's expenditures by that contributor's expenditures. This method of calculating returns assumes that each individual contributor can only take credit for that portion of total revenues which its expenditures alone generated. This amounts to assuming that expenditures of the other two contributors would continue unaffected if any one of the three contributors pulled out of the program.

The average returns per market development dollar by contributor calculated according to the first method above are shown in Table 6. Because the ASA share of total expenditures was relatively small in the early 1970's, the total export and grower returns per ASA dollar invested are extremely high during that period, peaking at between $540 and $545 per dollar invested. In later years, as the ASA share of total expenditures increase sharply, the returns to each ASA dollar spent drops to near $100. The average export return per ASA dollar over the period is about $281. Returns to FAS expenditures are lower than ASA returns from 1970 to 1975 and higher than ASA returns after 1975. This simply reflects the changing shares of ASA and FAS expenditures (see figure 2). The average export return per FAS dollar is only slightly lower at $220. Third party returns remain fairly constant at about $100 to $200 per dollar invested over most of the period.
Because the ASA share of total expenditures was relatively small in the early 1970's, the total export and grower returns per ASA dollar invested are extremely high during that period, peaking at between $540 and $545 per dollar invested. In later years, as the ASA share of total expenditures increase sharply, the returns to each ASA dollar spent drops to near $100. The average export return per ASA dollar over the period is about $281. Returns to FAS expenditures are lower than ASA returns from 1970 to 1975 and higher than ASA returns after 1975. This simply reflects the changing shares of ASA and FAS expenditures (see figure 2). The average export return per FAS dollar is only slightly lower at $220. Third party returns remain fairly constant at about $100 to $200 per dollar invested over most of the period.

Table 6--Average returns per market development dollar by contributor, 1970-80

<table>
<thead>
<tr>
<th>Average returns to:</th>
<th>Total US$/dollar invested</th>
<th>ASA</th>
<th>FAS</th>
<th>Third Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exports</td>
<td>61.9</td>
<td>280.8</td>
<td>220.2</td>
<td>141.8</td>
</tr>
<tr>
<td>Growers</td>
<td>57.7</td>
<td>292.4</td>
<td>201.7</td>
<td>130.2</td>
</tr>
</tbody>
</table>

\(^1\) Returns calculated by dividing the revenue gain from the sum of expenditures by all three parties by the expenditure of each respective contributor. This amounts to assuming that the program would not exist if any one of the three contributors pulled out of the program.
The average returns generated by each contributor alone are given in table 7.5. The comparatively small share of total expenditures by ASA in the early 1970s results in comparatively low returns to ASA during that period. The increasing level of ASA expenditures through 1977, however, increased export returns from $7 to about $92. Grower revenues generated by ASA expenditures increased from $29 in 1970 to $76 in 1977. The rate of growth in ASA expenditures during that period was sufficient to maintain and even increase the real purchasing power of those dollars through 1977, after which the slower rate of growth allowed some deterioration in purchasing power and returns per dollar expended. The rate of growth in FAS and 3rd party expenditures, however, dropped off in the early 1970s resulting in declining returns per dollar expended by each through 1980.

While all of the foregoing analysis is based on the results of the iterative simulation of the Chase U.S. Agricultural Model and World Soybean Model, the data presented in table 7 are not. Because the impacts on the U.S. agricultural sector from the total program are so small, the impact of the expenditures of any one contributor would be even smaller. Thus, the benefit of iterating the solutions from these three simulations (the impacts of ASA alone, FAS alone, and Third Party Contributors alone) through the U.S. Agricultural Model would be far outweighed by the computational costs. Consequently, the numbers presented in table 7 may be slightly overstated because, for example, the small positive simulated import on prices of alternative crops would lead to a slight reduction to soybean acreage and cash receipts over time.
Table 7—Average returns generated by specified contributor per dollar invested by the contributor, 1970-1980

<table>
<thead>
<tr>
<th>Average returns to:</th>
<th>ASA</th>
<th>FAS</th>
<th>Third Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exports</td>
<td>66.4</td>
<td>63.8</td>
<td>64.1</td>
</tr>
<tr>
<td>Growers</td>
<td>57.5</td>
<td>45.9</td>
<td>48.9</td>
</tr>
</tbody>
</table>

1/ Returns calculated by dividing the revenue gain from each individual contributor's expenditures by that contributor's expenditures. This amounts to assuming that the expenditures of the other two contributors would continue unaffected if any one of the three contributors pulled out of the program.

Table 8 summarizes the regional differences in export and grower returns. The returns are calculated by dividing the revenue gains from expenditures by all contributors in a given region by total expenditures in that region. This amounts to assuming that expenditures in other regions would continue unaffected if expenditures in any one region were discontinued. With the exception of the Rest-of-the-World region between 1970 and 1974, the average returns to expenditures were higher per dollar expended in the European Community than in any other region. Export returns per dollar invested in the EC averaged $88. Grower returns are slightly lower for the EC at an average of $76. Export and grower returns per dollar invested in Japan are the lowest and most consistent at an average of $20.
Table 8—Average returns per market development dollar invested in specified region by contributor, 1970-80 /1/

<table>
<thead>
<tr>
<th>Average returns to:</th>
<th>E.C.</th>
<th>Japan</th>
<th>Other Asia</th>
<th>Rest of the World</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exports</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASA</td>
<td>347.7</td>
<td>140.0</td>
<td>236.7</td>
<td>309.6</td>
</tr>
<tr>
<td>FAS</td>
<td>496.2</td>
<td>73.1</td>
<td>272.9</td>
<td>172.2</td>
</tr>
<tr>
<td>Third Party</td>
<td>191.0</td>
<td>38.6</td>
<td>147.5</td>
<td>413.2</td>
</tr>
<tr>
<td>All Contributors</td>
<td>88.1</td>
<td>19.8</td>
<td>64.3</td>
<td>107.4</td>
</tr>
<tr>
<td><strong>Growers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ASA</td>
<td>349.3</td>
<td>154.7</td>
<td>234.1</td>
<td>267.5</td>
</tr>
<tr>
<td>FAS</td>
<td>411.3</td>
<td>68.1</td>
<td>254.0</td>
<td>167.9</td>
</tr>
<tr>
<td>Third Party</td>
<td>162.4</td>
<td>37.5</td>
<td>139.6</td>
<td>361.5</td>
</tr>
<tr>
<td>All Contributors</td>
<td>76.4</td>
<td>19.2</td>
<td>60.7</td>
<td>108.7</td>
</tr>
</tbody>
</table>

/1/ Returns calculated by dividing the revenue gains from expenditures by all contributors in a given region by total expenditures in that region. This amounts to assuming that expenditures in other regions would continue unaffected if expenditures in any one region were discontinued. For reasons discussed previously, the solutions from these four regional simulations were not iterated through the U.S. Agricultural Model. Thus, as before, regional returns presented may be slightly overstated.

Export and grower returns in Other Asia average $64 and $61, respectively, per dollar invested. The time path of regional returns per market development dollar indicated a very high return in the early years expenditure in the less mature markets of Asia and Oceania and the rest-of-the-world region. For example, grower and export returns reached over $300 in 1972, reflecting small export and grower revenues from comparatively smaller expenditures. Between 1975 and 1980, however, export and grower returns for the Rest-of-the-World region dropped to an average $66 and $55, respectively, per dollar invested.

The differences in returns by contributor in each region generally reflect the differences in the proportion of total expenditures in each region accounted for by each contributor. Since U.S. export and grower revenue generated by total expenditures in a given region are attributed to the expenditures of each contributor, then the smaller the proportion of total expenditures accounted for by a given contributor, the higher the relative return per dollar expended by that contributor.
Since expenditures to enhance foreign demand for U.S. soybeans and products resulted in an increase in U.S. production of soybeans, gross cash receipts must be discounted by the additional costs of production in order to arrive at a measure of net returns to growers. Table 9 indicates that the additional production led to an average $268 million more in additional production costs over the years 1977/78 - 1979/80. Discounting the additional cash receipts over the same period by the additional costs gives average net additional receipts of $130 million. The average net return to growers over that period is $14.2 for each dollar of the $9.17 million invested in foreign market development.

VARIABILITY IN THE LEVEL AND COMMODITY EMPHASIS OF FUNDING

Because of the variability in the level of funding from year to year, it is interesting to consider the loss of export and grower revenue from a one year cut in funding. Figure 7 illustrates the cumulative soybean (not including soybean products) export revenue loss per dollar cut in market development expenditures for soybean promotional activities alone in only one year—1971. For every dollar not spent during 1971, the cumulative loss in soybean export revenue between 1971 and 1980 totals $136. The cumulative nature of this loss emphasizes that a one year cut in funding has negative implications for U.S. export revenue well beyond the first year. Since market development expenditures create a stream of new revenues, a cut in expenditures results in a disruption in the stream over several years. In this study, due to the impact structure of market development expenditures in the regional demand equations, the soybean export revenue drop from a cut in funding of soybean activities occurs almost totally in the first three years.

The joint product nature of soybeans and soybean products means that a cut in funding of market development activities for soybeans has implications for the export revenue of soybean products. Figure 8 emphasizes that a cut in soybean funding would likely lead to greater U.S. soybean meal and oil export revenue. This is so because a reduction in expenditures on soybean promotional activities, which results in a drop in soybean imports by a country, also reduces the production of meal and oil in that country and forces it to satisfy internal demand for meal and oil from available world supplies. The net cumulative impact on U.S. export revenue in this case is very close to zero.
Table 9—Calculation of net returns to growers per market development dollar invested, 1977/78 - 1979/80

<table>
<thead>
<tr>
<th></th>
<th>1977/78</th>
<th>1978/79</th>
<th>1979/80</th>
<th>3-Year average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual cost of production</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>total costs</td>
<td>5.14</td>
<td>5.31</td>
<td>7.39</td>
<td>5.95</td>
</tr>
<tr>
<td>total excl. land costs</td>
<td>3.39</td>
<td>3.60</td>
<td>5.02</td>
<td>4.00</td>
</tr>
<tr>
<td>variable costs</td>
<td>1.94</td>
<td>2.00</td>
<td>2.77</td>
<td>2.24</td>
</tr>
<tr>
<td>Total</td>
<td>11.47</td>
<td>12.91</td>
<td>15.18</td>
<td>13.21</td>
</tr>
<tr>
<td>Cost of additional production</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>total costs</td>
<td>234.12</td>
<td>230.88</td>
<td>338.54</td>
<td>267.85</td>
</tr>
<tr>
<td>total excl. land costs</td>
<td>154.41</td>
<td>156.53</td>
<td>230.00</td>
<td>180.31</td>
</tr>
<tr>
<td>variable costs</td>
<td>88.37</td>
<td>86.96</td>
<td>126.89</td>
<td>100.74</td>
</tr>
<tr>
<td>Total</td>
<td>477.90</td>
<td>474.47</td>
<td>695.43</td>
<td>557.20</td>
</tr>
<tr>
<td>Cash receipts added by MDE(1/)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>total costs</td>
<td>349.70</td>
<td>358.31</td>
<td>484.84</td>
<td>397.62</td>
</tr>
<tr>
<td>Cost of additional production</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>total costs</td>
<td>115.58</td>
<td>127.43</td>
<td>146.30</td>
<td>129.77</td>
</tr>
<tr>
<td>total excl. land costs</td>
<td>195.29</td>
<td>201.78</td>
<td>254.84</td>
<td>217.30</td>
</tr>
<tr>
<td>variable costs</td>
<td>261.33</td>
<td>271.35</td>
<td>357.95</td>
<td>296.88</td>
</tr>
<tr>
<td>Cash receipts minus:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>total costs</td>
<td>14.48</td>
<td>13.56</td>
<td>14.46</td>
<td>14.17</td>
</tr>
<tr>
<td>total excl. land costs</td>
<td>24.47</td>
<td>21.47</td>
<td>25.20</td>
<td>23.71</td>
</tr>
<tr>
<td>variable costs</td>
<td>32.74</td>
<td>28.87</td>
<td>35.39</td>
<td>32.33</td>
</tr>
</tbody>
</table>

\(1/\) Market development expenditures worldwide.
FIGURE 7—CUMULATIVE IMPACT OF U.S. SOYBEAN EXPORT REVENUE PER DOLLAR CUT IN INVESTMENT IN 1971
FIGURE 8—CUMULATIVE CHANGE IN EXPORT REVENUE OF A CHANGE IN COMMODITY EMPHASIS IN 1971 FROM SOYBEANS TO SOYBEAN PRODUCTS

US DOLLARS

CUMULATIVE CHANGE IN SOYBEAN EXPORT REVENUE PER DOLLAR INVESTED
CUMULATIVE CHANGE IN SOYBEAN OIL EXPORT REVENUE PER DOLLAR INVESTED
CUMULATIVE CHANGE IN SOYBEAN MEAL EXPORT REVENUE PER DOLLAR INVESTED
CUMULATIVE NET CHANGE PER DOLLAR INVESTED
FIGURE 9—CUMULATIVE CHANGE IN EXPORT REVENUE OF A CHANGE IN COMMODITY EMPHASIS IN 1971 FROM SOYBEAN PRODUCTS TO SOYBEANS

CUMULATIVE CHANGE IN SOYBEAN EXPORT REVENUE PER DOLLAR INVESTED
CUMULATIVE CHANGE IN SOYBEAN OIL EXPORT REVENUE PER DOLLAR INVESTED
CUMULATIVE CHANGE IN SOYBEAN MEAL EXPORT REVENUE PER DOLLAR INVESTED
CUMULATIVE NET CHANGE PER DOLLAR INVESTED
On the other hand, as figure 9 illustrates, a one year (1971) elimination of market development expenditures for soybean meal and oil alone would result in a net cumulative loss in export revenue. The cumulative net loss per dollar cut in funding is about $133. This occurs because the drop in demand for soybean meal and oil brought about by the drop in expenditures leads to a drop in the demand for soybeans to crush as well. The implication, therefore, is that a shift in the emphasis of funding from soybeans to soybean product would likely result in a gain in export revenue.

THE BRAZILIAN SOYBEAN INDUSTRY

An important concern to all contributors is the impact of the U.S. market development program activities on the soybean industries and exports of U.S. competitors in the world soybean market. While there has been some effort to differentiate U.S. from foreign produced soybeans and products in market development activities, in general the program has attempted only to create markets for these commodities. To the extent that the program has been successful in expanding U.S. exports, therefore, exports from U.S. competitors such as Brazil also have likely gained. This section considers the extent of the gain by Brazil.

Table 10 indicates that as a result of the U.S. market development program in 1970-80, Brazilian soybean production and crush increased by an average 171 thousand metric tons (m.t.) (1.7%) and 32 thousand m.t. (0.5%), respectively. Brazilian soybean meal and oil exports increased by an average of 26 thousand m.t. (0.6%) and 30 thousand m.t. (6.7%), respectively. Brazilian soybean exports increased by an average 139 thousand m.t. (13.2%). Brazilian export revenue increased by $3.4 million dollars (5.4%). The large percentage increase in Brazilian exports in 1978/79, 1979/80, and 1980/81 as a result of U.S. market development expenditures is due to an abnormally low level of Brazilian exports in those years following two years of drought.

The results reported here for Brazil (as for the United States) were adjusted by the impacts on all sectors of U.S. agriculture through iterative simulation of the U.S. Agriculture and World Soybean Models (see methodology appendix).
Table 10—Impact of market development expenditures on the Brazilian soybean industry, 1970/71 - 1980/81

<table>
<thead>
<tr>
<th>Marketing Year</th>
<th>Soybean Production</th>
<th>Soybean Crush</th>
<th>Soybean Exports</th>
<th>Soymeal Exports</th>
<th>Soyoil Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970/71</td>
<td>0.00</td>
<td>-0.97</td>
<td>0.97</td>
<td>-0.63</td>
<td>0.00</td>
</tr>
<tr>
<td>1971/72</td>
<td>6.51</td>
<td>-0.38</td>
<td>6.89</td>
<td>0.49</td>
<td>0.46</td>
</tr>
<tr>
<td>1972/73</td>
<td>29.48</td>
<td>2.97</td>
<td>26.51</td>
<td>3.40</td>
<td>2.44</td>
</tr>
<tr>
<td>1973/74</td>
<td>88.87</td>
<td>12.64</td>
<td>76.23</td>
<td>10.45</td>
<td>8.12</td>
</tr>
<tr>
<td>1974/75</td>
<td>175.87</td>
<td>32.98</td>
<td>142.89</td>
<td>27.26</td>
<td>18.47</td>
</tr>
<tr>
<td>1975/76</td>
<td>237.16</td>
<td>45.63</td>
<td>191.54</td>
<td>37.66</td>
<td>30.44</td>
</tr>
<tr>
<td>1976/77</td>
<td>278.00</td>
<td>56.51</td>
<td>221.49</td>
<td>45.26</td>
<td>42.14</td>
</tr>
<tr>
<td>1977/78</td>
<td>277.88</td>
<td>54.05</td>
<td>223.82</td>
<td>43.09</td>
<td>50.72</td>
</tr>
<tr>
<td>1978/79</td>
<td>227.56</td>
<td>42.82</td>
<td>184.74</td>
<td>34.63</td>
<td>53.43</td>
</tr>
<tr>
<td>1979/80</td>
<td>249.11</td>
<td>45.34</td>
<td>203.77</td>
<td>36.03</td>
<td>56.96</td>
</tr>
<tr>
<td>1980/81</td>
<td>313.33</td>
<td>60.63</td>
<td>252.70</td>
<td>47.76</td>
<td>64.12</td>
</tr>
<tr>
<td>Average</td>
<td>171.25</td>
<td>32.02</td>
<td>139.23</td>
<td>25.95</td>
<td>29.76</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marketing Year</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970/71</td>
<td>0.0</td>
</tr>
<tr>
<td>1971/72</td>
<td>0.3</td>
</tr>
<tr>
<td>1972/73</td>
<td>0.8</td>
</tr>
<tr>
<td>1973/74</td>
<td>1.8</td>
</tr>
<tr>
<td>1974/75</td>
<td>2.2</td>
</tr>
<tr>
<td>1975/76</td>
<td>2.4</td>
</tr>
<tr>
<td>1976/77</td>
<td>2.5</td>
</tr>
<tr>
<td>1977/78</td>
<td>2.2</td>
</tr>
<tr>
<td>1978/79</td>
<td>2.4</td>
</tr>
<tr>
<td>1979/80</td>
<td>2.4</td>
</tr>
<tr>
<td>1980/81</td>
<td>2.1</td>
</tr>
<tr>
<td>Average</td>
<td>1.7</td>
</tr>
</tbody>
</table>

ND: Percent change not defined. Change from small negative number (net imports) to small positive number (net exports).
### Table 11—Impact of market development expenditures on U.S. exports, 1969/70 - 1979/80

<table>
<thead>
<tr>
<th>Marketing Year</th>
<th>Soybean exports</th>
<th>Soymeal exports</th>
<th>Soyoil exports</th>
<th>Export revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969/70</td>
<td>308.85</td>
<td>-193.84</td>
<td>-33.13</td>
<td>20.31</td>
</tr>
<tr>
<td>1970/71</td>
<td>685.90</td>
<td>-230.65</td>
<td>-64.23</td>
<td>74.18</td>
</tr>
<tr>
<td>1971/72</td>
<td>954.22</td>
<td>-96.00</td>
<td>-12.83</td>
<td>163.12</td>
</tr>
<tr>
<td>1972/73</td>
<td>899.09</td>
<td>374.28</td>
<td>55.79</td>
<td>407.47</td>
</tr>
<tr>
<td>1973/74</td>
<td>684.41</td>
<td>780.40</td>
<td>148.65</td>
<td>473.07</td>
</tr>
<tr>
<td>1974/75</td>
<td>520.95</td>
<td>882.35</td>
<td>122.38</td>
<td>396.88</td>
</tr>
<tr>
<td>1975/76</td>
<td>496.62</td>
<td>1,023.80</td>
<td>150.44</td>
<td>354.66</td>
</tr>
<tr>
<td>1976/77</td>
<td>462.50</td>
<td>983.07</td>
<td>134.62</td>
<td>483.70</td>
</tr>
<tr>
<td>1977/78</td>
<td>479.89</td>
<td>1,012.02</td>
<td>129.84</td>
<td>424.48</td>
</tr>
<tr>
<td>1978/79</td>
<td>431.48</td>
<td>969.38</td>
<td>117.55</td>
<td>445.32</td>
</tr>
<tr>
<td>1979/80</td>
<td>363.54</td>
<td>1,127.95</td>
<td>130.25</td>
<td>514.22</td>
</tr>
<tr>
<td>Average</td>
<td>571.59</td>
<td>602.98</td>
<td>79.94</td>
<td>341.58</td>
</tr>
</tbody>
</table>

In order to compare the relative impacts on Brazilian and U.S. exports, the information on the impact on U.S. exports and export revenue from table 4 is converted to a standard 1,000 m.t. basis in table 11. The percentage changes in tables 4 and 11 remain the same. A comparison of tables 10 and 11, therefore indicates that the impact on U.S. exports is many times greater than the corresponding impact on Brazilian exports and export revenue. This is also indicated by a comparison of the increases in Brazilian and U.S. export revenues per market development dollar. U.S. export returns averaged $57.7 per market development dollar, nearly 4.5 times the $13.2 per market development dollar return in export revenues to Brazil.

Together, tables 10 and 11 also indicate that U.S. shares of expanding world trade for soybean meal and oil increased markedly over the period. By 1976 market development expenditures increased the U.S. share of world soybean meal and oil markets by over 6% and 10%, respectively. This gain in export share drops after 1976 as a result of declining real expenditures abroad. The U.S. share of world soybean trade remains fairly steady throughout the period.

An important conclusion is that U.S. market development activities benefit the Brazilian soybean industry to a much smaller degree than the U.S. soybean industry. This result is highly plausible since Brazilian domestic and trade policies tend to insulate the Brazilian domestic market from changes in world market conditions. The Brazilian soybean sector is less insulated from changes than the soybean meal or oil markets and thus tends to respond more to world market conditions.
CONCLUDING COMMENTS AND IMPLICATIONS FOR FUTURE FUNDING

While the measured impact of the market development program on the quantity and value of U.S. exports has been small in percentage terms, the returns per dollar invested have been very high. U.S. grower and export revenues generated by the program through a positive impact on both prices and quantities have far exceeded the expenditures which have been small compared to the historical values of U.S. soybean production and exports of soybeans and soybean products.

The study also provides evidence that while Brazil has benefited from U.S. efforts to develop foreign markets for soybeans and products, the increases in both Brazilian exports and export revenue (total and per U.S. market development dollar spent) as a result of the program have been many times smaller than for their U.S. counterparts.

This study considered only the historical impacts of the ASA and FAS cooperative foreign market development program. No attempt was made to generate a forecast baseline or simulate different scenarios over a forecast period. Consequently, caution must be taken in using the conclusions of this study for current and future planning. Obviously, any number of events could transpire to greatly modify the findings of this study. Nevertheless, several implications for future funding seem clear.

First, the time path of regional returns per market development dollar indicates that entrance into new markets generally results in high initial grower and export returns per dollar spent. The returns then decline over time as funding increases. However, while returns per dollar may be high in the early years, the actual volume of U.S. exports that can be generated over the long run may be very small. While the per dollar returns in more mature markets such as Japan may be lower, the volume of U.S. exports and the level of export revenue generated over the long run are likely to be much greater because of the greater population and livestock base and consumer acceptance. Thus, the criteria for investment should consider not only the short run or initial expected return per dollar invested but also the long term U.S. export potential of the investments. Even though initial returns per dollar expended tended to be higher in new markets in this study, the conclusion cannot be drawn that future allocations to these or other new markets should be increased at the expense of reduced expenditures to more developed markets over the long-run.

A second implication is that the maintenance of returns per dollar in a given region requires annual adjustments in the level of nominal expenditures for movements in the value of the U.S. dollar abroad and inflation in the regions of expenditure. Since market development activities create a stream of export revenues, failure to maintain the level of real expenditures over time will result in a loss of export revenue beyond the year in which real expenditures drop.

Third, a shift in the emphasis of funding from the promotion of soybeans to the promotion of soybean products leads to greater export revenue per dollar expended.

Fourth, as long as Brazilian policies continue to insulate the domestic Brazilian market from changes in world market conditions, the impact of market development expenditures on Brazilian exports and export revenue will be smaller than on U.S. exports and export revenue.
REFERENCES


METHODOLOGY APPENDIX

This appendix provides detail concerning the World Soybean Model, the iterative solution process utilized in quantifying the impacts of the market development program, and problems encountered in working with the expenditure data.

THE WORLD SOYBEAN MODEL

The model used in this study is an updated and enhanced version of the model used in Williams and Thompson (18). The equations were re-estimated using many improved data series and over two additional years of data (1960-1980). In addition to some improvement in the specification of several equations, market development expenditures are incorporated as additional explanatory variables in the appropriate demand equations in the regions of expenditure. This version of the model is presented in appendix table 1 along with several analytical statistics for each behavioral equation in the model.

THE ITERATIVE SOLUTION PROCESS

One assumption underlying the model is that soybean and soybean product prices and quantities are affected by, but do not affect, the prices and quantities of other commodities (i.e., other commodities are exogenous to the model). In order to assess the impact of market development expenditures on the U.S. agricultural economy outside the U.S. soybean industry, the results from simulating the removal of all expenditures for all commodities by all contributors in all regions and in all years (simulation) above were inserted into the comprehensive model of the U.S. agricultural sector maintained by Chase Econometrics. Resulting changes in the appropriate crop and livestock industry variables from that model were then inserted into the World Soybean Model. Simulation 1 was then rerun and new solution results, which then accounted for the impacts of the program on other sectors of U.S. agriculture, were obtained. These new solution results from the World Soybean Model were then inserted into the U.S. Agricultural Model to complete the second iteration and new impacts on the U.S. agricultural economy were obtained. Such an iteration process could go on indefinitely. However, since the changes in the solution values of all variables in the second iteration were small, further iterations were deemed unnecessary.

As discussed in the text, the impacts on U.S. agriculture from simulation 1 were very small. Since the impacts of expenditures in any one region, by any one contributor or for any one commodity would even be smaller. The cost of iterating the results of these simulated impacts through the Chase U.S. Agriculture Model was considered to be much greater than the benefit from such a process. Thus, only the results of the simulation 1 as reported in the text were adjusted for impacts on the sectors of U.S. agriculture outside the soybean industry.

EXPENDITURE DATA PROBLEMS

The expenditure data were tabulated by FAS and ASA. Several problems were encountered in working with the data. First, the countries of
expenditure in the tabulated data often included large and seemingly mutually inclusive regions such as "Western Europe," "Northern Europe," "Latin America," and "Far East Asia." Because of the regional requirements of the model, the data were aggregated into regions as follows:

1. European Community: "Western Europe," "Northern Europe," and all individual EC countries for which data was given;
2. Japan: Japan;
3. Other Asia and Oceania: All Asian countries and regions (including the Middle East countries) except Japan and the People's Republic of China (PRC);
4. Rest of the World: "Latin America," all individual Latin American countries, all non-EC European countries, "Eastern Europe," all individual Eastern European countries, the U.S.S.R. and the PRC;
5. Africa: "Africa" and all individual African countries.

Since the production and crush of soybeans and the domestic use of soybean meal in Africa were relatively small between 1960 and 1980, only an oil demand relationship for Africa was included in the World Soybean Model. Consequently, only expenditures for the promotion of oil were included in the model for Africa. Market development activities were funded in African countries only in fiscal years 1979 and 1980 and represented less than one percent of worldwide expenditures in those years. For the same reason only an oil demand relationship for Other Asia and Oceania was included in the model. The small disappearance and imports of soybeans and soybean meal by the countries in the Other Asia region during the 1960-80 period were included with the data for the Rest-of-the-World region. Consequently, expenditures for soybean, soybean meal and soyfood market development in Other Asia were included with expenditures for the Rest-of-the World region.

The second problem encountered was that expenditures were categorized by contributor (FAS, ASA and Third Party) and commodity and the FAS expenditures were further categorized by activity. The data were aggregated across all contributors and across all activities by commodity for each region. Thus, it was assumed that the impact of a dollar expended by ASA, FAS, or Third Party contributors was identical. The differences in return by contributor reported in the text thus reflect only the differences in the regional and commodity emphasis of expenditures by each contributor. This procedure also assumed no difference in the impact of expenditures for different activities in the promotion of a given commodity.

A related problem was that in addition to expenditures for soybeans, soybean meal and soybean oil promotion, the tabulated data included expenditures for "soyfood" promotional activities. Since the World Soybean Model did not explicitly include a "soyfood" sector and since soybean meal was used not only as a livestock food supplement but also to produce soy protein and other derivatives used in "soyfood" products, soybean meal and "soyfood" expenditures were added together for each region.

Fourth, the FAS data for expenditures included categories for "administrative costs" with no associated commodity of expenditure. Consequently, administrative costs in the FAS data were prorated and added to the expenditures for each commodity in each region according to the percentages of total expenditures for each commodity.

Finally, the available expenditure data for all regions (especially FAS data) was incomplete prior to 1970. Consequently, the range of the expenditure data utilized was fiscal 1970 through 1980. Because the World
Soybean Model equations utilized data prior to 1970, the market development expenditure variable values were set equal to zero prior to 1970.

EQUATIONS IN THE WORLD SOYBEAN MODEL

**U.S. Soybean and Products Component**

1. \( \log(\text{USSOYSAC}) = 1.0296 + 0.6376 \log(\text{USSOYPFC}(-1)/\text{USPPI}(-1)) - 0.4690 \log(\text{USCROPFC}(-1)/\text{USPPI}(-1)) - 0.1336 \log(\text{USCOLPFC}(-1)/\text{USPPI}(-1)) + 0.7461 \log(\text{USSOYSAC}(-1)) \)  
   \[
   \begin{align*}
   R^2 &= .991 \\
   \text{DW} &= 2.13
   \end{align*}
   \]

2. \( \text{USSOYSHC} = -1.2891 + 1.0059 \text{USSOYSAC} \)  
   \[
   \begin{align*}
   R^2 &= .999 \\
   \text{DW} &= 1.72
   \end{align*}
   \]

3. \( \text{USSOYSPC} = \text{USSOYSYC} \cdot \text{USSOYSHC} \)

4. \( \text{USSOYGCC} = -0.1025 + 0.2193 (\text{USSOOQ} \cdot \text{USSOOPWC}/100 + \text{USSOOMPWC}/1000) + 0.0033 \text{USSOYDCC} - 0.0030 \text{USOISCAPC} + 1.6003 \text{DSAIFIM} - 0.7569 \text{D1US} + 0.2783 \text{D2US} \)  
   \[
   \begin{align*}
   R^2 &= .981 \\
   \text{DW} &= 2.04
   \end{align*}
   \]

---

1Numbers in parentheses are standard errors. * indicates an identity relationship. (-1) indicates a one year lag. "DEL" should be read "change in".

2This is the soybean crush equation which was renormalized on USSOYGCC for simulation.
(5) \( USSOYPFC = USSOOQ \cdot USSOOPWC/100 + USSOMQ \cdot USSOMPWC/1000 - USSOYGCC \)

(6) \( USSOYHEC = -103.9610 - 54.5616 USSOYPFC + 127.1120 USCORPFC (16.2815) (10.4765) (20.3123) + 0.1587 USSOYSPC - 0.2581 USSOYHGC (0.0200) (0.0664) + 0.4196 USSOYHEC(-1) (0.1501) \)

\[ R^2 = .955 \quad \text{DW} = 1.20 \]

(7) \( USSOMSPC = USSOMQ \cdot USSOYDCC \)

(8) \( USHPMPWC/USWPI67 = 43.0667 - 1.56768 \frac{(USHPMDDC/USHPAUC)(22.4669)(0.5103)}{+ 3.8056 \frac{(USCORDDC/USHPAUC)(1.2332)}{+ 0.3261 \frac{(USFIMPWA/USWPI67)(0.0412)}{+ 0.5643 \frac{(0.25 \cdot USHGPWC + 0.75 \cdot USPOUWC)(0.3187)}{R^2 = .937 \quad \text{DW} = 2.29}} \]

(9) \( USSOMPWC = \frac{(USHPMPWC - USCOMDDPC \cdot USCOMPWC - USPEMDDPC \cdot USPEMPWC)/USSOMDDPC}{(USHPMPWC - USCOMDDPC \cdot USCOMPWC - USPEMDDPC)/USSOMDDPC} \)

(10) \( USSOOSPC = USSOOQ \cdot USSOYDCC \)

---

3 This is the crush margin identity which was renormalized on USSOYPFC for simulation.

4 This is the demand for high protein meals equation which was renormalized on USHPMPWC for simulation.

5 This is the weighted high protein meals price identity which was renormalized on USSOMPWC for simulation.
(11)\(^6\) \(\text{USOLOPWC}/\text{USWPI67} = \frac{2.1349 - 0.4500}{1.6013} \left(\frac{\text{USOLODDC}/\text{USPOP}}{\text{USPEODDPC} \cdot \text{USPEOPWC}/\text{USSOODPC}}\right)\)

\[+ 0.0991 \left(\frac{\text{USLAOPWC}/\text{USWPI67}}{0.0716}\right)\]

\[0.5977 \left(\frac{\text{USLARPWC}/\text{USWPI67}}{0.0721}\right)\]

\[+ 5.9579 \left(\frac{\text{USYDA}/\text{USCPI67}/\text{USPOP}}{1.6290}\right)\]

\[- 0.0121 \text{USSOOHGC}(-1)\]

\[R^2 = .973 \quad R^2 = .964 \quad DW = 1.89\]

(12)\(^7\) \(\text{USSOOPWC} = \left(\frac{\text{USOLOPWC} - \text{USCOODDPC} \cdot \text{USCOOPWC} - \text{USPEODDPC} \cdot \text{USPEOPWC}}{\text{USSOODDPC}}\right)\)

(13) \(\text{USSOOHEC} = -774.1670 - 14.5660 \left(\frac{\text{USSOOPWC}/\text{USWPI67}}{212.8380}/(11.8340)\right)\)

\[+ 0.2628 \text{USSOOSPC} + 2.2559 \text{USSOOHGC}\]

\[(0.0459) \quad (0.8004)\]

\[- 0.2122 \text{USSOODDC}(-1) + 719.8300(\text{USCORPFC}/\text{USPPI67})\]

\[(0.0619) \quad (196.9630)\]

\[+ 0.4069 \text{DEL(USSOOHEC}(-1)) + 427.3590 \text{D}3\text{US}\]

\[(0.1294) \quad (118.8530)\]

\[R^2 = 0.884 \quad R^2 = 0.822 \quad DW = 1.93\]

(14)\(^*\) \(\text{USSOYHTC} = \text{USSOYHEC} + \text{USSOYHGC}\)

(15)\(^*\) \(\text{USSOOHTC} = \text{USSOOHEC} + \text{USSOOHGC}\)

---

\(^6\)This is the demand for vegetable oils equation which was renormalized on USOLOPWC for simulation.

\(^7\)This is the weighted vegetable oils price identify which was renormalized on USSOOPWC for simulation.
(16) $^8$ USSOYDCC = USSOYHTC(-1) + USSOYSPC - USSOYMEC - USSOYDZC
- USSOYHTC
(17) $^9$ USHPMDDC = USSOMDDC/USSOOMDDPC
(18) $^{10}$ USSOMDDC = USSOMHEC(-1) + USSOMSPC - USSOMMEC - USSOMDZC
- USSOMHEC
(19) $^{11}$ USOLODDC = USSOODDC/USSOODDPC
(20) $^{12}$ USSOODDC = USSOOHTC(-1) + USSOOSPC - USSOOMTC - USSOODZC
- USSOOHTC

Brazil Soybean and Products Component

(21) $\log (BZSOYSHC) = 0.6485 + 0.4738 \log (BZSOYPFA(-1)/BZPPI(-1))$
\[ (1.2291) (0.1226) \]
- $0.6807 \log (BZWHEPFA(-1)/BZPPI(-1))$
\[ (0.1552) \]
- $0.3539 \log (BZCOFSAA) + 0.8417 \log (BZSOYSHC(-1))$
\[ (0.1129) (0.0285) \]
- $0.0716 \text{DBWBZSOY}$
\[ (0.0434) \]

$R^2 = 0.998$ $R^2 = 0.997$ $DW = 1.31$

(22) $BZSOYSPC = BZSOYSYC \cdot BZSOYSHC$

---

$^8$This is the U.S. soybean excess supply identity which was renormalized on USSOYDCC for simulation.

$^9$This is the U.S. soybean meal demand relationship which was renormalized on USHPMDDC for simulation.

$^{10}$This is the U.S. soybean meal excess supply identity which was renormalized on USSOMDDC for simulation.

$^{11}$This is the U.S. soybean oil demand relationship which was renormalized on USOLODDC for simulation.

$^{12}$This is the U.S. soybean oil excess supply identity which was renormalized on USSOODDC for simulation.
(23) BZSOYDCC
= -194.2350 + 214.0740 (BZSOYGCA/BZPEAGCA)
(96.4069) (95.0127)
+ 0.5476 BZSOYCAPC + 0.4539 BZSOYHEC(-1)
(0.0359) (0.2959)
+ 0.1836 BZSOYSPC
(0.0392)

\[ R^2 = 0.997 \quad R^2 = 0.996 \quad DW = 2.91 \]

(24)* BZSOMSPC
= BZSMQ \cdot BZSOYDCC

(25) BZSOMDDC
= 23.2020 - 219.2490 (BZSOMPWA/BZPEMPWA)
(94.8107) (100.5260)
+ 2008.5000 BZPOMSPA
(83.685)

\[ R^2 = 0.972 \quad R^2 = 0.969 \quad DW = 1.49 \]

(26)* BZSOOSPC
= BZSOOQ \cdot BZSOYDCC

(27)\footnote{Renormalized on BZSOOPWA for simulation.} BZSOOPWA \cdot 1000/BZWPI = 494.9200 + 0.1326 (BZSOOPEA \cdot XOBZUSA/BZWPI)
(109.3840) (0.0111)
- 19.2852 (BZSOODDC/BZPOPA)
(6.6187)
+ 366.2190 (BZLARPRA/BZWPI) + 132.4500 DLBZ
(78.4818) (105.6200)

\[ R^2 = 0.942 \quad R^2 = 0.927 \quad DW = 1.71 \]
(28) \[ BZSOYPEA \times XOBZUSA/BZWPI - BZSOYPFC/BZPPI = -89.1968 \]
\[ (16.8817) \]
\[ + 0.6163 (BZSOYPEA \times XOBZUSA/BZWPI) \]
\[ (0.052) \]
\[ + 0.0041 (BZBOPA \times XOBZUSA/BZGPI) \]
\[ (0.0016) \]
\[ - 10.8703 DN1BZ - 26.7198 DN2BZ \]
\[ (9.1003) \]
\[ + 1.5667 BZGPI \]
\[ (0.3316) \]
\[ R^2 = 0.955 \quad R^2 = 0.940 \quad DW = 2.31 \]

(29) \[ BZSOMPWA \times 1000/BZWPI - BZSOMPEA \times XOBZUSA/BZWPI = 92.1335 \]
\[ (36.3825) \]
\[ - 0.8946 (BZSOMPWA \times XOBZUSA/BZWPI) \]
\[ (0.0704) \]
\[ - 4.5545 BZGPI(-1) + 0.5439 (BZYDA(-1)) \]
\[ (1.3806) \]
\[ + 0.3454 (BZSOYPFA(-1)/BZPPI(-1)) \]
\[ (0.1609) \]
\[ + 14.3770 DN2BZ \]
\[ (9.1651) \]
\[ R^2 = 0.929 \quad R^2 = 0.905 \quad DW = 1.60 \]

(30) \[ BZQUSOOC = -414.4830 + 0.0664 BZSOYSPC + 0.5305 BZQUSOOC(-1) \]
\[ (82.5916) \]
\[ (0.0077) \]
\[ (0.1018) \]
\[ - 0.0372 (BZBOPA(-1) \times XOBZUSA(-1)/BZWPI(-1)) \]
\[ (0.0062) \]
\[ + 382.0520 DN1BZ + 316.0600 DN2BZ \]
\[ (81.0959) \]
\[ (66.2780) \]
\[ R^2 = 0.976 \quad R^2 = 0.968 \quad DW = 2.27 \]

---

14 Renormalized on BZSOYPFA for simulation.
15 Renormalized on BZSOMPWA for simulation.
European Economic Community (9) Soybean and Products Component

(35) \[
\text{ECOSYDCA} = 1370.6200 + 8.3990 \left( \frac{\text{ECOSYGCA}}{\text{ECWPI70}} \right) \\
= 578.4630 \quad (6.6858)
\]

\[-5.2121 \left( \frac{\text{ECPEAGCA}}{\text{ECWPI70}} \right) \\
= 3.1751 \]

\[-4.7791 \left( \frac{\text{ECCOPGCA}}{\text{ECWPI70}} \right) - 816.2080 \quad (481.8510)
\]

\[+ 520.0800 \quad \text{ECOISCAPT} + 1329.1600 \quad \text{D1EC} \\
= 47.7556 \quad (527.0940)
\]

\[+ 0.4309 \quad \text{ECSOYEXPCL2} \quad (0.1003)
\]

\[R^2 = .988 \quad \bar{R}^2 = .981 \quad \text{DW} = 1.70\]

(36) \[
\text{ECSOMSPA} = \text{ECSOMQ} \cdot \text{ECSDYDCA}
\]

(37) \[
\text{ECHPMDDA} = -6394.0700 - 8.9776 \left( \frac{\text{ECHPMPIA}}{\text{ECWPI70}} \right) \\
= 2495.6600 \quad (2.884)
\]

\[+ 5.2297 \left( \frac{\text{ECFIMPIA}}{\text{XOECUSA}/\text{ECWPI70}} \right) \\
= 1.2784 \]

\[+ 38.8804 \left( \frac{\text{ECCORPIA}}{\text{XOECUSA}/\text{ECWPI70}} \right) \\
= 2.9147
\]

\[+ 275.1630 \quad \text{ECGCAUA} - 1439.4700 \quad \text{D2EC} \\
= 22.9114 \quad (211.1680)
\]

\[+ 2.5274 \quad \text{ECOSMFEXPCL2} \\
= 0.2430
\]

\[R^2 = .994 \quad \bar{R}^2 = .991 \quad \text{DW} = 1.97\]
(38)* ECSoOSPA = ECSOQ \cdot ECSOYDCA

(39) \text{ECLODDA/ECPOPA} = 3.6277 \cdot 0.00456 \text{(ECLOPJA/ECWPI70)} \\
(0.6967) (0.0002)

+ 0.0152 \text{(ECPAOPIA/ECWPI70)} \\
(0.0011)

+ 0.4767 \text{(ECYGA/ECWPI70/ECPOPA)} \\
(0.0680)

+ 1.1232 \text{D3EC} - 0.4612 \text{D4EC} + 0.0004 \text{ECSOEXPCL2} \\
(0.1910) (0.1419) (0.00008)

R^2 = .982 \quad \bar{R}^2 = .974 \quad DW = 1.65

(40)* ECSoYGCA = (0.795ECSOMPIA + 0.177ECSoOPIA-ECsOPYPIA) \cdot \text{XOECSUSA}

(41)* \text{ECHPMPIA} = (\text{ECSOADMDDPA} \cdot \text{ECSOMPIA} + \text{ECCOMDDPA} \cdot \text{ECCOMPIA}) \\
+ \text{ECPEMDDPA} \cdot \text{ECPEMPIA} + \text{ECRAMDDPA} \\
\cdot \text{ECRAPMPIA) \cdot \text{XOECSUSA}}

(42)* \text{ECLOPIA} = (\text{ECSOODDPA} \cdot \text{ECSoOPIA} + \text{ECCOODDPA} \cdot \text{ECOPIA}) \\
+ \text{ECPEODDPA} \cdot \text{ECPEOPIA} + \text{ECRAODDPA} \\
\cdot \text{ECRAOPIA) \cdot \text{XOECSUSA}}

(43)* \text{ECsOYMA} = \text{ECSoYDCA} + \text{ECsOYDZA} - \text{ECsOYSPC}

(44)* \text{ECsOMDDA} = \text{ECSOMDDPA} \cdot \text{ECHPMDDA}

(45)* \text{ECsOMMMA} = \text{ECSOMDDA} - \text{ECsOMSPA}

(46)* \text{ECSoODDA} = \text{ECsoOdddpa} \cdot \text{ECLODDA}

(47)* \text{ECsOomea} = \text{ECsoospa} - \text{ECsOODDA}

\[ -43 - \]

\[^{16}\text{Renormalized on ECOLODDA for simulation.}\]
Canada Soybean and Products Component

(48) \[ \log(\text{CASOYSHC}) = 1.7715 + 0.6121 \log(\text{CASOYPFC(-1)}/\text{CAPPI(-1)}) \]
\[ (0.7748) (0.1143) \]
\[ - 0.8587 \log(\text{CACORPFC(-1)}/\text{CAPPI(-1)}) \]
\[ (0.1369) \]
\[ + (0.7599) \log(\text{CASOYSHC(-1)}) \]
\[ (0.0607) \]
\[ R^2 = 0.976 \quad \bar{R}^2 = 0.971 \quad DW = 1.79 \]

(49)* \[ \text{CASOYSPC} = \text{CASOYSYC \cdot CASOYSHC} \]

(50) \[ \text{CASOYDCC} = 369.8990 + 9.9192 (\text{CASOYGCC}/\text{CARAPGCC}) \]
\[ (13.0813) (6.0900) \]
\[ + 11.1370 \text{CASOYCAPT} + 0.3611 \text{CASOYSPC} \]
\[ (1.4352) (0.0621) \]
\[ - 66.6450 \text{DICA} \]
\[ (9.712) \]
\[ R^2 = 0.974 \quad \bar{R}^2 = 0.967 \quad DW = 1.90 \]

(51)* \[ \text{CASOMSPC} = \text{CASOMQ \cdot CASOYDCC} \]

(52) \[ \text{CAHPMDDC} = -1519.3000 - 1.4733 (\text{CAHPMPWC}/\text{CAWPI70}) \]
\[ (624.0530) (0.9222) \]
\[ - 3.4516 (\text{CACORPWC}/\text{CAWPI70}) \]
\[ (1.9588) \]
\[ + 11.3537 (\text{CALIVPFC}/\text{CAPPI}) + 0.0231 \text{CAPCAUC} \]
\[ (7.6188) (0.0073) \]
\[ + 0.3870 (\text{CAYDA}/\text{CACPI70}/\text{CAPOPA}) \]
\[ (0.0515) \]
\[ R^2 = 0.958 \quad \bar{R}^2 = 0.943 \quad DW = 1.00 \]

(53)* \[ \text{CASOOSPC} = \text{CASOOQ \cdot CASOYDCC} \]
(54)\textsuperscript{17} \text{CAOLODDC/CAPOPA} = -4.5904 - 0.0123 \left(\frac{\text{CAOLOPW/CAPW170}}{1.0755}\right) (0.0043) \\
\quad + 0.0128 \left(\frac{\text{CAPAOPUIA \cdot XOCAUSA/CAPW170}}{0.0048}\right) \\
\quad + 0.0048 \left(\frac{\text{CAYDA/CAPW170/CAPOPA}}{0.0003}\right) \\
R^2 = 0.945 \quad \overline{R}^2 = 0.936 \quad DW = 1.63

(55)\textsuperscript{*} \text{CASOYGCC} = \text{CASOMQ} \cdot \text{CASOMPWA} + \text{CASOOQ} \cdot \text{CASOOPWA} - \text{CASOYPFAC}

(56)\textsuperscript{*} \text{CAHPMPWC} = \text{CASOMDDPC} \cdot \text{CASOMPWA} + \text{CARAMDDPC} \cdot \text{CARAMPWA}

(57)\textsuperscript{*} \text{CAOLOPWC} = \text{CASOODDPC} \cdot \text{CASOOPWA} + \text{CARAODDPC} \cdot \text{CARAOPWA}

(58)\textsuperscript{*} \text{CASOYMMC} = \text{CASOYDCC} + \text{CASOYDZC} + \text{CASOYHEC} - \text{CASOYHEC}(-1) \\
\quad - \text{CASOYSPC}

(59)\textsuperscript{*} \text{CASOMDDC} = \text{CASOMDDPC} \cdot \text{CAHPMDDC}

(60)\textsuperscript{*} \text{CASOMMMC} = \text{CASOMDDC} + \text{CASOMDZC} + \text{CASOMHEC} - \text{CASOMHECC}(-1) \\
\quad - \text{CASOMSPC}

(61)\textsuperscript{*} \text{CASOODDC} = \text{CASOODDPC} \cdot \text{CAOLODDC}

(62)\textsuperscript{*} \text{CASOOMMC} = \text{CASOODDC} + \text{CASOODZC} + \text{CASOOHEC} - \text{CASOOHEC}(-1) \\
\quad - \text{CASOOSPC}

Japan Soybean and Products Component

(63) \text{JASOYDCA} = -6874.3200 + 11.8609 \left(\frac{\text{JASOYGCA/JARAPGCA}}{239.4590}\right) (5.4504) \\
\quad + 6.9852 \left(\frac{\text{JASOYGCA/JACOTGCA}}{2.2711}\right) \\
\quad + 9.6624 \left(\frac{\text{JASOYGCA/JACOPGCA}}{9.1243}\right) + 1.39567 \text{ JAOISCAPA} \\
\quad + 143.0540 \text{ DEBMJASOY} + 233.6590 \text{ DIJA} \\
\quad + 0.0016 \text{ JASOYEXPCL2} \\
R^2 = .997 \quad \overline{R}^2 = .995 \quad DW = 1.01

\textsuperscript{17} Renormalized on CAOLODDC for simulation.
(64) JASOMSPA = JASOMQ * JASOYDCA

(65) JAHPMDDA = 1348.1600 - 960.2680 (JAHPMWJ/JAFIMPIJ)
               (298.4950) (218.5750)
               - 0.0250 (JACORPWJ/JAWPI67) + 0.1117 JAGCAUA
               (0.0055) (0.0072)
               + 494.5400 DEMBJASOY + 0.0019 JASOMFEXPCL2
               (98.9495) (0.0009)
               + 244.1470 D2JA
               (55.6210)

R² = 0.996  R² = 0.994  DW = 2.27

(66) JASSOOSPA = JASSOQQ * JASOYDCA

(68) JAOLODDA/JAPOPA = 1.5227 - 0.1494 (JAOLOPUA/(JACNPUIA * XOJAUSA))
                         (0.1850) (0.1090)
                         + 0.0068 (JAYGA/JAWPI67/JAPOPA) - 0.5114 D3JA
                         (0.0003) (0.0760)
                         + 0.9853 D4JA + 0.0032 JASSOOEXPCL2
                         (0.1355) (0.0014)

R² = 0.997  R² = 0.996  DW = 2.38

(68) JASOYGCA = JASOMQ * JASOMPWJ (1000/37.5) + JASSOQQ * JASOOPUIA
                * XOJAUSA - JASOYPUIA * XOJAUSA

(69) JAHPMPWJ = (JASOMDDPA * JASOMPWJ + JARAMDDPA * JARAMPWJ
                + JACOMDDPA * JACOMPWJ) (1000/37.5)

(70) JAOLOPUA = (JASOOPDPA * JASOOPUIA + PARAOPDPA * JARAOOPUA
                + JACOOPDPA * JACOOPUIA) * XOJAUSA

(71) JASOYMA = JASOYHEA + JASOYDCA + JASOYDZA - JASOYSPC
               - JASOYHEA(-1)

(72) JASOMDDA = JASOMDDPA * JAHPMDDA

18
Renormalized on JAOLODDA for simulation.
\[(73)^* \text{JASOMMA} = \text{JASOMHEA} + \text{JASOMDDA} - \text{JASOMSPA} - \text{JASOMHEA}(-1)\]
\[(74)^* \text{JASOODDA} = \text{JASOODDPA} \cdot \text{JAOLODDA}\]
\[(75)^* \text{JASOOMMA} = \text{JASOOHEA} + \text{JASOODDDA} - \text{JASOOSPA} - \text{JASOHEA}(-1)\]

Other Asia and Oceania Soybean and Products Component

\[(76)^{19} \frac{\text{OAOLODDA}/\text{OAPOPA}}{\text{OAOLODDA}/\text{OAPOPA}} = 1.8066 - 0.1429 \left(\frac{\text{OAOLOPWA}/\text{OACPI67}}{\text{OAOLOPWA}/\text{OACPI67}}\right) - 0.6317 D10A (2.0363) (0.1121) + 0.3851 D20A + 0.0437 OASOOEXPCL2 (0.0528) (0.0277) + 15.2308 \left(\frac{\text{OAOLOPWA}/\text{OACPI67}/\text{OAPOPA}}{\text{OAOLOPWA}/\text{OACPI67}/\text{OAPOPA}}\right) - 0.6317 D10A (2.0363) (0.1121)

R^2 = 0.957 \quad R^2 = 0.943 \quad DW = 2.45

(77)^* \text{OAOLOPWA} = \text{OASOOMMPA} \cdot \text{OASOOPUIA} \cdot \text{XORPUSA} + \text{OACOODDDPA} \cdot \text{OACOOOFWA} + \text{OAPEODDPA} \cdot \text{OAPEOPWA} + \text{OARAODDPA} \cdot \text{OARAOPWA}

(78)^* \text{OASOODDA} = \text{OASOOMMPA} \cdot \text{OAOLODDA}

(79)^* \text{OASOOMMA} = \text{OASOODDA}

Africa Soybean and Products Component

\[(80)^{20} \frac{\text{AFOLODDA}/\text{AFPOPA}}{\text{AFIPODDA}/\text{AFPOPA}} = 2.9084 - 0.0153 \left(\frac{\text{AFOLOPUA} \cdot \text{XOFFUSA}/\text{AFCPI67}}{\text{AFOLOPUA} \cdot \text{XOFFUSA}/\text{AFCPI67}}\right) (0.2176) (0.0023) + 0.1616 \left(\frac{\text{AFYGA} \cdot \text{XOFFUSA}/\text{AFCPI67}/\text{AFPOPA}}{\text{AFYGA} \cdot \text{XOFFUSA}/\text{AFCPI67}/\text{AFPOPA}}\right) (0.0192) - 0.6148 \text{DTRAF} + 0.6216 \text{D1AF} + 0.4251 \text{D2AF} (0.1775) (0.1255) + 0.0194 \text{AFSOOEXP} (0.0981)

R^2 = 0.944 \quad R^2 = 0.920 \quad DW = 2.15

---

19. Renormalized on OAOLODDA for simulation.
20. Renormalized on AFOLODDA for simulation.
(81)* AFOLOPUA = AFCOODDPA • AFCOOPUIA + AFSOODDPA • AFSOOPUIA + AFPEODDPA • AFPEOPUXA + AFRAODDPA • AFRAOPUIA

(82)* AFSOODDA = AFSOODDPA • AFOLODDA

(83)* AFSOOMMA = AFSOODDA - 0.075 (AFSOYSPA + AFSOYMMA)

Rest of the World Soybean and Products Component

(84) RWSOYMMN = 5465.1600 (1675.7900)

- 1913.0800 log(USSOYPFC • XOECUSA/RWPCI67)
  (586.3520)

+ 3.5544 (TIME)^2 + 1249.69 D1RW + 1841.5500 D2RW
  (3.4866) (286.4230) (288.7660)

+ 0.4642 RWSOYEXPCL2
  (0.2453)

R^2 = 0.979  \bar{R}^2 = 0.972  DW = 2.16

(85)* RWSOOSPN = 0.179 • RWSOYMMN • 0.8

(86) RWSOODDN = 902.7610 - 14.5617(USSOOPWC • XOECUSA/RWPCI67)
  (285.3500) (3.9230)

+ 23.8908 TIME + 535.9140 D3RW + 846.0960 D4RW
  (13.3564) (55.0629) (160.1000)

+ 1.4375 RWSOOEXPCL2
  (0.4916)

R^2 = 0.977  \bar{R}^2 = 0.969  DW = 2.19

(87)* RWSOMSPN = 0.795 • RWSOYMMN • 0.9
\[ (88) \quad \text{RWSOMDDN} = 7880.2300 \quad (4700.0300) \]

\[ - 1431.9500 \log(\text{USSOMPWC} \times \text{XOECUSA/RWCPI67}) \quad (694.8220) \]

\[ + 352.3910 \text{TIME} - 1093.9100 \text{D5RW} \quad (95.7156) \quad (364.2890) \]

\[ + 0.4953 \text{ROSOMFEXPCL2} \quad (0.4372) \]

\[ R^2 = 0.956 \quad R^2 = 0.945 \quad DW = 1.40 \]

\[ (89)* \quad \text{RWSOOMMN} = \text{RWSOADDN} - \text{RWSOOSPN} \]

\[ (90)* \quad \text{RWSOMMMN} = \text{RWSOMDDN} - \text{RWSOMSPN} \]

World Trade Linkages

\[ (91)^{21} \quad \text{USSOYMEC} \cdot 27.2155 = \text{ECSOYMMMA} + \text{CASOYMMC} + \text{JASOYMMMA} + \text{RWSOYMMMN} \]

\[ + \text{BZSOYMMMN} - \text{BZSOYMEC} \]

\[ (92)^{22} \quad \text{USSMOMMEC} \cdot 0.90719 = \text{ECOSOMMMMA} + \text{CASOMMMC} + \text{JASSOMMMMA} + \text{RWSOMMMNN} \]

\[ - \text{BZSOMMMEC} \]

\[ (93)^{23} \quad \text{USSOOMTC} \cdot 0.45359 = \text{CASOOMMMC} + \text{JASOOMMMMA} + \text{AFSOOMMMMA} + \text{OASOOMMMMA} \]

\[ + \text{RWSOOMMN} - \text{BZUSOOC} - \text{ECUSOOMEA} \]

World Price Linkages

\[ (94)^* \quad \text{USSOYPWC} = \text{USSOYPFC} + \text{ZSOYUSUS} \]

\[ \text{------} \]

*21 Renormalized on USSOYMEC for simulation.
*22 Renormalized on USSOMMEC for simulation.
*23 Renormalized on USSOOMTC for simulation.
(95)* ECSOYPIA = USSOYPWC \cdot 36.7437 + ZSOYECUS
(96)* BZSOYPEA = ECSOYPIA + ZSOYBZEC
(97)* JASOYPUIA = USSOYPWC \cdot 36.7437 + ZSOYJAUS
(98)* CASOYPFC = XOCAUSA \cdot USSOYPFC \cdot 36.7437 + ZSOYCAUS
(99)* ECSOMPIA = USSOMPWC \cdot 1.10231 + ZSOMECUS
(100)* BZSOMPEA = ECSOMPIA + ZSOMBZEC
(101)* JASOMPWJ(1000/37.5) = XOJAUSA \cdot USSOMPWC \cdot 1.10231 + ZSOMJAUS
(102)* CASOMPWA = XOCAUSA \cdot USSOMPWC \cdot 1.10231 + ZSOMCAUS
(103)* ECSOOPPIA = USSOOPWC \cdot 22.0462 + ZSOOECUS
(104)* JASOOPUIA = USSOOPWC \cdot 22.0462 + ZSOOJAUS
(105)* CASOOPWA = XOCAUSA \cdot USSOOPWC \cdot 22.0462 + ZSOOCAUS
(106)* BZSOOPEA = ECSOOPPIA + ZSOOBZEC
(107)* AFSOOPUIA = USSOOPWC \cdot 22.0462 + ZSOOAFUS
(108)* OASOOPUIA = USSOOPWC \cdot 22.0462 + ZSOOAOUS
Endogenous
U.S. Soybean and Products Component

USHPMDDC = Demand for high protein meals in 1,000 short tons (year ending September).

USHPMPWC = Weighted price of high protein meal, soybean meal, cottonseed meal, peanut meal in US$/short ton (year ending September). Weights are USSOMDDPC, USCOMDDPC and USPEMDDPC.

USOLODDC = Demand for oleic-linoleic/linolenic oils in million lbs. (year ending September).

USOLOPWC = Weighted price of oleic-linoleic/linolenic oils, soybean oil, cottonseed oil and peanut oil in US$/lb. (year ending September). Weights are USSOODDPC, USCOODDPC and USPEODDPC.

USSOMDDC = Demand for soybean meal in 1,000 short tons (year ending September).

USSOMMEC = Excess supplies (exports) of soymeal in 1,000 short tons (year ending September).

USSOMPWC = Wholesale price of soymeal, wholesale bulk, 44% protein, Decatur in US$/short ton (year ending September).

USSOMSPC = Soymeal production in 1,000 short tons (year ending September).

USSOODDC = Demand for soyoil in million lbs. (year ending September).

USSOOHEC = Ending commercial stocks of soyoil in million lbs. (September 30).

USSOOHTC = Ending total stocks (commercial and government) of soyoil in million lbs. (September 30).

USSOOMTC = Excess supplies (exports) of soyoil in million lbs. (year ending September).

USSOOPWC = Wholesale price of soyoil, crude, f.o.b. Decatur in US$/lb. (year ending September).

USSOOSPC = Soyoil production in million lbs. (year ending September).

USSOYDCC = Crush of soybeans in million bu. (crop year ending August).

USSOYGCC = Soybean margin in US$/bu., calculated as USSOOQ \cdot USSOOPWC/100 + USSOMQ \cdot USSOMPWC/1000 - USSOYPFC.

USSOYHEC = Ending private stocks of soybeans in million bu. (August 31).
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>USSOYHTC</td>
<td>Ending total stocks (private and government) in million bu. (August 31)</td>
</tr>
<tr>
<td>USSOYMEC</td>
<td>Excess supplies (exports) of soybeans in million bu. (year ending August)</td>
</tr>
<tr>
<td>USSOYPFC</td>
<td>Price of soybeans received by farmers in US$/bu. (year ending August)</td>
</tr>
<tr>
<td>USSOYSAC</td>
<td>Planted area of soybeans in million acres (year ending August)</td>
</tr>
<tr>
<td>USSOYSHC</td>
<td>Harvested area of soybeans in million acres (year ending August)</td>
</tr>
<tr>
<td>USSOYSPC</td>
<td>Production of soybeans in million bu. (year ending August)</td>
</tr>
</tbody>
</table>

Brazil Soybean and Products Component

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BZQUSOOC</td>
<td>Quota of soyoil exports in 1,000 m.t. (year ending March)</td>
</tr>
<tr>
<td>BZSOODDC</td>
<td>Demand for soyoil in 1,000 m.t. (year ending March)</td>
</tr>
<tr>
<td>BZSOOPWA</td>
<td>Export price of soyoil, US$/m.t. (calendar year)</td>
</tr>
<tr>
<td>BZSOOSPC</td>
<td>Wholesale price of soybean oil, Cr$/kg. (calendar year)</td>
</tr>
<tr>
<td>BZSOMDDC</td>
<td>Production of soyoil in 1,000 m.t. (year ending March)</td>
</tr>
<tr>
<td>BZSOMMMEC</td>
<td>Demand for soymeal in 1,000 m.t. (year ending March)</td>
</tr>
<tr>
<td>BZSOMMMEC</td>
<td>Excess supplies (net exports) of soymeal in 1,000 m.t. (year ending March)</td>
</tr>
<tr>
<td>BZSOMPEEA</td>
<td>Export price of soymeal, US$/m.t. (calendar year)</td>
</tr>
<tr>
<td>BZSOMPWA</td>
<td>Wholesale price of soymeal, Sao Paulo, Cr$/kg. (calendar year)</td>
</tr>
<tr>
<td>BZSOMSPC</td>
<td>Production of soymeal in 1,000 m.t. (year ending March)</td>
</tr>
<tr>
<td>BZSOYDCC</td>
<td>Crush of soybeans in 1,000 m.t. (year ending March)</td>
</tr>
<tr>
<td>BZSOYGCA</td>
<td>Soybean margin in Cr$/m.t. (calendar year). Calculated as BZSOMQ * BZSOMPWA * 1000 + BZSOOQ * BZSOOPWA * 1000 - BZSOYPFA</td>
</tr>
<tr>
<td>BZSOYMEC</td>
<td>Excess supplies (exports) of soybeans in 1,000 m.t. (year ending March)</td>
</tr>
<tr>
<td>BZSOYPEA</td>
<td>Export price of soybeans in US$/m.t. (calendar year)</td>
</tr>
</tbody>
</table>
BZSOYPFA = Price of soybeans received by farmers, Cr$/kg. (calendar year).
BZSOYSHC = Harvested area of soybeans in 1,000 ha. (year ending March).
BZSOYSPC = Production of soybeans in 1,000 m.t. (year ending March).

E.C. Soybean and Products Component

ECHPMDDA = Demand for high protein meals (soymeal, rapemeal, cottonseed meal, and peanut meal) in 1,000 m.t. (calendar year).
ECHPMPIA = Weighted price of high protein meals in DM/m.t. (calendar year). Weights are ECSOMDDPA, ECRAMDDPA, ECCOMDDPA and ECPEMDDPA.
ECOLODDA = Demand for oleic-linoleic/linolenic oils (soyoil, rapeoil, cottonseed oil, and peanut oil) in 1,000 m.t. (calendar year).
ECOLOPIA = Weighted price of oleic-linoleic/linolenic oils in 1,000 m.t. (calendar year). Weights are ECSOIDDPA, ECRADDDPA, ECCOODDPA, and ECPEODDPA.
ECSOIDDDA = Demand for soyoil in 1,000 m.t. (calendar year).
ECSOOOMEA = Excess supplies (net exports) of soyoil in 1,000 m.t. (calendar year).
ECSOOPIA = Price of soyoil, all origins, f.o.b. ex-mill, Dutch ports in USS/m.t. (calendar year).
ECSOOSPA = Soybean oil production in 1,000 m.t. (calendar year).
ECSOMDDDA = Demand for soymeal in 1,000 m.t. (calendar year).
ECSOMMMA = Excess demand (net imports) of soymeal in 1,000 m.t. (calendar year).
ECSOMPPIA = Price of soymeal, US, 44% protein, c.i.f. Rotterdam in DM/m.t. (calendar year).
ECSOMSPPA = Soymeal production in 1,000 m.t. (calendar year).
ECSOOGCA = Soybean margin in DM/m.t. (calendar year). Calculated as (.795 ECSOMPPIA + .177 ECSOOPIA - ECSOYPIA)XOECUSA.
ECSOYDCA = Crush of soybeans in 1,000 m.t. (calendar year).
ECSOYMPIA = Excess demand (net imports) for soybeans in 1,000 m.t. (calendar year).
ECSOYPIA = Price of soybeans, US No. 2, bulk, c.i.f. Rotterdam, in US$/m.t. (calendar year).
Canada Soybean and Products Component

CAHPMDDC = Demand for high protein meals (soymeal and rapeseed meal in soymeal equivalents) in 1,000 m.t. (year ending July).

CAHPMPWC = Weighted price of high protein meals in CN$/m.t. (year ending July). Weights are CASOMDDPC and CARAMDDPC.

CAOLODDC = Demand for oleic-linoleic/linolenic oils (soyoil and rapeseed oil) in 1,000 m.t. (year ending July).

CAOLOPWC = Weighted price of oleic-linoleic/linolenic oils in CN$/m.t. Weights are CASO0DDPC and CARAO0DDPC.

CASOMDDC = Demand for soymeal in 1,000 m.t. (year ending July).

CASOMMMC = Excess demand (net imports) of soymeal in 1,000 m.t. (year ending July).

CASOMPWA = Wholesale price of soymeal in CN$/m.t. (calendar year).

CASOMSPC = Soymeal production in 1,000 m.t. (year ending July).

CASO0DDC = Demand for soyoil in 1,000 m.t. (year ending July).

CASO0MMC = Excess demand (net imports) of soyoil in 1,000 m.t. (year ending July).

CASO0PWA = Wholesale price of soyoil in CN$/m.t. (calendar year).

CASO0SPC = Soyoil production in 1,000 m.t. (year ending July).

CASOYDCC = Crush of soybeans in 1,000 m.t. (year ending July).

CASOYGCC = Soybean crush margin in CN$/m.t. calculated as CASOOQ * CASO0PWA + CASOMQ * CASOMPWA - CASOYPFC.

CASOYMNC = Excess demand (net imports) of soybeans in 1,000 m.t. (year ending July).

CASOYPFC = Price of soybeans received by producers in CN$/m.t. (year ending July).

CASOYSHC = Soybean area harvested in 1,000 ha. (year ending July).

CASOYSPC = Soybean production in 1,000 m.t. (year ending July).
Japan Soybean and Products Component

JAHPMDDA = Demand for high protein meals (soymeal, cottonseed meal and rapeseed meal in soymeal equivalents) in 1,000 m.t. (calendar year).

JAHPMPWDJ = Weighted price of high protein meals in yen/m.t. (Japan fiscal year (JFY) - year beginning April). Weights are JASOMDDPA, JARAMDDPA and JACOMDDPA.

JAOLODDA = Demand for oleic-linoleic/linolenic oils (soyoil, cottonseed oil and rapeseed oil) in 1,000 m.t. (calendar year).

JAOLOPUA = Weighted price of oleic-linoleic/linolenic oils in yen/m.t. (calendar year). Weights are JASOODPA, JARAODDPA and JACOODDPA.

JASOMDDA = Demand for soymeal in 1,000 m.t. (calendar year).

JASOMMMA = Excess demand (net imports) of soymeal in 1,000 m.t. (calendar year).

JASOMPWJ = Wholesale price of soymeal in yen/m.t. (JFY - year beginning April).

JASOMSPA = Production of soymeal in 1,000 m.t. (calendar year).

JASOOSDDA = Demand for soyoil in 1,000 m.t. (calendar year).

JASOOMMA = Excess demand (net imports) of soyoil in 1,000 m.t. (calendar year).

JASOOPUIA = Soyoil import unit value in yen/m.t. (calendar year).

JASOOSSPA = Production of soyoil in 1,000 m.t. (calendar year).

JASOYGCA = Soybean margin in yen/m.t. calculated as JASOOQ * JASOOPUIA / XOJAUSA + JASOMQ * JASOMPWJ(1000/37.5) - JASOYPUIA * XOJAUSA.

JASOYMMMA = Excess demand (net imports) of soybeans in 1,000 m.t. (calendar year).

JASOYPUIA = Soybean import unit value in yen/m.t.
Other Asia and Oceania Component

\[ \begin{align*}
\text{OAOLODDA} & = \text{Demand for oleic-linoleic/linolenic oils (soyoi, rapeseed oil, cottonseed oil and peanut oil) in 1,000 m.t. (calendar year).} \\
\text{OAOLPWA} & = \text{Weighted price of oleic-linoleic/linolenic oils in rupees/m.t. (calendar year). Weights are OASOOMMPA, OARAODDDPA, OACOODDDPA and OAPEODDDPA.} \\
\text{OASOODDA} & = \text{Demand for soyoil in 1,000 m.t. (calendar year).} \\
\text{OASOOMMA} & = \text{Excess demand (net imports) of soyoil in 1,000 m.t. (calendar year).} \\
\text{OASOOPUIA} & = \text{Soyoil import unit value in US$/m.t. (calendar year).}
\end{align*} \]

Africa Soybean and Products Component

\[ \begin{align*}
\text{AFOLODDA} & = \text{Demand for oleic-linoleic/linolenic oils (soybean oil, rapeseed oil, cottonseed oil and peanut oil) in 1,000 m.t. (calendar year).} \\
\text{AFOLOPUA} & = \text{Weighted price of oleic-linoleic/linolenic oils in US$/m.t. (calendar year). Weights are AFCOODDDPA, AFSOODDDDPA, AFPEODDDPA, and AFPRAODDDPA.} \\
\text{AFSOODDA} & = \text{Demand for soyoil in 1,000 m.t. (calendar year).} \\
\text{AFSOOMMA} & = \text{Excess demand (net imports) of soyoil in 1,000 m.t. (calendar year).} \\
\text{AFSOOPUIA} & = \text{Soyoil import unit value in US$/m.t. (calendar year).}
\end{align*} \]

Rest-of-the-World Soybean and Products Component

\[ \begin{align*}
\text{RWSOMDDN} & = \text{Demand for soymeal in 1,000 m.t.} \\
\text{RWSOOMMMN} & = \text{Excess demand (net imports) in 1,000 m.t.} \\
\text{RWSOMSPN} & = \text{Production of soymeal in 1,000 m.t.} \\
\text{RWSOODDN} & = \text{Demand for soyoil in 1,000 m.t.} \\
\text{RWSOOMMN} & = \text{Excess demand (net imports) for soyoil in 1,000 m.t.} \\
\text{RWSOOSPN} & = \text{Production of soyoil in 1,000 m.t.} \\
\text{RWSOYMMN} & = \text{Excess demand (net imports) of soybeans in 1,000 m.t.}
\end{align*} \]
Exogenous

U.S. Soybean and Products Component

DMNUSPEA = Dummy variable representing impact of CCC minimum peanut sales policy for diversion sales at 100% of the loan level in 1974: 1974 = 1.

DSAFIM = Dummy variable representing the shortfall in the Peruvian anchovy catch in 1972.

DIUS = Dummy variable: 1975 = 1.


USCOLPFC = Farm price of upland cotton in US cents/lb. (year ending July).

USCOMDDPC = Proportion of total high protein meals consumption accounted for by cottonseed meal (year ending September).

USCOMPWC = Wholesale price of cottonseed meal, Memphis, 41% protein in US$/short ton (year ending July).

USCORDCC = Disappearance of corn in million bu. (year ending September).

USCORPFC = Farm price of corn in US$/bu. (year ending September).

USCOODDPC = Proportion of total oils consumption accounted for by cottonseed oil (year ending September).

USCOOPWC = Wholesale price of cottonseed oil, tank cars, Valley points in US cents/lb. (year ending July).

USCPI67 = Consumer price index (1967 = 100) (calendar year).

USFIMPWA = Wholesale price of fish meal, Peruvian, East Coast in US$/short ton (calendar year).

USHOGPWC = Farm price of hogs in US$/c.w.t. (year ending September).

USHPAUC = High protein consuming animal units, million (year ending September).

USLAOFWC = Wholesale price of lauric oils (coconut oil and palm kernel oil) in US cents/lb. (year ending September). Weights are proportions of total lauric oils consumption accounted for by each.

USLARFWC = Wholesale price of lard in US cents/lb. (year ending September).
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>USOISCAPC</td>
<td>Soybean crush capacity in million bu. (calendar year).</td>
</tr>
<tr>
<td>USPEMDDPC</td>
<td>Proportion of total high protein meals consumption accounted for by peanut meal (year ending July).</td>
</tr>
<tr>
<td>USPEMPWC</td>
<td>Wholesale price of peanut meal, 50% protein, S.E. mills in US $/short ton (year ending July).</td>
</tr>
<tr>
<td>USPEODDPC</td>
<td>Proportion of total oils consumption accounted for by peanut oil (year ending September).</td>
</tr>
<tr>
<td>USPEOPWC</td>
<td>Wholesale price of peanut oil, crude, S.E. mills in US cents/lb. (year ending September).</td>
</tr>
<tr>
<td>USPOPA</td>
<td>Population, millions (calendar year).</td>
</tr>
<tr>
<td>USPOUPWC</td>
<td>Weighted farm price of poultry = .33(farm price of eggs) + .67(farm price of broilers), (year ending September).</td>
</tr>
<tr>
<td>USPPI</td>
<td>Farm producer price index (1967 = 100), (year ending August).</td>
</tr>
<tr>
<td>USSOMDDPC</td>
<td>Proportion of high protein meals consumption accounted for by soymeal (year ending September).</td>
</tr>
<tr>
<td>USSOMDZC</td>
<td>Other use of soymeal in 1,000 short tons (year ending September).</td>
</tr>
<tr>
<td>USSOMHEC</td>
<td>Ending stocks of soymeal in 1,000 short tons (year ending September).</td>
</tr>
<tr>
<td>USSOMQ</td>
<td>Soybean meal extraction rate, 1,000 ST/mil. bu. (year ending September).</td>
</tr>
<tr>
<td>USSOODDPC</td>
<td>Proportion of total oils consumption accounted for by soyoil (year ending September).</td>
</tr>
<tr>
<td>USSOODZC</td>
<td>Other use of soyoil in million lbs. (year ending September).</td>
</tr>
<tr>
<td>USSOOGHC</td>
<td>Government stocks of soyoil in million lbs. (year ending September).</td>
</tr>
<tr>
<td>USSOOMGC</td>
<td>PL480 and other government financed exports of soyoil (year ending September).</td>
</tr>
<tr>
<td>USSOOQ</td>
<td>Soybean oil extraction rate, lbs./bu. (year ending September).</td>
</tr>
<tr>
<td>USOYDZC</td>
<td>Feed, seed and other use of soybeans in million bu. (year ending August).</td>
</tr>
<tr>
<td>USOYHGC</td>
<td>Government stocks of soybeans in million bu. (year ending August).</td>
</tr>
<tr>
<td>USOYSYC</td>
<td>Soybean yield, bu./acre (year ending August).</td>
</tr>
<tr>
<td>USWPI67</td>
<td>Wholesale price index (1967 = 100), (calendar year).</td>
</tr>
<tr>
<td>USYDA</td>
<td>Disposable personal income, billion US $ (calendar year).</td>
</tr>
</tbody>
</table>
Brazil

BZBOPA = Balance of payments, surplus or deficit, in US $ million (calendar year).

BZCOFSA = Area planted to coffee in 1,000 ha. (calendar year).

BZCOOPWA = Wholesale price of cottonseed oil, Sao Paulo in Cr$/kg. (calendar year).

BZGPI = General price index (1965-67 = 100), (calendar year).

BZPEAGCA = Peanut crush margin in Cr$/m.t. (calendar year).

BZPEMPWA = Wholesale price of peanut meal, Sao Paulo, in Cr$/kg. (calendar year).

BZPOMSPA = Production of poultry meat in million m.t. (calendar year).

BZPOPA = Population, millions (calendar year).

BZPPI = Farm product price index (1965-67 = 100), (calendar year).

BZSOODZC = Other use of soybean oil in 1,000 m.t. (year beginning March).

BZSOOHEC = Ending stocks of soybean oil in 1,000 m.t. (year beginning March).

BZSOOQ = Soyoil extraction rate, percent (year ending March).

BZSOMDZC = Other use of soybean meal in 1,000 m.t. (year beginning March).

BZSOMHEC = Ending stocks of soybean meal in 1,000 m.t. (year beginning March).

BZSOMQ = Soymeal extraction rate, percent (year beginning March).

BZSOYCAPC = Soybean crush capacity in 1,000 m.t. (year beginning March).

BZSOYDZC = Feed, seed, other use of soybeans in 1,000 m.t. (year beginning March).

BZSOYHEC = Ending stocks of soybeans in 1,000 m.t. (year beginning March).

BZSOYMMC = Imports (drawback) of soybeans in 1,000 m.t. (year beginning March).

BZSOYSYC = Soybean yield, m.t./ha. (year beginning March).

BZWHEPFA = Farm price of wheat, Sao Paulo, Cr$/kg. (calendar year).
BZWPI = Wholesale price index (1965-67 = 100), (calendar year).
BZYDA = Disposable income of the private sector in Cr$ million (calendar year).
DBWBZSOY = Dummy variable representing weather-related reductions in soybean acreage in 1963, 64, 68, 78 and 82.
DN1BZ = Dummy variable representing Brazilian agricultural policy prior to Delfin Netto, 1 = 1960 to 1968.
DN2BZ = Dummy variable representing change in Brazilian agricultural policy with Finance Minister Delfin Netto, 1 = 1969 to 1973.
D1BZ = Dummy variable: 1971 = 1.
XOBZUSA = Exchange rate: Cr$/US$ (calendar year).

European Community Soybean and Products Component

DRGECOIS = Dummy variable representing institution of CAP regulations for oilseeds beginning in 1967, 1 = years of regulation; 0 = other years.
D1EC = Dummy variable: 1 = 1960.
D4EC = Dummy variable: 1 = 1980.
ECCOMDDPA = Proportion of high protein meals consumption accounted for by cottonseed meal (calendar year).
ECCOODDPA = Proportion of total oils consumption accounted for by cottonseed oil (calendar year).
ECCOPGCA = Copra crush margin in DM/m.t. (calendar year).
ECCORPIA = Price of corn in US$/m.t. (calendar year).
ECGCAUA = EC grain-consuming animal units in million head (calendar year).
ECFIMPIA = Price of fish meal, c. and f., Hamburg, all origins, 65% protein in US$/m.t. (calendar year).
ECOISCAPT = Time trend representing oilseed crush capacity.
ECPAOPIA = Price of palm oil, Malaysia, c.i.f. Europe, in US$/m.t. (calendar year).
ECPEAGCA = Peanut crush margin in DM/m.t. (calendar year).
ECPEMDDPA = Proportion of high protein meals consumption accounted for by peanut meal (calendar year).
ECPEODDPA = Proportion of total oils consumption accounted for by peanut oil (calendar year).
ECPOPA = Population in millions (calendar year).
ECSOMDDPA = Proportion of high protein meals consumption accounted for by soybean meal (calendar year).
ECSOMFEXPCL2 = EC market development expenditures for soymeal and soyfood in 1,000 DM (deflated by ECWPI70). Average of deflated expenditures in current and two previous periods.
ECSOMQ = Soymeal extraction rate, percent (calendar year).
ECSO0DDPA = Proportion of total oils consumption accounted for by soyoil (calendar year).
ECS00EXPCL2 = EC market development expenditures for soyoil in 1,000 DM (deflated by ECWPI70). Average of deflated expenditures in current and two previous periods.
ECSOOQ = Soyoil extraction rate, percent (calendar year).
ECRAMDDPA = Proportion of high protein meals consumption accounted for by rapeseed meal (calendar year).
ECRA0DDPA = Proportion of total oils consumption accounted for by rapeseed oil (calendar year).
ECSOYDZA = Feed, seed, other use of soybeans in 1,000 m.t. (calendar year).
ECSOYEXPCL2 = EC market development expenditures for soybeans in 1,000 DM (deflated by ECWPI70). Average of deflated expenditures in the current and two previous periods.
ECSOYSPC = Production of soybeans in 1,000 m.t. (year ending July).
ECWPI70 = EC wholesale price index (1970 = 100), (calendar year).
ECYGA = EC gross domestic product in billions of DM (calendar year).
XOECSUSA = Exchange rate: DM/US$ (calendar year).
Japan Soybean and Products Component

DEMBJASOY = Dummy variable representing U.S. soybean export embargo, 1 = 1973; 0 = all other years.

D1JA = Dummy variable: 1 = 1970 and 71.

D2JA = Dummy variable: 1 = 1960; -1 = 1962.


D4JA = Dummy variable: 1 = 1979 and 80.

JACNOPUIA = Import unit value of coconut oil in US$/m.t. (calendar year).

JACOMDDPA = Proportion of high protein meals accounted for by cottonseed meal (calendar year).

JACOMPWJ = Price of cottonseed meal, delivery at RR arrival point, in yen/37.5 kg. (year beginning April - Japan fiscal year).

JACOODDPA = Proportion of total oils consumption accounted for by cottonseed oil (calendar year).

JACOOPUIA = Import unit value of cottonseed oil in US$/m.t. (calendar year).

JACOPGCA = Copra crush margin in yen/m.t. (calendar year).

JACORPWJ = Wholesale price of imported corn in yen/m.t. (Japan fiscal year).

JACOTGCA = Cottonseed crush margin, yen/m.t. (calendar year).

JAFIMPIJ = Retail price of fish meal, delivery at store, in yen/m.t. (Japan fiscal year).

JAGCAUA = Grain-consuming animal units in 1,000 head (calendar year).

JAOISCAPA = Japan oilseed crush capacity in 1,000 m.t. (calendar year).

JAPOPA = Population in millions (calendar year).

JARAMDDPA = Proportion of high protein meals consumption accounted for by rapeseed meal (calendar year).

JARAMPWJ = Wholesale price of rapeseed meal, delivery at RR arrival point, in yen/37.5 kg. (Japan fiscal year).

JARAODDPA = Proportion of total oils consumption accounted for by rapeseed oil (calendar year).

JARAOPUXA = Export unit value of rapeseed oil in US$/m.t. (calendar year).
JARAPGCA = Rapeseed crush capacity, yen/m.t. (calendar year).
JASOMFEXPCL2 = Market development expenditures for soymeal and soyfood in 1,000 yen (deflated by JAWPI67). Average of deflated expenditures in current and two previous periods.
JASOMHEA = Ending stocks of soymeal in 1,000 m.t. (December 31).
JASOMQ = Soymeal extraction rate, percent (calendar year).
JASOOEXPCL2 = Market development expenditures for soyoil in million yen (deflated by JAWPI67). Average of deflated expenditures in current and two previous periods.
JASOOHEA = Ending stocks of soyoil in 1,000 m.t. (December 31).
JASOOQ = Soyoil extraction rate, percent (calendar year).
JASOYDZA = Feed, seed, other use of soybeans in 1,000 m.t. (calendar year).
JASOYEXPCL2 = Market development expenditures in 1,000 yen (deflated by JAWPI67). Average of deflated expenditures in current and two previous periods.
JASOYHEA = Ending stocks of soybeans in 1,000 m.t. (December 31).
JAWPI67 = Wholesale price index (1967 = 100), (calendar year).
JAYGA = Gross national product in billions of yen (calendar year).
XOJAUSA = Exchange rate: yen/US$ (calendar year).

Canada Soybean and Products Component
CACORPFC = Farm price of corn in CA$/m.t. (year ending July).
CACORPWCl = Wholesale price of corn, #2 yellow, Chatham 15%, in CA$/m.t. (year ending July).
CACPI70 = Consumer price index (1970 = 100), (calendar year).
CALIVPFC = Weighted farm price of livestock (beef, pork, chicken, turkey, eggs) in CA$/c.w.t. (year ending July).
CAPAOPUIA = Import unit value of palm oil in US$/m.t. (calendar year).
CAPCAUC = High protein animal consuming units in millions (year ending June).
CAPPI = Farm price index (1970 = 100), (calendar year).
<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPOPA</td>
<td>Population in millions (calendar year).</td>
</tr>
<tr>
<td>CARAOMDDPC</td>
<td>Proportion of high protein meals accounted for by rapeseed meal (year ending July).</td>
</tr>
<tr>
<td>CARAMPWA</td>
<td>Wholesale price of rapeseed meal in CA$/m.t. (year ending July).</td>
</tr>
<tr>
<td>CARAODDPC</td>
<td>Proportion of total oils consumption accounted for by rapeseed oil (year ending July).</td>
</tr>
<tr>
<td>CARAOPWA</td>
<td>Wholesale price of rapeseed oil in CA$/m.t. (calendar).</td>
</tr>
<tr>
<td>CARAPGCC</td>
<td>Rapeseed crush margin in CA$/m.t. (year ending July).</td>
</tr>
<tr>
<td>CASOMDDPC</td>
<td>Proportion of high protein meals consumption accounted for by soybean meal (year ending July).</td>
</tr>
<tr>
<td>CASOMDZC</td>
<td>Other use of soymeal in 1,000 m.t. (year ending July).</td>
</tr>
<tr>
<td>CASOMHEC</td>
<td>Ending stocks of soymeal in 1,000 m.t. (July 31).</td>
</tr>
<tr>
<td>CASOMQ</td>
<td>Soybean meal extraction rate, percent (year ending July).</td>
</tr>
<tr>
<td>CASOODDPC</td>
<td>Proportion of total oils consumption accounted for by soybean oil (year ending July).</td>
</tr>
<tr>
<td>CASOODZC</td>
<td>Other use of soybean oil in 1,000 m.t. (year ending July).</td>
</tr>
<tr>
<td>CASOOHEC</td>
<td>Ending stocks of soybean oil in 1,000 m.t. (July 31).</td>
</tr>
<tr>
<td>CASOOQ</td>
<td>Soybean oil extraction rate, percent (year ending July).</td>
</tr>
<tr>
<td>CASOYCAPT</td>
<td>Time trend representing crush capacity.</td>
</tr>
<tr>
<td>CASOYDZC</td>
<td>Feed, seed, other use of soybeans in 1,000 m.t. (year ending July).</td>
</tr>
<tr>
<td>CASOYHEC</td>
<td>Ending stocks of soybeans in 1,000 m.t. (July 31).</td>
</tr>
<tr>
<td>CASOYSYC</td>
<td>Soybean yield, m.t./ha. (year ending July).</td>
</tr>
<tr>
<td>CAWPI70</td>
<td>Wholesale price index (1970 = 100), (calendar year).</td>
</tr>
<tr>
<td>CAYDA</td>
<td>Personal disposable income in CA$ billion (calendar year).</td>
</tr>
<tr>
<td>D1CA</td>
<td>Dummy variable: 1 = 1973 and 74.</td>
</tr>
<tr>
<td>XOCAUSA</td>
<td>Exchange rate: CA$/US$ (calendar year).</td>
</tr>
</tbody>
</table>
Other Asia Soybean and Products Component

\[ D1OA \] = Dummy variable: \( 1 = 1973 \).

\[ D20A \] = Dummy variable: \( 1 = 1971 \) and \( 1978 \).

\[ OACOODDPA \] = Proportion of total oil consumption accounted for by cottonseed oil (calendar year).

\[ OACOOPWA \] = Wholesale price of cottonseed oil, Bombay, India, in rupees/m.t.

\[ OACPI67 \] = Consumer price index (1967 = 100), (calendar year).

\[ OAPEODDPA \] = Proportion of total oils consumption accounted for by peanut oil (calendar year).

\[ OAPEOPWA \] = Wholesale price of peanut oil, Bombay, India in rupees/m.t. (calendar year).

\[ OAPOPA \] = Population, millions (calendar year).

\[ OARAODDPA \] = Proportion of total oils consumption accounted for by rapeseed oil (calendar year).

\[ OARAOPWA \] = Wholesale price of rapeseed oil, Kanpur, India in rupees/m.t.

\[ OAS00EXPCL2 \] = Market development expenditures for soyoil in million NT$ (Taiwan), (deflated by OACPI67). Average of deflated expenditures in current and two previous periods.

\[ OASOOMMPA \] = Proportion of total oils consumption accounted for soybean oil (calendar year).

\[ OAYGA \] = Gross domestic product in trillions of rupees (calendar year).

\[ XORPUSA \] = Exchange rate: rupees/US$ (calendar year).

Africa Soybean and Products Components

\[ AFCOODDPA \] = Proportion of total oils consumption accounted for by cottonseed oil (calendar year).

\[ AFCOODUIA \] = Import unit value of cottonseed oil in US$/m.t. (calendar year).

\[ AFCPI67 \] = Consumer price index (1967 = 100), (calendar year).

\[ AFPEODDPA \] = Proportion of total oils consumption accounted for by peanut oil (calendar year).
AFPEOPUXA = Export unit value of peanut oil in US$/m.t. (calendar year).
AFPOPA = Population in millions (calendar year).
AFRAODDPA = Proportion of total oils consumption accounted for by rapeseed oil (calendar year).
AFRAODUIA = Import unit value of rapeseed oil in US$/m.t. (calendar year).
AFSOOOPAPA = Proportion of total oils consumption accounted for by soyoil (calendar year).
AFSOOEEXP = Market development expenditures for soyoil in French Francs (deflated by AFCPI67). Current year only (expenditures occurred only in 1979 and 1980).
AFSOYMMA = Net imports of soybeans in 1,000 m.t. (calendar year).
AFSOYSPA = Production of soybeans in 1,000 m.t. (calendar year).
AFYGA = Gross domestic product of selected West African nations in million US$ (calendar year).
DTRAF = Dummy variable representing political strife in Africa in 1968.
D1AF = Dummy variable: 1 = 1960, -1 = 1075.

Rest-of-the-World Soybean and Products Component
D1RW = Dummy variable: 1 = 1974 and 76.
D2RW = Dummy variable: 1 = 1974; -1 = 1979.
D3RW = Dummy variable: 1 = 1960 and 62.
D5RW = Dummy variable: 1 = 1966 and 68.
ROSOMExpCL2 = Rest of the world and Other Asia market development expenditures for soymeal and soyfood in 1,000 DM (deflated by RWCP167). Average of deflated expenditures in current and two previous periods.
ROSOYEXPCL2 = Rest of the world and Other Asia market development expenditures for soybeans in 1,000 DM (deflated by RW CPI 67). Average of deflated expenditures in current and two previous periods.

RWSOOEXPCL2 = Rest of the world market development expenditures for soyoil in current and two previous periods.

TIME = Time trend: 1960 = 1; 1962 = 2; ..., 1980 = 21