Scope of ASM: The U.S. Agricultural Sector Model

by

Ching-Cheng Chang and Bruce McCarl

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This paper presents an overview of the agricultural sector model that is resident in the Department of Agricultural Economics at Texas A&M. The presentation is divided into three parts: model scope, output, and use.

Model Scope

The agricultural sector model is designed to simulate the effects of various changes in agricultural resource usage or resources available, in turn determining the implications for prices, quantities produced, consumers' and producers' welfare, exports, imports and food processing. In doing this the model considers production, processing, domestic consumption, imports, exports and input procurement. The model works from a set of budgets for a number of primary crops and livestock. For production purposes the U.S. is desegregated into 63 geographical subregions. Each region possesses different endowments of land, labor and water as well as crop yields. Therefore, the regionally specified information is also an important feature in this model. Details on the items mentioned above follow. The model distinguishes between primary and secondary commodities with primary commodities being those directly produced by the farms and secondary commodities being those involving processing.

Primary Commodities

There are 36 primary commodities in the model. These are listed in Table 1. The primary commodities are chosen so as to depict the majority of total agricultural production, land use and economic value. They can be grouped into crops and livestock.

Both supply and demand information (i.e., prices, quantities, slopes and/or elasticities) are required in the model. The total supply consists of domestic production from all agricultural regions and imports. Total demand is made up of domestic and foreign (or export) components. Domestic demand includes food consumption, CCC stock, livestock feed and processing.

Transportation costs to the market are included in the supply budget. Livestock feed and processing demands are endogenously determined. The prices and quantity data came from Agricultural Statistics, Agricultural Prices Annual Summary, and Livestock and Meat Statistics Supplement. Elasticity, slope, and other information came from Baumes, Burton, Tanyeri-Abur and Bob House in the USDA.

Secondary Commodities

The model incorporates processing of the primary commodities. The production of primary commodities are regionally specified, but the processing of secondary commodities is done in the overall U.S. aggregate sector. Table 2 lists the 39 secondary commodities that are processed in the model. These commodities are chosen based on their linkages to agriculture. Some primary commodities are inputs to the processing activities yielding these secondary commodities and certain secondary products (feeds and by-products) are in turn inputs to agriculture. The primary data sources were Agricultural Statistics, Agricultural Prices Annual Summary, Livestock and Meat Situation, and Livestock Slaughter Annual Summary.

National Inputs

The model contains 24 national inputs. They are listed in Table 3. For the most part these are specified in dollar terms; for example, ten dollars worth of nitrogen, twenty dollars worth of repairing cost. In doing so, the input usage is converted into a homogeneous commodity. These inputs are usually assumed infinitely available at fixed prices and the prices are updated annually according to the paid-by-farmers index in Agricultural Statistics.

Regional Disaggregation

The model operates with two levels of regional disaggregation. The fundamental unit of disaggregation is 63 state and/or substate areas. In addition, these smaller areas are grouped into larger regions for the purposes of land supply, and labor supply. A list of these two levels of desegregated regions and areas are given in Table 4.

Regional Inputs

There are two inputs that are available at the regional level: land and farm labor. Production of crops and livestock compete for these scarce resources in each state or region. Therefore, the price and quantities of these inputs are determined on a regional basis.

Three major types of land are specified. The first one (type 1) is land suitable for crop production. Depending on ASM version crop land may be treated as a single type or in four erodibility classes. The second land type (type 2) is suitable for pasture or grazing. The third land type is AUM grazing land. The information on land utilization by states or regions was derived from Agricultural Statistics. The regional price of land were derived from the information in Farm Real Estate Market Development. Cash rental prices of land were used to reflect annual opportunity costs to the owners.

The labor input also include two components: family labor and hired labor. The model requires specification of a maximal amount of family labor available, and a reservation wage for family labor. The additional labor to be hired is based on an inducement wage rate which is higher than the reservation wage. The regional information about the quantities and wages was obtained from Farm Labor.

The water use is also divided into fixed (or surface) and variable available (or pumped ground) water and is supplied at the subregion level. The fixed water is available for a constant price but the amount of variable water is provided according to a supply schedule where increasing amounts of water are available for higher prices. The information on water came from USDA and NASS sources who used the Farm and Ranch Irrigation Survey and other government sources in its formation.

Regional Production Activities

Currently more than 1200 production possibilities (budgets) are specified to represent agricultural production. These include major field crop production, livestock production, tree production and some miscellaneous transfer activities. Some field crop activities are also divided into irrigated and non-irrigated according to the irrigation facilities available in each state or area. Appendix A gives the information about the distribution of each production activity across various

areas. Appendix B lists the production activities by area.

In some cases, the production possibilities produce more than one commodity. All commodities are produced by more than one production possibility. Most field crops (except rice) are produced by either irrigated or non-irrigated production practices. Livestock production is somewhat more complicated. Table 5 lists the main types of production activities and details the relationship between the production activities and primary commodities.

For each activity, information on yields, and usages of national and regional inputs or other commodities is required. The basic source of these information is the 1982 USDA FEDS budget. The irrigated/nonirrigated budget breakdown arose from the USDA water group who developed budgets based on the FEDS survey sources, the survey of irrigated acreage, extension budgets and SCS budget sets.[1] The Livestock budgets came straight from the FEDS system 1982.[2]

If the users are interested in examining the consequences of a technological change, the budgets for producing crops or livestock will need to be revised. The list in Appendix A can help the users acknowledge where the required adjustments are most likely to happen in the model.

Processing Activities

Basically, the secondary commodities are produced by a number of processing activities. They are soybean crushing, corn wet-milling, processing of potatoes, sweeteners, and timber, combining feed ingredients into various livestock and poultry feed, and the conversion of livestock and milk into consumable meat and dairy products. Processing cost of each commodity is calculated as the difference between its price and the costs of the primary commodity inputs. A list of all the processing activities currently included is given in table 6.

Soybean crushing involves conversion of soybean meal and oil. Two soybean crushing activities are included so that the model can select the more profitable one. The meat processing includes conversion from culled animals to slaughter and from slaughter to meat. The dairy

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[1]   Thanks to Bob House, Marcel Alillery, Glen Schaible and Terry Hickenbotham in the USDA/ERS Policy and Soil and Water Groups for making these data available.

[2]   Thanks to Bob House and Terry Hickenbotham for making these data.

processing involves conversion of raw milk to five different dairy products. The conversion of feed and feed supplements always involves more than one processing activities so that the model can select the least cost combination of feed ingredients.

Crop Mixes

The sector model is desegregated into 63 "homogeneous" production areas. However, within each region production are often represented by one crop budget. Such representation cannot capture the full factor-product substitution possibilities in each of those areas. In cases, this can lead to quite misleading results. This is avoided by requiring the crops in a region to fall within the mix of crops observed in the Agricultural Statistics historical cropping records. The model is constrained so that for each area the crop mix falls within one of those observed in the past 20 years.

Output from the Model

A considerable amount of output is generated by the model. The output consists of supply-demand disappearance tables for both the primary and secondary commodities as given in tables 7 and 8, respectively. These two tables display the market situation for the modelled commodities including the price, production and disposition. For example, in Table 7 the equilibrium market price of corn is $2.29 per bushel. There are 8.2 billion bushels of corn produced and no import. From the total supply of corn available (8.2 billion bushels), 710.6 million are consumed domestically as food, 4.1 billion are directly used as livestock feed, 941.4 million are processed into livestock feed mixes, 892.7 million are wet-milled into oil and starch and 1.5 billion are exported.

The social welfare accounting is given in tables 9-14. These tables separate social welfare by region and component. The first component presented in Table 9 is the benefit attributed to agricultural producers in each region. This benefit arises from labor, the two land types, water,

and grazing animal unit months.

The second component of the benefit is attributed to domestic and foreign consumers and is listed by commodities in tables 10 and 11 respectively. Tables 12-13 give the calculation of government program payment and CCC loan cost. Table 14 summarizes the total social welfare accounting. There are three major components: domestic, foreign, and government sectors. The net social welfare is the sum of domestic and foreign welfare minus the government deficiency payments and marketing loan payments. CCC loan costs are not accounted because the net cost depends on receipts when government disposes of the commodity.

Regional labor, water and land reports are listed in tables 15, 16 and 17, respectively. The labor report includes the reservation wage and quantity utilized of family labor, as well as the equilibrium wage and quantity of hired labor in each region. The water report lists the amount used and equilibrium prices as well as the total values of fixed and purchased water. The land report presents the quantities of land utilized by types (type 1 for crop, type 2 for pasture and public grazing) and rental value of land in each region. The distribution of irrigated and nonirrigated (dry) land among field crop production are listed in the harvest acreage report as given by table 18.

National input usages in the production and processing activities are reported in Table 19 by the name of the input. Table 20 is a revenue statement which lists the gross incomes received from commodity sales including government payments.

Sub-regional reports are given for an example in Tables 21-23. Table 21 lists the crop harvested acreages, Tables 22-23 list the amount of crop and livestock produced in each sub-region.

Using the Model

There are many ways that the model as described above has been used originally. Baumes developed the model which was used to study import quotas for beef and wheat. Subsequently, the model was used by Burton to study the impacts of banning various herbicides. Then, McCarl

and others, under an OTA sponsored project studied the effect of making ethanol from agricultural byproducts and agricultural products. This was followed by Chattin who re-examined the ethanol situation. Subsequently, the model has been used in air pollution evaluations by McCarl and Associates involving ozone (Adams, Hamilton, and McCarl) acid rain (Adams, Calloway and McCarl) and more recently ultraviolet radiation and global climate change. Simultaneously, the model has also been used for a number of years at the USDA for policy assessment and has been used by the Western Regional Water Groups to examine water questions. The University of Minnesota has also used the model in technology assessment.Many of the uses of the model have involved expansion of model scope to include new primary or secondary commodities (i.e. as in Tanyeri-Abur where sugarcane, sugarbeets, corn wet-milled, and other sweetener related commodities are added to study the impact of sugar import quota removal). Additional production activities have also been added and there have been modifications to the yields of current production activities. In this section we wish to present some brief notes on two issues regarding using the model. The first involves adding new commodities. The second involves preparing input for using the model in technological appraisal. Before discussing these we will introduce a short section on model flexibility.

Model Flexibility

The original design of the model and the subsequent versions of the model have all attempted to maintain flexibility in the model structure making it easy to add commodities, sources of export, import sources of domestic demand, additional production activities, etc. This is facilitated through use of GAMS. Those wishing to utilize the model will find it simple to add desirable features. However, certain changes such as disaggregation of an input category into several may require extensive respecification since more than 1200 production activities are involved.

Adding a New Commodity

Model use may require addition of a new commodity. Suppose, for example, one wished to use the model to study vegetable policy questions and wished to add production of onions and

tomatoes, as well as tomato processing. In order to do this several modifications have to be done. First, one would need to develop production budgets for tomatoes and onions. Second, one would need to respecify the crop mixes to reflect the presence of tomatoes and onions. This would involve going through the historical USDA statistics and finding out how much of each of these were produced in each of the 63 areas and then augmenting the crop mixes with this information. Third, one would then need to develop processing budgets for processing tomatoes into whatever products were needed to be modeled. Fourth, one would have to develop data on domestic demand, export demand and import supply relationships for tomatoes, processed tomato products and onions.

All things considered, then adding a new commodity to the model as in the above illustration embodies consideration of new production activities, crop mixes, demand, processing, and foreign trade.

Preparing Input for Using the Model on a Technological Appraisal

Alternative production processes which make use of new technology, better management, etc. can be specified into the model. Fundamentally, the model has facilities for changing technical coefficients or resource endowments. As such, new technology or management practice may alter the technical coefficients in terms of land, labor, water use, national input use and primary product yields.

The use of the model to do a technological appraisal requires consideration of several things. First, the user has to identify what regions will be affected by the technological change. This can be specified on a now and later basis but should include all regions that would be effected. When a technology is being developed, it will be contained to a particular region only for the first few years. Therefore, one must also specify where (and when) the eventual adoption of this technology will take place.

Second, once the regions have been identified, one needs to develop budget alterations for each region. In altering the budgets, one of the following two assumptions has to be made. Namely, one has to identify whether or not this new budget is an alternative production pattern or a replacement production pattern. If, for example, one anticipates that this technology is potentially

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an improved way of growing corn but is not sure that it is always dominant, then it should be entered as an alternative production budget. On the other hand, if one anticipates this technology is indeed a dominant way of growing corn (i.e., in which all of the production costs are either reduced or unchanged), then one should indicate that it is a substitute and the production budget can be replaced by the new one.

Table 1. Primary Commodities

	Crop Commodities		Livestock Commodities
1	Cotton	17	Milk
2	Corn	18	Cull Dairy Cows
3	Soybeans	19	Cull Dairy Calves
4	Wheat	20	Cull Beef Cows
5	Sorghum	21	Calves
6	Rice	22	Yearlings
7	Barley	23	Non Fed Beef
8	Oats	24	Fed Beef
9	Silage	25	Veal Calves
10	Hay	26	Cull Sows
11	Sugar Cane	27	Hogs
12	Sugar Beets	28	Feeder Pigs
13	Potatoes	29	Poultry
14	Saw Wood	30	Cull Ewes
15	Pulp Wood	31	Wool
16	Forest Carbon	32	Feeder Lambs
		33	Slaughter Lambs
		34	Unshorn Lambs
		35	Wool Subsidy
		36	Other Livestock

Table 2. Secondary Commodities

	Crop Commodities		Livestock Commodities
1	Soybean Meal	27	Fluid Milk
2	Soybean Oil	28	Skim Milk
3	Raw Sugar	29	Non Fat Dry Milk
4	Refined Sugar	30	Cream
5	Corn Starch	31	Butter
6	Corn Gluten Feed	32	Ice Cream
7	Corn Oil	33	American Cheese
8	Ethanol	34	Other Cheese
9	HFCS	35	Cottage Cheese
10	Corn Syrup	36	Fed Beef
11	Dextrose	37	Non Fed Beef
12	Confectioneries	38	Veal
13	Beverages	39	Pork
14	Baked Goods		
15	Canned Goods		
16	Dried Potatoes		
17	Chipped Potatoes		
18	Frozen Potatoes		
19	Feed Grains		
20	Dairy Protein Feed		
21	High Protein Swine Fd		
22	Low Protein Swine Fd		
23	Low Protein Cattle Fd		
24	High Protein Cattle Fd		
25	Pulp Wood Lumber		
26	Saw Wood Lumber		

Table 3. National Inputs

Lists of Inputs	Units
1. Nitrogen	$
2. Potassium	$
3. Phosphorous	$
4. Lime	$
5. Other Chemicals	$
6. Custom Operation	$
7. Seed Costs	$
8. Fuel and Energy Costs	$
9. Interest on Operating Capital	$
10. Irrigation Energy Cost	$
11. Repair Costs	$
12. Vet and Medical Costs	$
13. Marketing/Storage Costs	$
14. Insurance (Except Crop)	$
15. Machinery	$
16. Management	$
17. Land Taxes	$
18. General Overhead Costs	$
19. Non-Cash Variable Costs	$
20. Crop Insurance	$
21. Land Rent	$
22. Set-Aside (Conservation Cost)	$
23. Processing Labor	$
24. Other Variable Costs	$

Table 4. Regional and Subregional Disaggregation in the Sector Model

NORTHEAST	CORNBELT	SOUTHERN PLAINS
Connecticut	North Illinois	Oklahoma
Delaware	South Illinois	Texas Central Blacklands
Maine	North Indiana	Texas Coast Bend
Maryland	South Indiana	Texas East
Massachusetts	North East Iowa	Texas Edwards Plateau
New Hampshire	Central Iowa	Texas High Plains
New Jersey	South Iowa	Texas Rolling Plains
New York	West Iowa	Texas South
Pennsylvania	Missouri	Texas Trans Pecos
Rhode Island	North East Ohio	
Vermont	North West Ohio	
	South Ohio	

MOUNTAIN	LAKE STATES	SOUTHEAST
Arizona	Michigan	Alabama
Colorado	Minnesota	Florida
Idaho	Wisconsin	Georgia
Nevada		South Carolina
Montana		
New Mexico		
Utah		
Wyoming		

NORTHERN PLAINS	DELTA STATES	PACIFIC
Kansas	Arkansas	North California
Nebraska	Louisiana	South California
North Dakota	Mississippi	Oregon
South Dakota		Washington

APPALACHIAN
Kentucky
North Carolina
Tennessee
Virginia
West Virginia

Table 5. Production Activities and Primary Commodities

(I). Crop Production

Production Activities	Primary Commodities
Cotton Cotton Irrigated	Cotton
Corn Corn Irrigated	Corn
Soybeans Soybeans Irrigated	Soybeans
Wheat Wheat Irrigated	Wheat
Sorghum Sorghum Irrigated	Sorghum
Rice Irrigated	Rice
Barley Barley Irrigated	Barley
Oats Oats Irrigated	Oats
Silage Silage Irrigated	Silage
Hay Hay Irrigated	Hay
Sugar Cane Sugar Can Irrigated	Sugar Cane
Sugar Beets Sugar Beets Irrigated	Sugar Beets
Potatoes Potatoes Irrigated	Potatoes
Saw Wood	Carbon Saw Wood

(II). Livestock Production

Production Activities	Primary Commodities
Beef Cow	Cull Beef Cows, Beef Feeder Yearlings, Live Calves
Beef Feed	Slaughtered Fed Beef Cows
Cow Calf	Cull Beef Cows, Live Calves, Beef Feeder Yearlings
Dairy	Milk, Cull Dairy Cows, Live Calves
Farrow Finishing (79A)	Hogs for Slaughter, Cull Sows
Feeder Pig (79A)	Feeder Pigs, Cull Sows
Feedlot (79)	Slaughtered Fed Beef Cows
Hog Farrow	Hogs for Slaughter, Cull Sows
Pig Finishing (79A)	Hogs for Slaughter
Pig Finishing	Hogs for Slaughter
Other Livestock	Other Livestock (Primary Horses)
Poultry	Poultry
Sheep	Slaughtered Lambs, Feeder Lambs, Culled Ewes, Wool, Wool Incentive Payments, Unshorn Lamb Payments
Stocker	Live (Beef Feeder) Calves, Slaughtered Nonfed Beef

Table 6. Processing Activities

Processing Activities	Number of Activities
Soybean Crushing	
Soybean to soybean meal and oil	2
Livestock to Meat and Dairy Products:	
Culled Beef Cow to Nonfed Slaughter	1
Culled Dairy Cow to Nonfed Slaughter	1
Beef Feeder Yearling to Nonfed Slaughter	1
Nonfed Slaughter to Nonfed Beef	1
Live Calf to Calf Slaughter	1
Culled Dairy Calf to Calf Slaughter	1
Calf Slaughter to Veal	1
Fed Slaughter to Fed Beef	1
Hog Slaughter to Pork	1
Sow Slaughter to Pork	1
Raw Milk to Skim Milk and Cream	1
Raw Milk to Fluid Milk and Cream	1
Raw Milk to Butter and Nonfat Dry Milk	1
Cream and Skim Milk to American Cheese	1
Cream and Skim Milk to Other Cheese	1
Cream and Skim Milk to Ice Cream	1
Cream and Nonfat Dry Milk to Ice Cream	1
Cream and Skim Milk to Cottage Cheese	1
Livestock Feed Mixing:	
Feed Grain	6
Dairy Protein Feed	6
High Protein Swine Feed	1
Low Protein Swine Feed	2

High Protein Cattle Feed	1
Low Protein Cattle Feed	4

Potato Processing:

Potatoes to Frozen Potatoes	1
Potatoes to Potato Chips	1
Potatoes to Dehydrated Potatoes	1

Corn Wetmilling:

Corn to Corn-oil, Gluten feed, and Starch	1
Gluten Feed to Soybean Meal	1
Starch to HFCS	1
Starch to Corn Syrup	1
Starch to Dextrose	1
Starch to Ethanol	1

Sweetener Processing:

HFCS and Refined Sugar to Beverages	1
HFCS and Refined Sugar to Confectioners	1
HFCS and Refined Sugar to Canned Good	1
HFCS and Refined Sugar to Baked Good	1
Sugar Cane to Cane-Refinering	1
Cane-Refinering to Refined Sugar	1
Sugar Beets to Refined Sugar	1

Timber Processing & Transportation:

Regional Saw Wood to Saw Wood Lumber	7
Regional Pulp Wood to Pulp Wood Lumber	7
Regional Saw Wood to Pulp Wood	7

TABLE 7.   BALANCEP   PRIMARY PRODUCT SUPPLY DEMAND BALANCE

	PRICEX100	PRODUCTION	IMPORT	PROD-USE	FEEDMIXUSE	PROC-USE	DOM-DEMAND	EXPORT
COTTON	31484	16067					8159	7908
CORN	229	8163225		4116633	941445	892687	710610	1501850
SOYBEANS	576	1919152				1374964		544188
WHEAT	260	2620101		225144	102467		1216275	1076215
SORGHUM	208	829898		290526	456885		2003	80485

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TABLE 8.   BALANCES   SECONDARY SUPPLY DEMAND BALANCE

	PRICEX100	PROC-YLD	IMPORT	PROD-USE	FEEDMIXUSE	PROC-USE	DOM-DEMAND	EXPORT
SOYBEANMEA	825	668993		387920	171069			110004
SOYBEANOIL	20600	14987					10993	3995
FLUIDMILK	2495	598300					598300	
FEEDGRAIN	4252	42383		42383			143101	
DAIRYPROT1	857	593110		593110			3570	

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TABLE 9.   REGWELFAR   REGIONAL WELFARE ACCOUNTING

	CROPLAND	PASTURE	AUMS	WATER	LABOR	TOTALPS
CS	GRNDTOT					

	CROPLAND	PASTURE	AUMS	WATER	LABOR	TOTALPS	CS	GRNDTOT
NORTHEAST	200293	14312		324	205435	420365	232078095	232498460
LAKESTATES	1167735	268399		10704	1240459	2687297	76462920	79150216
CORNBELT	5214773	345764		11178	1379015	6950730	149333535	156284265
NORTHPLAIN	2421263	331675		130921	668116	3551975	22676187	26228162
APPALACHIA	607045	101189		EPS	1075128	1783362	96649597	98432959
SOUTHEAST	575065	13979		5467	648204	1242714	111220306	112463020
DELTASTATE	719293	3954		42952	455236	1221434	39982026	41203460
SOUTHPLAIN	736135	97332	EPS	109555	732027	1675050	86325625	88000674
MOUNTAIN	1163133	2402	EPS	350773	667330	2183637	57283703	59467340
PACIFIC	1021690	3521		173109	370149	1568469	150747726	152316195
TOTAL	13826424	1182527	EPS	834982	7441098	23285032	1022759720	1046044752

TABLE 10.   PCONSUR   DOMESTIC CONSUMER SURPLUS

	QUANTITY	PRICEX100	EXPEND	DOMEST-CS	TOTCS
TOTAL	22430884	1147297	230520736	1022759720	1022759720
COTTON	8159	31484	2568877	17070486	17070486
CORN	710610	229	1628309	10373387	10373387
SOYBEANS		576			
WHEAT	1216275	260	3164246	25643906	25643906
SORGHUM	2003	208	4175	27907	27907
RICE	80293	648	520375	4251549	4251549
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FROZENPOT	65789	3500	2302620	16973449	16973449
DRIEDPOT	5615	8630	484576	3738373	3738373
CHIPPOT	11486	29580	3397560	21569804	21569804

TABLE 11.   FWELFARE   FOREIGN WELFARE

	IMPORT-PS	PS+CS	TOTWEL	PRICEX100	MIN-REQ	EXPQUANT	EXPORT-CS	IMPQUANT
TOTAL	1147297		EPS	3688158	77916255	477569	5954329	
	83870585	83870585						
COTTON	31484			7908	4023511			
	4023511	4023511						
CORN	229			1501850	18948488			
	18948488	18948488						
SOYBEANS	576			544188	8935258			
	8935258	8935258						
WHEAT	260			1076215	14973779			
	14973779	14973779						
SORGHUM	208			80485	492578			
	492578	492578						
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FROZENPOT	3500			457	123398	138	4025	
	127423	127423						
DRIEDPOT	8630			58	38615	128	9205	
	47821	47821						
CHIPPOT	29580		EPS	47	107255			
	107255	107255						

TABLE 12.   GOVDEF   GOVERNMENT DEFICIENCY PAYMENT SUMMARY

	DEFRATE	DEFPYMT	5092PYMT	UNHARVPYMT	TOTDEFPYMT	MKTRATE	MKTPYMT
	DEF+MKT						
TOTAL		7622168.618	227930.693	50251.191	7900350.501		2226.425
	7902576.926						
COTTON	108.600	1440395.228	86549.241	30248.300	1557192.769		
	1557192.769						
CORN	0.459	2841558.720	22306.475		2863865.195		
	2863865.195						
WHEAT	1.398	2467695.279	68114.066		2535809.345		
	2535809.345						
SORGHUM	0.526	289406.783	18256.260		307663.043		
	307663.043						
RICE	4.210	491201.811	25950.068	18665.669	535817.548	0.019	2226.425
	538043.973						
BARLEY	0.226	55717.606	637.289	1337.223	57692.117		
	57692.117						
OATS	0.314	36193.190	6117.294		42310.484		
	42310.484						

TABLE 13.   GOVCCC   GOVERNMENT CCC LOAN COST SUMMARY

	CCCSTK	CCCRATE	CCCLOANCST
TOTAL			389520.443
CORN		1.570	
SOYBEANS		4.480	
WHEAT		1.950	
SORGHUM		1.490	
BARLEY		1.320	
OATS		0.850	
BUTTER		1.010	
AMCHEESE		1.150	
NONFATDRYM	458259.344	0.850	389520.443

TABLE 14.   WELSUM   SOCIAL WELFARE SUMMARY REPORT

DOM-TOTAL	1046044752
DOM-CONSUM	1022759720
DOM-PRODUC	23285032
FOR-TOTAL	83870585
FOR-EXPORT	77916255
FOR-IMPORT	5954329
TOT-SOCIAL	1129915337
GOV-DEFPMT	7900351
GOV-MKTLN	2226
GOV-TOTPMT	7902577
NET-SOCIAL	1122012760
NET-DOMEST	1038142175

TABLE 15. LABORSUM   LABOR USE SUMMARY

	FAMILY	REWAG	VALUE	HIRED	WAGE	VALU
TOTALLABR	TOTVALU					
NORTHEAST	44580.000	2.230	99413.400	72036.366	4.391	316337.669
116616.366	415751.069					
LAKESTATES	553907.000	2.060	1141048.420	67090.136	4.127	276887.621
620997.136	1417936.041					
CORNBELT	602440.000	2.280	1373563.200	3131.143	4.561	14280.755
605571.143	1387843.955					
NORTHPLAIN	183033.000	2.290	419145.570	155301.004	4.596	713708.346
338334.004	1132853.916					
APPALACHIA	487560.000	2.050	999498.000	57174.230	4.090	233828.011
544734.230	1233326.011					
SOUTHEAST	278250.000	2.280	634410.000	8806.303	4.560	40155.064
287056.303	674565.064					
DELTASTATE	215301.000	2.050	441367.050	10182.613	4.098	41724.157
225483.613	483091.207					
SOUTHPLAIN	277895.000	2.320	644716.400	56112.927	4.632	259897.773
334007.927	904614.173					
MOUNTAIN	272450.000	2.390	651155.500	11205.545	4.772	53469.407

21

283655.545   704624.907
PACIFIC   122010.000   2.750   335527.500   18818.011   5.492   103342.640
140828.011 438870.140
TOTAL   3037426.000   22.700 6739845.040   459858.277   45.317 2053631.444
3497284.277 8793476.484

TABLE 16.   WATERSUM   WATER USE SUMMARY

	PUMPPRICE	FIXED	FIXPRC	FVALUE	PUMPED	PVALUE
TOTALWATER	TOTWAL					
NORTHEAST	13.806	8.000	2.600	20.800	19.255	265.840
27.255	286.640					
LAKESTATES	24.223	171.600	7.408	1271.170	501.566	12149.353
673.166	13420.523					
CORNBELT	20.386	97.700	7.874	769.270	740.502	15096.201
838.202	15865.471					
NORTHPLAIN	20.274	1572.000	10.310	16207.880	8959.228	181642.065
10531.228	197849.945					
SOUTHEAST	14.835	526.367	9.939	5231.533	620.320	9202.712
1146.686	14434.245					
DELTASTATE	14.726	973.500	3.844	3742.120	5389.896	79370.438
6363.396	83112.558					
SOUTHPLAIN	30.302	1828.720	16.553	30270.129	4196.994	127177.966
6025.715	157448.095					
MOUNTAIN	25.312	17704.117	8.240	145882.428	6669.303	168816.730
24373.420	314699.158					
PACIFIC	27.811	10383.400	18.536	192465.840	5915.244	164508.536
16298.644	356974.376					
TOTAL	22.968	33265.404	11.900	395861.169	33012.308	758229.842
66277.712	1154091.011					

TABLE 17.   LANDSUM   LAND USE SUMMARY

	USE	RENTALRATE
NORTHEAST .CROPLAND	5598.52	46.33
NORTHEAST .PASTURE	849.40	26.96
NORTHEAST .AUMS	360.24	8.98
LAKESTATES.CROPLAND	31815.44	47.19
LAKESTATES.PASTURE	23281.45	18.45
LAKESTATES.AUMS	1880.99	8.98
CORNBELT .CROPLAND	89211.00	74.56
CORNBELT .PASTURE	19786.08	27.96
CORNBELT .AUMS	14074.41	8.98
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TOTAL .CROPLAND	320953.08	
TOTAL .PASTURE	126516.39	
TOTAL .AUMS	61901.94	

TABLE 18.   HARVEST   HARVESTED ACREAGE REPORT

	DRYHARV	IRRHARV	TOT-HARV	DIVERTLAND	TOT-ACRE	AVG-YIELD
COTTON	12141.58	1501.86	13643.44	2870.93	16514.37	1.18
CORN	70605.71	2124.02	72729.72	7708.49	80438.22	112.24
SOYBEANS	45504.96	8592.81	54097.77		54097.77	35.48
WHEAT	53826.30	9052.91	62879.21	4756.77	67635.98	41.67
SORGHUM	13500.13	583.78	14083.91	2159.52	16243.43	58.93
RICE		2720.81	2720.81	823.20	3544.00	54.98
BARLEY	8307.37	1213.63	9521.00	649.71	10170.71	55.79
OATS	10453.44	12.78	10466.22	1150.27	11616.49	52.46
SILAGE	6447.13	203.06	6650.19		6650.19	13.13
HAY	34350.99	16208.73	50559.72		50559.72	2.85
SUGARCANE	910.61		910.61		910.61	5.66
SUGARBEET	355.05	880.89	1235.94		1235.94	5.31
POTATOES	1335.64		1335.64		1335.64	301.06

TABLE 19.   NATINPUSE   NATIONAL INPUT USAGES IN $1000

NITROGEN	3966713,	POTASSIUM	2726110,	PHOSPOROUS	1376563
LIMEIN	391532,	OTHERVARIA	4260092,	CUSTOMOPER	1876486
CHEMICALCO	4114223,	SEEDCOST	3311799,	CAPITAL	2329323
REPAIRCOST	5392270,	VETANDMEDI	1157756,	MARKETING	1632064
INSURANCE	115247,	MANAGEMENT	115492,	FUELANDOTH	5741912
IRRIGATION	412331				

TABLE 20.   GROSSREV   GROSS REVENUE REPORT BY COMMODITY

	PRICE	PRODUCTION	DEFPYMT	TOTAL-REV
COTTON	315	16067	1557193	6615842
CORN	2	8163225	2863865	21569272
SOYBEANS	6	1919152		11055212
WHEAT	3	2620101	2535809	9352232
SORGHUM	2	829898	307663	2037340
.				
.				
.				

TABLE 21.   SOLCROP   SUBREGIONAL ACREAGE REPORT BY CROP

	COTTON	CORN	SOYBEANS	WHEAT	SORGHUM
ALABAMA	852	956	1000	183	107
ARIZONA	488	35		108	19
ARKANSAS	738	66	3492	1170	339
NCALIFORNI	772	212		854	165
COLORADO		701		3365	443
.					
.					
.					

TABLE 22.   CROPSUBREG   SUBREGIONAL CROP PRODUCTION REPORT

	COTTON	CORN	SOYBEANS	WHEAT	SORGHUM
ALABAMA	883	63986	26175	6519	4902
ARIZONA	1323	4920		12755	1840
ARKANSAS	971	4838	96937	40705	20482
NCALIFORNI	1995	28992		75456	10551
COLORADO		94062		134223	10523
.					
.					
.					

TABLE 23.   LIVESUBREG   SUBREGIONAL LIVESTOCK PRODUCTION REPORT

	OTHERLIVES	CULLDAIRYC	CULLBEEFCO	MILK	HOGSLAUGHT
ALABAMA		186	121	9694	848
ARIZONA		93		5315	185
ARKANSAS		155		9067	950
NCALIFORNI		773		44182	1956
COLORADO		151		8962	374
.					
.					
.					

APPENDIXES

APPENDIX A. SUBREGIONAL DISTRIBUTION OF PRIMARY PRODUCTION ACTIVITIES

(I). CROP PRODUCTION:

	COTTON	CORN	SOYBEANS	WHEAT	SORGHUM
ALABAMA	YES	YES	YES	YES	YES
ARIZONA	YES	YES		YES	YES
ARKANSAS	YES	YES	YES	YES	YES
NCALIFORNI	YES	YES		YES	YES
COLORADO		YES		YES	YES
DELEWARE		YES	YES	YES	
FLORIDA	YES	YES	YES	YES	
GEORGIA	YES	YES	YES	YES	YES
IDAHO		YES		YES	
NILLINOIS		YES	YES	YES	YES
NINDIANA		YES	YES	YES	YES
WIOWA		YES	YES	YES	YES
KANSAS		YES	YES	YES	YES
KENTUCKY	YES	YES	YES	YES	YES
LOUISIANA	YES	YES	YES	YES	YES
MARYLAND		YES	YES	YES	
MICHIGAN		YES	YES	YES	
MINNESOTA		YES	YES	YES	
MISSISSIPP	YES	YES	YES	YES	YES
MISSOURI	YES	YES	YES	YES	YES
MONTANA		YES		YES	
NEBRASKA		YES	YES	YES	YES
NEVADA	YES			YES	
NEWJERSEY		YES	YES	YES	
NEWMEXICO	YES	YES		YES	YES
NEWYORK		YES	YES	YES	
NORTHCAROL	YES	YES	YES	YES	YES
NORTHDAKOT		YES	YES	YES	
NWOHIO		YES	YES	YES	
OKLAHOMA	YES	YES	YES	YES	YES
OREGON		YES		YES	
PENNSYLVAN		YES	YES	YES	YES
SOUTHCAROL	YES	YES	YES	YES	YES
SOUTHDAKOT		YES	YES	YES	YES
TENNESSEE	YES	YES	YES	YES	YES
UTAH		YES		YES	
VIRGINIA	YES	YES	YES	YES	YES
WASHINGTON		YES		YES	
WESTVIRGIN		YES		YES	
WISCONSIN		YES	YES	YES	
WYOMING		YES		YES	
SINDIANA		YES	YES	YES	YES
CENTIOWA		YES	YES	YES	YES
NEIOWA		YES	YES	YES	YES
SIOWA		YES	YES	YES	YES
SOHIO		YES	YES	YES	
NEOHIO		YES	YES	YES	
SILLINOIS		YES	YES	YES	YES
HIPLAINSTX	YES	YES	YES	YES	YES
ROLINGPLTX	YES	YES	YES	YES	YES
CNTBLACKTX	YES	YES	YES	YES	YES
EASTTX	YES	YES	YES	YES	YES
EDPLATTX	YES	YES	YES	YES	YES
TEXCOASTBE	YES	YES	YES	YES	YES
SOUTHTX	YES	YES	YES	YES	YES
TRANSPECTX	YES	YES	YES	YES	YES
SCAL	YES	YES		YES	YES

+	RICE	BARLEY	OATS	SILAGE	HAY

+	SUGARCANE	SUGARBEET	POTATOES	SAWNE	SAWNC
ALABAMA			YES	YES	YES
ARIZONA		YES		YES	YES
ARKANSAS	YES		YES	YES	YES
NCALIFORNI	YES	YES	YES	YES	YES
COLORADO		YES	YES	YES	YES
CONN				YES	YES
DELEWARE		YES	YES	YES	YES
FLORIDA			YES	YES	YES
GEORGIA		YES	YES	YES	YES
IDAHO		YES	YES	YES	YES
NILLINOIS		YES	YES	YES	YES
NINDIANA		YES	YES	YES	YES
WIOWA			YES	YES	YES
KANSAS		YES	YES	YES	YES
KENTUCKY		YES	YES	YES	YES
LOUISIANA	YES		YES	YES	YES
MAINE			YES	YES	YES
MARYLAND		YES	YES	YES	YES
MASS				YES	YES
MICHIGAN		YES	YES	YES	YES
MINNESOTA		YES	YES	YES	YES
MISSISSIPP	YES		YES	YES	YES
MISSOURI	YES	YES	YES	YES	YES
MONTANA		YES	YES	YES	YES
NEBRASKA		YES	YES	YES	YES
NEVADA		YES	YES	YES	YES
NEWHAMPSHI				YES	YES
NEWJERSEY		YES	YES	YES	YES
NEWMEXICO		YES		YES	YES
NEWYORK		YES	YES	YES	YES
NORTHCAROL		YES	YES	YES	YES
NORTHDAKOT		YES	YES	YES	YES
NWOHIO		YES	YES	YES	YES
OKLAHOMA		YES	YES	YES	YES
OREGON		YES	YES	YES	YES
PENNSYLVAN		YES	YES	YES	YES
RHODEISLAN				YES	YES
SOUTHCAROL		YES	YES	YES	YES
SOUTHDAKOT		YES	YES	YES	YES
TENNESSEE		YES	YES	YES	YES
UTAH		YES	YES	YES	YES
VERMONT			YES	YES	YES
VIRGINIA		YES	YES	YES	YES
WASHINGTON		YES	YES	YES	YES
WESTVIRGIN		YES	YES	YES	YES
WISCONSIN		YES	YES	YES	YES
WYOMING		YES	YES	YES	YES
SINDIANA		YES	YES	YES	YES
CENTIOWA			YES	YES	YES
NEIOWA			YES	YES	YES
SIOWA			YES	YES	YES
SOHIO			YES	YES	YES
NEOHIO			YES	YES	YES
SILLINOIS		YES	YES	YES	YES
HIPLAINSTX		YES	YES	YES	YES
ROLINGPLTX		YES	YES	YES	YES
CNTBLACKTX	YES	YES	YES	YES	YES
EASTTX	YES		YES	YES	YES
EDPLATTX		YES	YES	YES	YES
TEXCOASTBE	YES		YES	YES	YES
SOUTHTX		YES	YES	YES	YES
TRANSPECTX		YES	YES	YES	YES
SCAL	YES	YES	YES	YES	YES

State					
ALABAMA			YES		
ARIZONA		YES	YES		
NCALIFORNI		YES	YES		
COLORADO		YES	YES		
CONN			YES	YES	
DELEWARE			YES	YES	
FLORIDA	YES		YES		
IDAHO		YES	YES		
NILLINOIS			YES		YES
NINDIANA			YES		YES
WIOWA					YES
KANSAS		YES			
KENTUCKY					YES
LOUISIANA	YES		YES		
MAINE			YES	YES	
MARYLAND			YES	YES	
MASS			YES	YES	
MICHIGAN		YES	YES		YES
MINNESOTA		YES	YES		YES
MISSOURI					YES
MONTANA		YES	YES		
NEBRASKA		YES	YES		
NEVADA			YES		
NEWHAMPSHI				YES	
NEWJERSEY			YES	YES	
NEWMEXICO		YES	YES		
NEWYORK			YES	YES	
NORTHCAROL			YES		YES
NORTHDAKOT		YES	YES		
NWOHIO		YES	YES		YES
OREGON		YES	YES		
PENNSYLVAN			YES	YES	
RHODEISLAN			YES	YES	
SOUTHDAKOT			YES		
TENNESSEE			YES		YES
UTAH		YES	YES		
VERMONT				YES	
VIRGINIA			YES		YES
WASHINGTON		YES	YES		
WESTVIRGIN					YES
WISCONSIN			YES		YES
WYOMING		YES	YES		
SINDIANA					YES
CENTIOWA					YES
NEIOWA			YES		YES
SIOWA					YES
SOHIO		YES			YES
NEOHIO		YES			YES
SILLINOIS					YES
HIPLAINSTX		YES	YES		
ROLINGPLTX			YES		
EASTTX			YES		
TEXCOASTBE			YES		
SOUTHTX	YES		YES		
SCAL		YES	YES		

+	SAWSE	SAWSC	SAWPF	SAWSW
ALABAMA	YES			
ARKANSAS		YES		
NCALIFORNI			YES	
FLORIDA	YES			
GEORGIA	YES			
LOUISIANA		YES		
MISSISSIPP		YES		

OKLAHOMA			YES
OREGON		YES	
SOUTHCAROL	YES		
WASHINGTON		YES	
CNTBLACKTX			YES
EASTTX			YES
TEXCOASTBE			YES
SOUTHTX			YES

(II).   LIVESTOCK PRODUCTION

	POULTRY	BEEFCOWS	COWCALF	BEEFFEED	DAIRY
ALABAMA	YES		YES		YES
ARIZONA		YES			YES
ARKANSAS	YES		YES		YES
NCALIFORNI	YES	YES			YES
COLORADO		YES			YES
CONN					YES
DELEWARE	YES				YES
FLORIDA	YES		YES		YES
GEORGIA	YES		YES		YES
IDAHO		YES			YES
NILLINOIS			YES	YES	YES
NINDIANA	YES				YES
WIOWA	YES		YES	YES	YES
KANSAS		YES	YES	YES	YES
KENTUCKY	YES		YES		YES
LOUISIANA	YES		YES		YES
MAINE	YES				YES
MARYLAND	YES				YES
MASS					YES
MICHIGAN	YES				YES
MINNESOTA	YES		YES	YES	YES
MISSISSIPP	YES		YES		YES
MISSOURI	YES				YES
MONTANA		YES			YES
NEBRASKA	YES	YES	YES	YES	YES
NEVADA		YES			YES
NEWHAMPSHI					YES
NEWJERSEY					YES
NEWMEXICO		YES			YES
NEWYORK	YES				YES
NORTHCAROL	YES		YES		YES
NORTHDAKOT		YES			YES
NWOHIO	YES				YES
OKLAHOMA	YES	YES			YES
OREGON	YES	YES			YES
PENNSYLVAN	YES				YES
RHODEISLAN					YES
SOUTHCAROL	YES		YES		YES
SOUTHDAKOT		YES			YES
TENNESSEE	YES		YES		YES
UTAH		YES			YES
VERMONT					YES
VIRGINIA	YES				YES
WASHINGTON	YES	YES			YES
WESTVIRGIN	YES				YES
WISCONSIN	YES				YES
WYOMING		YES			YES
SINDIANA	YES				YES
CENTIOWA	YES		YES	YES	YES
NEIOWA	YES		YES	YES	YES
SIOWA	YES		YES	YES	YES
SOHIO	YES				YES

+	HOGFARROW	FEEDPIG	PIGFINISH	FARFIN79A	SHEEP
NEOHIO	YES				YES
SILLINOIS			YES	YES	YES
HIPLAINSTX		YES			YES
ROLINGPLTX	YES	YES			YES
CNTBLACKTX	YES	YES			YES
EASTTX	YES	YES			YES
EDPLATTX		YES			YES
TEXCOASTBE	YES	YES			YES
SOUTHTX	YES	YES			YES
TRANSPECTX		YES			YES
SCAL	YES	YES			YES

+	HOGFARROW	FEEDPIG	PIGFINISH	FARFIN79A	SHEEP
ALABAMA	YES	YES	YES		
ARIZONA				YES	YES
ARKANSAS				YES	YES
NCALIFORNI					YES
COLORADO				YES	YES
CONN	YES				YES
DELEWARE	YES				
FLORIDA	YES				
GEORGIA	YES	YES	YES		
IDAHO				YES	YES
NILLINOIS	YES	YES	YES		YES
NINDIANA	YES		YES		YES
WIOWA	YES	YES	YES		YES
KANSAS	YES	YES			YES
KENTUCKY	YES	YES	YES		YES
LOUISIANA				YES	YES
MAINE	YES				YES
MARYLAND	YES				YES
MASS	YES				YES
MICHIGAN					YES
MINNESOTA	YES	YES			YES
MISSISSIPP				YES	
MISSOURI	YES		YES		YES
MONTANA				YES	YES
NEBRASKA	YES	YES			YES
NEVADA				YES	YES
NEWHAMPSHI	YES				YES
NEWJERSEY	YES				YES
NEWMEXICO				YES	YES
NEWYORK	YES				YES
NORTHCAROL	YES	YES	YES		YES
NORTHDAKOT					YES
NWOHIO	YES		YES		YES
OKLAHOMA				YES	YES
OREGON					YES
PENNSYLVAN	YES				YES
RHODEISLAN	YES				
SOUTHCAROL	YES	YES	YES		
SOUTHDAKOT				YES	YES
TENNESSEE	YES	YES	YES		YES
UTAH				YES	YES
VERMONT	YES				YES
VIRGINIA	YES	YES	YES		YES
WASHINGTON					YES
WESTVIRGIN				YES	YES
WISCONSIN					YES
WYOMING				YES	YES
SINDIANA	YES		YES		YES
CENTIOWA	YES	YES	YES		YES
NEIOWA	YES	YES	YES		YES
SIOWA	YES	YES	YES		YES

+	PIGFIN79A	STOCKER	OTHLVSTK	FDRPIG79A	FEEDLOT79
SOHIO	YES		YES		YES
NEOHIO	YES		YES		YES
SILLINOIS	YES	YES	YES		YES
HIPLAINSTX			YES		YES
ROLINGPLTX	YES	YES	YES		YES
CNTBLACKTX	YES	YES	YES		YES
EASTTX		YES	YES		YES
EDPLATTX			YES		YES
TEXCOASTBE			YES		YES
SOUTHTX			YES		YES
TRANSPECTX			YES		YES
SCAL					YES
ALABAMA			YES		
ARIZONA	YES	YES	YES	YES	YES
ARKANSAS	YES		YES	YES	
NCALIFORNI	YES		YES	YES	YES
COLORADO	YES	YES	YES	YES	YES
CONN			YES		
DELEWARE			YES		
FLORIDA			YES	YES	
GEORGIA			YES		
IDAHO	YES	YES	YES	YES	YES
NILLINOIS			YES		
NINDIANA			YES		
WIOWA			YES		
KANSAS	YES		YES		YES
KENTUCKY			YES		
LOUISIANA	YES		YES	YES	
MAINE			YES		
MARYLAND			YES		
MASS			YES		
MICHIGAN	YES		YES		YES
MINNESOTA	YES		YES		YES
MISSISSIPP	YES		YES	YES	
MISSOURI			YES		
MONTANA	YES	YES	YES	YES	YES
NEBRASKA	YES		YES		YES
NEVADA	YES	YES	YES	YES	YES
NEWHAMPSHI			YES		
NEWJERSEY			YES		
NEWMEXICO	YES	YES	YES	YES	YES
NEWYORK			YES		
NORTHCAROL			YES		
NORTHDAKOT	YES		YES		YES
NWOHIO			YES		
OKLAHOMA	YES	YES	YES	YES	YES
OREGON	YES		YES	YES	YES
PENNSYLVAN			YES		
RHODEISLAN			YES		
SOUTHCAROL			YES		
SOUTHDAKOT	YES		YES	YES	YES
TENNESSEE			YES		
UTAH	YES	YES	YES	YES	YES
VERMONT			YES		
VIRGINIA			YES		
WASHINGTON	YES		YES	YES	YES
WESTVIRGIN	YES		YES	YES	
WISCONSIN	YES		YES		YES
WYOMING	YES	YES	YES	YES	YES
SINDIANA			YES		
CENTIOWA			YES		
NEIOWA			YES		

SIOWA			YES		
SOHIO			YES		
NEOHIO			YES		
SILLINOIS			YES		
HIPLAINSTX		YES	YES		YES
ROLINGPLTX		YES	YES		YES
CNTBLACKTX		YES	YES		YES
EASTTX		YES	YES		YES
EDPLATTX			YES		YES
TEXCOASTBE			YES		YES
SOUTHTX		YES	YES		YES
TRANSPECTX			YES		YES
SCAL	YES		YES	YES	YES

(I). CROP PRODUCTION:

	ALABAMA	ARIZONA	ARKANSAS	NCALIFORNI	COLORADO
COTTON	YES	YES	YES	YES	
CORN	YES	YES	YES	YES	YES
SOYBEANS	YES		YES		
WHEAT	YES	YES	YES	YES	YES
SORGHUM	YES	YES	YES	YES	YES
RICE			YES	YES	
BARLEY		YES		YES	YES
OATS	YES		YES	YES	YES
SILAGE	YES	YES	YES	YES	YES
HAY	YES	YES	YES	YES	YES
SUGARBEET		YES		YES	YES
POTATOES	YES	YES		YES	YES
SAWSE	YES				
SAWSC			YES		
SAWPF				YES	

+	CONN	DELEWARE	FLORIDA	GEORGIA	IDAHO
COTTON			YES	YES	
CORN		YES	YES	YES	YES
SOYBEANS		YES	YES	YES	
WHEAT		YES	YES	YES	YES
SORGHUM				YES	
BARLEY		YES		YES	YES
OATS		YES	YES	YES	YES
SILAGE	YES	YES	YES	YES	YES
HAY	YES	YES	YES	YES	YES
SUGARCANE			YES		
SUGARBEET					YES
POTATOES	YES	YES	YES		YES
SAWNE	YES	YES			
SAWSE			YES	YES	

+	NILLINOIS	NINDIANA	WIOWA	KANSAS	KENTUCKY
COTTON					YES
CORN	YES	YES	YES	YES	YES
SOYBEANS	YES	YES	YES	YES	YES
WHEAT	YES	YES	YES	YES	YES
SORGHUM	YES	YES	YES	YES	YES
BARLEY	YES	YES		YES	YES
OATS	YES	YES	YES	YES	YES
SILAGE	YES	YES	YES	YES	YES
HAY	YES	YES	YES	YES	YES
SUGARBEET				YES	
POTATOES	YES	YES			
SAWNC	YES	YES	YES		YES

+	LOUISIANA	MAINE	MARYLAND	MASS	MICHIGAN
COTTON	YES				
CORN	YES		YES		YES
SOYBEANS	YES		YES		YES
WHEAT	YES		YES		YES
SORGHUM	YES				
RICE	YES				
BARLEY			YES		YES
OATS	YES	YES	YES		YES

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SILAGE	YES	YES	YES	YES	YES
HAY	YES	YES	YES	YES	YES
SUGARCANE	YES				
SUGARBEET					YES
POTATOES	YES	YES	YES	YES	YES
SAWNE		YES	YES	YES	
SAWNC					YES
SAWSC	YES				

+	MINNESOTA	MISSISSIPP	MISSOURI	MONTANA	NEBRASKA
COTTON		YES	YES		
CORN	YES	YES	YES	YES	YES
SOYBEANS	YES	YES	YES		YES
WHEAT	YES	YES	YES	YES	YES
SORGHUM		YES	YES		YES
RICE		YES	YES		
BARLEY	YES		YES	YES	YES
OATS	YES	YES	YES	YES	YES
SILAGE	YES	YES	YES	YES	YES
HAY	YES	YES	YES	YES	YES
SUGARBEET	YES			YES	YES
POTATOES	YES			YES	YES
SAWNC	YES		YES		
SAWSC		YES			

+	NEVADA	NEWHAMPSHI	NEWJERSEY	NEWMEXICO	NEWYORK
COTTON	YES			YES	
CORN			YES	YES	YES
SOYBEANS			YES		YES
WHEAT	YES		YES	YES	YES
SORGHUM				YES	
BARLEY	YES		YES	YES	YES
OATS	YES		YES		YES
SILAGE	YES	YES	YES	YES	YES
HAY	YES	YES	YES	YES	YES
SUGARBEET				YES	
POTATOES	YES		YES	YES	YES
SAWNE		YES	YES		YES

+	NORTHCAROL	NORTHDAKOT	NWOHIO	OKLAHOMA	OREGON
COTTON	YES			YES	
CORN	YES	YES	YES	YES	YES
SOYBEANS	YES	YES	YES	YES	
WHEAT	YES	YES	YES	YES	YES
SORGHUM	YES			YES	
BARLEY	YES	YES	YES	YES	YES
OATS	YES	YES	YES	YES	YES
SILAGE	YES	YES	YES	YES	YES
HAY	YES	YES	YES	YES	YES
SUGARBEET		YES	YES		YES
POTATOES	YES	YES	YES		YES
SAWNC	YES		YES		
SAWPF					YES
SAWSW				YES	

+	PENNSYLVAN	RHODEISLAN	SOUTHCAROL	SOUTHDAKOT	TENNESSEE
COTTON			YES		YES
CORN	YES		YES	YES	YES
SOYBEANS	YES		YES	YES	YES
WHEAT	YES		YES	YES	YES
SORGHUM	YES		YES	YES	YES

BARLEY	YES		YES	YES	YES
OATS	YES		YES	YES	YES
SILAGE	YES	YES	YES	YES	YES
HAY	YES	YES	YES	YES	YES
POTATOES	YES	YES		YES	YES
SAWNE	YES	YES			
SAWNC					YES
SAWSE			YES		

+	UTAH	VERMONT	VIRGINIA	WASHINGTON	WESTVIRGIN
COTTON			YES		
CORN	YES		YES	YES	YES
SOYBEANS			YES		
WHEAT	YES		YES	YES	YES
SORGHUM			YES		
BARLEY	YES		YES	YES	YES
OATS	YES	YES	YES	YES	YES
SILAGE	YES	YES	YES	YES	YES
HAY	YES	YES	YES	YES	YES
SUGARBEET	YES			YES	
POTATOES	YES		YES	YES	
SAWNE		YES			
SAWNC			YES		YES
SAWPF				YES	

+	WISCONSIN	WYOMING	SINDIANA	CENTIOWA	NEIOWA
CORN	YES	YES	YES	YES	YES
SOYBEANS	YES		YES	YES	YES
WHEAT	YES	YES	YES	YES	YES
SORGHUM			YES	YES	YES
BARLEY	YES	YES	YES		
OATS	YES	YES	YES	YES	YES
SILAGE	YES	YES	YES	YES	YES
HAY	YES	YES	YES	YES	YES
SUGARBEET		YES			
POTATOES	YES	YES			YES
SAWNC	YES		YES	YES	YES

+	SIOWA	SOHIO	NEOHIO	SILLINOIS	HIPLAINSTX
COTTON					YES
CORN	YES	YES	YES	YES	YES
SOYBEANS	YES	YES	YES	YES	YES
WHEAT	YES	YES	YES	YES	YES
SORGHUM	YES			YES	YES
BARLEY				YES	YES
OATS	YES	YES	YES	YES	YES
SILAGE	YES	YES	YES	YES	YES
HAY	YES	YES	YES	YES	YES
SUGARBEET		YES	YES		YES
POTATOES					YES
SAWNC	YES	YES	YES	YES	

+	ROLINGPLTX	CNTBLACKTX	EASTTX	EDPLATTX	TEXCOASTBE
COTTON	YES	YES	YES	YES	YES
CORN	YES	YES	YES	YES	YES
SOYBEANS	YES	YES	YES	YES	YES
WHEAT	YES	YES	YES	YES	YES
SORGHUM	YES	YES	YES	YES	YES
RICE		YES	YES		YES
BARLEY	YES	YES		YES	
OATS	YES	YES	YES	YES	YES

SILAGE	YES	YES	YES	YES	YES
HAY	YES	YES	YES	YES	YES
POTATOES	YES		YES		YES
SAWSW		YES	YES		YES

+	SOUTHTX	TRANSPECTX	SCAL
COTTON	YES	YES	YES
CORN	YES	YES	YES
SOYBEANS	YES	YES	
WHEAT	YES	YES	YES
SORGHUM	YES	YES	YES
RICE			YES
BARLEY	YES	YES	YES
OATS	YES	YES	YES
SILAGE	YES	YES	YES
HAY	YES	YES	YES
SUGARCANE	YES		
SUGARBEET			YES
POTATOES	YES		YES
SAWSW	YES		

(II). LIVESTOCK PRODUCITON:

	ALABAMA	ARIZONA	ARKANSAS	NCALIFORNI	COLORADO
POULTRY	YES		YES	YES	
BEEFCOWS		YES		YES	YES
COWCALF	YES		YES		
DAIRY	YES	YES	YES	YES	YES
HOGFARROW	YES				
FEEDPIG	YES				
PIGFINISH	YES				
FARFIN79A		YES	YES		YES
SHEEP		YES	YES	YES	YES
PIGFIN79A		YES	YES	YES	YES
STOCKER		YES			YES
OTHLVSTK	YES	YES	YES	YES	YES
FDRPIG79A		YES	YES	YES	YES
FEEDLOT79		YES		YES	YES

+	CONN	DELEWARE	FLORIDA	GEORGIA	IDAHO
POULTRY		YES	YES	YES	
BEEFCOWS					YES
COWCALF			YES	YES	
DAIRY	YES	YES	YES	YES	YES
HOGFARROW	YES	YES	YES	YES	
FEEDPIG				YES	
PIGFINISH				YES	
FARFIN79A					YES
SHEEP	YES				YES
PIGFIN79A					YES
STOCKER					YES
OTHLVSTK	YES	YES	YES	YES	YES
FDRPIG79A			YES		YES
FEEDLOT79					YES

+	NILLINOIS	NINDIANA	WIOWA	KANSAS	KENTUCKY
POULTRY		YES	YES		YES
BEEFCOWS				YES	
COWCALF	YES		YES	YES	YES
BEEFFEED	YES		YES	YES	

DAIRY	YES	YES	YES	YES	YES
HOGFARROW	YES	YES	YES	YES	YES
FEEDPIG	YES		YES	YES	YES
PIGFINISH	YES	YES	YES		YES
SHEEP	YES	YES	YES	YES	YES
PIGFIN79A				YES	
OTHLVSTK	YES	YES	YES	YES	YES
FEEDLOT79				YES	

+	LOUISIANA	MAINE	MARYLAND	MASS	MICHIGAN
POULTRY	YES	YES	YES		YES
COWCALF	YES				
DAIRY	YES	YES	YES	YES	YES
HOGFARROW		YES	YES	YES	
FARFIN79A	YES				
SHEEP	YES	YES	YES	YES	YES
PIGFIN79A	YES				YES
OTHLVSTK	YES	YES	YES	YES	YES
FDRPIG79A	YES				
FEEDLOT79					YES

+	MINNESOTA	MISSISSIPP	MISSOURI	MONTANA	NEBRASKA
POULTRY	YES	YES	YES		YES
BEEFCOWS				YES	YES
COWCALF	YES	YES			YES
BEEFFEED	YES				YES
DAIRY	YES	YES	YES	YES	YES
HOGFARROW	YES		YES		YES
FEEDPIG	YES				YES
PIGFINISH			YES		
FARFIN79A		YES		YES	
SHEEP	YES		YES	YES	YES
PIGFIN79A	YES	YES		YES	YES
STOCKER				YES	
OTHLVSTK	YES	YES	YES	YES	YES
FDRPIG79A		YES		YES	
FEEDLOT79	YES			YES	YES

+	NEVADA	NEWHAMPSHI	NEWJERSEY	NEWMEXICO	NEWYORK
POULTRY					YES
BEEFCOWS	YES			YES	
DAIRY	YES	YES	YES	YES	YES
HOGFARROW		YES	YES		YES
FARFIN79A	YES			YES	
SHEEP	YES	YES	YES	YES	YES
PIGFIN79A	YES			YES	
STOCKER	YES			YES	
OTHLVSTK	YES	YES	YES	YES	YES
FDRPIG79A	YES			YES	
FEEDLOT79	YES			YES	

+	NORTHCAROL	NORTHDAKOT	NWOHIO	OKLAHOMA	OREGON
POULTRY	YES		YES	YES	YES
BEEFCOWS		YES		YES	YES
COWCALF	YES				
DAIRY	YES	YES	YES	YES	YES
HOGFARROW	YES		YES		
FEEDPIG	YES				
PIGFINISH	YES		YES		
FARFIN79A				YES	
SHEEP	YES	YES	YES	YES	YES

PIGFIN79A		YES		YES	YES
STOCKER				YES	
OTHLVSTK	YES	YES	YES	YES	YES
FDRPIG79A				YES	YES
FEEDLOT79		YES		YES	YES

+	PENNSYLVAN	RHODEISLAN	SOUTHCAROL	SOUTHDAKOT	TENNESSEE
POULTRY	YES		YES		YES
BEEFCOWS				YES	
COWCALF			YES		YES
DAIRY	YES	YES	YES	YES	YES
HOGFARROW	YES	YES	YES		YES
FEEDPIG			YES		YES
PIGFINISH			YES		YES
FARFIN79A				YES	
SHEEP	YES			YES	YES
PIGFIN79A				YES	
OTHLVSTK	YES	YES	YES	YES	YES
FDRPIG79A				YES	
FEEDLOT79				YES	

+	UTAH	VERMONT	VIRGINIA	WASHINGTON	WESTVIRGIN
POULTRY			YES	YES	YES
BEEFCOWS	YES			YES	
DAIRY	YES	YES	YES	YES	YES
HOGFARROW		YES	YES		
FEEDPIG			YES		
PIGFINISH			YES		
FARFIN79A	YES				YES
SHEEP	YES	YES	YES	YES	YES
PIGFIN79A	YES			YES	YES
STOCKER	YES				
OTHLVSTK	YES	YES	YES	YES	YES
FDRPIG79A	YES			YES	YES
FEEDLOT79	YES			YES	

+	WISCONSIN	WYOMING	SINDIANA	CENTIOWA	NEIOWA
POULTRY	YES		YES	YES	YES
BEEFCOWS		YES			
COWCALF				YES	YES
BEEFFEED				YES	YES
DAIRY	YES	YES	YES	YES	YES
HOGFARROW			YES	YES	YES
FEEDPIG				YES	YES
PIGFINISH			YES	YES	YES
FARFIN79A		YES			
SHEEP	YES	YES	YES	YES	YES
PIGFIN79A	YES	YES			
STOCKER		YES			
OTHLVSTK	YES	YES	YES	YES	YES
FDRPIG79A		YES			
FEEDLOT79	YES	YES			

+	SIOWA	SOHIO	NEOHIO	SILLINOIS	HIPLAINSTX
POULTRY	YES	YES	YES		
BEEFCOWS					YES
COWCALF	YES			YES	
BEEFFEED	YES			YES	
DAIRY	YES	YES	YES	YES	YES
HOGFARROW	YES	YES	YES	YES	
FEEDPIG	YES			YES	

PIGFINISH	YES	YES	YES	YES	YES
SHEEP	YES	YES	YES	YES	YES
STOCKER					YES
OTHLVSTK	YES	YES	YES	YES	YES
FEEDLOT79					YES

+	ROLINGPLTX	CNTBLACKTX	EASTTX	EDPLATTX	TEXCOASTBE
POULTRY	YES	YES	YES		YES
BEEFCOWS	YES	YES	YES	YES	YES
DAIRY	YES	YES	YES	YES	YES
HOGFARROW	YES	YES			
FEEDPIG	YES	YES	YES		
PIGFINISH	YES	YES	YES	YES	YES
SHEEP	YES	YES	YES	YES	YES
STOCKER	YES	YES	YES		
OTHLVSTK	YES	YES	YES	YES	YES
FEEDLOT79	YES	YES	YES	YES	YES

+	SOUTHTX	TRANSPECTX	SCAL
POULTRY	YES		YES
BEEFCOWS	YES	YES	YES
DAIRY	YES	YES	YES
PIGFINISH	YES	YES	
SHEEP	YES	YES	YES
PIGFIN79A			YES
STOCKER	YES		
OTHLVSTK	YES	YES	YES
FDRPIG79A			YES
FEEDLOT79	YES	YES	YES

APPENDIX C. LISTING OF SETS, PARAMETERS, AND SAMPLES OF DATA IN ASM

I. SETS
_____
_____

NAME   DEFINITION   CONTENT
_____
_____

ALLI   ALL BUDGET ITEMS   cotton,   corn,   soybeans,
    wheat,
                                                sorghum,   rice,   barley,
      oats,
                                             otherlives, culldairyc, cullbeefco,
  potatoes,
                                                   milk,   silage,   hay,
hogslaught,
                                              feederpig,   livecalf, beefyearli,
calfslaugh,
                                              nonfedsla,   fedbeefsla,   cullsow,
    poultry,
                                             lambslaugh,   lambfeerde,   cullewes,
      wool,
                                             woolincpay,   unshrnlamb,   sugarcane,
sugarbeet,
                                             soybeanmea,   soybeanoil,   fluidmilk,
feedgrain,
                                             dairyprot1,   highprotsw,   lowprotswi,
lowprotcat,
                                                 fedbeef,   veal,   nonfedbeef,
      pork,
                                             highprotca,   butter,   amcheese,
  otcheese,
                                               icecream,   nonfatdrym,   cottageche,
  skimmilk,
                                                  cream,   hfcs,   beverages,
confection,
                                                 baking,   canning,   refsugar,
glutenfeed,
                                                 starch,   canerefini,   cornoil,
    ethanol,
                                                cosyrup,   dextrose,   frozenpot,
  driedpot,
                                                 chippot,   nitrogen,   potassium ,
phosporous,
                                                  limein,   othervaria,   publicgraz,
customoper,
                                             chemicalco,   seedcost,   capital   ,
irrigation,
                                             repaircost,   vetandmedi,   marketing,
insurance ,
                                               machinery,   management,   landtaxes,
generalove,
                                               noncashvar,   mgt,   fuelandoth,
cropinsur ,
                                                landrent ,   setaside,   blank,
laborinhou,
                                                 cropland ,   pasture,   aums,
    addland,
                                                misccost,   profit,   complianc,
  validnum,
                                                proccost,   trancost,   miscinput,
    maximum,
                                                 minimum,   water,   labor,

total,
procs, obj

ANIMAL   NAMES OF LIVESTOCK BUDGETS   beefcows,   cowcalf,   sheep ,
pigfin79a,
                                                           beeffeed,   dairy,   stocker ,
feedlot79,
                                                           hogfarrow,   feedpig,   othlvstk ,
 poultry,
                                                           pigfinish,   farfin79a,   fdrpig79a

C   FARM POGRAM CROPS   cotton,   corn,   sorghum,
    rice,
                                                            soybeans,   wheat,   barley,
      oats

COST   BUDGET COST ITEMS   misccost,   proccost,   trancost,
   profit

CROP   CROPS   cotton,   corn,   barley,
    oats,   soybeans,
wheat,   silage,   hay,
      sorghum,   rice,   sugarcane,   sugarbeet,
                                                           potatoes

CRPMIXALT   SUBREGIONAL CROP MIX ALTERNATIVES   1971*1990

CTECH   CROP BUDGET ALTERNATIVES   base,   nonpart,   particip

FPTECH   FARM PROGRAM CROP BUDGET ALTERNATIVES   nonpart,   particip

INPUT   NATIONAL INPUTS   nitrogen,   potassium,   machinery,
management,
limein, landtaxes,   generalove,   phosporous,

        mgt,   othervaria, publicgraz, noncashvar,

 cropinsur,   customoper, chemicalco, fuelandoth,

  setaside,   seedcost,   capital,   landrent,

laborinhou,   repaircost, vetandmedi,   blank,

                   LANDTYPE   LAND TYPES   marketing,   insurance, irrigation
pasture,   aums   cropland,

LIVESTOCK   LIVESTOCK PRODUCTS   otherlives, culldairyc,   nonfedsla,
fedbeefsla,
                                                           cullbeefco,   cullsow,   poultry,
                                                                 milk, hogslaught, lambslaugh,
lambfeerde,
                                                           feederpig,   livecalf,   cullewes,
      wool,
                                                           beefyearli, calfslaugh, woolincpay,
unshrnlamb

LIVETECH   LIVESTOCK TECHNOLOGY
              ALTERNATIVES   0*10

MAPPING   ASSIGMENT OF SUBREGIONS TO   northeast. conn   , appalachia.
kentucky   ,

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REGIONS

northcarol,
tennessee ,
virginia ,
westvirgin,
alabama ,
florida ,
georgia ,
southcarol ,
arkansas ,
louisiana ,
mississipp,
oklahoma ,
hiplainstx,
rolingpltx,
cntblacktx,
easttx ,
edplattx ,
texcoastbe,
southtx ,
transpectx,
arizona ,
colorado ,
idaho ,
montana ,
nevada ,
newmexico ,
utah ,

northeast. deleware , appalachia.
northeast. maine , appalachia.
northeast. maryland , appalachia.
northeast. mass , appalachia.
northeast. newhampshi , southeast.
northeast. newjersey , southeast.
northeast. newyork , southeast.
northeast. pennsylvan , southeast.
northeast. rhodeislan ,deltastate.
northeast. vermont ,deltastate.
lakestates. michigan ,deltastate.
lakestates. minnesota , southplain.
lakestates. wisconsin , southplain.
cornbelt. nillinois , southplain.
cornbelt. nindiana , southplain.
cornbelt. wiowa , southplain.
cornbelt. missouri , southplain.
cornbelt. nwohio , southplain.
cornbelt. sindiana , southplain.
cornbelt. centiowa , southplain.
cornbelt. neiowa , mountain.
cornbelt. siowa , mountain.
cornbelt. sohio , mountain.
cornbelt. neohio , mountain.
cornbelt. sillinois , mountain.
northplain. kansas , mountain.
northplain. nebraska ,mountain.

northplain.northdakot ,mountain. wyoming ,
northplain. southdakot,pacific. ncaliforni ,
pacific. oregon ,
pacific.
washington ,
pacific.
scal

MIXFEED FEED MIXING PROCESSING grain1 , catpro3, catpro4

,   ALTERNATIVES   grain2 ,
  grain3, loproswn1 , loproswn2,
        dairysup1 , dairysup2, hiproswn1 , catprohi,
                        dairysup3 , dairysup4, sowtopork , grain1a,
                                dairysup5 , dairysup6, grain1b , grain1c
                                        catpro1 , catpro2

NATMIXALT   PRIMARY PRODUCT MIX ALTERNATIVES   1960*1986
             ACROSS REGIONS

NFPTECH   NONFARM PROGRAM CROP BUDGET   base
             ALTERNATIVES

PRIMARY   PRIMARY PRODUCTS   cotton,   corn,   feederpig,
  livecalf,   soybeans,
wheat,   beefyearli, calfslaugh,
        sorghum,   rice,   nonfedsla, fedbeefsla,
                        barley,   oats,   cullsow,   poultry,
                                potatoes, cullbeefco,   lambslaugh,
  lambfeerde,   otherlives,
culldairyc,   cullewes,   wool,
             milk,   silage,   woolincpay, unshrnlamb,
                        hay, hogslaught,   sugarcane, sugarbeet,

PROCESSALT   PROCESSING ALTERNATIVES   beverage2, beverage3,   dairysup1,
  dairysup2,
                                                    beverage4, confectin2,   dairysup3,
  dairysup4,
                                                    confectin3, confectin4,   dairysup5,
  dairysup6,
                                                      canning2,   canning3,   catpro1,
    catpro2,
                                                      canning4,   baking2,   catpro3,
   catpro4,
                                                       baking3,   baking4,   loproswn1,
  loproswn2,
                                                       wetmill,   gluttosbm,   hiproswn1,
   catprohi,
                                                          hfcs,   csyrup,   sowtopork,
    grain1a,
                                                      dextrose,   ethanol,   grain1b,
    grain1c,
                                                     beverages, confection,   butterpow,
  fluidmlk1,
                                                       canning,   baking,   fluidmlk2,
  icecream1,
                                                     refsugar1, refsugar2 ,   icecream2,
    amcheese,
                                                     canerefine, soycrush1,   otcheese,
    cottage,
                                                     soycrush2, hogtopork,   clcowsla,
     bcafsla,
                                                                                 nfslatonf,
fslatofbe,   dcowsla,   bfhefsla,
        caftoveal,   grain1,   dcafsla, frozen-pot,
                                                       grain2,   grain3,   dehydr-pot,
    chip-pot

REGION   REGIONS EXCLUDING TOTAL   northeast, lakestates,   cornbelt,
northplain,
                                                   appalachia, southeast,   deltastate,
southplain,
                                                     mountain,   pacific

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REGIONS      REGIONS INCLUDING TOTAL              northeast,  lakestates,      cornbelt,
northplain,
                                                  appalachia,   southeast,   deltastate,
southplain,
                                                   mountain,     pacific,         total

SDITEM       SUPPLY DEMAND CURVE PARAMETERS           price,    quantity,   elasticity,
maxq,     minq                                                                     tfac,
constant1,      constant2, constant3, box


SECONDARY    PROCESSED PRODUCTS                   soybeanmea,  soybeanoil,   cottageche,
 skimmilk,                                                                    fluidmilk,
feedgrain,        cream,         hfcs,
        dairyprot1, highprotsw,    beverages, confection,
                               lowprotswi, lowprotcat,       baking,      canning,
                                 fedbeef,        veal,      refsugar,
glutenfeed,                                                 nonfedbeef,
 pork,        starch,  canerefini,
   highprotca,       butter,        cornoil,      ethanol,
                        amcheese,     otcheese,      cosyrup,     dextrose,
                                icecream, nonfatdrym,    frozenpot,     driepot,

                        CHIPPOT

SUBREG       SUBREGIONS                            alabama,      arizona,        nwohio,
 oklahoma,
                                                  arkansas,   ncaliforni,        oregon,
pennsylvan,
                                                  colorado,        conn,     rhodeislan,
southcarol,
                                                  deleware,      florida,     southdakot,
tennessee,
                                                   georgia,        idaho,          utah,

                                                 nillinois,    nindiana,       vermont,
 virginia,
                                                    wiowa,       kansas,     washington,
westvirgin,
                                                  kentucky,    louisiana,     wisconsin,
 wyoming,
                                                    maine,      maryland,      sindiana,
 centiowa,
                                                     mass,     michigan,        neiowa,
   siowa,
                                                 minnesota,    mississipp,        sohio,
  neohio,
                                                  missouri,      montana,      sillinois,
hiplainstx,
                                                  nebraska,       nevada,     rolingpltx,
cntblacktx,
                                                 newhampshi,    newjersey,        easttx,
 edplattx,
                                                  newmexico,      newyork,     texcoastbe,
  southtx,
                                                  northcarol,  northdakot,    transpectx,
     scal


TECH         CROP TECHNOLOGY ALTERNATIVES          0*10

WATERITEM    WATER SUPPLY PARAMETERS                  well,      surface,      fixedmax,
 fixedprc,
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			pumpprice,	pumpmax,	pumpelas,
pumpq					
WATER	IRRIGATION WATER		water		
WTECH	IRRIGATION ALTERNATIVES		dryland,	irrig	

_____
_____

II. PARAMETERS

_____

ITEM	DEFINITION

_____

ITEM	DEFINITION
CBUDDATA	CROP BUDGET DATA
FARMPROD	FARM PROGRAM DATA
FPPART	FARM PROGRAM PARTICIPATION RATES
INPUTPRICE	NATIONAL INPUT PRICES
LABORSUP	REGIONAL LABOR SUPPLY
LANDAVAIL	MAXIMUM LAND AVAILABLE BY SUBREGION
LANDSUPPL	REGIONAL LAND SUPPLY DATA
LBUDDATA	LIVESTOCK BUDGET DATA
MIXDATA	PRIMARY PRODUCT MIX DATA (HISTORICAL HARVESTED ACRE BY SUBREGION)
NATMIXDATA	PRIMARY PRODUCT MIX DATA (HISTORICAL LIVESTOCK PRODUCTION BY SUBREGION)
PDEMAND	PRIMARY COMMODITY DOMESTIC DEMAND DATA
PEXPORT	PRIMARY COMMODITY EXPORT DEMAND DATA
PIMPORT	PRIMARY COMMODITY IMPORT DEMAND DATA
PROCBUD	PROCESSING BUDGET DATA
SCALE	OVERALL SCALING FACTORS
SCALLIVE	LIVESTOCK PRODUCTION SCALE
SCALMIX	MIX SCALING
SCALOBJ	OBJECTIVE FUNCTION SCALAR
SCALPROC	PROCESSING SCALE
SCALPROD	CROP PRODUCTION SCALE
SDEMAND	SECONDARY COMMODITY DOMESTIC DEMAND DATA
SEXPORT	SECONDARY COMMODITY EXPORT DEMAND DATA
SIMPORT	SECONDARY COMMODITY IMPORT DEMAND DATA
TUNE	TUNING FACTORS
WATERSUP	SUBREGIONAL WATER SUPPLY DATA

_____

III. SAMPLES OF DATA

1. CBUDDATA

TABLE CBUDDATA(ALLI, SUBREG, CROP, WTECH, CTECH, TECH)   CROP BUDGET DATA

```
                alabama    . cotton      . dryland. base.  0
labor                   6.13800
cropland                1.00000
trancost               11.00000
profit                389.71503
maximum                 0.00000
cotton                  0.98900
nitrogen               22.88000
potassium              14.34000
phosporous              8.65000
limein                  9.05000
customoper             10.59000
chemicalco             98.15000
seedcost                5.80000
capital                81.11400
repaircost             19.68000
marketing              53.98000
machinery              96.83000
generalove             17.17000
mgt                    32.11000
fuelandoth             26.82000
landrent               87.71000
+               alabama    . corn        . irrig. base.  0
labor                   5.95400
cropland                1.00000
water                    .60000
trancost                4.00000
profit                197.66301
maximum                 0.00000
corn                  108.55200
nitrogen               45.39000
potassium              17.42000
phosporous             12.07000
limein                  6.24000
othervaria              .44000
customoper              8.80000
chemicalco             21.42000
seedcost               17.40000
capital                75.77000
repaircost             16.95000
machinery              62.75000
generalove             11.00000
mgt                    22.34000
fuelandoth             19.03000
landrent               48.03000
laborinhou             16.61000  . . .    ;
```

2. FARMPROD

TABLE FARMPROD(FARMPRO, ALLI)   FARM PROGRAM DATA

	cotton	corn	wheat	sorghum	rice	barley	oats
slippage	0.7	0.60	0.80	0.60	0.45	0.60	0.60
setaside	0.125	0.10	0.05	0.10	0.20	0.10	0.10
setasdcost	20.00	20.00	20.00	20.00	20.00	20.00	20.0
diversion	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50-92	0.058	0.008	0.027	0.051	0.047	0.012	0.082
unharvacr	0.021	0.000	0.000	0.000	0.038	0.024	0.00
percntpaid	1.000	0.967	0.897	0.806	1.000	1.000	0.502
fpyield	1.165	105.0	33.0	59.0	46.19	47.0	49.0
AGSTATYLD	1.330	118.5	39.5	62.9	55.07	55.9	60.1
diverpay	0.000	0.730	1.601	0.650	0.000	0.570	0.360
mktloany-n	1.000	0.000	0.000	0.000	1.000	0.000	0.000
target	349.9	2.75	4.00	2.61	10.71	2.36	1.45
loanrate	241.3	1.57	1.95	1.49	6.50	1.32	0.85
defic	24.5	0.45	1.40	0.50	4.00	0.26	0.36
mktloan	0.0	0.00	0.0	0.00	0.00	0.0	0.0

+	soybeans	butter	amcheese	nonfatdrym	
loanrate	4.480	1.010	1.150	0.850	;

```
farmprod("fpyield",alli)$farmprod("agstatyld",alli)
   =farmprod("fpyield",alli)/farmprod("agstatyld",alli);
```

3. FPPART

TABLE FPPART(SUBREG, ALLI)   FARM PROGRAM PARTICIPATION RATES

	cotton	corn	wheat	sorghum	rice	barley	oats
alabama	0.95	0.58	0.76	0.59	0.00	0.17	0.39
arizona	0.95	0.57	0.54	0.30	0.00	0.21	0.76
arkansas	0.95	0.90	0.86	0.82	0.95	0.27	0.29
ncaliforni	0.95	0.50	0.75	0.42	0.93	0.35	0.52
.							
.							
.							
scal	0.95	0.50	0.75	0.42	0.93	0.35	0.52 ;

4. INPUTPRICE

PARAMETER INPUTPRICE(INPUT) NATIONAL INPUT PRICES

```
        / nitrogen        1.042
          potassium       1.039
          phosporous      1.008
          limein          1.051
          othervaria      0.973
          .
          .
          .
          irrigation       .90  / ;
```

5. LABORSUP

TABLE LABORSUP(REGIONS, LABORITEM) REGIONAL LABOR SUPPLY

	familymax	familyprc	hireq	hirep	hiremax	hireelas
northeast	44580.00	2.23	73875.00	4.45	0.00	1.90
lakestates	553907.00	2.06	66563.00	4.11	0.00	1.90
cornbelt	602440.00	2.28	3130.00	4.56	0.00	1.90

northplain	183033.00	2.29	154298.00	4.58	0.00	1.90
appalachia	487560.00	2.05	57181.00	4.09	0.00	1.90
southeast	278250.00	2.28	8807.00	4.56	0.00	1.90
deltastate	215301.00	2.05	10194.00	4.10	0.00	1.90
southplain	277895.00	2.32	56074.00	4.63	0.00	1.90
mountain	272450.00	2.39	11198.00	4.77	0.00	1.90
pacific	122010.00	2.75	18807.00	5.49	0.00	1.90;

6. LANDAVAIL

TABLE LANDAVAIL(SUBREG, LANDTYPE)   MAXIMUM LAND AVAILABLE BY SUBREGION

	cropland	pasture	aums
alabama	4338.00	10385.25	15000.00
arizona	1232.00	45413.00	15000.00
arkansas	8933.00	9587.00	15000.00
ncaliforni	6264.00	31399.00	15000.00
.			
.			
.			
scal	772.00	3872.00	15000.00 ;

7. LANDSUPPL

TABLE LANDSUPPL(LANDTYPE, REGIONS, LANDITEM) REGIONAL LAND SUPPLY DATA

	price	quantity	elasticity
cropland. northeast	45.63	5573.00	.30
cropland. lakestates	46.60	31695.00	.30
cropland. cornbelt	74.56	89211.00	.30
.			
.			
.			
pasture. northeast	23.29	778.00	.60
pasture. lakestates	18.47	23300.00	.60
pasture. cornbelt	27.96	19786.00	.60
.			
.			
.			
aums. northeast	8.98	1.00	0.00
aums. lakestates	8.98	1.00	0.00
aums. cornbelt	8.98	1.00	0.00
.			
.			
. ;			

8. LBUDDATA

TABLE LBUDDATA(ALLI, SUBREG, ANIMAL, LIVETECH)   LIVESTOCK BUDGET DATA

	rolingpltx . beefcows . 0
labor	10.70200
aums	12.59200
profit	33.38100
maximum	544.59998
corn	-.80500
cullbeefco	.50100
silage	-.17600
hay	-.70700
livecalf	1.85700
beefyearli	2.04600
highprotca	.15300
othervaria	1.76700
capital	60.09400
repaircost	9.32700
vetandmedi	4.53500
marketing	8.83200
landtaxes	8.14700
generalove	5.27800
fuelandoth	9.87100

	minnesota . dairy . 0
+	
labor	15.69200
pasture	.20800
profit	669.26801
maximum	890.00000
culldairyc	2.73500
milk	144.20799
silage	-4.37000
hay	-5.17000
livecalf	.29500
dairyprot1	62.82100
othervaria	169.23399
capital	138.51900
repaircost	61.63400
vetandmedi	31.31000
marketing	12.64200
landtaxes	.21500
generalove	102.01900
fuelandoth	59.91400 ..... ;

9. MIXDATA

PARAMETER MIXDATA(CROP, SUBREG, CRPMIXALT) PRIMARY PRODUCT MIX DATA

/ barley	. arizona	. 1971	119.00
barley	. arizona	. 1972	109.00
barley	. arizona	. 1973	120.00
.			
.			
.			
barley	. arizona	. 1988	13.00
barley	. arizona	. 1989	12.00
barley	. arizona	. 1990	15.00
.			
.			
.			
corn	. nillinois	. 1988	4800.00
corn	. nillinois	. 1989	5375.00
corn	. nillinois	. 1990	5200.00 .... / ;

10. NATMIXDATA

TABLE NATMIXDATA(SUBREG,PRIMARY,NATMIXALT) PRIMARY PRODUCT MIXDATA

	milk.1960	milk.1961	milk.1962	. . .	milk.1968
alabama	9610.00	9550.00	9340.00		8080.00
arizona	4610.00	4680.00	4780.00		5530.00
arkansas	9140.00	9310.00	9020.00		6880.00
ncaliforni	40375.00	41055.00	41540.00		44750.00
.					
.					
.					
scal	40375.00	41055.00	41540.00		44750.00 ... ;

11. PDEMAND   PRIMARY COMMODITY DOMESTIC DEMAND DATA

TABLE PDEMAND(PRIMARY,SDITEM) PRIMARY COMMODITY DOMESTIC DEMAND DATA

	price	quantity	elasticity	maxq	minq	tfac
cotton	325.44	8100.00	-.22	0.00	0.0	10.0
corn	2.30	710000.00	-.23	0.00	0.0	10.0
soybeans	5.75	.00	-.00	0.00	0.0	10.0
wheat	2.61	1216000.00	-.07	0.00	0.0	10.0
sorghum	2.10	2000.00	-.20	0.00	0.0	10.0
.						
.						
.						
wool	1.24	127600.00	-.40	0.00	0.0	10.0 ;

12. PEXPORT

TABLE PEXPORT(PRIMARY,SDITEM) PRIMARY COMMODITY EXPORT DEMAND DATA

	price	quantity	elasticity	maxq	minq	tfac
cotton	325.44	7600.00	-1.20	0.00	0.00	10.00
corn	2.30	1500000.00	-.33	0.00	0.00	10.00
soybeans	5.75	545000.00	-.82	0.00	0.00	10.00
wheat	2.61	1075000.00	-.35	0.00	0.00	10.00
sorghum	2.10	80000.00	-.80	0.00	0.00	10.00
.						
.						
.						
wool	1.24	2700.00	-.80	0.00	0.00	10.00;

13. PIMPORT

TABLE PIMPORT(PRIMARY,SDITEM) PRIMARY COMMODITY IMPORT DEMAND DATA

	price	quantity	elasticity	maxq	minq	tfac
cotton	.00	.00	.00	0.00	0.00	10.00
corn	.00	.00	.00	0.00	0.00	10.00
soybeans	.00	.00	.00	0.00	0.00	10.00
wheat	.00	.00	.00	0.00	0.00	10.00
sorghum	.00	.00	.00	0.00	0.00	10.00
.						
.						
.						
wool	1.24	71700.00	.20	0.00	0.00	10.00;

14. PROCBUD

TABLE PROCBUD(ALLI,PROCESSALT) PROCESSING BUDGET DATA

```
                  frozen-pot
 proccost            4.60300
 profit              9.40700
 potatoes            2.00000
 frozenpot           1.00000

+                    wetmill
 profit           2787.52808
 corn             1000.00000
 glutenfeed         15.40000
 cornoil             1.50000
 starch             31.50000

+                    dairysup1
 proccost           28.67000
 profit             19.65300
 corn               15.00000
 soybeanmea          -.96300
 dairyprot1         10.00000

+                    bfhefsla
 profit            -15.62000
 beefyearli          1.00000
 nonfedsla          -1.00000  ...  ;
```

16. SCALE, SCALLIVE, SCALMIX, SCALOBJ, SCALPROC, SCALPROD

```
parameter scale(alli) scaling factors ;

scale(alli)=1.;
scalobj=1000.;
scalprod=1000.;
scalmix=1000.;
scalproc=1000.;
scallive=1000.;
```

17. SDEMAND   SECONDARY COMMODITY DOMESTIC DEMAND DATA

TABLE SDEMAND(SECONDARY,SDITEM)   SECONDARY COMMODITY DOMESTIC DEMAND DATA

	price	quantity	elasticity	maxq	minq	tfac
soybeanmea	8.25	.00	.00	0.00	0.0	10.0
soybeanoil	205.00	11000.00	-.14	0.00	0.0	10.0
fluidmilk	26.10	590250.00	-.30	0.00	0.0	10.0
.						
.						
.						
driedpot	86.30	5615.00	-0.10	0.00	0.0	10.0
chippot	295.80	11486.00	-0.23	0.00	0.0	10.0 ;

18. SEXPORT   SECONDARY COMMODITY EXPORT DEMAND DATA

TABLE SEXPORT(SECONDARY,SDITEM)   SECONDARY COMMODITY EXPORT DEMAND DATA

	price	quantity	elasticity	maxq	minq	tfac
soybeanmea	8.25	110000.00	-.37	0.00	0.00	10.00
soybeanoil	205.00	4000.00	-.28	0.00	0.00	10.00
fluidmilk	.00	.00	.00	0.00	0.00	10.00

.
.
.

driedpot	86.30	58.00	-0.10	0.00	0.0	10.0
chippot	295.80	47.00	-0.10	0.00	0.0	10.0 ;

19. SIMPORT   SECONDARY COMMODITY IMPORT DEMAND DATA

TABLE SIMPORT(SECONDARY,SDITEM)   SECONDARY COMMODITY IMPORT DEMAND DATA

	price	quantity	elasticity	maxq	minq	tfac
veal	413.29	244.10	.20	0.00	0.00	10.00
nonfedbeef	163.57	21790.00	.20	0.00	0.00	10.00
pork	212.60	8950.00	.20	0.00	0.00	10.00
.						
.						
.						
frozenpot	35.00	138.00	0.20	0.00	0.0	10.0
driedpot	86.30	128.00	0.20	0.00	0.0	10.0 ;

20. TUNE   TUNING FACTORS

tune(crop)   = 0.0 ;

21. WATERSUP   SUBREGIONAL WATER SUPPLY DATA

TABLE WATERSUP(SUBREG,WATERITEM) SUBREGIONAL WATER SUPPLY DATA

	well	surface	pumpprice	pumpelas	fixedmax	fixedprc
alabama	7.3	17.6	17.3	1.50	0.8	11.1
arizona	1204.8	137.7	37.0	0.80	1730.0	20.2
arkansas	3247.5	524.4	13.9	1.50	29.0	1.6
.						
.						
.						
ncaliforni	4754.6	713.4	29.2	0.85	5631.1	23.6
scal	1584.9	237.8	29.2	0.85	1877.1	23.6 ;

watersup(subreg, "pumpq")= watersup(subreg, "well") ;
watersup(subreg, "fixedmax")= watersup(subreg, "fixedmax")
                    + watersup(subreg, "surface") ;

_____

ITEM   DEFINITION
_____

I. VARIABLES

ARTIF   ARTIFICIAL PRODUCTION
BUYINPUT   INPUT PURCHASES
CCCLOANP   PRIMARY PRODUCT CCC LOAN DEMAND
CCCLOANS   SECONDARY PRODUCT CCC LOAN DEMAND
CROPBUDGET   CROP BUDGETS
CSPS   CONSUMER PLUS PRODUCER SURPLUS
DEFPRODN   PRODUCTION RECEIVE DEFIC PYMT
DEMANDP   PRIMARY PRODUCT DOMESTIC DEMAND
DEMANDS   SECONDARY PRODUCT DOMESTIC DEMAND
DIVPRODN   PRODUCTION RECEIVE DIVERSION PYMT
EXPORTP   PRIMARY PRODUCT EXPORTS
EXPORTS   SECONDARY PRODUCT EXPORTS
FAMILY   FAMILY LABOR SUPPLY
HIRED   HIRED LABOR SUPPLY
IMPORTP   PRIMARY PRODUCT IMPORTS
IMPORTS   SECONDARY PRODUCT IMPORTS
LANDSUPPLY   REGIONAL LAND SUPPLY
LVSTBUDGET   LIVESTOCK BUDGETS
MIXR   CROP MIXES BY REGION
NATMIX   PRIMARY PRODUCT MIXES ACROSS REGIONS
PRDN5092   PRODUCTION RECEIVE 5092 PYMT
PROCESS   PROCESSING BUDGETS
TOLR   NATIONAL CROP MIX TOLERENCE
TWID   CROP MIXES TOLERENCE
UNHARV   UNHARVESTED PRODUCTION
WATERFIX   FIXED PRICE - FIXED WATER SUPPLY
WATERVAR   VARIABLE COST - PUMPED WATER SUPPLY

II. EQUATIONS

ARTIFICIAL   ARTIFICIAL FARM PROGRAM PRODUCTION
DIVERT   TOTAL VOLUNTARY DIVERSION PRODUCTION
FAMILYLIM   MAXIMUM FAMILY LABOR
FIX   SUBREGIOANL MAXIMUM FIXED PRICE WATER
FRMPROG   TOTAL FARM PROGRAM PRODUCTION
HIRELIM   MAXIMUM HIRED LABOR
INPUTBAL   NATIONAL INPUT BALANCES
LABOR   REGIONAL LABOR BALANCE
LAND   REGIONAL LAND BALANCE
MAXLAND   MAXIMUM LAND AVAILABLE IN A SUBREG
MINLAND   MINIMUM CROPLAND USE IN A SUBREG
MIXNAT   PRIMARY PRODUCT DISTRIBUTION ACCROSS REGIONS
MIXREG   CROP MIX CONSTRAINTS BY ACREAGE IN SUBREGION
MIXREGTOT   TOTAL ACRES IN A CROP MIX
OBJT   OBJECTIVE FUNCTION
P5092   TOTAL 5092 ACREAGE PRODUCTION
PRIMARYBAL   PRIMARY PRODUCT BALANCE
SECONDBAL   SECONDARY PRODUCT BALANCE
UNHARVEST   PAID BUT UNHARVESTED FARM PROGRAM PRODUCITON
WATERR   SUBREGIONAL WATER BALANCE

_____

III. MODEL

```
*############################################################################
* DEMAND CURVES SPECIFICATIONS IN ASM INCLUDE THE FOLLOWING 4 CASES:
*(1) NO FINAL DEMAND:    P NE 0.0;  Q EQ 0.0;  ELAS EQ 0.0
*(2) REGULAR DEMAND:     P NE 0.0;  Q NE 0.0;  ELAS LE -0.05
*(3) HORIZONATAL DEMAND: P NE 0.0;  Q NE 0.0;  ELAS EQ 0.0 (FIXED PRICE DEMAND)
*(4) VERTICAL DEMAND:    P NE 0.0;  Q NE 0.0;  W/ MINQ GT 0.0
* THESE SPEICIFICATIONS ALSO APPLY TO THE IMPORT AND INPUT SUPPLY CURVES.
*############################################################################
```

  POSITIVE VARIABLES

CROPBUDGET(SUBREG, CROP, WTECH, CTECH, TECH)	CROP BUDGETS
LVSTBUDGET(SUBREG, ANIMAL, LIVETECH)	LIVESTOCK BUDGETS
LANDSUPPLY(REGIONS, LANDTYPE)	REGIONAL LAND SUPPLY
PROCESS(PROCESSALT)	PROCESSING BUDGETS
WATERFIX(SUBREG)	FIXED PRICE - FIXED WATER SUPPLY
WATERVAR(SUBREG)	VARIABLE COST - PUMPED WATER SUPPLY
FAMILY(REGIONS)	FAMILY LABOR SUPPLY
HIRED(REGIONS)	HIRED LABOR SUPPLY
DEMANDP(PRIMARY)	PRIMARY PRODUCT DOMESTIC DEMAND
IMPORTP(PRIMARY)	PRIMARY PRODUCT IMPORTS
EXPORTP(PRIMARY)	PRIMARY PRODUCT EXPORTS
DEMANDS(SECONDARY)	SECONDARY PRODUCT DOMESTIC DEMAND
IMPORTS(SECONDARY)	SECONDARY PRODUCT IMPORTS
EXPORTS(SECONDARY)	SECONDARY PRODUCT EXPORTS
MIXR(SUBREG, CRPMIXALT)	CROP MIXES BY REGION
NATMIX(PRIMARY, NATMIXALT)	PRIMARY PRODUCT MIXES ACROSS REGIONS
BUYINPUT(INPUT)	INPUT PURCHASES
CCCLOANP(PRIMARY)	PRIMARY PRODUCT CCC LOAN DEMAND
CCCLOANS(SECONDARY)	SECONDARY PRODUCT CCC LOAN DEMAND
DEFPRODN(ALLI)	PRODUCTION RECEIVE DEFIC PYMT
PRDN5092(ALLI)	PRODUCTION RECEIVE 5092 PYMT
DIVPRODN(ALLI)	PRODUCTION RECEIVE DIVERSION PYMT
ARTIF(ALLI)	ARTIFICIAL PRODUCTION
UNHARV(ALLI)	UNHARVESTED PRODUCTION

  VARIABLES

CSPS	
tolr(PRIMARY, SUBREG)	NATIONAL CROP MIX TOLERENCE
TWID(CROP, SUBREG)	CROP MIXES TOLERENCE

  EQUATIONS

OBJT	
MAXLAND(SUBREG, LANDTYPE)	MAXIMUM LAND AVAILABLE IN A SUBREG
MINLAND(SUBREG)	MINIMUM CROPLAND USE IN A SUBREG
LAND(REGIONS, LANDTYPE)	REGIONAL LAND BALANCE
WATERR(SUBREG)	SUBREGIONAL WATER BALANCE
FIX(SUBREG)	SUBREGIOANL MAXIMUM FIXED PRICE WATER
LABOR(REGIONS)	REGIONAL LABOR BALANCE
FAMILYLIM(REGIONS)	MAXIMUM FAMILY LABOR
HIRELIM(REGIONS)	MAXIMUM HIRED LABOR
PRIMARYBAL(PRIMARY)	PRIMARY PRODUCT BALANCE
SECONDBAL(SECONDARY)	SECONDARY PRODUCT BALANCE
MIXREG(CROP, SUBREG)	CROP MIX CONSTRAINTS BY ACREAGE IN SUBREGION
MIXREGTOT(SUBREG)	TOTAL ACRES IN A CROP MIX
MIXNAT(PRIMARY, SUBREG)	PRIMARY PRODUCT DISTRIBUTION ACCROSS REGIONS
INPUTBAL(INPUT)	NATIONAL INPUT BALANCES
FRMPROG(CROP)	TOTAL FARM PROGRAM PRODUCTION
P5092(CROP)	TOTAL 5092 ACREAGE PRODUCTION

DIVERT(CROP)   TOTAL VOLUNTARY DIVERSION PRODUCTION
 ARTIFICIAL(CROP)   ARTIFICIAL FARM PROGRAM PRODUCTION
  UNHARVEST(CROP)   PAID BUT UNHARVESTED FARM PROGRAM
PRODUCITON

```
*    THE FOLLOWING ARE IMPOSED BY BOUNDS

*     IMPORTMAX(PRIMARY)                        PRIMARY COMMODITY IMPORT MAXIMUM
*     IMPORTMIN(PRIMARY)                        PRIMARY COMMODITY IMPORT MINIMUM
*     EXPORTMAX(PRIMARY)                        PRIMARY COMMODITY EXPORT MAXIMUM
*     EXPORTMIN(PRIMARY)                        PRIMARY COMMODITY EXPORT MINIMUM
*     DEMANDMAX(PRIMARY)                        PRIMARY COMMODITY DEMAND MAXIMUM
*     DEMANDMIN(PRIMARY)                        PRIMARY COMMODITY DEMAND MINIMUM
*     IMPORTMAX(SECONDARY)                      SECONDARY COMMODITY IMPORT MAXIMUM
*     IMPORTMIN(SECONDARY)                      SECONDARY COMMODITY IMPORT MINIMUM
*     EXPORTMAX(SECONDARY)                      SECONDARY COMMODITY EXPORT MAXIMUM
*     SEXPORTMIN(SECONDARY)                     SECONDARY COMMODITY EXPORT MINIMUM
*     SDEMANDMAX(SECONDARY)                     SECONDARY COMMODITY DEMAND MAXIMUM
*     SDEMANDMIN(SECONDARY)                        SECONDARY COMMODITY DEMAND MINIMUM
*   LANDMIN(REGION, LANDTYPE)                     LAND SUPPLY MINIMUM TO AVOID NUMERIC
PROBLEM
*    WATERMIN(SUBREG)                           WATER SUPPLY MINIMUM TO AVOID NUMERIC
PROBLEM
*    HIREMIN(REGION)                            HIRED LABOR MINIMUM TO AVOID NUMERIC
PROBLEM


    ;
*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*  objective function

*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

  OBJT.. CSPS =E=

*     area under primary commodity demand curves

*   integrate for primary demand curves with elasticity

( SUM(PRIMARY$(PDEMAND(PRIMARY,"QUANTITY")   GT 0 AND
             PDEMAND(PRIMARY,"PRICE")        GT 0 AND
             PDEMAND(PRIMARY,"ELASTICITY") LT -0.05      ),
  (DEMANDP(PRIMARY)*SCALE(PRIMARY)/PDEMAND(PRIMARY,"QUANTITY"))
                     **(1./PDEMAND(PRIMARY,"ELASTICITY"))
   * DEMANDP(PRIMARY)*SCALE(PRIMARY)
   * PDEMAND(PRIMARY,"PRICE")
   * PDEMAND(PRIMARY,"ELASTICITY")
   / (1.+PDEMAND(PRIMARY,"ELASTICITY"))
   +PDEMAND(PRIMARY,"CONSTANT1")
   +PDEMAND(PRIMARY,"CONSTANT2")
    )

*   fixed price term for primary demand curves without elasticity

+SUM(PRIMARY$(PDEMAND(PRIMARY,"PRICE")        GT 0 AND
               PDEMAND(PRIMARY,"ELASTICITY") GE -0.05
              and pdemand(primary,"quantity") ne 0    ),
               PDEMAND(PRIMARY,"PRICE")*DEMANDP(PRIMARY)*SCALE(PRIMARY))


*   integrate for primary export demand curves with elasticity

+SUM(PRIMARY$(PEXPORT(PRIMARY,"QUANTITY")   GT 0 AND
             PEXPORT(PRIMARY,"PRICE")        GT 0 AND
             PEXPORT(PRIMARY,"ELASTICITY") LT -0.05      ),
  (EXPORTP(PRIMARY)*SCALE(PRIMARY)/PEXPORT(PRIMARY,"QUANTITY"))
                     **(1./PEXPORT(PRIMARY,"ELASTICITY"))
   * EXPORTP(PRIMARY)*SCALE(PRIMARY)
   * PEXPORT(PRIMARY,"PRICE")
```

```
          *  PEXPORT(PRIMARY, "ELASTICITY")
          /  (1.+PEXPORT(PRIMARY, "ELASTICITY"))
          +PEXPORT(PRIMARY, "CONSTANT1")
          +PEXPORT(PRIMARY, "CONSTANT2")
            )




*    fixed price term for export primary demand curves without elasticity

+SUM(PRIMARY$(PEXPORT(PRIMARY, "PRICE")       GT 0 AND
                PEXPORT(PRIMARY, "ELASTICITY") GE -0.05
              and pexport(primary, "quantity") ne 0     ),
               PEXPORT(PRIMARY, "PRICE")*EXPORTP(PRIMARY)
                *SCALE(PRIMARY))

*   integrate for primary import supply curves with elasticity

-SUM(PRIMARY$(PIMPORT(PRIMARY, "PRICE")       GT 0 AND
               PIMPORT(PRIMARY, "QUANTITY")    GT 0 AND
              PIMPORT(PRIMARY, "ELASTICITY")   GT 0.05      ),
   +PIMPORT(PRIMARY, "ELASTICITY")
                       /(1.+PIMPORT(PRIMARY, "ELASTICITY"))
  *(PIMPORT(PRIMARY, "PRICE")
  *(IMPORTP(PRIMARY)*SCALE(PRIMARY)/PIMPORT(PRIMARY, "QUANTITY"))**
               (1./PIMPORT(PRIMARY, "ELASTICITY"))
              * IMPORTP(PRIMARY)*SCALE(PRIMARY)   ) )

*   fixed price term for primary import supply curves without elasticity

-SUM(PRIMARY$(PIMPORT(PRIMARY, "PRICE")       GT 0 AND
               PIMPORT(PRIMARY, "ELASTICITY") LE 0.05
              and pimport(primary, "quantity") ne 0       ),
              PIMPORT(PRIMARY, "PRICE")*IMPORTP(PRIMARY)*SCALE(PRIMARY))

*   integrate for secondary demand curves with elasticity

+SUM(SECONDARY$(SDEMAND(SECONDARY, "QUANTITY")   GT 0 AND
              SDEMAND(SECONDARY, "PRICE")       GT 0 AND
              SDEMAND(SECONDARY, "ELASTICITY") LT -0.05     ),
   (DEMANDS(SECONDARY)*SCALE(SECONDARY)/SDEMAND(SECONDARY, "QUANTITY"))
                     **(1./SDEMAND(SECONDARY, "ELASTICITY"))
   * DEMANDS(SECONDARY)*SCALE(SECONDARY)
   * SDEMAND(SECONDARY, "PRICE")
   * SDEMAND(SECONDARY, "ELASTICITY")
   / (1.+SDEMAND(SECONDARY, "ELASTICITY"))
   +SDEMAND(SECONDARY, "CONSTANT1")
   +SDEMAND(SECONDARY, "CONSTANT2")
    )

*   fixed price term for secondary demand curves without elasticity

+SUM(SECONDARY$(SDEMAND(SECONDARY, "PRICE")       GT 0 AND
                SDEMAND(SECONDARY, "ELASTICITY") GE -0.05
              and sdemand(secondary, "quantity") ne 0     ),
               SDEMAND(SECONDARY, "PRICE")*DEMANDS(SECONDARY)*SCALE(SECONDARY))

*   integrate for secondary export demand curves with elasticity

+SUM(SECONDARY$(SEXPORT(SECONDARY, "QUANTITY")   GT 0 AND
                SEXPORT(SECONDARY, "PRICE")       GT 0 AND
                SEXPORT(SECONDARY, "ELASTICITY") LT -0.05      ),
   (EXPORTS(SECONDARY)*SCALE(SECONDARY)/SEXPORT(SECONDARY, "QUANTITY"))
```

```
                              **(1./SEXPORT(SECONDARY,"ELASTICITY"))
      * EXPORTS(SECONDARY)*SCALE(SECONDARY)
      * SEXPORT(SECONDARY,"PRICE")
      * SEXPORT(SECONDARY,"ELASTICITY")
      / (1.+SEXPORT(SECONDARY,"ELASTICITY"))
      +SEXPORT(SECONDARY,"CONSTANT1")
      +SEXPORT(SECONDARY,"CONSTANT2")
      )

*    fixed price term for secondary export demand curves without elasticity

+SUM(SECONDARY$(SEXPORT(SECONDARY,"PRICE")        GT 0 AND
                SEXPORT(SECONDARY,"ELASTICITY") GE -0.05
               and sexport(secondary,"quantity") ne 0    ),
                SEXPORT(SECONDARY,"PRICE")*EXPORTS(SECONDARY)*SCALE(SECONDARY))


*    integrate for secondary import supply curves with elasticity

-SUM(SECONDARY$(SIMPORT(SECONDARY,"QUANTITY")    GT 0 AND
                SIMPORT(SECONDARY,"PRICE")       GT 0 AND
                SIMPORT(SECONDARY,"ELASTICITY") GT 0.05         ),
    +SIMPORT(SECONDARY,"ELASTICITY")/(1.+SIMPORT(SECONDARY,"ELASTICITY"))
         *SIMPORT(SECONDARY,"PRICE")*
                 (IMPORTS(SECONDARY)*SCALE(SECONDARY)
                      /SIMPORT(SECONDARY,"QUANTITY"))
               **(1./SIMPORT(SECONDARY,"ELASTICITY"))
                * IMPORTS(SECONDARY)*SCALE(SECONDARY) )

*    fixed price term for secondary import supply curves without elasticity

-SUM(SECONDARY$(SIMPORT(SECONDARY,"PRICE")        GT 0 AND
                SIMPORT(SECONDARY,"ELASTICITY") LE 0.05
               and simport(secondary,"quantity") ne 0      ),
                SIMPORT(SECONDARY,"PRICE")*IMPORTS(SECONDARY)*SCALE(SECONDARY))

*    integrate for land supply curves with elasticity

-SUM((REGION,LANDTYPE)$(LANDSUPPL(LANDTYPE,REGION,"QUANTITY")    GT 0 AND
                        LANDSUPPL(LANDTYPE,REGION,"PRICE")       GT 0 AND
                        LANDSUPPL(LANDTYPE,REGION,"ELASTICITY") GT 0.05  ),
        +LANDSUPPL(LANDTYPE,REGION,"ELASTICITY")
        /(1.+LANDSUPPL(LANDTYPE,REGION,"ELASTICITY"))
        *LANDSUPPL(LANDTYPE,REGION,"PRICE")*
        (LANDSUPPLY(REGION,LANDTYPE)*SCALE(LANDTYPE)
        /LANDSUPPL(LANDTYPE,REGION,"QUANTITY"))
        **(1./LANDSUPPL(LANDTYPE,REGION,"ELASTICITY"))
        * LANDSUPPLY(REGION,LANDTYPE)*SCALE(LANDTYPE) )

*    fixed price term for land supply curves without elasticity

-SUM((REGION,LANDTYPE)$(LANDSUPPL(LANDTYPE,REGION,"PRICE")        GT 0 AND
                        LANDSUPPL(LANDTYPE,REGION,"ELASTICITY") LE 0.05 AND
                        LANDSUPPL(LANDTYPE,REGION,"quantity") ne 0.0  ),
                        LANDSUPPL(LANDTYPE,REGION,"PRICE")*
                        LANDSUPPLY(REGION,LANDTYPE)*SCALE(LANDTYPE))

*    integrate for water supply curves with elasticity

-SUM(SUBREG$( WATERSUP(SUBREG,"PUMPQ")       GT 0 AND
              WATERSUP(SUBREG,"PUMPPRICE")   GT 0 AND
              WATERSUP(SUBREG,"PUMPELAS")    GT 0.05    ),
    WATERSUP(SUBREG,"PUMPELAS")
    /(1.+WATERSUP(SUBREG,"PUMPELAS"))
    *WATERSUP(SUBREG,"PUMPPRICE")*
```

```
             (WATERVAR(SUBREG)*SCALE("WATER")
             /WATERSUP(SUBREG,"PUMPQ"))
             **(1./WATERSUP(SUBREG,"PUMPELAS"))
             * WATERVAR(SUBREG)*SCALE("WATER") )


*    fixed price term for water supply curves without elasticity

-SUM(SUBREG$(WATERSUP(SUBREG,"PUMPPRICE")   GT 0 AND
              WATERSUP(SUBREG,"PUMPELAS")    LE 0.05 AND
              WATERSUP(SUBREG,"PUMPq") NE 0.0       ),
              WATERSUP(SUBREG,"PUMPPRICE")*
              WATERVAR(SUBREG)*SCALE("WATER"))


*    integrate for hired labor supply curves with elasticity

-SUM(REGION$(LABORSUP(REGION,"HIREQ")       GT 0 AND
              LABORSUP(REGION,"HIREP")       GT 0 AND
              LABORSUP(REGION,"HIREELAS")    GT 0.05       ),
         LABORSUP(REGION,"HIREELAS") /(1.+LABORSUP(REGION,"HIREELAS"))
              *LABORSUP(REGION,"HIREP")*
    (HIRED(REGION)*SCALE("LABOR")/LABORSUP(REGION,"HIREQ"))**
           (1./LABORSUP(REGION,"HIREELAS"))
             * HIRED(REGION)*SCALE("LABOR") )


*    fixed price term for hired labor supply curves without elasticity

- SUM(REGION$(LABORSUP(REGION,"HIREQ")     LE 0 AND
                   LABORSUP(REGION,"HIREP")     GT 0 AND
                   LABORSUP(REGION,"HIREELAS") LE 0.05 AND
                   LABORSUP(REGION,"HIREq") NE 0.0),
                   LABORSUP(REGION,"HIREP")*
                   HIRED(REGION)*SCALE("LABOR"))


*    subtract production costs for participating crops

- SUM((SUBREG, CROP, WTECH, TECH)$(FARMPROD("SLIPPAGE",CROP) gt 0.0 and
              CBUDDATA(crop,SUBREG,CROP,WTECH,"PARTICIP",TECH) gt 0.0),
     (tune(crop)+SUM(COST,CBUDDATA(COST,SUBREG,CROP,WTECH,"PARTICIP",TECH)))
        *CROPBUDGET(SUBREG,CROP,WTECH,"PARTICIP",TECH)*SCALPROD
     +(tune(crop)+SUM(COST,CBUDDATA(COST,SUBREG,CROP,WTECH,"NONPART",TECH)))
        *CROPBUDGET(SUBREG,CROP,WTECH,"NONPART",TECH)*SCALPROD)


*    subtract production costs for non participating crops

- SUM((SUBREG, CROP, WTECH, TECH)$(FARMPROD("SLIPPAGE",CROP) LE 0.0 and
              CBUDDATA(crop,SUBREG,CROP,WTECH,"base",TECH) gt 0.0),
     +(tune(crop)+ SUM(COST,CBUDDATA(COST,SUBREG,CROP,WTECH,"BASE",TECH)))
        *CROPBUDGET(SUBREG,CROP,WTECH,"BASE",TECH)*SCALPROD  )


*    subtract production costs for livestock

- SUM((SUBREG, ANIMAL, LIVETECH),
            (SUM(COST,LBUDDATA(COST,SUBREG,ANIMAL,LIVETECH)))
              * LVSTBUDGET(SUBREG,ANIMAL,LIVETECH) )*SCALLIVE


*    subtract processing costs

- SUM(PROCESSALT, PROCESS(PROCESSALT)*SCALPROC*
            (SUM(COST,PROCBUD(COST,PROCESSALT))))   )


*    subtract opportunity cost for hired labor

- SUM(REGION, FAMILY(REGION)* LABORSUP(REGION,"FAMILYPRC")*SCALE("LABOR"))


*    subtract costs of national inputs
```

```
- SUM(INPUT, INPUTPRICE(INPUT)*BUYINPUT(INPUT)*SCALE(INPUT))

*    subtract costs of fixed price water

- SUM(SUBREG, WATERFIX(SUBREG)* WATERSUP(SUBREG, "FIXEDPRC")*SCALE("WATER"))

*    add in deficiency payments

+ SUM(CROP$(FARMPROD("TARGET",CROP) GT 0 AND
            FARMPROD("SLIPPAGE",CROP) GT 0 AND
            FARMPROD("MKTLOANY-N",CROP) GT 0),
  (FARMPROD("DEFIC",CROP)+FARMPROD("MKTLOANY-N",CROP)*FARMPROD("MKTLOAN",CROP))
    *DEFPRODN(CROP) *SCALE(CROP)      )

*  add in marketing loan payments

+ SUM(CROP$(FARMPROD("TARGET",CROP) GT 0 AND
            FARMPROD("SLIPPAGE",CROP) GT 0 AND
            FARMPROD("MKTLOANY-N",CROP) LE 0),
  (FARMPROD("DEFIC",CROP)*DEFPRODN(CROP) *SCALE(CROP)  )   )

*  add in 50/92 payments

+ SUM(CROP$FARMPROD("TARGET",CROP),
        FARMPROD("DEFIC",CROP)*PRDN5092(CROP) *SCALE(CROP))

*  add in diversion payments

+ SUM(CROP$FARMPROD("TARGET",CROP),
        FARMPROD("DIVERPAY",CROP)*DIVPRODN(CROP) *SCALE(CROP) )

*  add in payments for actual yield is less than farm program yield

+ SUM(CROP$(FARMPROD("TARGET",CROP)  gt 0 and
            FARMPROD("FPYIELD",CROP) GT 1.0),
        FARMPROD("DEFIC",CROP)*ARTIF(CROP) *SCALE(CROP)    )

*  add in unharvested acre payments

+ SUM(CROP$(FARMPROD("TARGET",CROP) GT 0 AND
              FARMPROD("UNHARVACR",CROP) GT 0),
        FARMPROD("DEFIC",CROP)*UNHARV(CROP)  *SCALE(CROP)  )

*  add in loan rate payments

+ SUM(PRIMARY$(FARMPROD("LOANRATE",PRIMARY) GT 0 AND
              FARMPROD("MKTLOANY-N",PRIMARY) LT 1.0),
      FARMPROD("LOANRATE",PRIMARY)*CCCLOANP(PRIMARY)*SCALE(PRIMARY) )

*  add in loan rate payments for processed (secondary) commodities

+ SUM(SECONDARY$(FARMPROD("LOANRATE",SECONDARY) GT 0 AND
              FARMPROD("MKTLOANY-N",SECONDARY) LT 1.0),
      FARMPROD("LOANRATE",SECONDARY)*CCCLOANS(SECONDARY)*SCALE(SECONDARY) ))
        /SCALOBJ  ;

*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*  primary commodity supply demand balance (including farm program
*                   crops, non-farm program crops and animals)

*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

 PRIMARYBAL(PRIMARY)..
```

```
*   add in production from non-participating acres for farm program crops

        - SUM(SUBREG,
          SUM((CROP, WTECH, TECH)$FARMPROD("SLIPPAGE", CROP),
             CROPBUDGET(SUBREG, CROP, WTECH, "NONPART", TECH)
            *SCALPROD
            *CBUDDATA(PRIMARY, SUBREG, CROP, WTECH, "NONPART", TECH)
            *CBUDDATA("CROPLAND", SUBREG, CROP, WTECH, "NONPART", TECH)

*   add in production from non-participating acres associated with
*   participating acres at max participation rate for farm program crops

          + CROPBUDGET(SUBREG, CROP, WTECH, "PARTICIP", TECH)
            *SCALPROD
            *CBUDDATA(PRIMARY, SUBREG, CROP, WTECH, "NONPART", TECH)
            *CBUDDATA("CROPLAND", SUBREG, CROP, WTECH, "PARTICIP", TECH)
            *(1.0-FPPART(SUBREG, CROP))

*   add in production from participating acres where acres are not
*   fully paid due to reasons such as payment limitation for farm program crops

          + CROPBUDGET(SUBREG, CROP, WTECH, "PARTICIP", TECH)
            *SCALPROD
            *CBUDDATA(PRIMARY, SUBREG, CROP, WTECH, "PARTICIP", TECH)
            *CBUDDATA("CROPLAND", SUBREG, CROP, WTECH, "PARTICIP", TECH)
            *FPPART(SUBREG, CROP) * (1.0-FARMPROD("SETASIDE", CROP)
                 -FARMPROD("DIVERSION", CROP)-FARMPROD("50-92", CROP))
            * (1.0-FARMPROD("PERCNTPAID", CROP))    )
            /SCALE(PRIMARY)
```

```
*   add in production from participating acres that get paid but yield exceed
*   farm program yield and thus cannot receive deficiency payment

        + SUM((CROP, WTECH, TECH)$(FARMPROD("SLIPPAGE", CROP) GT 0.0 AND
                      FARMPROD("FPYIELD", CROP) LE 1.0),
             CROPBUDGET(SUBREG, CROP, WTECH, "PARTICIP", TECH)
              *SCALPROD
                *CBUDDATA("CROPLAND", SUBREG, CROP, WTECH, "PARTICIP", TECH)
                *FPPART(SUBREG, CROP) * (1.0-FARMPROD("SETASIDE", CROP)
                    -FARMPROD("DIVERSION", CROP)-FARMPROD("50-92", CROP))
                * FARMPROD("PERCNTPAID", CROP)
             /SCALE(PRIMARY)
                *CBUDDATA(PRIMARY, SUBREG, CROP, WTECH, "PARTICIP", TECH)
                *(1.0-FARMPROD("FPYIELD", CROP))      )

*   add in production for non-farm program crops

        + SUM((CROP, WTECH, TECH)$(FARMPROD("SLIPPAGE", CROP) LE 0.),
                CROPBUDGET(SUBREG, CROP, WTECH, "BASE", TECH)
                *SCALPROD
                *CBUDDATA(PRIMARY, SUBREG, CROP, WTECH, "BASE", TECH) )
             /SCALE(PRIMARY)

* add in animal production from livestock budgets

         + SUM((ANIMAL, LIVETECH),
                LVSTBUDGET(SUBREG, ANIMAL, LIVETECH)
                *SCALLIVE
                *LBUDDATA(PRIMARY, SUBREG, ANIMAL, LIVETECH))
             /SCALE(PRIMARY) )

*   add in production which gets deficiency payments for farm program crops

     -DEFPRODN(PRIMARY)$(FARMPROD("SLIPPAGE", PRIMARY) gt 0 and
                      FARMPROD("target", PRIMARY) GT 0 )

*   remove domestic demand

     +DEMANDP(PRIMARY)$PDEMAND(PRIMARY, "quantity")

*   add in imports

     -IMPORTP(PRIMARY)$PIMPORT(PRIMARY, "quantity")

*   remove export demand

     +EXPORTP(PRIMARY)$PEXPORT(PRIMARY, "quantity")

*   remove processing use

     +SUM(PROCESSALT, PROCESS(PROCESSALT)*PROCBUD(PRIMARY, PROCESSALT))
             /SCALE(PRIMARY)*SCALPROC

*   remove loan rate purchases

     +CCCLOANP(PRIMARY)$(FARMPROD("LOANRATE", PRIMARY) GT 0  AND
                      FARMPROD("MKTLOANY-N", PRIMARY) LT 1.0)
         =L= 0.  ;
```

```
*     &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*  primary commodity balance for deficiency payment eligible commodities

*     &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

  FRMPROG(CROP)$FARMPROD("TARGET",CROP)..

*  add in production which receive deficiency payments from paid participating
*  acres based on the lower of participating yield and farm program yield

    - SUM((SUBREG,WTECH,TECH),  CROPBUDGET(SUBREG,CROP,WTECH,"PARTICIP",TECH)
         *SCALPROD
         * ( CBUDDATA("CROPLAND",SUBREG,CROP,WTECH,"PARTICIP",TECH)
             *FPPART(SUBREG,CROP)*(1.0-FARMPROD("SETASIDE",CROP)
             -FARMPROD("DIVERSION",CROP)-FARMPROD("50-92",CROP))
             *FARMPROD("PERCNTPAID",CROP)  )
         * MIN( CBUDDATA(CROP,SUBREG,CROP,WTECH,"PARTICIP",TECH)  ,
        (FARMPROD("FPYIELD",CROP)
         *CBUDDATA(CROP,SUBREG,CROP,WTECH,"PARTICIP",TECH))))
         /SCALE(CROP)
     +DEFPRODN(CROP)
       =L=  0.   ;

*     &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*  primary commodity balance for 50/92 payment eligible commodities
*  from participating 50/92 acres based on farm program yield

*     &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

  P5092(CROP)$FARMPROD("TARGET",CROP)..
    - SUM((SUBREG,WTECH,TECH),  CROPBUDGET(SUBREG,CROP,WTECH,"PARTICIP",TECH)
         *SCALPROD
         *CBUDDATA("CROPLAND",SUBREG,CROP,WTECH,"PARTICIP",TECH)
         *FPPART(SUBREG,CROP)*FARMPROD("50-92",CROP)
         *FARMPROD("FPYIELD",CROP)
         /SCALE(CROP)
        *CBUDDATA(CROP,SUBREG,CROP,WTECH,"PARTICIP",TECH) )
         *0.92
  +PRDN5092(CROP)
      =L=  0.   ;


*     &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*  primary commodity balance for diversion payment eligible commodities
*  from diverted paricipating acres based on farm program yield

*     &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

  DIVERT(CROP)$FARMPROD("TARGET",CROP)..
    - SUM((SUBREG,WTECH,TECH),  CROPBUDGET(SUBREG,CROP,WTECH,"PARTICIP",TECH)
         *SCALPROD
         *CBUDDATA("CROPLAND",SUBREG,CROP,WTECH,"PARTICIP",TECH)
         *FPPART(SUBREG,CROP)*FARMPROD("DIVERSION",CROP)
         *FARMPROD("FPYIELD",CROP)
         *CBUDDATA(CROP,SUBREG,CROP,WTECH,"PARTICIP",TECH) )
         /SCALE(CROP)
  +DIVPRODN(CROP)
     =L=  0.   ;
```

```
* &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

* primary commodity balance for unharvested acre payment eligible commodities
* from paid participating but unharvested acres based on farm program yield

* &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&
  UNHARVEST(CROP)$(FARMPROD("TARGET",CROP) GT 0 AND
                 FARMPROD("UNHARVACR",CROP) GT 0)..
    - SUM((SUBREG,WTECH,TECH), CROPBUDGET(SUBREG,CROP,WTECH,"PARTICIP",TECH)
         *SCALPROD
       *CBUDDATA("CROPLAND",SUBREG,CROP,WTECH,"PARTICIP",TECH)
       *FPPART(SUBREG,CROP)
       *(1.0-FARMPROD("SETASIDE",CROP)-FARMPROD("DIVERSION",CROP)
        -FARMPROD("50-92",CROP))*FARMPROD("PERCNTPAID",CROP)
       *FARMPROD("UNHARVACR",CROP) *FARMPROD("FPYIELD",CROP)
       *CBUDDATA(CROP,SUBREG,CROP,WTECH,"PARTICIP",TECH) )
        /SCALE(CROP)
 +UNHARV(CROP)
   =L=  0.  ;


* &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

* primary commodity balance for deficiency payment eligible but
*        yield below farm program yield commodities

* &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&
  ARTIFICIAL(CROP)$(FARMPROD("TARGET",CROP) GT 0 AND
                 FARMPROD("FPYIELD",CROP) GT 1.0 )..
    - SUM((SUBREG,WTECH,TECH), CROPBUDGET(SUBREG,CROP,WTECH,"PARTICIP",TECH)
         *SCALPROD
       *CBUDDATA("CROPLAND",SUBREG,CROP,WTECH,"PARTICIP",TECH)
       *FPPART(SUBREG,CROP)
       *(1.0-FARMPROD("SETASIDE",CROP)-FARMPROD("DIVERSION",CROP)
        -FARMPROD("50-92",CROP))*FARMPROD("PERCNTPAID",CROP)
       *(FARMPROD("FPYIELD",CROP)-1.0)
       *CBUDDATA(CROP,SUBREG,CROP,WTECH,"PARTICIP",TECH) )/ SCALE(CROP)
 +ARTIF(CROP)
   =L=  0.  ;



* &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*  secondary commodity balance

* &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&
  SECONDBAL(SECONDARY)..

          +SUM(SUBREG,

*   use by primary production of farm program crops

             SUM((CROP,WTECH,CTECH,TECH)$FARMPROD("SLIPPAGE",CROP),
                CROPBUDGET(SUBREG,CROP,WTECH,"PARTICIP",TECH)
               *SCALPROD
               *CBUDDATA(SECONDARY,SUBREG,CROP,WTECH,"PARTICIP",TECH)+
                CROPBUDGET(SUBREG,CROP,WTECH,"NONPART",TECH)
               *SCALPROD
               *CBUDDATA(SECONDARY,SUBREG,CROP,WTECH,"NONPART",TECH)  )
               /SCALE(SECONDARY)
```

66

```
*    use by primary production of non-farm program crops

             +SUM((CROP, WTECH, CTECH, TECH)$(FARMPROD("SLIPPAGE", CROP) LE 0.0),
                 CROPBUDGET(SUBREG, CROP, WTECH, "BASE", TECH)
                *SCALPROD
                *CBUDDATA(SECONDARY, SUBREG, CROP, WTECH, "BASE", TECH)      )
                /SCALE(SECONDARY)

*    use by livestock production

             +SUM((ANIMAL, LIVETECH),
                 LVSTBUDGET(SUBREG, ANIMAL, LIVETECH)
                 *SCALLIVE
                 *LBUDDATA(SECONDARY, SUBREG, ANIMAL, LIVETECH)        )
                /SCALE(SECONDARY) )

*    remove domestic demand

          +DEMANDS(SECONDARY)$SDEMAND(SECONDARY, "quantity")

*    add in import supply

          -IMPORTS(SECONDARY)$SIMPORT(SECONDARY, "quantity")

*    remove export demand

          +EXPORTS(SECONDARY)$SEXPORT(SECONDARY, "quantity")

*    add/subtract processing production/use

          -SUM(PROCESSALT, PROCESS(PROCESSALT)*PROCBUD(SECONDARY, PROCESSALT)
                /SCALE(SECONDARY))*SCALPROC

*    remove loan rate usage

          +CCCLOANS(SECONDARY)$(FARMPROD("LOANRATE", SECONDARY) GT 0  AND
                                FARMPROD("MKTLOANY-N", SECONDARY) LT 1.0)
      =L= 0. ;


*  &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*  subregional land maximum usage constraint

*  &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

 MAXLAND(SUBREG, LANDTYPE)$LANDAVAIL(SUBREG, LANDTYPE)..

* add in land usage by farm program crops

        SUM((CROP, WTECH, TECH)$FARMPROD("SLIPPAGE", CROP),
            CROPBUDGET(SUBREG, CROP, WTECH, "PARTICIP", TECH)
           *SCALPROD
            *CBUDDATA(LANDTYPE, SUBREG, CROP, WTECH, "PARTICIP", TECH)
            /SCALE(LANDTYPE)
            + CROPBUDGET(SUBREG, CROP, WTECH, "NONPART", TECH)
            *SCALPROD
            *CBUDDATA(LANDTYPE, SUBREG, CROP, WTECH, "NONPART", TECH)
            /SCALE(LANDTYPE)  ) +

* add in land usage by non-farm program crops

        SUM((CROP, WTECH, TECH)$(FARMPROD("SLIPPAGE", CROP) LE 0.),
            CROPBUDGET(SUBREG, CROP, WTECH, "BASE", TECH)
```

```
                  *SCALPROD
                  *CBUDDATA(LANDTYPE, SUBREG, CROP, WTECH, "BASE", TECH)
                  /SCALE(LANDTYPE)     ) +

* add in land usage by livestock production

            SUM((ANIMAL, LIVETECH),
                 LVSTBUDGET(SUBREG, ANIMAL, LIVETECH)
                 *SCALLIVE
                 *LBUDDATA(LANDTYPE, SUBREG, ANIMAL, LIVETECH)
                 /SCALE(LANDTYPE))
              =L=
            LANDAVAIL(SUBREG, LANDTYPE)
                 /SCALE(LANDTYPE)  ;

*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*  subregional land minimum usage constraint

*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

 MINLAND(SUBREG)$LANDAVAIL(SUBREG, "CROPLAND")..

* add in land usage by farm program crops

            ( SUM((CROP, WTECH, TECH)$FARMPROD("SLIPPAGE", CROP),
                 CROPBUDGET(SUBREG, CROP, WTECH, "PARTICIP", TECH)
                 *SCALPROD
                 *CBUDDATA("CROPLAND", SUBREG, CROP, WTECH, "PARTICIP", TECH)+
                  CROPBUDGET(SUBREG, CROP, WTECH, "NONPART", TECH)
                 *SCALPROD
                 *CBUDDATA("CROPLAND", SUBREG, CROP, WTECH, "NONPART", TECH)   ) +

* add in land usage by non farm program crops

            SUM((CROP, WTECH, TECH)$(FARMPROD("SLIPPAGE", CROP) LE 0.),
                 CROPBUDGET(SUBREG, CROP, WTECH, "BASE", TECH)
                 *SCALPROD
                 *CBUDDATA("CROPLAND", SUBREG, CROP, WTECH, "BASE", TECH)       ) +

* add in land usage by livestock

            SUM((ANIMAL, LIVETECH),
                 LVSTBUDGET(SUBREG, ANIMAL, LIVETECH)
                 *SCALLIVE
                 *LBUDDATA("CROPLAND", SUBREG, ANIMAL, LIVETECH)))
                 /SCALE("CROPLAND")
        =G=
            0.0 * LANDAVAIL(SUBREG, "CROPLAND")
                 /SCALE("CROPLAND")  ;



*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*  regional land balance

*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

 LAND(REGION, LANDTYPE)..

* usage by  farm program crops

            ( SUM(SUBREG$MAPPING(REGION, SUBREG),
                 SUM((CROP, WTECH, TECH)$FARMPROD("SLIPPAGE", CROP),
```

```
                    CROPBUDGET(SUBREG, CROP, WTECH, "PARTICIP", TECH)
                    *SCALPROD
                    *CBUDDATA(LANDTYPE, SUBREG, CROP, WTECH, "PARTICIP", TECH)+
                    CROPBUDGET(SUBREG, CROP, WTECH, "NONPART", TECH)
                    *SCALPROD
                    *CBUDDATA(LANDTYPE, SUBREG, CROP, WTECH, "NONPART", TECH)   ) +

*  usage by non-farm program crops

                SUM((CROP, WTECH, TECH)$(FARMPROD("SLIPPAGE", CROP)  LE 0.0),
                    CROPBUDGET(SUBREG, CROP, WTECH, "BASE", TECH)
                    *SCALPROD
                    *CBUDDATA(LANDTYPE, SUBREG, CROP, WTECH, "BASE", TECH)        ) +

*  usage by livestock

                SUM((ANIMAL, LIVETECH),
                    LVSTBUDGET(SUBREG, ANIMAL, LIVETECH)
                    *SCALlive
                    *LBUDDATA(LANDTYPE, SUBREG, ANIMAL, LIVETECH))))
                /SCALE(LANDTYPE)

*  land from supply curve

          -LANDSUPPLY(REGION, LANDTYPE)

          =L= 0.  ;



*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*    subregional water balance

*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*  usage by  farm program crops

 WATERR(SUBREG)$(WATERSUP(SUBREG, "FIXEDMAX")+WATERSUP(SUBREG, "PUMPQ")+
                    WATERSUP(SUBREG, "PUMPMAX"))..

*  usage by  farm program crops

           (SUM((CROP, TECH)$FARMPROD("SLIPPAGE", CROP),
                    CROPBUDGET(SUBREG, CROP, "IRRIG", "PARTICIP", TECH)
                    *SCALPROD
                    *CBUDDATA("WATER", SUBREG, CROP, "IRRIG", "PARTICIP", TECH)+
                    CROPBUDGET(SUBREG, CROP, "IRRIG", "NONPART", TECH)
                    *SCALPROD
                    *CBUDDATA("WATER", SUBREG, CROP, "IRRIG", "NONPART", TECH)    ) +

*  usage by non-farm program crops

                SUM((CROP, TECH)$(FARMPROD("SLIPPAGE", CROP)  LE 0.0),
                    CROPBUDGET(SUBREG, CROP, "IRRIG", "BASE", TECH)
                    *SCALPROD
                    *CBUDDATA("WATER", SUBREG, CROP, "IRRIG", "BASE", TECH)         ) +

*  usage by livestock

                SUM((ANIMAL, LIVETECH),
                    LVSTBUDGET(SUBREG, ANIMAL, LIVETECH)
                    *SCALLIVE
                    *LBUDDATA("WATER", SUBREG, ANIMAL, LIVETECH)))/SCALE("WATER")
```

```
*   fixed price water supply

        -  WATERFIX(SUBREG)

*   water from supply curve

        -  WATERVAR(SUBREG)

    =L=  0;
```

```
*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*  subregional maximum fixed price water

*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

 FIX(SUBREG)..
            WATERFIX(SUBREG)
            =L= WATERSUP(SUBREG, "FIXEDMAX")/SCALE("WATER");


*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*  regional labor balance

*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

 LABOR(REGION)..

* usage by  farm program crops

            ( SUM(SUBREG$MAPPING(REGION, SUBREG),
                SUM((CROP, WTECH, TECH)$FARMPROD("SLIPPAGE", CROP),
                    CROPBUDGET(SUBREG, CROP, WTECH, "PARTICIP", TECH)
                   *SCALPROD
                   *CBUDDATA("LABOR", SUBREG, CROP, WTECH, "PARTICIP", TECH)+
                    CROPBUDGET(SUBREG, CROP, WTECH, "NONPART", TECH)
                   *SCALPROD
                   *CBUDDATA("LABOR", SUBREG, CROP, WTECH, "NONPART", TECH)   ) +

* usage by non program crops

                SUM((CROP, WTECH, TECH)$(FARMPROD("SLIPPAGE", CROP) LE 0.0),
                    CROPBUDGET(SUBREG, CROP, WTECH, "BASE", TECH)
                   *SCALPROD
                   *CBUDDATA("LABOR", SUBREG, CROP, WTECH, "BASE", TECH)      ) +

* usage by livestock

                SUM((ANIMAL, LIVETECH),
                    LVSTBUDGET(SUBREG, ANIMAL, LIVETECH)
                   *SCALLIVE
                   *LBUDDATA("LABOR", SUBREG, ANIMAL, LIVETECH))))/SCALE("LABOR")

*    family supply

          - FAMILY(REGION)

*   hired labor supply from supply curve

 -HIRED(REGION)

            =L= 0;



*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*  maximum family labor

*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

 FAMILYLIM(REGION)$LABORSUP(REGION, "familyMAX")..
            FAMILY(REGION) =L= LABORSUP(REGION, "FAMILYMAX")/SCALE("LABOR") ;
```

71

```
*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*     maximum hired labor

*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

 HIRELIM(REGION)$LABORSUP(REGION,"HIREMAX")..
           HIRED(REGION)   =L= LABORSUP(REGION,"HIREMAX")/SCALE("LABOR") ;



*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*     national input balance

*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

 INPUTBAL(INPUT)..

* usage by  farm program crops

        +SUM(SUBREG,
             SUM((CROP,WTECH,TECH)$FARMPROD("SLIPPAGE",CROP),
                 CROPBUDGET(SUBREG,CROP,WTECH,"PARTICIP",TECH)
                *SCALPROD/SCALE(INPUT)
                *CBUDDATA(INPUT,SUBREG,CROP,WTECH,"PARTICIP",TECH)+
                 CROPBUDGET(SUBREG,CROP,WTECH,"NONPART",TECH)
                *SCALPROD/SCALE(INPUT)
                *CBUDDATA(INPUT,SUBREG,CROP,WTECH,"NONPART",TECH)   )

* usage by non-farm program crops

          +SUM((CROP,WTECH,TECH)$(FARMPROD("SLIPPAGE",CROP) LE 0.0),
               CROPBUDGET(SUBREG,CROP,WTECH,"BASE",TECH)
              *SCALPROD/SCALE(INPUT)
              *CBUDDATA(INPUT,SUBREG,CROP,WTECH,"BASE",TECH)       )

* usage by livestock

          +SUM((ANIMAL,LIVETECH),
               LVSTBUDGET(SUBREG,ANIMAL,LIVETECH)
              *SCALLIVE/SCALE(INPUT)
              *LBUDDATA(INPUT,SUBREG,ANIMAL,LIVETECH)))

* usage by processing

        +SUM(PROCESSALT,PROCESS(PROCESSALT)*PROCBUD(INPUT,PROCESSALT))
            *SCALPROC/SCALE(INPUT)

* input purchase

        -BUYINPUT(INPUT)
          =L= 0. ;
```

```
*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*     crop mix constraints by crop

*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

 MIXREG(CROP, SUBREG) $SUM(CRPMIXALT, MIXDATA(CROP, SUBREG, CRPMIXALT))..

*   acreage of farm program crops

         SUM((WTECH, TECH)$FARMPROD("SLIPPAGE", CROP),
             CROPBUDGET(SUBREG, CROP, WTECH, "PARTICIP", TECH)
           *SCALPROD/scalmix
           *(CBUDDATA("cropland", SUBREG, CROP, WTECH, "PARTICIP", TECH)
            -CBUDDATA("addLAND", SUBREG, CROP, WTECH, "PARTICIP", TECH))
          + CROPBUDGET(SUBREG, CROP, WTECH, "NONPART", TECH)
           *SCALPROD/scalmix
           *CBUDDATA("cropland", SUBREG, CROP, WTECH, "NONPART", TECH)   )

*   acreage of non-farm program crops

         +SUM((WTECH, TECH)$(FARMPROD("SLIPPAGE", CROP) LE 0.0),
             CROPBUDGET(SUBREG, CROP, WTECH, "BASE", TECH)
           *SCALPROD/scalmix
           *CBUDDATA("cropland", SUBREG, CROP, WTECH, "BASE", TECH)      )

*   acreage allowed by crop mixes

         -SUM(CRPMIXALT
             , MIXDATA(CROP, SUBREG, CRPMIXALT)*MIXR(SUBREG, CRPMIXALT))

*   tolerance to prevent cycling

         + TWID(CROP, SUBREG)

         =E= 0.0;



*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*     total acres crop mix constraints

*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

 MIXREGTOT(SUBREG)
         $SUM(CRPMIXALT, SUM(CROP, MIXDATA(CROP, SUBREG, CRPMIXALT)))..

*   acreage of farm program crops

         SUM((CROP, WTECH, TECH)$FARMPROD("SLIPPAGE", CROP),
             CROPBUDGET(SUBREG, CROP, WTECH, "PARTICIP", TECH)
           *SCALPROD/SCALMIX
           *(CBUDDATA("cropland", SUBREG, CROP, WTECH, "PARTICIP", TECH)
            -CBUDDATA("addLAND", SUBREG, CROP, WTECH, "PARTICIP", TECH))
          +  CROPBUDGET(SUBREG, CROP, WTECH, "NONPART", TECH)
           *SCALPROD/SCALMIX
           *CBUDDATA("cropland", SUBREG, CROP, WTECH, "NONPART", TECH)   )

*   acreage of non-farm program crops

         +SUM((CROP, WTECH, TECH)$(FARMPROD("SLIPPAGE", CROP) LE 0.0),
             CROPBUDGET(SUBREG, CROP, WTECH, "BASE", TECH)
           *SCALPROD/SCALMIX
           *CBUDDATA("cropland", SUBREG, CROP, WTECH, "BASE", TECH)      )
```

```
*   total acreage crops in mix

            -  SUM(CRPMIXALT, SUM(CROP,
                    MIXDATA(CROP, SUBREG, CRPMIXALT))*MIXR(SUBREG, CRPMIXALT))
            =E= 0.;


*     &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*      national mix constraints

*     &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

 MIXNAT(PRIMARY, SUBREG)
                $SUM(NATMIXALT, NATMIXDATA(SUBREG, PRIMARY, NATMIXALT))..

*   production of farm program commodities

            SUM((CROP, WTECH, TECH)
              $(FARMPROD("SLIPPAGE", CROP)
                *cbuddata(primary, subreg, crop, wtech, "particip", TECH)),
                 CROPBUDGET(SUBREG, CROP, WTECH, "PARTICIP", TECH)
                *SCALPROD/SCALMIX
                *(CBUDDATA("cropland", SUBREG, CROP, WTECH, "PARTICIP", TECH)
                 -CBUDDATA("addLAND", SUBREG, CROP, WTECH, "PARTICIP", TECH))
              +   CROPBUDGET(SUBREG, CROP, WTECH, "NONPART", TECH)
                *SCALPROD/SCALMIX
                *CBUDDATA(primary, SUBREG, CROP, WTECH, "NONPART", TECH)   )

*   production of non-farm program commodities

            +SUM((CROP, WTECH, TECH)$(FARMPROD("SLIPPAGE", CROP) LE 0.0 and
                cbuddata(primary, subreg, crop, wtech, "nonpart", TECH) gt 0),
                 CROPBUDGET(SUBREG, CROP, WTECH, "BASE", TECH)
                *SCALPROD/SCALMIX
                *CBUDDATA(primary, SUBREG, CROP, WTECH, "BASE", TECH)       )

*   production of livestock commodities

            +SUM((ANIMAL, LIVETECH)$LBUDDATA(PRIMARY, SUBREG, ANIMAL, LIVETECH),
                LVSTBUDGET(SUBREG, ANIMAL, LIVETECH)
                *SCALLIVE/SCALMIX
                *LBUDDATA(PRIMARY, SUBREG, ANIMAL, LIVETECH))

*   national mix of production of this commodity

            -  SUM(NATMIXALT,
                    NATMIXDATA(SUBREG, PRIMARY, NATMIXALT)*NATMIX(PRIMARY, NATMIXALT))

*   tolerance to prevent cycling

            + tolr(PRIMARY, SUBREG)

     =E= 0.;
```

```
*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*    upper and lower bounds

*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

* set bounds for the tolerance level on mixes equations to prevent cycling
*      based on the size of the mixdata

 TWID.LO(CROP, SUBREG) $SUM(CRPMIXALT, MIXDATA(CROP, SUBREG, CRPMIXALT))
          = -0.001*mixdata(crop, subreg, "1989")/scalmix;

 TWID.UP(CROP, SUBREG) $SUM(CRPMIXALT, MIXDATA(CROP, SUBREG, CRPMIXALT))
                = 0.001*mixdata(crop, subreg, "1989")/scalmix;

 tolr.LO(PRIMARY, SUBREG)  $SUM(NATMIXALT, NATMIXDATA(SUBREG, PRIMARY, NATMIXALT))
                = -0.001*NATMIXDATA(SUBREG, PRIMARY, "1986")/SCALMIX;

 tolr.UP(PRIMARY, SUBREG)  $SUM(NATMIXALT, NATMIXDATA(SUBREG, PRIMARY, NATMIXALT))
                =  0.001*NATMIXDATA(SUBREG, PRIMARY, "1986")/SCALMIX ;


* set upper bounds for importing primary commodities when there is a maximum
*      or quota limitation

 IMPORTP.UP(PRIMARY)$(PIMPORT(PRIMARY, "MAXQ") GT 0)
                = PIMPORT(PRIMARY, "MAXQ")
                /SCALE(PRIMARY)          ;


* set lower bounds for importing primary commodities to 1.0 or higher if
*        a minimum quota presents

 IMPORTP.LO(PRIMARY)$(PIMPORT(PRIMARY, "MINQ") GT 0 OR
                       PIMPORT(PRIMARY, "ELASTICITY") GT 0)
                = MAX(1.,PIMPORT(PRIMARY, "MINQ")  )
                /SCALE(PRIMARY)         ;

* set upper bounds for exporting primary commodities when there is a maximum
*      or quota limitation

 EXPORTP.UP(PRIMARY)
    $(PEXPORT(PRIMARY, "MAXQ") GT 0)
                = PEXPORT(PRIMARY, "MAXQ")
                /SCALE(PRIMARY)          ;

* set lower bounds for exporting primary commodities to 1.0 or higher if
*        a minimum quota presents

 EXPORTP.LO(PRIMARY)$(PEXPORT(PRIMARY, "MINQ") GT 0 OR
                       PEXPORT(PRIMARY, "ELASTICITY") GT 0)
                = MAX(1.,PEXPORT(PRIMARY, "MINQ"))
                /SCALE(PRIMARY)         ;

* set upper bounds for primary commodity domestic demand when there
*       is a maximum or quota limitation

 DEMANDP.UP(PRIMARY)
       $(PDEMAND(PRIMARY, "MAXQ") GT 0)
                = PDEMAND(PRIMARY, "MAXQ")
                /SCALE(PRIMARY)         ;

* set lower bounds for primary commodity domdestic demand to 1.0 or higher if
*        a minimum quota presents
```

```
       DEMANDP.LO(PRIMARY)$(PDEMAND(PRIMARY,"MINQ") GT 0 OR
                         PDEMAND(PRIMARY,"ELASTICITY") GT 0)
                = MAX(1.,PDEMAND(PRIMARY,"MINQ"))
                /SCALE(PRIMARY)          ;


* set upper bounds for importing secondary commodities when there is a maximum
*       or quota limitation

  IMPORTS.UP(SECONDARY)$(SIMPORT(SECONDARY,"MAXQ") GT 0)
                = SIMPORT(SECONDARY,"MAXQ")
                  /SCALE(SECONDARY);


* set lower bounds for importing secondary commodities to 1.0 or higher if
*        a minimum quota presents

  IMPORTS.LO(SECONDARY)$(SIMPORT(SECONDARY,"MINQ") GT 0 OR
                         SIMPORT(SECONDARY,"ELASTICITY") GT 0)
                = MAX(1.,SIMPORT(SECONDARY,"MINQ"))
                  /SCALE(SECONDARY);



* set upper bounds for exporting secondary commodities when there is a maximum
*       or quota limitation

  EXPORTS.UP(SECONDARY)
   $(SEXPORT(SECONDARY,"MAXQ") GT 0)
                = SEXPORT(SECONDARY,"MAXQ")
                  /SCALE(SECONDARY);


* set lower bounds for exporting secondary commodities to 1.0 or higher if
*        a minimum quota presents

  EXPORTS.LO(SECONDARY)$(SEXPORT(SECONDARY,"MINQ") GT 0 OR
                         SEXPORT(SECONDARY,"ELASTICITY") GT 0)
                = MAX(1.,SEXPORT(SECONDARY,"MINQ"))
                  /SCALE(SECONDARY);


* set upper bounds for secondary commodity domdestic demand when there
*       is a maximum or quota limitation

  DEMANDS.UP(SECONDARY)
      $(SDEMAND(SECONDARY,"MAXQ") GT 0)
                = SDEMAND(SECONDARY,"MAXQ")
                  /SCALE(SECONDARY);


* set lower bounds for secondary commodity domestic demand to 1.0 or higher if
*        a minimum quota presents

  DEMANDS.LO(SECONDARY)$(SDEMAND(SECONDARY,"MINQ") GT 0 OR
                         SDEMAND(SECONDARY,"ELASTICITY") GT 0)
                = MAX(1.,SDEMAND(SECONDARY,"MINQ"))
                  /SCALE(SECONDARY);

* set lower bounds for regional land, pumped water and hired labor supply
*        cruves to 1.0

  LANDSUPPLY.LO(REGION,LANDTYPE)$LANDSUPPL(LANDTYPE,REGION,"ELASTICITY")  = 1.
             /SCALE(LANDTYPE);

  WATERVAR.LO(SUBREG)$WATERSUP(SUBREG,"PUMPELAS")                = 1.
             /SCALE("WATER")  ;
  HIRED.LO(REGION)  $LABORSUP(REGION,"HIREELAS")                = 1.
             /SCALE("LABOR")  ;


* set lower/upper bounds for crop, livestock, and processing budgets if a
```

```
*        a minimum/maximum constraint presents

  CROPBUDGET.LO(SUBREG, CROP, WTECH, CTECH, TECH)
                $CBUDDATA("MINIMUM", SUBREG, CROP, WTECH, CTECH, TECH) =
                  CBUDDATA("MINIMUM", SUBREG, CROP, WTECH, CTECH, TECH)/SCALPROD ;

  CROPBUDGET.UP(SUBREG, CROP, WTECH, CTECH, TECH)
                $CBUDDATA("MAXIMUM", SUBREG, CROP, WTECH, CTECH, TECH) =
                   CBUDDATA("MAXIMUM", SUBREG, CROP, WTECH, CTECH, TECH)/SCALPROD ;

  LVSTBUDGET.LO(SUBREG, ANIMAL, LIVETECH)
         $ LBUDDATA("MINIMUM", SUBREG, ANIMAL, LIVETECH)
         = LBUDDATA("MINIMUM", SUBREG, ANIMAL, LIVETECH) ;


  LVSTBUDGET.UP(SUBREG, ANIMAL, LIVETECH)
         $ LBUDDATA("MAXIMUM", SUBREG, ANIMAL, LIVETECH)
         = LBUDDATA("MAXIMUM", SUBREG, ANIMAL, LIVETECH)/SCALLIVE ;

  PROCESS.LO(PROCESSALT)$PROCBUD("MINIMUM", PROCESSALT)
                           =PROCBUD("MINIMUM", PROCESSALT)/SCALPROC;

  PROCESS.UP(PROCESSALT)
     $PROCBUD("MAXIMUM", PROCESSALT)
                           =PROCBUD("MAXIMUM", PROCESSALT)/SCALPROC;


*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

*    set initial values for nonlinear variables

*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&


  IMPORTP.L(PRIMARY)$(PIMPORT(PRIMARY, "QUANTITY") GT 0 OR
                        PIMPORT(PRIMARY, "ELASTICITY") GT 0)
                = PIMPORT(PRIMARY, "QUANTITY")
                /SCALE(PRIMARY)           ;
  EXPORTP.L(PRIMARY)$(PEXPORT(PRIMARY, "QUANTITY") GT 0 OR
                        PEXPORT(PRIMARY, "ELASTICITY") GT 0)
                = PEXPORT(PRIMARY, "QUANTITY")
                /SCALE(PRIMARY)           ;
  DEMANDP.L(PRIMARY)$(PDEMAND(PRIMARY, "QUANTITY") GT 0 OR
                        PDEMAND(PRIMARY, "ELASTICITY") GT 0)
                = PDEMAND(PRIMARY, "QUANTITY")
                /SCALE(PRIMARY)           ;
  IMPORTS.L(SECONDARY)$(SIMPORT(SECONDARY, "QUANTITY") GT 0 OR
                        SIMPORT(SECONDARY, "ELASTICITY") GT 0)
                = SIMPORT(SECONDARY, "QUANTITY")
                  /SCALE(SECONDARY);
  EXPORTS.L(SECONDARY)$(SEXPORT(SECONDARY, "QUANTITY") GT 0 OR
                        SEXPORT(SECONDARY, "ELASTICITY") GT 0)
                = SEXPORT(SECONDARY, "QUANTITY")
                  /SCALE(SECONDARY);
  DEMANDS.L(SECONDARY)$(SDEMAND(SECONDARY, "QUANTITY") GT 0 OR
                        SDEMAND(SECONDARY, "ELASTICITY") GT 0)
                = SDEMAND(SECONDARY, "QUANTITY")
                  /SCALE(SECONDARY);
  LANDSUPPLY.L(REGION, LANDTYPE)$LANDSUPPL(LANDTYPE, REGION, "ELASTICITY")
                = LANDSUPPL(LANDTYPE, REGION, "QUANTITY")
               /SCALE(LANDTYPE)    ;
  WATERVAR.L(SUBREG)$WATERSUP(SUBREG, "PUMPELAS")
                = WATERSUP(SUBREG, "PUMPQ")/SCALE("WATER") ;
  HIRED.L(REGION)  $LABORSUP(REGION, "HIREELAS")
                = LABORSUP(REGION, "HIREQ")/SCALE("LABOR") ;
```

```
*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&
*     define the name and content of the model
*    &&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

  MODEL SECTOR /ALL/;
```