AGRICULTURAL SECTOR STUDY
APPENDICES

APPENDIX A

EPA Actions Considered In This Study

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Appendix A

EPA Actions Considered in this Study

As part of this study, each of the program offices at EPA submitted a description of the regulations that were passed during the past five years and those that were being considered for the next five years. These regulations were reviewed to determine which ones were likely to have a direct economic impact on the agricultural sector; regulations having an indirect economic impact were not included in this analysis because of the difficulty in determining what portion of their cost would be passed on to agricultural producers. The set of potential direct impacts included:

Air — Lead Phasedown: If lead is banned from gasoline, farmers that use gasoline powered tractors, combines and trucks would have to use a fuel additive or rebuild their valves. These costs were incorporated into Scenario 3.

Air — Agricultural Burning Restrictions: Agricultural open burning of crop residues may be restricted. Possible control techniques include proper fire and fuel management, appropriate burning operations under optimum meteorological conditions, and alternative residue disposal procedures. The impact of this regulation was not quantified in this study because of insufficient information on its cost and incidence.

OPTS — SARA Title III (jointly with OSWER): Title III of SARA requires farmers to provide information on the chemicals that they use and store. The cost of Sections 302-303 are estimated to be approximately $50 per farm, and apply to 33% of all farms. Farms are exempt from 311-312 requirements provided that they do not employ more than 10 full-time employees. This means that virtually all farms are exempt from Section 311-312 requirements. SARA Title III costs were incorporated into Scenarios 1-3.

OSWER — Financial Responsibility Requirements for Petroleum Underground Storage Tanks (USTs): Would require farms with petroleum USTs of greater than a 1,100 gallon capacity to carry insurance. This would cost farms $2,500 per year. Information is available on the number of covered USTs in each USDA production region;: however, no information is available concerning the types of farms most likely to have them. Insurance costs were incorporated into Scenarios 1-3.

OSWER — Technical Standards for Design and Operation of USTs Containing Petroleum or Hazardous Substances: By 1991, farms having USTs will have to begin monitoring. This

is estimated to cost $500 and will have to be repeated at least every 3 years. If a leak is found, they will have to be repaired and upgraded. No information is available on the likelihood of finding leaks in farm USTs or the cost of repairing or replacing the tanks. By year 10, all USTs will have to be brought up to standards, again. Monitoring costs were incorporated into Scenarios l-3. Although there is no information specific to farm USTs, national data estimate that 15 percent of all USTs may be leaking. The estimated cost of replacing a 4,000 gallon coated and cathodically protected tank system is $21,000 and the cost of upgrading an existing tank is $3,050.

OSWER — Waste Oil Management: There is insufficient information to determine whether this is relevant.

Water — Nonpoint Source Guidance and Management Plans: Under legislation passed in February 1987, states were given grants to assess the magnitude of NPS problem and to develop management plans. These plans will have to be submitted by August 1988. EPA has until February 1988 to approve the plans. Information from Office of Water indicates that this should not be considered a direct affect on agriculture because EPA cannot force states to implement their management plans and because actions on the part of farmers will be voluntary.

Water — Wellhead Protection Program: Section 1428 of SDWA as amended in June 1986 mandated states to submit wellhead protection programs to EPA. Although states are required to submit plans, there are no federal sanctions for not submitting except for the withholding of grant funds. Twenty states have begun development of plans. The cost question is difficult to address because there are no minimum federal standards or management strategies which states must include as part of an approvable WHP; therefore, impacts are likely to vary considerably from state to state. These costs were not quantified in this study.

Water — National Estuary Program: There are no national program guidances and/or regulations yet associated with the NEP. The first is expected in 1989. For agriculture, use of pesticides in certain watersheds may be eliminated or restricted. Target reductions of nutrient loadings may be established and BMPs may be put into place by SCS and state cost sharing programs. No information is currently available to determine the impact of this program on agriculture.

Water — Sewage Sludge Regulations: A proposed rule is planned for October 1988. This rule may limit the amount of municipal sludge farmers are allowed to use on their fields. No information currently exists on the limits that would be imposed or the costs that farmers would bear as a result of this rule.

OPTS — FIFRA/OPP Part 170 (Farm workers): The proposed rule establishes requirements to improve the occupational health and safety of workers performing hand labor in the fields. Specific estimates on per acre production cost increases for various crops were utilized in this analysis and were incorporated into Scenarios 1-3.

OPTS — Pesticides in Groundwater Strategy: Groundwater protection may result in prohibitions of certain water soluble pesticides in areaswith vulnerable groundwater. Three alternative sets of impacts associated with the Pesticide in Groundwater Strategy were developed by OPTS and used-in Scenarios l-3.

OPTS — Endangered Species Act: Actions that bring EPA into compliance with the Endangered Species Act will impose some direct costs on agriculture. No information currently exits to determine the extent of costs imposed by the ESA; therefore, these costs were not included in this analysis.

OPTS — FIFBA/OPP Individual Actions: The following individual actions were included in this study: cancellation of EDB, toxaphene, dinoseb; restricted use of alachlor; cancellation of yield enhancement of cholordimeform; and an expansive, intermediate, and conservative scenario for actions on the following groups of pesticides: fungicides, corn rootworm insecticides, broad spectrum organophosphates, and grain fumigants.

Direct Impacts Included in the Empirical Analysis:

The objective of this study is to examine the cumulative impact that EPA policies promulgated over the period 1983-1992 have on the agricultural sector. It is obviously difficult to predict what future EPA policies might look like: therefore, we have defined three alternative scenarios corresponding to a range of future EPA policies. The scenarios can best be summarized as follows:

SCENARIO 1: Past and current EPA actions plus a conservative (low cost) set of assumptions about future actions.

SCENARIO 2: Past and current EPA actions plus an intermediate (mid cost) set of assumptions about future actions.

SCENARIO 3: Past and current EPA actions plus an expansive (high cost) set of assumptions about future actions.

Past and Near Term Actions Included in Scenarios 1 - 3:

Actions that the Agency has undertaken in the past five years or plans to undertake in the very near future were included. in all three scenarios. These actions are:

EDB - cancellation
Toxaphene - cancellation
Dinoseb - cancellation
SARA Title III
Leaking Underground Storage Tanks
Farm Worker Protection Standards
Chlorodimeform - cancellation of yield enhancement
Alachlor - restricted use.

For actions that there is a great deal of uncertainty over, three alternative plans were considered, with the most conservative plan being incorporated into Scenario 1, the intermediate plan into Scenario 2, and the most expansive plan into Scenario 3. These actions and the alternative plans are listed below:

Fungicides

Scenario 3: EPA would cancel the use of all EBDCs and chlorothalonil. Captan would not be cancelled.

Scenario 2: EPA would cancel the use of all EBDCs. Chlorothalonil and captan would not be cancelled.

Scenario 1: EPA would put additional restrictions on the use of all EBDCs chlorothalonil and captan (e.g., restricted use, pre-harvest restrictions, limited number of applications).

Corn Rootworm Insecticides

Scenario 3: EPA would cancel all of the corn rootworm insecticides.

Scenario 2: EPA would cancel all of the corn rootworm insecticides with the exception of one of the organophosphates and one of the carbamates.

Scenario 1: EPA would cancel soil use, but not foliar use, of all of the corn rootworm insecticides.

Broad Spectrum Organophosphates

Scenario 3: EPA would cancel three-quarters of all of the broad spectrum OPs. The most toxic ones would be cancelled.

Scenario 2: EPA would cancel one-half of all of the broad spectrum OPs. The most toxic ones would be cancelled.

Scenario 1: EPA would place restrictions on the use of OPs (e.g., closed cabs).

Grain Fumigants

Scenario 3: EPA would cancel methyl bromide. Aluminum phosphine and magnesium phosphine would not be cancelled.

Scenario 2: EPA would put additional restrictions on the use of methyl bromide, aluminum phosphine, and magnesium phosphine.

Scenario 1: No action.

Pesticides in Groundwater Strategy

Scenario 3: EPA would cancel the use of aldicarb, alachlor, and three triazines over the next five years in all counties having high drastic scores and 20% of the counties having medium drastic scores.

Scenario 2: EPA would cancel the use of aldicarb, alachlor, and three triazines over the next five years in 25% of the counties having high drastic scores.

Scenario 1: EPA would cancel the use of aldicarb in 25% of the counties having high drastic scores. Restricted use would be instituted for alachlor and the triazines. Monitoring would be-required for the triazines that have not yet had monitoring required.

Lead Phaseout

Scenario 1,2: A total ban of lead in gasoline (for agricultural use) was not assumed in these two scenarios.

Scenario 3: EPA would eliminate lead in gasoline for agricultural use.

Risk Reductions Corresponding to the Actions Considered:

The objective of the preceding report is to estimate cumulative costs associated with EPA actions. To provide some background as to why EPA has undertaken, or might consider, the actions listed above, the following section describes the health and environmental risks and exposure pathways associated-with the substances those actions are meant to control.

EDB:

Health effects were the primary concern that motivated the cancellation of EDB. EDB is classified as a likely human carcinogen and may cause adverse reproductive effects to exposed workers. The exposure routes were: food consumption, drinking water, and worker exposure. Cancer risk estimates due to occupational inhalation of EDB range from 1×10^{-1} to 3.6×10^{-4}. Millworkers and farmers had the largest populations of workers at risk, with 16,000 millworkers and 14,000 farmers estimated as being exposed to EDB through inhalation. Dietary risks occurred through the consumption of wheat products, citrus, and tropical fruits. Cancer risks from EDB to the average U.S. consumer were estimated to be 3.55×10^{-3} due to wheat product consumption and from 2.8×10^{-4} to 1.7×10^{-5} due to citrus fruit consumption, depending on state requirements about fumigation.

Toxaphene:

Ecological damages were the primary concern motivating the cancellation of toxaphene. Toxaphene was found to cause adverse reproductive effects in fish populations at very low concentrations. It may be carried for long distance in the upper atmosphere and find its way into water bodies far from the locations where it was used. In addition to the concern about fish populations, laboratory experiments indicated that toxaphene has both acute and chronic effects on several bird species. Finally, human exposure may occur both through worker exposure (inhalation and dermal) and dietary exposure. Estimates of lifetime probability of cancer to toxaphene applicators (toxaphene was applied to several crops) ranged from 2×10^{-2} to 3×10^{-5}. Dietary risk was estimated to be the greatest for local populations of fish consumers in areas where significant fish contamination had been demonstrated.

Dinoseb:

Exposure to dinoseb may cause a variety of hazards such as developmental toxicity, reproductive toxicity, acute toxicity, induction of cataracts, and immunotoxicity. An oncogenicity hazard (resulting in benign tumors) may also exist. A particular concern that led to the emergency suspension of dinoseb was its potential to cause birth defects. Exposure to dinoseb occurred through direct contact by farm workers. Approximately 45,000 workers, including up to 2,200 females, were involved in the application of dinoseb. A large number of farm workers and bystanders had the potential to be exposed to dinoseb during or shortly after application, and other people had a chance of being exposed by a secondary route (e.g., laundering of contaminated clothing). In addition, dinoseb has been found in groundwater in several states, indicating that exposure through drinking water is also possible.

Chlorodimeform:

The registrants of chlorodimeform have voluntarily cancelled it since the beginning of this project. Chlorodimeform was used only on cotton. The health risk of concern was the possibility of cancer in exposed workers.

Alachlor:

Risk of cancer is the primary concern associated with alachlor. There are multiple routes of exposure: worker exposure, consumption of ground water and surface water, and residue on food products.

Farm Worker Safety:

The objective of farm worker safety requirements are to minimize the acute and chronic health effects for pesticide handlers and field workers. There are approximately 500,000 handlers and 1.8 million field workers. The regulations are directed primarily towards minimizing the risk of acute poisoning. There are 20,000 to 300,000 acute poisoning incidences estimated to occur annually due to farm worker exposure.

Underground Storage Tank Regulations:

The proposed underground storage tank regulations would set insurance and monitoring requirements for underground petroleum tanks (with greater than 1,100 gallon capacity) on farms. The primary health risks associated with leakage from these tanks are cancer (caused by benzene, a component of petroleum) and fire and explosion. Ecological damages may occur if leakages found their way into streams. Risks are greatest in small streams where the opportunity for dilution is less than in larger streams.

SARA Title III:

Benefits associated with Title III take the form of "negative reductions in damages". Title III is expected to contribute to human health and welfare in at least two ways: by helping to prevent potentially harmful releases of hazardous substances, and by making it possible to reduce the harm from those releases that still occur.

Fungicides:

The fungicides OPP may consider for cancellation are classified as probable human carcinogens. Exposure routes for fungicides are: worker exposure, dietary, and groundwater. Worker exposure is the primary concern associated with chlorothalonil at this point, with dietary exposure the primary concern for both captan. and EBDCs; however, evidence of thyroid and teratogenic effects (birth defects) have been found for EBDCs. Chlorothalonil and EBDCs (or their breakdown products) have been found in groundwater.

Broad Spectrum Organophosphates:

There are both human health and ecological concerns associated with broad spectrum organophosphates (OPs). The OPs are acutely toxic. They depress an enzyme that causes an interference with nerve transmission, and may result in nausea, diarrhea, dizziness, or death. In addition, some OPs may result in adverse eye effects (myopia) and neurological disorders. Worker exposure, dietary exposure, and groundwater contamination are all of concern. Ecological impacts are also a concern, since broad spectrum OPs are acutely toxic to birds and fish, as well as humans.

Corn Rootworm Insecticides:

The health and ecological concerns associated with corn rootworm insecticides are similar to those for broad spectrum organophosphates. However, worker exposure is not thought to be a problem with corn rootworm insecticides because they are applied in granular form, as opposed to a spray. Hazard to bird populations is a major concern with corn rootworm insecticides.

Grain Fumigants:

Worker exposure is the primary concern with grain fumigants. Methyl bromide may result in acute toxicity (possibly causing nausea, diarrhea, dizziness, or death) while aluminum phosphine and magnesium phosphine are neurotoxins.

Pesticides in Groundwater:

Alachlor effects and exposure routes are discussed above.

Aldicarb is an acutely toxic substance that may result in nausea, diarrhea, dizziness, or death. The exposure paths of concern for aldicarb are residues on food (mainly potatoes and citrus crops) and groundwater contamination.

Triazine herbicide (cyanazine, atrazine, and simazine) exposure may occur through groundwater and surface water. Health effects are the primary concern for these substances. All of the triazines are considered possible human carcinogens, And there is some concern that the triazines can react with nitrites (also found in groundwater) to form nitrosamines, which are potent animal carcinogens. In addition, exposure to cynanzine may cause birth defects.

Lead in Gasoline:

Lead in gasoline has been shown to increase blood lead levels, which in turn have been linked to a variety of serious health effects, particularly in small children. Recent studies linking lead to high blood pressure in adult males also are a source of concern. People are exposed to lead from gasoline through a variety of routes, including direct inhalation of lead particles when they are emitted from vehicles, inhalation of lead contaminated dust, and ingestion of lead contaminated food.

APPENDIX B

AGSIM Model and Results

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Appendix B

AGSIM Model and Results

1.0 Introduction

In examining the impact of EPA actions on the financial condition of agricultural producers, it is crucial to account for the crop and livestock price increases that result from these actions. Failure to account for these price changes would result in an overestimation of the impact of EPA actions on farmers. The crop and livestock price changes resulting from EPA policies were predicted using AGSIM, a regional econometric-simulation model of U.S. crop and livestock markets (Eales, Frank, Taylor 1987a, 1987b, 1987c). The new crop and livestock prices obtained from AGSIM under each scenario, were then used as inputs to representative farm models (along with additional information on production costs and yield impacts) to determine the change in financial condition caused by EPA actions. The-set of crop and livestock prices in the base run of AGSIM (no EPA actions) is presented in Table B-2 (tables appear at the end of this appendix). The change in these prices under Scenarios 1, 2, and 3, are presented in Tables B-6, B-11, and B-16, respectively.

In addition to providing information on price changes, AGSIM is useful in predicting the impact of EPA actions on: crop acreage, livestock production, and changes in aggregate producer and consumer welfare. All of these impacts are examined in this appendix; however, only the price changes are essential to the preceding report. While the examination of these additional impacts does not shed any further light on how representative producers are impacted by EPA actions, it provides a more complete picture of the cost these actions are likely to have on society as a whole.

2.0 Description of AGSIM

AGSIM simulates regional production of major field crops and livestock as well as the demand for those commodities. Together the demand and supply systems provide estimates of commodity production, distribution, prices, and the economic welfare of producers and consumers. Initial impacts of EPA actions under each scenario are expressed as inputs to AGSIM in the form of increased costs of crop production and reduced crop yields.

The crop supply component of AGSIM is comprised of a set of supply equations for each of 11 regions. Results from only 10 regions are presented here to correspond to the principal production regions. Crops included in the model are corn, grain-sorghum, barley, oats, wheat, soybeans, cotton, and hay. Cultivated

summer fallow is treated as another land use in semi-arid regions. Region definitions are presented below.

Corn Belt:	Iowa, Illinois, Indiana, Missouri, Ohio
Lake States:	Michigan, Minnesota, Wisconsin
Northern Plains:	Kansas, Nebraska, North Dakota, South Dakota
Southern Plains:	Oklahoma, Texas
Mountain States:	Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming
Pacific States:	California, Oregon, Washington
Delta States:	Arkansas, Louisiana, Mississippi
Southeast:	Alabama, Florida, Georgia, South Carolina
Appalachia:	Kentucky, North Carolina, Tennessee, Virginia, West Virginia
Northeast:	Mid-Atlantic States and New England

For each region, the model first determines total acreage planted or placed in summer fallow and total acreage diverted or set-aside under farm programs. Then, a set of equations determine the proportion of acreage planted to each crop. Acreage is modeled as a function of expected returns, which account for target prices. Yield per acre, modeled as a time trend-for each crop in each region is held constant after 1987 (except as altered by EPA actions). Yield per acre is multiplied by acreage to calculate production. Summing crop production across regions and adding inventories determines crop supply.

Crop demands are estimated for cotton lint, hay, grain exports, grain stocks, food, soybeans, feed, and cottonseed. The soybean demand component consists of a crushing, export, and stock demand function as well as demands for the derivative meal and oil products. These functions are primarily determined by relative prices.

Equating crop supply and demand functions and solving the system of price-dependent equilibrium excess supply equations provides annual equilibrium prices. Prices from one simulated year are used to calculate net returns for that year. The system is recursive. A price from one year may affect acreage response the following year. Expected net returns drive the acreage response functions. The maximum of price from the previous simulated year and the effective support price is used to calculate expected net returns. That is, price from the previous year serves as a price expectation for the following year.

The livestock sector of AGSIM is linked to the crop sector through feed and hay prices which determine the supply and inventory of livestock products: beef, veal, pork, chicken, and milk. Also, quantities of feed demanded are influenced by livestock prices.

The model runs twice to simulate a technological change. The initial, or base run simulates commodity market conditions without any technological change. A second run simulates market conditions under the new technology, showing differences attributable to the technology. The three scenarios were simulated by changing the yields, and both fixed and variable production costs of selected crops in particular regions.

The principal limitation on the interpretation of AGSIM results is that the model is not specific and detailed enough to recognize any particular technological change. That is, any two changes having identical impacts on net returns would be treated identically by AGSIM and, thus, calculated economic impacts would be identical. The factors that might limit use of any particular technology may not be incorporated in AGSIM. Overestimating impacts is a real possibility.

Income impacts may be overestimated because AGSIM does not account for the effects of price changes on commodity program payments. Commodity programs may stabilize farm income. When prices rise, revenues derived from commodity sales rise, but deficiency payments fall, thereby partially offsetting the revenue increase. AGSIM calculates farm income based on a market price ignoring deficiency payments and hence the reduction in payments likely to accompany an increase in market price.

AGSIM simulates production and the operation of commodity markets over a ten year horizon. The year-by-year changes cannot be considered market forecasts. Instead, the multi-year information is designed to provide a longrun description of the policy impacts. AGSIM is designed to equilibrate supply and demand forces in each simulated year. Actual commodity markets may operate, at times, with much greater or lesser speed than AGSIM suggests. For example, price expectations modeled-in AGSIM do not rapidly adjust to changed conditions. That expectations mechanism is empirically adequate for historical data. Whether that expectation formation mechanism will hold in the future is a matter of speculation. The particular type of equilibrium assumed for commodity markets in AGSIM leads to stocks being rapidly depleted. In recent years, stocks have demonstrated much more inertia, suggesting that prices may not increase as rapidly as the AGSIM simulations suggest. Again, these examples indicate that the presented time paths variables follow are primarily descriptive, rather than exact.

Information from the AGSIM base run and the three alternative policy runs is presented in this appendix. Information from a base run, which is common to all three policy scenarios, is presented in Tables B-l through B-4. This information includes crop acreage by commodity, commodity prices (farm level prices for crops and retail prices for dairy and livestock commodities), crop and livestock income, and livestock production. Crop income

is calculated by subtracting most fixed and variable production costs from gross revenue. Land costs and commodity program payments are not considered in that calculation. Changes in acreage, prices, and income are presented for each policy scenario. Also, several variables measuring income changes throughout the agricultural sector and impacts on consumers are shown.

Gains and losses resulting from regulations affecting crop productivity may go far beyond the farms for which yields and costs of production are immediately affected. The crop sector supplies the dairy and livestock sectors. Increased crop production costs and reduced production may lead to higher feed costs and hence higher meat and dairy products. Other industries depend on the success of crop enterprises. Industries that process and market field crops as well as dairy and livestock products depend on the price and volume of those products. AGSIM provides some estimates of the aggregate gains and losses to industries up and down the food and fiber marketing chain.

The heading, "Crop Consumer Effect" in the boxheads of Tables B-9, B-14, and B-19 refers to the sum of gains or losses to consumers (that is, the effects of higher prices for all food and fiber products) and to all industries beyond the farm gate that depend on crop production. These industries include, but are not limited to, processors, packers, retail grocers, and transportation firms. One should expect that as crop production is carried out less efficiently, farm prices will rise and output will fall. The intermediate industries will have reduced business and the price increase, representing higher input prices to processors, will imply reduced profits for the various processing industries. With higher input and output prices throughout the marketing chain, consumers should face higher retail prices.

Similarly, the heading "Livestock Consumer Effect" refers to the sum of gains and losses beginning with livestock purchasers and ending with consumers of meat and dairy products.' These gains and losses are a subset of those included in the "Crop Consumer Effect". The "Livestock Consumer Effect" is smaller, in absolute value, than the "Crop Consumer Effect" because the latter effect includes crop uses that do not support livestock production. Only a small portion of wheat supply, for example, is used for livestock feed. Cotton is not used for livestock feed, although cottonseed meal is used for feed.

Just and Hueth showed that in vertically related industries where the output of each industry is an input for the industry one step up the marketing chain, the welfare effects of an imposed price distortion in an initial or intermediate market on all forward industries can be captured by measuring the change in consumers' surplus (the difference between what consumers are willing to pay and what they are required to pay to acquire goods and services). That is, if a calculation to compute changes in

consumers' surplus were carried out on an initial or intermediate-level general equilibrium demand function, the change should be interpreted as the change in final consumers' surplus plus the changes in all forward industry rents. Chavas and Collins generalized this analysis to include technological change or distortion. These ideas are incorporated in the AGSIM calculations presented here.

3.0 Results

As discussed above, the impact of EPA actions on crop producers are entered into AGSIM in the form of yield decreases and/or production cost increases. These impacts result in a decline in crop production and an increase in crop prices - a cost for crop purchasers. Yield and cost changes in Scenario 1 are the least of the three scenarios. The changes induce losses for both crop consumers and producers. As a result of higher costs of feeding livestock, livestock income decreases, but livestock purchasers are affected less since livestock prices change less then crop prices.

Scenarios 2 and 3 generate greater effects than Scenario 1, primarily because of larger corn yield declines beginning in 1992. Prior to 1992, these two scenarios have somewhat greater cost changes than Scenario 1, while Scenario 3 has greater changes than Scenario 2. Thus, Scenarios 2 and 3 cause somewhat larger-price changes than Scenario 1, during that time period. As a result, crop consumers, livestock producers, and livestock consumers generally lose more and crop producers lose less than in Scenario 1. Beginning in 1992, prices, in Scenarios 2 and 3 increase so much that crop income increases. In effect, the relatively large yield and cost changes of Scenarios 2 and 3 cause an income transfer from crop consumers to crop producers. Crop consumers, livestock producers, and livestock consumers lose more while producers gain more for Scenario 3 than Scenario 2, during 1992-96.

While crop producers gain in aggregate under Scenarios 2 and 3 during 1992-96, income does not increase for all crops and all regions. The cost and yield changes cause a complex change of acreages and prices for different crops. Income decreases for some crops because price increases do not outweigh cost increases and/or yield declines. Crop income declines in some regions. For example, the Northeast and Appalachian States lose in Scenario 3 because they have the highest corn yield losses, despite higher corn prices.

Scenario 1

Scenario 1 assumes the smallest initial direct changes in yields and costs among the three scenarios. Only cotton, soybeans, and

wheat yields decrease, all by less than 0.5 percent. Fixed costs generally increase by less than $1 per acre, but never by more than $1.50 per acre. Similarly, variable production costs generally increase by less than $1 per acre. Thus, changes in acreage, output, and prices are smaller than changes estimated for Scenarios 2 and 3.

Acreage and Prices. Total crop acreage steadily decreases, but never by more than 200,000 acres which is less than 0.1 percent of baseline total crop acreage (Table B-5). The acreage of all crops decreases in most years. Price changes for field crops never exceed $0.022 per bushel and are generally less than $0.01 per bushel (Table B-6). Retail prices for livestock products either fail to change or change by less than $0.01 per pound. Price decreases occur for soybean meal in 1991-93 because soybean production increases. AGSIM predicts that higher hay prices encourage the slaughter of cattle and calves. The result is that beef and veal prices fall by less than $0.0l after 1991.

Income. Since the cost increases outweigh the price increases, total crop income (net of fixed and variable costs) decreases in all years (Table B-7). The greatest income loss, $339 million, which is about 4 percent of baseline total crop income, occurs in 1988. The losses become smaller in succeeding years as cost and yield changes decline. On average, the crop income losses are less than $l per baseline crop acre. However, income (net of variable costs) increases for barley in 1992-93 and for hay from. 1991-96. In 1987, there are crop income gains (net of fixed and variable costs) in some regions. These gains are exceeded by losses in the Delta States and Southeast (Table B-8). These two regions have relatively high soybean and cotton yield losses from 1987-89. From 1988 on, income declines in all regions.

Consumer Effects. Crop consumers lose from higher prices and lower production (Table B-9). The losses become steadily larger, varying from $23 million in 1987 and to $95 million in 1996. Livestock producers generally suffer income losses due to higher feed and hay costs and unchanged or lower livestock prices beginning in 1988. The greatest loss, $42 million (less than 0.1 percent of baseline income for the S livestock products), occurs in 1993. Additionally, livestock consumers would gain in some years and lose in others.

Scenario 2

Scenario 2 has greater cost and yield changes than Scenario 1. The largest differences from Scenario 1 are the corn yield declines beginning in 1992 due to restrictions on soil insecticides. Corn yield losses exceed 8 percent in the Corn Belt and Northern Plains and vary from 2 to 6 percent in the remaining regions. The yield losses moderate in later years. Some variable costs increase noticeably in 1992. Cotton costs increase by $5.40 in

the Delta States. However, corn costs decrease by less than $2 per acre in the Corn Belt, Northern Plains, Southern Plains, and Pacific States.

Acreage and Prices. Prior to 1992, price and acreage changes are greater than Scenario 1. As a result, total crop acreage declines range from 19,000 in 1987 to 108,000 in 1991 (Table B-10). From 1988 to 1991, total crop acreage declines less for Scenario 2 than for Scenario 1. Higher crop prices in Scenario 2 seem to explain this result. Soybean price increases by $0.18 per bushel in 1988 and by lesser amounts in 1987 and 1989 (Table B-11). During these three years, the Appalachian, Delta, and Southeastern States suffer greater soybean yield losses than in Scenario 1. These initial -soybean yield losses reduce soybean and increase corn and cotton acreage, primarily due to similar changes in the Southeast. The prices of meal and oil products of cotton and soybeans increase during 1987-89 as a result of lower soybean production and higher prices.

The larger corn yield losses (as compared to Scenario 1) beginning in 1992 cause a noticeable change in results from Scenario 1. Total crop acreage decreases by 300,000 in 1992, but increases by 46,000 in 1993 to 226,000 in 1996 (Table B-10). Corn price increases by $0.51 per bushel in 1992 (Table B-11). AGSIM predicts an interesting pattern for corn and soybeans. Soybean acreage increases and price decreases in 1992, because corn cost and yield changes reduce expected corn return-s and, hence, planted acreage. The higher corn price in 1992 encourages farmers to shift acreage from soybeans and other crops to corn. Corn price rises less in following years, and the prices of barley, oats, wheat, soybeans, and cotton also increase as the acreage and production of those crops decrease. As a result, prices of meal and oil products of cotton and soybeans also rise. Since sorghum is a good feed substitute for corn, sorghum demand rises causing its price and acreage to rise. Hay acreage increases in 1988 and later years causing price decreases in most years. In 1992, lower feed and hay prices reduce retail livestock prices. After that, higher feed costs increase all livestock prices in some years. However, all price changes are less than $0.10 per pound. Beef and veal prices increase in some years and decrease in others.

Income. Crop income (net of fixed and variable costs) rises $159 million in 1987, but falls $111 million in 1988 and $315 million in 1991 after fixed costs increase in 1988 (by the same amount as in Scenario 1) and groundwater regulations begin in 1990 (Table B-12). All of those income changes are less than 2 percent of baseline total crop income. Income (net of variable costs only) decreases for all crops except soybeans, barley, oats, and hay in 1987 and soybeans in 1988, because cost increases outweigh price increases. Beginning in 1992, crop income increases because price increases, particularly for corn and soybeans, outweigh cost increases. Crop income increases the most in 1992, $1.9

billion (12 percent of baseline crop income) or an average of about $5 per crop acre, but the increases become smaller as cost and yield changes decline over time. After 1992, income rises for corn (the crop suffering the greatest regulation induced per-acre production loss), and soybeans, but decreases for barley, oats, wheat, and hay in some years.

Prior to 1992, crop income (net of fixed and variable costs) falls in most regions (Table B-13). In 1987, before fixed costs increase, income increases in the Corn Belt, Lake States, Northeast, and Appalachian States. From 1988 to 1991, crop income decreases in all regions but the Corn Belt in 1988-89. In 1992 and later years, income increases in all regions except the Delta States in 1992 because soybean prices fall and in the Mountain and Northeastern States in 1996 because higher crop prices no longer rise enough to outweigh cost increases and yield losses.

Consumer Effects. Consumers lose much more in Scenario 2 than in Scenario 1 (Table B-14). Prior to 1992, crop consumer loss peaks at $272 million and declines to $45 million in 1991. Because of the large price increases after 1992, the consumer loss peaks at $2.8 billion in 1992 but falls to $1.5 billion in 1996. Due to higher feed costs and modest livestock price increases, livestock income declines after 1987. Before the corn yield losses have their full effect on feed prices in 1993, livestock producer losses do not exceed $100 million (less than 0.1 percent of baseline income for the 5 livestock products). In 1993 and some later years, their losses exceed $1 billion (2 percent of livestock income). Before the corn yield losses have their full effect, livestock consumers have losses of less than $100 million while gaining in 1991-92 when beef prices fall. In 1993-94, livestock consumers lose more than $2 billion. However, lower beef and veal prices cause consumer gains in 1996.

Scenario 3

Scenario 3 has greater fixed cost changes throughout the simulation than Scenario 2. Yield losses and variable cost changes are greater during 1990-96. In particular, greater corn yield losses occur after 1991, than in Scenario 2. Corn yield losses are approximately 23 percent for the Northeast, 13 percent for the Appalachian States, and 10 percent for the Corn Belt and Northern Plains in 1992. Production costs are also greater than for Scenario 2; cost increases approach $12 per acre in the Northeast and Southeast and $14 per acre in Appalachian States in 1992. The yield losses and cost changes moderate in later years. Fixed costs also increase more than Scenario 2 but never by more than $2.25 per acre. The result is greater price changes, income changes, and consumer losses than for Scenario 2. The two-scenarios produce identical results for 1987.

Acreage and Prices. Prior to 1992, total crop acreage in Scenario 3 decreases, ranging from 57,000 in 1988 to 141,000 in 1991. These changes are greater than those in Scenario 2 for 1988-91, but less than those in Scenario 1 for 1987-89 (Table B-15). The pattern of individual crop acreage and price changes is very similar to Scenario 2 for 1988-91. However, acreage changes tend to be greater for Scenario 3 than Scenario 2. Also, soybean acreage increases in 1991 rather than decreases. Price changes for Scenario 3 are also greater than Scenario 2, but soybean, soybean meal, and cottonseed meal prices increase in 1990-91 rather than decrease (Table B-16). Some livestock prices do not change during 1988-91, but increases of $0.003 per pound or less occur for beef and pork.

For 1992 and later years when the larger corn yield losses occur, total crop acreage is less for Scenario 3 than Scenario 2. Total crop area decreases by 505,000 acres in 1992, decreases by lesser amounts in 1993-94, and increases by less than 200,000 acres in 1995-96 (Table B-15). Scenario 3 shows the same pattern of corn and soybean acreage changes as Scenario 2, but has greater price changes. Corn price increases by $0.78 per bushel and soybean price decreases by $0.26 per bushel in 199-2, reflecting greater corn acreage decreases and soybean increases for Scenario 3 (Table B-16). The higher corn prices encourage farmers to shift acreage from other crops to corn causing the prices of the crops to increase. As a result, the price of soybeans increases in 1993-96, with its greatest increase, $0.43, in 1994. Barley acreage increases from 1994-96, but did not in Scenario 2. However, hay acreage does not begin to increase until 1995, while in Scenario 2 it began to increase in 1993. Higher feed prices cause higher pork and chicken prices. Most livestock prices do not change by more than $0.10 per pound, but pork price increases by $0.13 per pound in 1994. Beef prices decrease $0.016 per pound or less in 1992 and 1996. Veal prices decrease $0.067 per pound or less through the entire time period.

Income. Total crop income (net of fixed and variable costs) declines during 1988-1991, ranging from $200 million in 1988 to $303 million in 1991, approximately 2 percent of baseline crop income (Table B-17). Income declines more than for Scenario 2 in 1988-90. In 1991, income decreases less for Scenario 3 than Scenario 2 because of higher soybean prices in Scenario 3. Income (net of variable costs only) decreases for all crops except corn and sorghum in 1990-91 and barley and hay in 1991. Beginning in 1992, crop income (net of fixed and variable costs) increases because of price increases that outweigh yield and cost changes. Crop income increases by $2.6 billion in 1992 (16 percent of baseline income), approaching an average of $7 per crop acre, but increases are smaller in later years as cost and yield changes decrease. These crop income increases are greater than those in Scenario 2. After 1992, income (net of variable costs only) increases for all crops in most years.

From 1988-91, regional crop income (net of fixed and variable costs) decreases for all regions except the Corn Belt in 1988-89, when it benefits from higher soybean prices (Table B-18). From 1992-96, most regions gain, but some lose. The Delta States lose in 1992 due to lower soybean prices. The Northeast and Appalachian States lose in all those years, because they incur relatively high corn yield losses. In most regions, corn replaces soybeans as corn price rises. However, corn acreage in the Northeast and Appalachian States is replaced by soybeans, resulting in income declines. In Scenario 2, these two regions generally did not lose although the Northeast lost in 1996.

Consumer Effects. Consumers lose in all years due to higher prices and lower production. Prior to 1992, the greatest consumer loss is $280 million in 1988. Consumer loss falls to $170 million in 1989 but then rises to $206 million in 1991. After the comparatively large price increases beginning in 1992, consumer loss peaks at $4.4 billion in 1992 declining to $2.2 billion in 1996. These consumer losses are larger than those in Scenario 2. Livestock effects are identical for Scenarios 2 and 3 in 1988. Livestock income falls more under Scenario 3 than Scenario 2 from 1989-96 due to higher feed costs which outweigh livestock price increases. Livestock income declines range from $3.5 million in 1989 to $122 million in 1992 (less than 0.2 percent of baseline income for the 5 livestock products). After the corn yield losses have their full effect on feed prices, livestock income decreases by $2.5 billion in 1993 (about 3 percent of baseline livestock income), ranging from about $1 billion to $2 billion in later years. From 1989 to 1993, livestock consumers incur losses of less than $86 million while gaining in 1992 when beef prices fall slightly. After 1992, livestock consumers suffer greater losses than under Scenario 2, exceeding $3 billion in 1993-94.

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Table B-1. AGSIM baseline U.S. crop acreage.

Crop	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
					Thousand acres					
Corn	74784.	76765.	76152.	75558.	76028.	77036.	77683.	78241.	78564.	78967.
Grain sorghum	12253.	12292.	12177.	12175.	12169.	12414.	12515.	12608.	12637.	12717.
Barley	11859.	11395.	10720.	10512.	10184.	10140.	10035.	10199.	10303.	10482.
Oats	12982.	11921.	12595.	13203.	13419.	13519.	13685.	13821.	13932.	14008.
Wheat	76596.	79614.	79888.	81123.	81170.	82045.	82192.	82766.	82827.	83201.
Soybeans	61090.	62067.	64536.	66871.	67480.	67452.	67324.	67340.	67384.	67437.
Cotton	11472.	12143.	12323.	12465.	12478.	12391.	12321.	12310.	12291.	12262.
All hay	57219.	58369.	57535.	57891.	57778.	58369.	58329.	58657.	58640.	58895.
Fallow	27462.	28091.	27642.	28200.	27955.	28343.	28216.	28495.	28443.	28655.
Diverted	11259.	8893.	9418.	10068.	10364.	10464.	10900.	11171.	11495.	11592.
Conservation reserve	16600.	16600.	16600.	16600.	16600.	16600.	16600.	16600.	16600.	16600.
U.S. total	373577.	378150.	379586.	384666.	385625.	388774.	389802.	392208.	393115.	394816.

Table B-2. AGSIM baseline commodity prices

Commodity	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Farm prices:										
Corn ($/bu.)	1.578	1.980	2.371	2.669	2.801	2.791	2.786	2.799	2.846	2.882
Grain sorghum ($/bu.)	1.738	2.001	2.284	2.555	2.742	2.770	2.765	2.771	2.810	2.845
Barley ($/bu.)	1.502	1.579	1.757	1.931	2.163	2.354	2.553	2.636	2.683	2.667
Oats ($/bu.)	1.818	2.921	3.307	3.124	2.966	2.873	2.763	2.674	2.606	2.562
Wheat ($/bu.)	2.495	2.737	3.028	3.212	3.324	3.329	3.325	3.310	3.325	3.337
Soybeans ($/bu.)	5.117	5.856	5.701	5.206	4.963	4.856	4.841	4.867	4.933	5.003
Cotton ($/lb.)	.582	.563	.572	.581	.598	.618	.640	.660	.681	.703
All hay ($/T)	95.499	88.346	92.260	92.408	93.561	89.914	88.761	86.480	86.056	84.635
Cottonseed ($/T)	55.207	63.039	63.075	57.457	54.878	53.695	53.663	53.673	54.439	55.191
Cott meal($/T)	102.150	93.869	94.771	94.092	92.516	89.341	87.137	86.062	85.892	85.447
Cott oil ($/T)	.262	.252	.246	.232	.227	.229	.235	.242	.250	.260
Soybean meal ($/T)	110.021	105.160	104.608	101.289	97.728	93.391	90.167	88.195	86.978	85.541
Soybean oil ($/T)	.302	.343	.341	.304	.290	.293	.306	.322	.342	.365
Retail prices:										
Beef ($/lb.)	2.599	2.408	2.657	2.831	2.884	2.782	2.671	2.584	2.546	2.523
Pork ($/l	1.665	1.382	1.577	1.854	1.948	1.813	1.728	1.757	1.832	1.858
Chicken (..)	.524	.515	.623	.699	.723	.699	.684	.683	.695	.703
Milk ($/lb.)	.163	.168	.170	.169	.170	.174	.179	.181	.180	.180
Veal ($/lb.)	4.157	4.330	4.239	4.365	4.426	4.442	4.480	4.494	4.478	4.423

Table B-3. AGSIM baseline crop income net of fixed and variable costs. 1/

Region	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
					Million dollars					
Corn Belt	1659.70	4150.88	5680.89	6269.13	6501.73	6166.59	6009.25	5936.57	6079.44	6173.54
Lake States	720.85	1417.59	2118.05	2460.47	2662.67	2573.68	2564.51	2532.30	2584.50	2576.21
Northern Plains	-236.75	668.45	1533.90	1988.21	2198.61	2062.58	1958.28	1850.51	1838.08	1801.37
Southern Plains	-135.46	42.22	287.47	432.63	549.54	567.41	588.23	590.33	626.91	654.84
Delta States	217.63	463.11	539.21	502.96	519.98	534.24	570.37	602.09	648.80	687.85
Mountain States	554.83	754.76	990.64	1247.94	1329.51	1363.41	1337.04	1340.75	1331.36	1344.93
Pacific States	726.73	697.61	887.28	974.33	1066.44	1042.20	1056.58	1035.48	1052.81	1047.66
Northeast	521.91	644.28	790.27	857.54	898.10	871.54	863.76	852.40	863.45	864.88
Appalachian States	37.80	291.54	438.12	458.39	446.28	382.94	332.06	281.88	249.71	209.50
Southeast	-170.64	-51.97	35.18	64.38	92.74	106.11	130.32	154.16	187.59	213.53
U.S. Total	3896.60	9078.47	13301.01	15282.98	16265.60	15670.61	15410.40	15176.47	15462.65	15574.31

1/ Excluding commodity program payments.

Table B-4. AGSIM baseline livestock production and income.

Commodity	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
					Million pounds dressed weight					
Production										
Beef	22206.	23841.	22348.	21676.	21663.	22524.	23621.	24781.	25604.	26202.
Pork	15885.	18863.	17345.	15319.	14849.	15928.	16690.	16470.	15947.	15871.
Chicken	17092.	16341.	15516.	15302.	15361.	15441.	15406.	15327.	15275.	15271.
Milk	131785.	127347.	127127.	129340.	129903.	127418.	124407.	123855.	125657.	127090.
Veal	312.	278.	300.	277.	268.	268.	264.	264.	270.	284.
					Million dollars					
Livestock Income										
Beef	37345.	35326.	37769.	39621.	40233.	39324.	38668.	38457.	38752.	38977.
Pork	20776.	19070.	19961.	21097.	21385.	20569.	20174.	20426.	20973.	21233.
Chicken	1427.	1118.	2344.	3133.	3294.	2846.	2620.	2621.	2785.	2878.
Milk	13178.	13241.	12599.	11961.	11640.	11707.	12043.	12281.	12405.	12479.
Veal	1144.	1064.	1113.	1054.	1032.	1034.	1029.	1035.	1053.	1091.

Table B-5. Change in U.S. crop acreages, scenario 1.

Crop	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
					Thousand acres					
Corn	21.92	-5.86	-23.73	-43.82	-45.72	-45.12	-47.36	-51.27	-51.68	-42.83
Grain sorghum	2.54	.12	-2.28	-3.48	-2.75	-2.29	-2.54	-3.48	-3.70	-4.09
Barley	.31	-10.04	-16.27	-22.46	-25.41	-29.02	-20.11	-12.85	-10.49	-6.89
Oats	-.07	-16.87	-17.16	-16.28	-21.19	-25.53	-28.51	-33.11	-36.18	-38.58
Wheat	-.70	-3.97	-4.07	-6.07	-7.49	-11.35	-23.26	-33.87	-39.75	-47.00
Soybeans	26.83	-23.25	-8.24	4.23	3.87	-.11	-.94	-1.54	-3.05	-12.90
Cotton	-1.21	-2.71	-5.35	-9.20	-12.13	-13.20	-12.22	-9.89	-7.42	-5.61
All hay	-.67	9.52	8.48	-1.13	-2.73	-4.48	-5.10	-7.19	-8.10	-9.31
Fallow	-.04	-3.19	-3.84	-6.29	-6.38	-8.78	-9.09	-10.18	-11.08	-11.99
Total	-4.82	-59.42	-76.28	110.79	126.32	148.68	-158.25	173.58	182.51	191.20

Table B-6. Change in commodity prices, scenario 1.

Commodity	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Corn	-.000	.000	.002	.004	005	.004	.004	.005	.005	.004
Grain sorghum	-.000	.000	.000	.002	003	.003	.003	.003	.003	.003
Barley	.000	.002	.004	.008	013	.018	.019	.016	.013	.010
Oats	.000	.009	.015	.013	014	.016	.017	.019	.020	.022
Wheat	.000	.000	.000	.000	000	.000	.002	.003	.003	.004
Soybeans	.012	.015	.009	.004	003	.003	.003	.003	.003	.006
Cotton	.000	.000	.001	.001	002	.002	.001	.001	.000	.000
All hay	.004	.049	.062	.004	043	.068	.084	.103	.118	.130
Cottonseed	.225	.263	.209	.163	138	.128	.111	.087	.079	.098
Cottonseed meal	.112	.117	.104	.098	087	.080	.070	.060	.056	.064
Cottonseed oil	.000	.000	.000	.000	000	.000	.000	.000	.000	.000
Soybean meal	.080	.081	.033	.000	017	-.015	-.009	.000	.008	.030
Soybean oil	.001	.002	.000	.000	000	.000	.000	.000	.000	.000
Beef	.000	.000	.000	.000	000	-.000	-.001	-.000	.000	.000
Pork	.000	.000	.000	.000	000	.000	.000	.000	.001	.001
Chicken	.000	.000	.000	.000	000	.000	.000	.000	.000	.000
Milk	.000	.000	.000	.000	000	.000	.000	.000	.000	.000
Veal	.000	.000	.000	.000	000	-.001	-.002	-.003	.003	-.002

Table B-7. Change in crop income over variable costs, scenario 1. 1/

Crop	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
					Million dollars					
Crop	-3.14	-76.39	-53.10	-50.88	-47.83	-48.50	-46.62	-43.51	-40.83	-42.89
Grain sorghum	-.12	-4.19	-3.69	-2.84	-2.43	-2.54	-2.62	-2.52	-2.34	-2.40
Barley	-.07	-7.48	-5.86	-4.08	-2.00	.23	.35	-.99	-2.18	-3.62
Oats	.00	-5.12	-3.43	-4.64	-4.13	-3.42	-3.17	-2.49	-2.01	-1.57
Wheat	-.16	-26.17	-25.75	-25.56	-25.26	-25.13	-23.98	-22.99	-21.81	-21.13
Soybeans	-3.81	-33.09	-33.92	-36.36	-36.50	-33.43	-30.34	-27.49	-27.68	-24.02
Cotton	-2.62	-10.05	-7.81	-5.79	-3.94	-2.36	-1.57	-1.02	-1.03	-1.97
All hay	.38	-5.01	-6.35	-.20	3.62	6.15	7.72	9.62	11.15	12.42
Total, net of fixed and variable costs	-9.32	-338.62	-309.65	-297.93	-291.17	-271.49	-260.55	-257.84	-244.76	-243.35

1/ Excluding changes in commodity program payments.

Table B-8. Change in crop income by region, scenario 1. 1/

Region	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
					Million dollars					
Corn Belt	10.63	-75.90	-65.95	-67.95	-69.65	-64.84	-64.42	-62.92	-57.07	-55.38
Lake States	1.88	-43.70	-39.97	-39.56	-41.96	-37.50	-36.68	-39.27	-34.98	-35.11
Northern Plains	.96	-51.09	-45.77	-44.37	-43.12	-38.61	-36.30	-36.54	-32.83	-32.17
Southern Plains	1.57	-21.73	-21.04	-19.78	-20.07	-18.08	-17.92	-19.00	-17.34	-17.52
Delta States	-19.09	-34.58	-31.91	-28.41	-25.58	-20.34	-16.22	-13.17	-11.90	-11.67
Mountain	-.27	-36.08	-34.90	-33.13	-19.55	-30.50	-30.42	-18.84	-30.82	-31.38
Pacific States	.88	-17.49	-17.03	-15.55	-16.69	-13.37	-12.82	-15.18	-12.96	-13.32
Northeast	.22	-18.22	-17.90	-17.76	-20.27	-17.85	-17.93	-20.34	-17.93	-18.11
Appalachian	.07	-20.64	-18.58	-17.95	-19.66	-17.54	-17.24	-18.67	-16.48	-16.14
Southeast	-6.17	-19.18	-16.61	-13.47	-14.62	-12.86	-12.60	-13.90	-12.46	-12.55

1/ Excluding changes in commodity program payments.

Table B-9. Important welfare effects, scenario 1.

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
						Million dollars				
Crop consumer effect	-22.72	-32.44	-36.65	-56.26	-69.11	-78.34	-82.43	-88.57	-91.85	-95.44
Livestock income change	.00	-.45	1.21	-5.21	-25.90	-39.62	-44.45	-41.91	-37.18	-29.86
Livestock consumer effect	.00	.00	-24.01	-35.01	-14.27	5.43	10.81	6.03	-8.57	-25.99

Table B-10. Change in U.S. crop acreages, scenario 2.

Crop	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
						Thousand acres				
Corn	157.22	42.39	-84.30	120.60	-39.80	-800.95	1115.13	1023.33	841.48	706.48
Grain sorghum	4.19	-3.96	-12.05	-12.36	-2.82	31.99	138.12	197.58	183.52	146.83
Barley	-.08	-9.51	-15.34	-20.57	-23.70	-25.74	-18.38	-14.20	-7.93	-3.57
Oats	-.43	-15.66	-11.46	-9.00	-15.48	-20.70	-51.36	-54.04	-33.75	-15.32
Wheat	.47	-17.58	-27.06	-17.00	-3.27	-11.04	18.35	-17.31	-22.34	-23.69
Soybeans	-204.99	-98.40	50.78	90.41	-7.75	607.04	-999.43	-933.60	-601.20	-445.06
Cotton	27.85	41.07	36.13	16.22	.37	-41.71	-152.68	-217.99	-232.57	-215.87
All hay	-3.69	23.78	22.89	7.02	-2.01	-25.83	11.46	58.31	99.06	80.95
Fallow	-.02	-2.01	-3.16	-5.67	-6.78	-8.97	-7.47	-7.40	-.08	-2.17
Total	-19.52	-41.86	-46.71	-77.19	-108.02	-304.88	46.27	27.28	226.13	226.42

Table B-11. Change in commodity prices, scenario 2.

Commodity	1987	1988	1989	1990	1991	1992	1993	1994	995	1996
Corn	-.002	.000	.008	.012	.007	.508	.339	.286	.227	.161
Grain sorghum	-.000	.000	.003	.007	.006	.149	.163	.137	.106	.073
Barley	.000	.002	.004	.008	.012	.017	.017	.016	.012	.007
Oats	.000	.009	.012	.009	.011	.013	.027	.030	.020	.008
Wheat	.000	.001	.003	.003	.002	.001	.005	.010	.010	.008
Soybeans	.156	.180	.076	-.012	-.012	-.153	.216	.367	.322	.243
Cotton	-.000	-.002	-.001	-.000	.000	.003	.008	.011	.013	.013
All hay	.022	-.124	-.172	-.079	.010	.198	.146	-.086	-.479	-.581
Cottonseed	1.403	1.727	.827	-.000	-.039	-1.198	2.713	4.756	4.491	3.547
Cottonseed meal	.822	.759	.344	-.028	-.048	-.660	2.048	3.101	2.552	1.699
Cottonseed oil	.004	.005	.002	.000	.000	-.003	.007	.015	.017	.016
Soybean meal	1.441	1.393	.617	-.101	-.159	-1.330	2.007	3.141	2.339	1.339
Soybean oil	.012	.017	.008	.000	-.000	-.012	.016	.036	.037	.032
Beef	.000	.000	.002	.002	-.002	-.005	.045	.033	.009	-.013
Pork	.000	.000	.002	.002	.002	.000	.048	.088	.056	.013
Chicken	.000	.000	.000	.000	.000	-.000	.027	.025	.016	.007
Milk	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Veal	.000	-.001	.000	.002	.000	-.002	-.047	.003	.002	-.007

Table B-12. Change in crop income over variable costs, scenario 2. 1/

Crop	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
					Million dollars					
Corn	-21.51	-83.82	-21.77	1.28	-35.16	2244.83	1010.27	973.92	747.64	472.29
Grain sorghum	-.41	-4.28	-2.34	-.15	-.71	100.50	113.40	100.51	79.15	54.98
Barley	.00	-7.52	-5.94	-3.88	-1.98	.03	-.03	-1.01	-2.68	-4.27
Oats	.05	-5.25	-4.69	-6.27	-5.44	-4.52	1.00	1.69	-2.45	-6.74
Wheat	-.01	-25.96	-23.21	-22.19	-24.24	-25.75	-15.26	-6.43	-8.06	-15.95
Soybeans	189.94	209.05	68.66	-58.29	-56.26	-292.86	333.95	591.33	514.60	380.52
Cotton	-11.57	-23.22	-20.37	-14.16	-9.23	-17.35	9.46	30.50	42.01	44.28
All hay	2.14	-12.21	-17.26	-8.74	-.00	17.96	17.80	4.46	44.74	-57.97
Total, net of fixed and variable costs	159.46	-111.34	-186.60	-272.97	-314.49	1864.80	1298.05	1469.10	1100.07	611.63

1/ Excluding changes in commodity program payments.

Table B-13. Change in crop income by region, scenario 2. 1/

Region	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
					Million dollars					
Corn Belt	150.16	88.40	21.17	-57.75	-81.11	832.22	549.58	666.42	515.54	306.47
Lake States	27.98	-12.54	-20.44	-34.18	-44.42	486.61	288.87	277.27	199.98	107.03
Northern Plains	23.03	-26.48	-30.59	-36.32	-42.35	246.97	130.53	141.59	89.38	28.80
Southern Plains	-.00	-24.37	-24.10	-22.23	-21.85	84.36	86.67	88.16	72.59	48.74
Delta States	-4.15	-15.72	-28.91	-37.01	-31.56	-47.62	52.42	89.80	74.91	51.85
Mountain States	-.86	-24.33	-22.21	-19.13	-19.77	60.30	32.44	24.79	11.42	-1.74
Pacific States	-.83	-21.13	-20.56	-17.69	-18.21	21.85	17.03	15.25	10.05	2.46
Northeast	3.26	-14.69	-15.45	-16.81	-20.57	54.20	15.49	15.51	7.71	-4.04
Appalachian	2.87	-12.64	-14.89	-19.41	-21.94	88.96	78.48	93.41	72.91	43.74
Southeast	-42.00	-47.83	-30.62	-12.46	-12.71	36.95	46.55	56.89	45.58	28.31

1/ Excluding changes in commodity program payments.

Table B-14. Important welfare effects, scenario 2.

Crop	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
					Million dollars					
Crop consumer effect	-235.82	-272.95	-158.41	-60.75	-44.76	-2881.31	-2607.44	-2564.88	-2062.60	-1477.10
Livestock income change	.00	-6.53	-.63	-29.99	-78.33	-99.18	-1601.30	-621.24	-1067.03	-1421.79
Livestock consumer effect	.00	-38.95	-87.96	-81.74	11.31	109.22	-2251.88	-2626.22	-1350.11	16.92

Table B-15. Change in U.S. crop acreages, scenario 3.

Crop	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
					Thousand acres					
Corn	157.22	38.23	-90.93	-139.25	-106.42	-1639.77	1098.16	1003.95	797.60	664.47
Grain sorghum	4.19	-4.11	-12.30	-11.93	-3.26	43.02	212.86	308.10	285.68	222.23
Barley	-.08	-9.98	-16.01	-27.02	-33.04	-30.21	-4.92	8.08	16.47	16.97
Oats	-.43	-16.27	-12.91	-11.15	-17.83	-23.73	-82.43	-104.37	-85.23	-62.61
Wheat	.47	-19.73	-30.45	-14.20	-7.50	-26.08	-9.36	-85.58	-112.37	-127.91
Soybeans	204.99	101.00	48.62	82.16	45.79	1358.06	-867.56	-776.59	-327.85	-161.86
Cotton	27.85	40.87	35.84	19.73	3.92	-91.45	-287.44	-400.34	-424.51	-385.31
All hay	-3.69	20.26	19.17	.62	-7.26	-72.90	-61.61	-21.95	31.78	8.83
Fallow	-.02	-2.63	-3.86	-6.84	-7.71	-10.78	-7.61	-4.59	8.96	8.41
Total	-19.52	-56.97	-66.72	-114.72	-140.99	-504.65	-17.52	-77.89	199.51	191.65

Table B-16. Change in commodity prices, scenario 3.

Commodity	1987	1988	1989	1990	1991	1992	1993	994	1995	1996
Corn	-.002	.000	.008	.018	.016	.777	.513	.430	.339	.240
Grain sorghum	-.000	.000	.004	.009	.010	.237	.254	.208	.159	.110
Barley	.000	.002	.004	.018	.030	.038	.033	.022	.010	.002
Oats	.000	.009	.013	.011	.013	.017	.043	.058	.051	.038
Wheat	.000	.001	.003	.007	.008	.008	.013	.021	.021	.017
Soybeans	.156	.181	.077	.031	.025	-.257	.222	.425	.354	.243
Cotton	-.000	-.002	-.001	-.000	.000	.010	.018	.025	.029	.027
All hay	.022	-.101	-.137	-.022	.074	.547	.755	.632	.140	-.020
Cottonseed	1.403	1.739	.841	.410	.352	1.450	3.606	6.376	5.852	4.283
Cottonseed meal	.822	.764	.349	.173	.162	-.855	2.873	4.353	3.537	2.263
Cottonseed oil	.004	.005	.002	.001	.001	-.003	.011	.022	.024	.021
Soybean meal	1.441	1.399	.623	.242	.167	2.283	2.068	3.596	2.461	1.145
Soybean oil	.012	.017	.008	.004	.003	-.020	.016	.041	.042	.033
Beef	.000	.000	.002	.002	.000	-.003	.067	.048	.013	-.016
Pork	.000	.000	.002	.002	.003	.003	.072	.130	.082	.020
Chicken	.000	.000	.000	.000	.000	.000	.039	.037	.024	.012
Milk	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Veal	.000	-.001	.000	.001	.000	-.003	-.067	-.000	-.006	-.019

Table B-17. Change in crop income above variable costs, scenario 3. 1/

Crop	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
					Million dollars					
Corn	-21.51	-82.72	-19.55	16.07	3.74	3136.56	1308.52	1283.34	982.40	620.88
Grain sorghum	-.41	-4.27	-2.29	.52	1.63	149.84	169.17	147.73	115.10	80.59
Barley	.00	-7.48	-5.86	-1.35	3.63	7.40	4.99	.37	-4.35	-7.60
Oats	.05	-5.14	-4.26	-5.63	-4.73	-3.41	7.35	12.12	8.64	3.75
Wheat	-.01	-25.83	-22.85	-20.84	-18.26	-17.43	-.58	13.81	12.65	2.23
Soybeans	189.94	210.46	70.35	-2.88	-9.25	-480.30	330.17	672.07	553.46	366.99
Cotton	-11.57	-23.23	-20.39	-14.72	-10.11	-27.97	23.03	62.50	83.96	85.64
All hay	2.14	-10.00	-13.85	-3.15	6.22	50.56	77.93	66.93	16.76	-3.31
Total, net of fixed and variable costs	159.46	-199.53	-271.62	-285.89	-302.70	2561.71	1645.41	1930.67	1421.98	763.67

1/ Excluding changes in commodity program payments.

Table B-18. Change in crop income by region, scenario 3. 1/

Region	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
					Million dollars					
Corn Belt	150.16	66.23	.11	-15.60	-33.74	1391.40	876.73	1009.11	760.24	438.96
Lake States	27.98	-26.57	-33.96	-43.95	-47.97	641.81	354.27	353.69	255.06	134.95
Northern Plains	23.03	-39.76	-43.14	-41.44	-40.95	483.86	281.46	284.99	193.00	91.53
Southern Plains	-.00	-29.10	-28.59	-23.76	-22.23	151.51	159.98	164.13	139.59	100.32
Delta States	-4.15	-17.16	-30.27	-27.88	-24.70	-93.58	43.84	99.35	80.77	50.84
Mountain States	-.86	-29.80	-27.41	-20.05	-18.46	112.36	73.83	66.26	45.70	26.98
Pacific States	-.83	-24.67	-23.88	-18.36	-17.31	46.50	45.93	49.56	42.41	29.49
Northeast	3.26	-22.95	-23.80	-23.02	-26.01	-137.04	-164.05	-133.20	-115.05	-99.70
Appalachian	2.87	-25.90	-28.07	-59.75	-58.83	-48.75	-51.86	-7.09	-11.48	-23.57
Southeast	-42.00	-49.85	-32.59	-12.09	-12.49	13.55	25.28	43.86	31.74	13.88

1/ Excluding changes in commodity program payments.

Table B-19. Important welfare effects, scenario 3

Crop	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
					Million dollars					
Crop consumer effect	-235.82	-280.22	-169.70	-195.30	-205.83	-4403.68	-3893.57	-3805.28	-3055.84	-2188.32
Livestock income change	.00	-6.53	-3.46	-33.35	-97.74	-121.54	-2501.32	-995.59	-1597.77	-2053.40
Livestock consumer effect	.00	-38.95	-85.67	-79.43	-35.48	19.78	-3331.59	-3822.66	-1974.73	-60.06