

Structure of the Model

In this section of this bulletin, we list the commodities, inputs, processes, and agricultural programs included in the model and the data sources from which we obtained the estimates. In subsequent sections of this bulletin, we will present specific parameter values in tabular form and discuss post-optimal economic indicator calculations and supply-response characteristics of the model.

Commodities

Production quantities in the EDMP model are average acreages and production by commodity, summarized nationally and by region and type of farm, from the Agricultural Resource Management Survey (ARMS) for 1996-2000 and updated to 2001-05. ARMS is an annual survey of farm economic information that underpins most of the *Commodity Costs and Returns* (USDA, ERS, 2006) accounts and *Farm Income and Costs* (USDA, ERS, 2006) accounts published by ERS. Model national estimates are matched to quantities in USDA Agricultural Projections to 2016. Farm prices for the respective commodities are also calculated from USDA Agricultural Projections to 2016.

The EDMP model includes the following commodities:

- 16 Top crop commodities: corn, soy, wheat, rice, barley, oats, sorghum, cotton, sugar beets, sugar cane, potatoes, dry beans, sunflowers, peanuts, tobacco, and hay and crops not elsewhere classified;
- 8 Top livestock commodities: cow-calf, fed beef, hogs, dairy, sheep lamb and wool, broilers, eggs, turkeys, and livestock not elsewhere classified;
- 3 Nontradable forages: crop pasture, range, and corn silage;
- 4 Balanced grain rations, produced in region: corn, barley, oats, and sorghum rations, protein balanced with soy meal;
- 4 Joint products: straw, cottonseed, excess calves, and cull cows;
- Import hay to region;
- Import balanced grain ration to region;
- Farm-related income; and
- Off-farm income.

Specified Resources

The model requires specification of total availabilities of resources, nationally and by type and region. These are summarized from ARMS data for 1996-2000 and the *1997 Census of Agriculture* (USDA, ERS, 2006), the most recent data available when the model was last updated:

- Total cropland (ARMS, 1996-2000);
- Total crop pasture (*1997 Census of Agriculture*);
- Total permanent pasture/range (*1997 Census of Agriculture*);

- Facilities by livestock commodity (estimated from ARMS 1996-2000);
- Dollar-equivalent of operator and family labor (*Commodity Costs and Returns* (USDA, ERS, 2006)); and
- Land rent (*Farm Income and Costs* (USDA, ERS, 2006)).

Specified Purchasable Inputs

Commodity yields and specified purchasable inputs are calculated from Commodity Costs and Returns datasets. The ERS commodity costs and returns accounts are annual estimates of the average dollar value of input requirements for producing crops and livestock, assuming they are produced with Leontief (constant proportion) production technology. Supplies of purchasable inputs are assumed to be perfectly elastic. The dollar values of the following categories of inputs from the ERS commodity costs and returns accounts are incorporated in the EDMP model:

- Hired labor at regional wage rates.
- Miscellaneous variable inputs at rates and prices that may vary by region or farm grouping.
- Fuel, lube, and electricity-related inputs at rates and prices variable by region or farm grouping.
- Seed and specialized genetic inputs at rates and prices variable by region or farm grouping.
- Specialized technology inputs at rates and prices variable by region or farm grouping.
- Fertilizer and lime inputs at rates and prices variable by region or farm grouping.
- Chemical inputs at rates and prices variable by region or farm grouping.
- Fixed cash costs, by commodity. These costs do not vary with acreage or production and are incurred whether or not the commodity is produced.
- Capital replacement costs, by commodity. These costs are financial allowances for replacement of depreciable machinery and equipment when it wears out. They are not cash costs in the shortrun but must be covered in the longrun if the farm or sector is to maintain its productive capacity.
- Residual overhead costs, by commodity. These costs are endogenously determined to calibrate the model to sector accounts.

Processes

Processes or activities are specified for each model commodity from cost-of-production budgets in the ERS commodity costs and returns accounts. Each process assumes a Leontief (fixed proportion) technology. Thus, they are essentially recipes for producing one unit of the product, using all the required inputs in their specified proportions:

- Produce crops and livestock (national, regional, or farm grouping levels).

- Fallowing required in arid western regions.
- Use forages, feed grains, and oilseeds in livestock production (national, regional, or farm grouping levels).
- Sell commodities into domestic nonfarm market (price differentials by region or farm grouping).
- Purchase any deficit of mixed grain ration and/or hay in regional or type of farm grouping from domestic markets.
- Sell commodities into domestic nonfarm demands, nationally. (Demand functions are estimated by removing farm sector use for feed, seed, and residual from domestic use estimates from the USDA Agricultural Projections to 2016):
 - Corn, soy, wheat, rice, barley, oats, sorghum, cotton, dry beans, sunflower, peanuts, tobacco, fed beef, hogs, dairy, and poultry.
- Sell commodities into export demands, nationally. (Demand functions are estimated from USDA Agricultural Projections to 2016):
 - Corn, soy, wheat, rice, barley, oats, sorghum, cotton, dry beans, sunflower, peanuts, tobacco, fed beef, hogs, dairy, and poultry.
 - Poultry proportions are fixed in the same proportions as in base year.
- Competing import supplies, nationally. (Calculated from USDA Agricultural Projections to 2016):
 - Corn, soy, wheat, rice, barley, oats, sorghum, cotton, fed beef, and hogs.
- Storage demands/dis-storage supplies, nationally. (Calculated from USDA Agricultural Projections to 2016):
 - Corn, soy, wheat, rice, barley, oats, sorghum, dry beans, and sunflower.
- Farm-related income, by region or farm grouping. (Calculated from ERS farm income accounts.)
- Work off-farm, by region or farm grouping. (Calculated from ERS farm income accounts.)

Agricultural Policies and Programs

Provisions and economic parameters for agricultural programs in the 1996 and 2002 Farm Acts are taken from the briefing room, *Farm and Commodity Policy* (2007). Major agricultural programs included in the model are:

- Production flexibility contract payments, market loss assistance payments, and post-2002 direct payments (decoupled from current production levels and prices). These are lump sum payments that are post-optimally calculated and affect only net farm income.
- Post 2002 counter-cyclical payments (decoupled from current production levels by individual producers, but coupled to current market prices). These payments are post-optimally calculated for individual crops but paid as lump sum payments. They affect net farm income but do not

affect producer choices of crops to raise because they do not alter the market-determined marginal revenues of producers.

- Loan deficiency payments and marketing loan gains (fully coupled to current production levels and prices). These programs put a floor under producer incentive prices for commodities whenever commodity prices are below the loan rate. They **do** affect production choices because they alter the marginal revenues the producer faces.
- Conservation reserve and wetlands reserve payments (long-term rental of eligible cropland). These programs reduce aggregate supply of cropland and, as a result, restrict production of commodities, thus raising their market prices.
- Crop insurance subsidies. These indirect subsidies stimulate increased production of insured commodities by underwriting some of the cost of managing production risks. In addition, they may encourage expansion of commodity production to more risky production areas.