USDA

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Documenting USDA's Forecast Model

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Abstract

The Economic Research Service of the U.S. Department of Agriculture (USDA) develops and publishes estimates and forecasts of three primary measures of income and returns for the U.S. farm economy: (1) net value added, or total value of the farm sector's production of goods and services less purchases of inputs and services from other sectors of the economy; (2) net farm income, the portion of net value added earned by farm operators and others who share the risks of production, and (3) net cash income, the cash earned from sales of production and conversion of assets into cash. The USDA short-term income forecast model generates forecasts of receipts for individual commodities, Government payments for each program commodity or activity, and expenses for inputs such as fertilizer, fuel, feed, rent, and labor. The report describes the components and equations in the model, showing how components can be recombined to produce the three main measures of income.

Keywords: cash receipts, forecasts, Government payments, net cash income, net farm income, output, prices paid, production expenses, value-added, value of production

About the Authors

This report was coordinated by Christopher McGath, an economist with the Resource and Rural Economics Division (RRED) of ERS, and Sara D. Short and Robert McElroy, recently retired. Coauthors James Johnson, Roger Strickland, Theodore Covey, and Stephen Vogel are all economists with RRED, as were Robert Green and Larry Traub, both now retired. Mir Ali is an economist with the Marketing and Trade Division of ERS.

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Summary

Since 1910, estimates of farm income by the U.S. Department of Agriculture (USDA), now developed and published by USDA's Economic Research Service (ERS), have been accepted as the official U.S. Government estimates of farming's contribution to the national economy. The annual estimates provide a retrospective view of farmers' income and financial status. In addition to estimates, USDA has a long tradition of providing forecasts of farm income, balance sheets, and a variety of financial indicators. This report describes USDA's short-term farm income forecast model. Issued three times per year, the forecasts serve as a tracking device for changes in agricultural markets, production, and trade environments, indicating how the changes may affect farm profits and the economic health of the farm sector in the year ahead. The forecasts provide regular clients, such as the Bureau of Economic Analysis, and other researchers with current data for analyzing farm income and financial issues.

What Are the Issues?

Agriculture's contribution to national output can be severely affected by changes in production, domestic and international markets for farm commodities, and the availability and cost of inputs. As a result, a forecast released during winter months can look very different by mid-summer. Economic changes—and events such as flooding or drought—pose significant problems for income forecasting because data availability differs greatly for components of the agricultural account, all of which may be affected. For instance, data used to track production and price adjustments for crops and livestock are issued monthly. There are no data to track current adjustments to farmers' marketing patterns, so forecasts are based on patterns from earlier years. Farm expenditures provide particular challenges to the development of income forecasts. Unlike data on crop or livestock production and markets, there are no ongoing systematic data on farm input markets; expenditures are forecast drawing on a forecast of prices paid indexes and proxies for quantities of inputs.

The ERS income forecasts must also adapt to any new Government farm programs that occur within a calendar year. The forecast model provides a systematic way to sort out the combined effects of changes in commodity and input markets and Government programs on farm income, enabling a prospective view of financial outcomes. In combination with forecasts of the farm balance sheet, the income forecasts are used to generate indicators of performance that range from profitability to solvency. The indicators may also provide an early intimation of stressful financial circumstances in the farm economy.

What Does the Model Do?

The USDA short-term farm income forecast model generates forecasts of national-level farm income for 1 or 2 calendar years beyond the most current farm income estimates, depending on the time of the year the results are presented. Projections of individual farm income components are provided so that the source of changes in farm income can be ascertained.

In developing the forecasts, the model calculates values for individual components of farm income and combines them to create overall forecasts of subtotals and net income. It generates separate quarterly forecasts of 27 commodity items and annual forecasts of 32 production expenses, 4 noncommodity items, and 11 types of Government payments. It also forecasts 21 annual prices-paid indexes, used primarily in forecasting production expenses. To measure commodity output, it uses a Tornvist output index model.

Data used in the model come from a number of sources. The model generates forecasts of prices paid indexes that emulate the prices paid indexes published by the National Agricultural Statistics Service (NASS). Quarterly estimates of commodity production and prices are based largely on USDA's monthly World Agricultural Supply and Demand Estimates. Other data (for example, crude oil prices) are obtained from ERS macroeconomic analysts, NASS, the Agricultural Resource Management Survey (ARMS), and various external sources.

Introduction

For almost 100 years, the U.S. Department of Agriculture (USDA) has published an estimate of calendar-year net farm income, which has traditionally been defined as the gross income from the production of farm commodities and services less the expenses incurred in that production. This is one of the most frequently cited USDA statistics.

For many years, USDA published estimates and forecasts of net farm income solely in the farm income accounting format. However, it now employs value-added accounting as its principal conceptual framework for presenting net farm income and measuring the contributions and remuneration of various participants in the production process. Value-added accounting is also a framework for measuring the farm sector's output of products and services and, thus, its contribution to the national economy. In this framework, net farm income reflects the share of value added to the U.S. economy created through the use of production factors (land, capital, labor, and management) belonging to farm equity owners.

Value-added accounting offers a number of advantages as a presentation format. It broadens the scope of farm-income accounting beyond net farm income to net value added, which encompasses the contribution of all factors of production, regardless of form or ownership. While net farm income focuses solely on returns to equity holders, net value added also includes returns to production factors obtained from non-equity holders as payments to stakeholders. In farm-income accounting, these payments were treated as undifferentiated production expenses.

Value-added accounting gives a more detailed view of the dynamics of economic activity within the sector. The additional detail provides more insight into trends in farming and the status of the many participants in farm production, as determined by the distribution of their returns.

The methods and data used to generate USDA's farm income forecast were last documented in 1993 (Dubman et al). Dubman's report explained the processes of forecasting net farm income in the farm accounting framework then in use. Since then, ongoing research and analysis has led to changes not only in the methodology of forecasting farm income, but also in the presentation of results. This report explains the processes of net farm income forecasting, using both the value-added accounting framework and the farm income accounting framework that are currently in use. A main purpose of the report is to communicate the accounting concepts, practices, and approach to estimation that the ERS uses in preparing periodic, national-level forecasts of value-added and net income for the farm sector of the U.S. economy.

The ERS model described in this report presents 5 calendar years of farm income data. When the forecast for the current calendar year is first presented each February, the values for the current and immediately previous calendar years in the model are both forecasts and the values for the first 3 calendar years are estimates. At this point, the forecast for the fourth (i.e., previous) year is the base year for the fifth (i.e., current) year's forecast. The model is first updated in August. At this point, the model presents 4 years of estimates, releasing, for the first time, estimates of farm income for the fourth

(i.e., previous) year and revisions to estimates for the previous 3 years. The current year in the model is still a forecast, which has been updated with new data and revised, using the new estimates for the fourth year as its base. The forecast year in the model is again updated in November, using any data that have been revised since August. The final forecast is presented in February of the following year. At this point, commodity quantities and prices used in the first forecast year have the benefit of 12 months of data from USDA's World Agricultural Supply and Demand Estimates (WASDE), and the 12-month average annual prices paid indexes published by NASS are substituted for the forecasts in the model.

The information flows utilized to develop forecasts of value added and net income are presented in figure 1. The first sources of information are all exogenous to ERS. Data from interagency crop and livestock committees (top line in fig. 1) are filtered through ERS commodity analysts; the other three sources (second line) are incorporated directly into the model. These data are used to derive two intermediary components, prices and production, and the final six components that go into sector income measures. Forecasts of prices paid for production items are not published. Instead, they are used along with commodity production indicators, macroeconomic variables, and other data to develop forecasts of the published production expenses. The sector income measures, in turn, provide data for other ERS outputs, such as the balance sheet of agriculture and forecasts of income by type and economic size of farm business and geographic regions of the continental United States.

This report has two sections: (1) a description of the conceptual framework and updated documentation of the model used to forecast net farm income and its components, and (2) two appendixes listing equations that form the income forecast model.

Figure 1
Information flows used to develop a forecast of value-added and net farm income
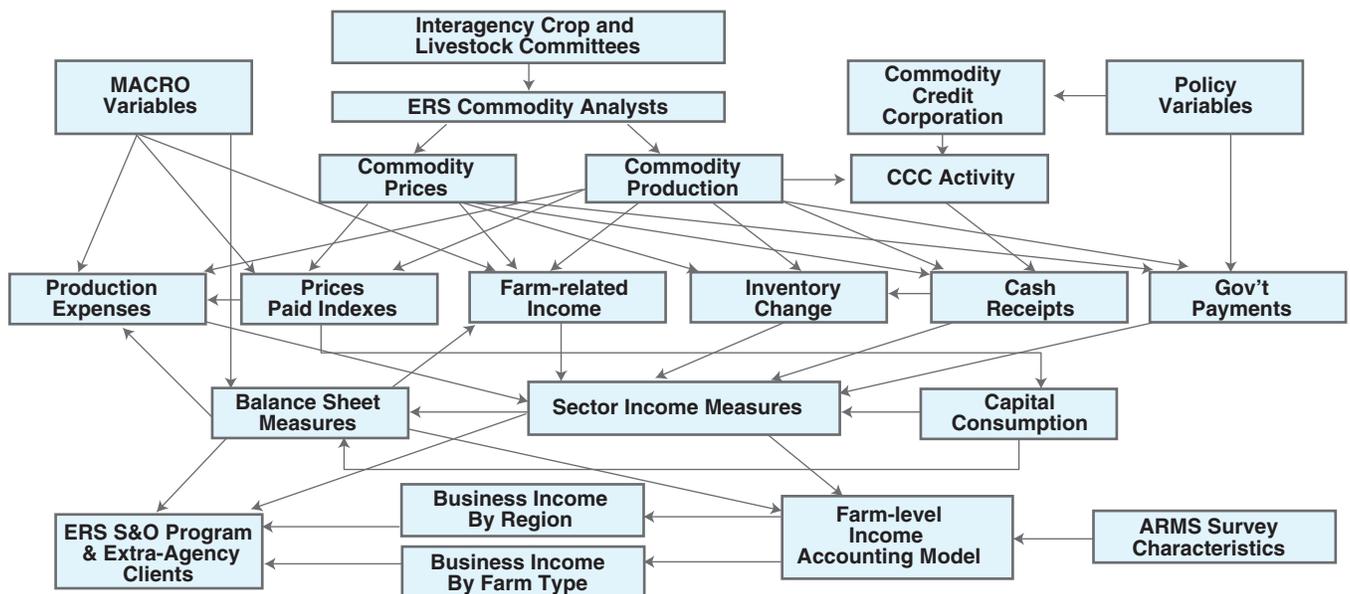
Source: USDA, Economic Research Service.

Conceptual Framework

The environment in which the USDA estimates and forecasts farm income is unique among major economic sectors. The unit of observation is the farm establishment. Farm establishments are defined by the nature of the economic activities that take place in a particular space (plot of land). If part of the economic activity is production of the equivalent of $1,000 of farm commodities, either crops or livestock or both, then the unit is classified as a farm establishment. Unless specifically identified as part of a separate business, all the economic activities of this establishment are classified as farm activities.

Value-added accounting emphasizes the income created through the production of goods and services by the factors of production employed in the production activities. Accounting for the factors of production is distinct from the out-of-pocket expenses incurred for exhaustible inputs to the production process (purchased inputs), taxes, and capital consumption allowances. Accounting for the contributions/earnings of factors of production distinguishes: (1) farm real estate rented from individuals who are not equity holders in the business, (2) capital not owned by farm operators and landlords (borrowed), (3) hired labor employed to work in the sector, and (4) the contribution of factors owned and provided by all equity-holders (i.e., land, capital, labor, and management of farm operators and others). The earnings of the equity holders are net farm income.

Principal farm operators and their families receive most of the net farm income from farming activities. However, net income accrues to all who own either the commodities produced or the farm assets that are used to provide farm-related services such as custom work or recreational activities. Examples of others who share in the distribution of net farm income are partners engaged in a farm business and nonoperator equity holders such as contractors, who retain ownership of commodities which they engage farm operators to produce (e.g., broiler chickens).

In applying value-added accounting, component income and expenditure accounts are estimated at the most disaggregated level feasible. These disaggregated data are then aggregated to generate meaningful subtotals and then, as a residual, net farm income. The presentation format of the value-added accounts largely duplicates the computational process and facilitates a quick and accurate analysis. Showing value of production by major commodity groups enables a reader to ascertain sources of change in income, such as feed crops or meat animals, or in expenses, such as the components of purchased inputs.

USDA's farm income accounts largely adhere to conventions consistent with requirements of the U.S. National Income and Product Accounts (NIPA) produced by the Bureau of Economic Analysis (BEA). However, USDA's estimates of farm income include all types and legal forms of business organizations in sector-wide forecasts and estimates of income originating in farming. BEA distinguishes income originating from farm sole proprietorships and partnerships from income originating from farms organized as corporations, including family-based corporations. Beyond accounting for the legal form of the business, other ways that USDA's income accounting differs from BEA's center largely on estimates of depreciation and capital

consumption, imputed rental values of farm housing, and patronage dividends received from farm cooperatives.[1] The definition of the farm sector as consisting of establishments that meet the criteria for a farm is a key point of agreement.

Adherence to principles of national income accounting that divide the economy into sectors produces accounting rules that require additional explanation. For one, contract labor is separated from hired labor, with the former being treated as a purchased input and the latter as a payment to stakeholders. With contract labor, workers are employed by a business for the purpose of providing services, and that business is by definition in the service sector. Hired labor is included among payments to stakeholders, which are made to other sectors for the services of the factors of agricultural production. An example of the distinction between farm-related and nonfarm activity is the treatment of income earned from machine hire and customwork. Income earned from these activities is credited to the farm sector only if the assets are owned by the farm business principally for use in that business. If a farmer owns equipment primarily to do work for others, then that is a business separate from the farming operation, which more properly belongs in the service sector. Another example of the distinction is the income from sales of forestry products. These products are credited to the farm sector only if the enterprise sells enough agricultural commodities to meet the official definition of a farm. If the enterprise is not classified as a farm, then revenues from forestry products are credited to the forestry sector of the economy.

[1] For differences between USDA and BEA estimates of farm income at the national level, see NIPA table 7.15, "Relation of Net Farm Income in the National Income and Product Accounts to Net Farm Income as Published by the U.S. Department of Agriculture." Survey 84 (August 2004):164.een.

Forecast Model Structure

The ERS farm-income forecast model is structured as an economic accounts model designed to yield a forecast for 1 calendar year (t+1) beyond a base reference year (t). The model produces a projection for each component of the three major income indicators reported by ERS: value added, net farm income, and net cash income.

As structured, the model includes two main types of equations: accounting equations and equations that embed the results of regression analysis as coefficients. An example of an accounting equation would be wheat cash receipts (shown in appendix 1), where cash receipts are equal to open market sales plus Commodity Credit Corporation (CCC) placement values. Further equations included in the wheat receipts module show open market sales to be equal to open market quantity sold times open market price, where open market quantity sold is equal to the annual quantity available for sale times the percent marketed by quarter. An important aspect of accounting equations, such as those for wheat or other major crops, is that data needed to implement the accounting relationships are drawn from USDA's ongoing program of work, including production, supply, demand, and price program outputs such as those reported through the WASDE releases. Receipt modules for other crop commodities are structured in a manner comparable to the module for wheat.

Equation modules for livestock or livestock product cash receipts include cattle, calves, hogs, sheep, milk, broilers, turkey, eggs, other chicken receipts, and miscellaneous livestock (appendix 1). Modules are similar across species or product. Each module derives a forecast cash receipt by updating the prior time period's estimate to reflect a production index and a farm price index. Data used to develop production and price ratios are again taken from the USDA commodity supply, demand, and price outlook program.

Estimating any of the three main income indicators requires a forecast not only of revenues, but also of expenditures for inputs used during the same calendar year. USDA does not have an outlook program that provides information about the types or quantities of inputs used in production, comparable to that for crop or livestock commodities. Neither does USDA project prices paid for individual production input items such as gasoline, fertilizer, or feed. To address the absence of input price and quantity information, the ERS farm-income forecast model provides an updated forecast for each input expenditure item included in the farm income accounts published by USDA. A typical input expense equation is structured to update the prior year estimate for changes in a price index and a quantity index.

Data for quantity indexes included in the expense equations typically are derived from USDA's commodity-based outlook program. This would include items like acreage, production, and inventory of cattle. Since input price projections are not developed through the outlook program, the income forecast model includes a module of equations developed to generate a forecast of the prices-paid indexes that are published by NASS. (Equations for each index are listed beginning on page 73.) Coefficients in the prices-paid equations are derived from regression analysis. A discussion of procedures used to forecast prices paid for farm inputs is included in "Forecasting Prices that Farmers Pay for Production Inputs" (Jinkins et al.).

Value-Added Accounting Framework

The value-added accounting framework features a summation of the sector's crop production, livestock production, and revenues from services and forestry within a calendar year. This summation of output from various economic activities yields an estimate of the total value of agricultural sector production. From this estimate of total output, purchases of production inputs, either intrasector or from other sectors of the economy, are subtracted—and Government transactions are added—to generate an estimate of the amount of gross value-added originating in agriculture. From gross value added, an estimate of the amount of capital assets consumed at replacement value is subtracted to produce an estimate of net value added, which reflects production agriculture's addition to the national economic product.

It is important to emphasize that net value added and net farm income measure the net value of production of commodities and services generated by the U.S. farm sector. The farm sector ends at the farm gate or first point of sale and does not include value added by agribusiness functions such as packaging, marketing, etc. The measurement of income also includes production not sold in the market place. For these reasons, farm income is primarily a measure of the value of farm production that is more comparable to Gross Domestic Product (GDP) than to taxable income. Table 1 gives a numerical example of the value-added format, using the most recent estimates. To compare this format with the farm accounting format, see table 12, p. 36.

Table 1
Value-added to the U.S. economy by the agricultural sector via the production of goods and services, 2004-08F

Row	Source	Item[1]	2004	2005	2006	2007	2008F[2]
			Million dollars				
1	Sum: 2-10	Value of crop production	124,380.3	115,222.7	119,176.4	150,841.9	181,100.7
2	Value	Food grains	8,906.7	8,601.2	9,085.8	12,786.3	19,247.4
3	Value	Feed crops	27,421.2	24,701.4	29,447.5	42,455.9	60,181.0
4	Value	Cotton	4,784.4	6,320.4	5,565.9	6,172.1	5,124.4
5	Value	Oil crops	17,861.5	18,450.3	18,500.7	22,649.6	28,702.0
6	Value	Fruits and tree nuts	15,455.5	17,439.6	17,195.2	17,802.2	18,487.4
7	Value	Vegetables	16,190.8	17,029.7	18,457.5	19,964.9	22,039.6
8	Value	All other crops	22,999.7	23,429.9	24,348.8	25,123.2	26,120.7
9	Value	Home consumption	102.0	82.6	104.7	93.4	143.7
10	Value	Value of inventory adjustment[3]	10,658.6	-832.2	-3,529.6	3,794.3	1,054.6
11	Sum: 12-17	Value of livestock production	124,367.6	126,481.0	119,027.2	138,132.2	143,360.4
12	Value	Meat animals	62,351.6	64,847.5	63,550.1	64,992.0	67,009.7
13	Value	Dairy products	27,386.6	26,697.6	23,404.6	35,425.0	34,841.5
14	Value	Poultry and eggs	29,514.1	28,726.8	26,459.2	32,606.9	36,682.0
15	Value	Miscellaneous livestock	4,332.0	4,646.4	4,812.8	4,865.5	5,014.2
16	Value	Home consumption	199.4	260.0	308.8	293.7	350.0
17	Value	Value of inventory adjustment[3]	583.8	1,302.7	491.7	-51.0	-537.1
18	Sum: 19-22	Revenues from services and forestry	33,920.3	35,005.4	38,387.2	40,271.2	42,449.5
19	Value	Machine hire and customwork	3,367.6	2,782.4	2,652.6	2,535.3	2,926.4
20	Value	Forest products sold	2,446.6	2,488.9	2,494.7	2,357.4	2,359.4
21	Value	Other farm income	11,313.1	10,905.3	12,322.9	11,754.9	12,319.9
22	Value	Gross imputed rental value of farm dwellings	16,793.0	18,828.8	20,917.0	23,623.7	24,843.8
23	1 + 11 + 18	Value of agricultural sector production	282,668.1	276,709.2	276,590.8	329,245.3	366,910.6
24	25 + 29 + 34	Purchased inputs	137,401.0	143,962.6	153,613.0	171,383.0	205,295.0
25	Sum: 26-28	Farm origin	57,484.0	56,910.3	60,967.2	68,830.6	80,315.7
26	Value	Feed purchased	29,731.6	28,029.0	31,425.1	38,124.9	46,868.3
27	Value	Livestock and poultry purchased	18,127.4	18,454.9	18,515.6	18,779.0	18,210.4
28	Value	Seed purchased	9,625.0	10,426.4	11,026.5	11,926.8	15,237.0
29	Sum: 30-33	Manufactured inputs	31,648.0	35,406.3	37,465.6	43,671.0	58,945.8
30	Value	Fertilizers and lime	11,425.0	12,829.1	13,330.9	16,731.5	27,450.7
31	Value	Pesticides	8,616.7	8,817.6	9,017.0	10,017.0	10,873.7
32	Value	Petroleum fuel and oils	8,215.1	10,305.6	11,327.9	12,989.8	16,394.7
33	Value	Electricity	3,391.2	3,454.0	3,789.8	3,932.7	4,226.7
34	Sum: 35-39	Other intermediate expenses	48,269.0	51,646.0	55,180.2	58,881.3	66,033.5
35	Value	Repair and maintenance	11,943.3	11,890.4	12,460.5	13,551.8	15,587.3
36	Value	Machine hire and customwork	3,633.1	3,474.9	3,504.0	3,708.5	4,156.1
37	Value	Marketing, storage, and transportation	7,193.08	,820.5	9,022.8	9,784.0	10,910.2
38	Value	Contract labor	3,103.2	3,064.6	3,033.7	3,824.5	4,101.5
39	Value	Miscellaneous expenses	22,396.4	24,395.5	27,159.2	28,012.5	31,278.5
40	41 - (42 + 43)	Net government transactions	5,415.6	15,822.7	6,220.4	1,487.4	1,665.6
41	Value	Direct Government payments[4]	12,969.9	24,395.9	15,788.9	11,903.1	12,492.1
42	Value	Motor vehicle registration and licensing fees	547.8	565.8	560.2	606.7	630.7
43	Value	Property taxes	7,006.5	8,007.4	9,008.2	9,809.0	10,195.8
44	23 - 24 + 40	Gross value added	150,682.7	148,569.3	129,198.2	159,349.8	163,281.2
45	Value	Capital consumption	23,085.2	24,938.1	26,086.6	26,894.2	28,408.5
46	44 - 45	Net value added	127,597.6	123,631.2	103,111.7	132,455.6	134,872.6

—continued

Table 1
Value-added to the U.S. economy by the agricultural sector via the production of goods and services, 2004-08F—Continued

Row	Source	Item[1]	2004	2005	2006	2007	2008F[2]
			Million dollars				
47	Sum: 48-50	Payments to stakeholders	41,796.6	44,296.0	44,602.3	45,677.9	48,000.9
48	Value	Employee compensation (total hired labor)	20,211.0	20,491.3	21,196.0	21,818.3	22,687.7
49	Value	Net rent received by nonoperator landlords	10,001.9	10,633.4	9,438.8	8,807.4	10,596.2
50	Value	Real estate and nonreal estate interest	11,583.7	13,171.3	13,967.5	15,052.2	14,717.0
51	46 - 47	Net farm income	85,801.0	79,335.2	58,509.4	86,777.7	86,871.8

F = forecast. Numbers may not add due to rounding.

[1]Final sector output is the gross value of the commodities and services produced within a year. Net value-added is the sector's contribution to the National economy and is the sum of the income from production earned by all factors of production. Net farm income is the operators' share of income from the sector's production activities. The concepts presented are consistent with those employed by the Organisation for Economic Cooperation and Development. (OECD).

[2]As of November 25, 2008.

[3]A positive value of inventory change represents current-year production not sold by December 31. A negative value is an off set to production from prior years included in current-year sales.

[4]Government payments reflect payments made directly to all recipients in the farm sector, including landlords. The nonoperator landlords' share is offset by its inclusion in rental expenses paid to these landlords and thus is not reflected in net farm income or net cash income.

The current forecast and historical information are available at http://www.ers.usda.gov/data/farmincome/finfidmu.htm.

Source: USDA, Economic Research Service.

Value of Agricultural Sector Production

Final agricultural sector output or value of production is recorded in three accounts—crop output, animal output, and noncommodity output, which includes forestry products and services rendered. Crop, animal, and noncommodity output are the commodities and services produced by the bundle of inputs used in the farm production process.

Crop Output

Total crop output consists of sales of commodities harvested in the year (cash receipts), home consumption of crops on the farms where they were produced, and either (1) the value of additional amounts from the year's harvest that are still in inventory at the end of the year (a positive change) or (2) the value of crops that were taken from the inventory of the previous year's production and sold during the current year (a negative change). The value of the change in inventory is only calculated for crops that can be stored. The value of crops placed under Commodity Credit Corporation (CCC) nonrecourse loans is treated as a sale because the farmer has immediate access to the CCC payment and it is his or her decision as to whether to reclaim the commodity and repay the loan or allow the CCC to retain the commodity and keep the proceeds of the loan.

Livestock Output

Livestock output includes animals and animal products. As with crops, the value of total output includes sales, home consumption, and either the value of unsold new production, which adds to end-of-year inventory, or the value of animals raised in a previous year and sold during the current year, which decreases end-of-year inventory. Changes in livestock inventories reflect only live animals. Animal products (eggs, milk, etc.) are perishable and do not remain for long in farm storage, but are quickly removed into a processing and/or marketing stage.

Home Consumption

Estimates of the home consumption of farm-produced commodities are taken from the Agricultural Resource Management Survey (ARMS). Each year farmers are asked to report the market value of products produced and consumed on their farms for home consumption. Since there are no observed data on the home consumption of farm products between annual ARMS surveys, a forecast is derived by moving the most recent estimate by the ratio of the forecast crop and livestock cash receipts to the most recent estimate of crop and livestock cash receipts. When the ratio of the forecast receipts to the estimated receipt increases, the forecast of home consumption rises. When the ratio of the forecast receipts to the estimated receipts decreases, so does the forecast of home consumption.

Cash Receipt Forecasts

Cash receipts are forecast for 21 crops and 10 livestock commodities on a quarterly basis (table 2). CCC loans are also forecast on a quarterly basis for 8 crops. The annual value of change in farm inventories is forecast for 16 crops and 4 livestock commodities. In crop cash receipts, monthly marketing

Table 2
Commodities whose receipts are forecast

Food grains	**Feed grains**	**Oil crops**	**Other crops**	
Wheat[1,2]	Corn[1,2]	Soybeans[1,2]	Cotton lint[1,2]	Other vegetables
Rice[1,2]	Sorghum[1,2]	Peanuts	Cottonseed[2]	Fruits & nuts
Rye[2]	Barley[1,2]	Sunflower[2]	Tobacco[2]	Greenhouse &
	Oats[1,2]	Other[2,3]	Potatoes[2]	nursery
	Hay[2]		Dry beans[2]	Miscellaneous

Meat animals	**Poultry & eggs**	**Dairy**	**Other livestock**
Cattle & calves[2]	Broilers	Milk	Miscellaneous
Hogs & pigs[2]	Turkeys		
Sheep & lambs[2]	Eggs		
	Other chicken[2]		

[1]CCC loans are forecast for these 8 crops.
[2]The value of changes in inventories is forecast for these 16 crops and 4 livestock commodities.
[3]Includes flaxseed, safflower, and canola.

percentages are summed to create a quarterly marketing pattern. The quarterly marketing pattern is used to allocate forecasts of crop-year production into calendar-year quarterly sales. In livestock cash receipts, quarterly production and farm price forecasts are utilized.

Noncommodity Output

Revenues from services and forestry products include all sources other than commodity production and consist of the value of services rendered for a fee, products other than agricultural commodities produced from farm sector resources, and other sources of revenue such as insurance indemnity payments. The largest component of this category is the gross imputed annual rental value of farm dwellings. Sales of forestry products are the principal source of income from nonagricultural products produced on farms. The largest source of income from services is the fees paid to operators by contractors to raise animals and animal products. Performance of custom-work for other farmers, using equipment belonging to the farm, is the other major source of income from services. Renting out of farmland for recreation purposes, such as hunting, and cooperative patronage dividends (refunds to members based on the amount of business they did with the cooperative) are other sources of revenues from services.

Value of Crop Production

The forecast of the value of final crop output requires forecasts of the underlying data, such as annual production, percent of a crop's use on the farm where it is produced, distribution of marketing over the crop year, and quarterly market prices. The income forecast model, including components of the model related to the value of crop production, relies on historical data, ARMS data, forecasts provided by commodity analysts, and crop and livestock production, supply, use and crop-year price data published by USDA in the WASDE reports that are approved by the World Agricultural Outlook Board. Figure 2 shows the groups and elements involved in the forecasts of crop cash receipts.

Crop cash receipts include open-market sales plus the placement value of CCC loans for commodities that are part of the Federal commodity loan program. Crop cash receipt forecasts are developed on a quarterly basis to reflect changes in price and volume sold throughout the calendar year. Storable crops such as wheat, corn, and soybeans can be sold all at once or stored for later sale at a producer's discretion. To forecast these periodic crop sales, historical monthly marketing patterns from recent crop years for each crop, calculated and published by NASS, are incorporated to apportion quarterly sales of a crop throughout the marketing year. Since the ERS income accounts are on a calendar year basis, this apportioning places some sales of a year's production into that year's sales and some into the next calendar year's sales. The prices needed to calculate quarterly cash receipt forecasts are provided by ERS commodity analysts, who convert crop-year and monthly marketing percentages into calendar year quarterly price estimates to derive the annual forecast of cash receipts. Table 3 provides an example of how a calendar year's sale of corn is calculated and spread across 2 calendar years.

Nonrecourse CCC loans are treated as sales to the Government with an option to repurchase, primarily because the loan proceeds are immediately available to the producer, as with a cash sale. A further reason is that, in a nonrecourse loan program, producers are not obligated to repay the loan. At the end of

Figure 2
Crop cash receipts forecast data
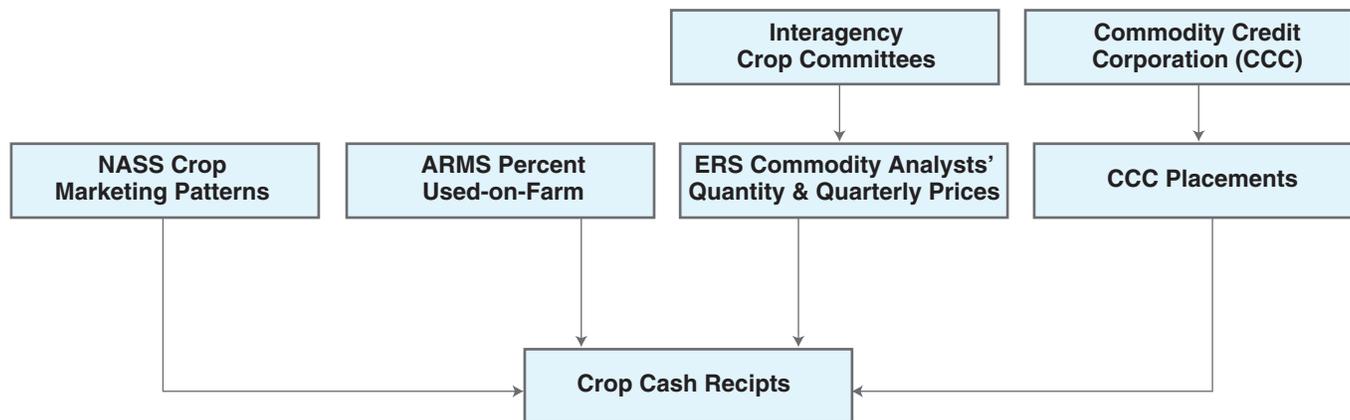
Source: USDA, Economic Research Service.

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Economic Research Service/USDA

Table 3
Example of corn value of production forecast, 2008[1]

Row	Source[2]		2007	2008F
		Farm prices ($/bu)		
1	Input	Calendar year Q1	3.22	4.28
2	Input	Calendar year Q2	3.48	5.29
3	Input	Calendar year Q3	3.29	5.16
4	Input	Calendar year Q4	3.46	4.10
5	Input	Crop year $_{[y, y+1]}$[3]	4.25	4.40
6	Input	Acres planted (thousands)	93,600	85.889
7	Input	Production (million bu.)	13,074	12,020
		Program parameters:		
8	Input	Loan rate	1.95	1.95
		Crop year CCC placements		
9	3-year avg. or cap (9%)	Percent of production	2.13	2.25
10	7 * 9	Placement quantity (million bu)	277.9	303.3
		Placement patterns		
11	3-year average	Calendar year Q1		0.216
12	3-year average	Calendar year Q2		0.024
13	3-year average	Calendar year Q3		0.055
14	3-year average	Calendar year Q4		0.592
		Calendar year placements (million bu)[3]		
15	10 $_{[y-1]}$ * 11	Calendar year Q1		60.0
16	10 $_{[y-1]}$ * 12	Calendar year Q2		6.6.
17	10 $_{[y]}$ * 13	Calendar year Q3		16.5
18	10 $_{[y]}$ * 14	Calendar year Q4		179.4
19	Sum: 15-18	Annual		262.6
		Placement values[3]		
20	15 * 8 $_{[y-1]}$	Calendar year Q1		117.0
21	16 * 8 $_{[y-1]}$	Calendar year Q2		12.8
22	17 * 8 $_{[y]}$	Calendar year Q3		32.2
23	18 * 8 $_{[y]}$	Calendar year Q4		349.9
24	Sum: 20-23	Annual		512.0
		Crop year annual calculations		
25	Input	Percent used-on-farm	11.7	11.7
26	7 * 25	Quantity used-on-farm	1,525.4	1,402.4
27	"100" - 25	Percent sold	0.883	0.883
28	7 * 27	Quantity available for sale	11,548.6	10,617.5
29	19	Quantity CCC placements	277.9	303.3
30	28 - 29	Quantity sold in open market	11,270.7	10,314.2

—continued

Table 3
Example of corn value of production forecast, 2008[1] —continued

Row	Source[2]		2007	2008F
		Marketing patterns of crop year production		
31	3-year average	Calendar year $Q1_{[y-1]}$		0.313
32	3-year average	Calendar year $Q2_{[y-1]}$		0.169
33	3-year average	Calendar year $Q3_{[y-1]}$		0.104
34	3-year average	Calendar year $Q3_{[y]}$		0.074
35	3-year average	Calendar year $Q4_{[y]}$		0.330
		Open-market quantities		
36	$30_{[y-1]}$ * 31	Calendar year Q1		3,527.7
37	$30_{[y-1]}$ * 32	Calendar year Q2		1,904.7
38	$30_{[y-1]}$ * 33 + $30_{[y]}$ * 34	Calendar year Q3		1,935.4
39	$30_{[y]}$ * 35	Calendar year Q4		3,400.3
40	Sum: 36 - 39	Annual		10,768.1
		Open-market sales ($million)		
41	1 * 36	Calendar year Q1		15,098.6
42	2 * 37	Calendar year Q2		10,076.1
43	3 * 38	Calendar year Q3		9,986.7
44	4 * 39	Calendar year Q4		13,941.1
45	Sum: 41 - 44	Annual		49,102.5
		Corn total receipts ($million)		
46	20 + 41	Calendar year Q1		15,215.7
47	21 + 42	Calendar year Q2		10,076.1
48	22 + 43	Calendar year Q3		10,018.9
49	23 + 44`	Calendar year Q4		14,291.0
50	Sum: 46 - 49	Annual		49,614.4
		Value of the change in inventory		
51	26	Quantity used on farm (crop year)	1,525.4	1,402.4
52	Input	Share used before January 1	0.365	0.365
53	"1" - 52	Share used after January 1	0.635	0.635
54	$51_{[y-1]}$ * 53 + $51_{[y]}$ * 52	Quantity used on farm (calendar year)[3]		1,480.5
55	19 + 40	Quantity sold in calendar year	9,723.7	11,030.7
56	7 - (54 + 55)	Inventory quantity change	2,011.9	-491.3
57	50 / 40	Calendar year average price	3.37	4.56
58	56 * 57	Value of inventory change	6,771.5	-2,240.4
59	50 + 58	Total value of production		47,374.0

F = Forecast.
[1]As of November 25, 2008.
[2]Data in lines 1-8 are provided by commodity analysts in ERS' Market and Trade Economics Division.
[3]$_{[y]}$ = current crop year; [y+1] = following crop year; [y-1] = previous crop year.
Source: USDA, Economic Research Service.

the loan term, they may forfeit the commodity to the CCC and retain the loan proceeds, which is likely if market prices are below the contract loan rate. Placement and redemption of a CCC loan thus entails two decisions, each based on prevailing market conditions at different points in time.

Internal Revenue Service (IRS) tax regulations support the ERS treatment of nonrecourse loans. The IRS does not consider money protected against loss through nonrecourse loans as actual loans because the money is not at risk. CCC placements are forecast for eight commodities, as shown in table 2. The apportionment of annual CCC placements among quarters is based on patterns in historical data.

When a loan is repaid at less than the loan principal, the producer realizes a marketing loan gain, which is accounted for as a Government payment. (See "Marketing Loan Gains," p. 28.) Producers eligible for a marketing loan also have the option of forgoing the loan and receiving a loan deficiency payment, which is also considered a Government payment. (See "Loan Deficiency Payments," p. 27.) If a portion of the crop harvested in a year is not sold or used on the farm where it was produced by December 31, it is accounted for within the calendar year through placement into inventories, which produces a positive value of the change in inventories. If the quantity sold and the amount used on-farm during the calendar year exceed the quantity harvested, a drawdown of inventories from an earlier year occurs and the negative value of the change in inventories offsets the value of sales from crops produced in an earlier year. Figure 3 shows the data elements included in the value of change in inventories. Specifically, a crop's inventory change is determined by starting with production and subtracting out the sum of the quantity sold in open market, the amount placed under CCC, and the quantity used on-farm prior to January 1 of the year following harvest. The quantity of crops put into or taken out of inventory is valued at the calendar year weighted-average price for the quantity sold. The weighted-average annual price is used to eliminate, as far as possible, the effects of the change in price from January 1 to December 31. In value-added income accounting, only income from production activities is included. Capital gains and losses from changes in the potential market value of assets, such as inventories carried into the next year, are excluded.

Figure 3
Example of value of the change in crop inventories
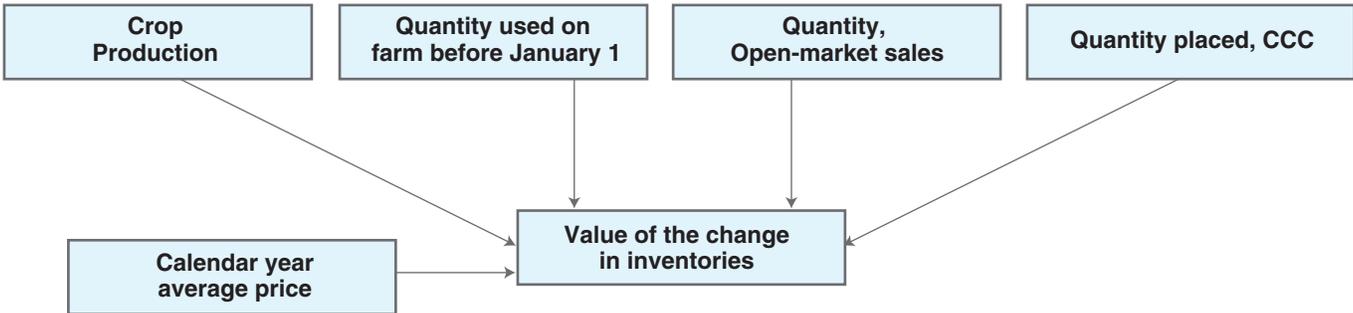
Source: USDA, Economic Research Service.

The forecasts of cash receipts for vegetables, fruits and nuts, greenhouse and nursery products, and miscellaneous crops are handled differently than for the 17 major field crops, due to a lack of detailed production and marketing data. Vegetables, fruits and nuts, greenhouse and nursery products and miscellaneous crops include many different commodities, but are forecast as aggregates. With respect to fruits and nuts, ERS forecasts annual production for only 15 products, dominated by citrus. These 15, however, account for a large majority of total fruits and nuts cash receipts. The forecast total production of these 15 commodities in the year for which the forecast of income is being developed is compared with the previous year's total to compute an output index. This output index measures the expected change in production for the fruits and nuts sector. A similar index of fruit prices is also computed. The historical price index is based on estimates provided by NASS. NASS reports monthly prices for a market basket of fruits and nuts and publishes a weighted-average fruits and nuts price index. This index changes with prices and does not reflect quantities available for sale. ERS analysts develop a quarterly forecast of this index. The resulting change in output and price indexes are used to move the previous year's estimate or forecast of fruits and nuts cash receipts. A similar procedure is used for vegetables and for greenhouse and nursery products.

Value of Livestock Production

Equations used to produce forecasts of meat animals, poultry and eggs, and other livestock cash receipts differ from those used to forecast receipts for most crop commodities, in that a price-times-quantity calculation is not used. Livestock receipts are projected by adjusting the previous year's estimates or forecasts for changes in price and quantity. The equations used in this procedure are termed "recursive." Indexing is used with livestock because of a difference between price and quantity forecasts as developed by USDA livestock analysts and the cash receipts estimates required by the income accounting model. The quantity and price forecasts developed by livestock analysts are on a carcass-weight or slaughter basis, while official cash receipts estimates in the income accounts measure animals sold excluding intrastate sales of feeder and breeding livestock on a live-weight basis. ERS analysts use carcass weights and carcass-weight prices because carcass-weight forecasts are available from monthly surveys of federally inspected slaughter. Quarterly estimates are summed to derive the cash receipt forecast for the calendar year. Table 4 provides an example of the calculation of quarterly cattle cash receipts.

Dairy receipts are handled differently than those for cattle, hogs, or sheep. Quarterly price and production forecasts provided by ERS analysts are consistent with cash receipts definitions and methodology, so quarterly dairy cash receipts are projected by multiplying forecasts of quarterly production and prices of milk (fig. 4).

Because animals can live more than 1 year, a value of the change in inventory is calculated. This is computed by subtracting the preceding year's end-of-year inventory from the current year's end-of-year inventory and multiplying the result by the midyear price of one head of the type of animal. Data for estimates are provided by NASS, and forecasts are based on data provided by commodity analysts.

Table 4
**Example of cattle cash receipts forecast, 2008[1]**

Row	Source[2]		2007	2008F
		Beef production, commercial (Million lb)		
1	Input	1st quarter	6,237	6,371
2	Input	2nd quarter	6,649	6,897
3	Input	3rd quarter	6,802	6,911
4	Input	4th quarter	6,733	6,520
5	Sum: 1-4	Annual total	26,421	26,689
		Farm price ($/cwt)		
6	Input	1st quarter	87.13	88.00
7	Input	2nd quarter	91.77	89.90
8	Input	3rd quarter	91.17	95.20
9	Input	4th quarter	90.00	90.15
10	Average: 6-9	Annual average	90.02	90.81
		Production ratios[3]		
11	$1_{[t]} / 1_{[t-1]}$	1st quarter		1.021
12	$2_{[t]} / 2_{[t-1]}$	2nd quarter		1.037
13	$3_{[t]} / 3_{[t-1]}$	3rd quarter		1.016
14	$4_{[t]} / 4_{[t-1]}$	4th quarter		0.968
15	$5_{[t]} / 5_{[t-1]}$	Annual		1.011
		Price ratios		
16	$6_{[t]} / 6_{[t-1]}$	1st quarter		1.010
17	$7_{[t]} / 7_{[t-1]}$	2nd quarter		0.980
18	$8_{[t]} / 8_{[t-1]}$	3rd quarter		1.044
19	$9_{[t]} / 9_{[t-1]}$	4th quarter		1.002
20	$10_{[t]} / 10_{[t-1]}$	Annual		1.009
		Total cattle receipts ($ million)		
21	$21_{[t-1]} * 11_{[t]} * 16_{[t]}$	1st quarter	10,883.4	11,228.2
22	$22_{[t-1]} * 12_{[t]} * 17_{[t]}$	2nd quarter	11,289.3	11,471.8
23	$23_{[t-1]} * 13_{[t]} * 18_{[t]}$	3rd quarter	11,739.9	12,455.3
24	$24_{[t-1]} * 14_{[t]} * 19_{[t]}$	4th quarter	11,865.5	11,509.2
25	Sum: 21-24	Calendar year	45,778.0	46,664.5

F = Forecast.
[1]As of November 25, 2008.
[2]Data in lines 1-10 are provided by commodity analysts in the ERS Market and Trade Economics Division.
[3][t] = current calendar year; [t-1] = previous calendar year.
Source: Economic Research Service, USDA.

Figure 4
Animal and animal products cash receipts
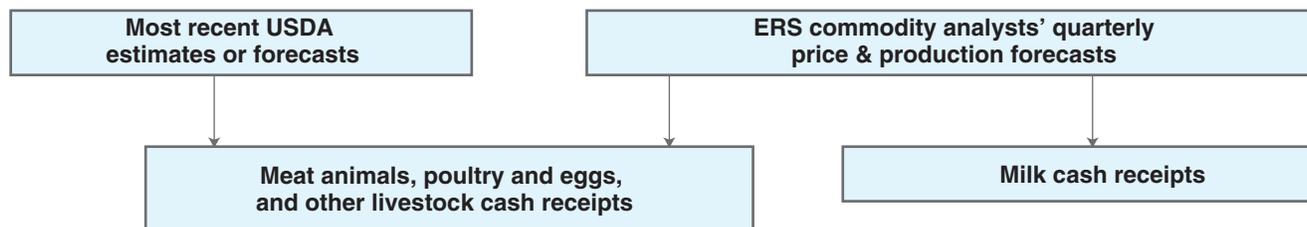
Source: USDA, Economic Research Service.

Services and Forestry

Two criteria are used in accounting for the value of services and forestry: (1) the income is not received from the sale of farm commodities and is counted separately; however, (2) the income is generated from a farm's resource base. In the value-added format, this income is recorded in four component accounts: machine hire and customwork, sales of forest products, other farm income, and gross imputed rental value of farm dwellings.

Machine Hire and Customwork

Revenues reported in ARMS for the machine hire and customwork account are payments received from customwork performed for other farmers using equipment owned by the servicing farm. The key conditions are that the farm assets were acquired primarily for use in the farm's own business and are used to perform work on other farms or elsewhere only when not required in the primary business. When equipment is purchased strictly to do custom-work for others, income from this business would be in the service sector, not the farm sector. Separate sets of tax records are one indication that custom-work performed with this equipment constitutes a separate business.

To forecast the income from machine hire and customwork, the model uses the previous year's income as a base. This base is then adjusted by a combination of crop output and the NASS Index of Prices Paid for Commodities and Services, Interest, Taxes, and Farm Wage Rates (PPITW).

Sales of Forest Products

Under the North American Industry Classification System followed by U.S. statistical agencies, timber, pulpwood, and firewood are treated as forestry products rather than agricultural products. For this reason, revenues from forest products sold from establishments that are classified as farms are treated as noncommodity income accruing to the farm operation. Forecasts of forest products are calculated by moving the previous year's estimate by the expected change in greenhouse and nursery cash receipts.

Sales of Christmas trees are not treated as noncommodity income, but are included in greenhouse and nursery cash receipts. Christmas trees are treated as a commodity because their producing establishments have many of the operating attributes of farms producing other crops.

Other Farm Income

The Other Farm Income account enumerates revenues accruing to farm operations from sources not included elsewhere. Estimates of other farm income are taken from ARMS. Included in this account are:

1. Payments received for use of the farm land and bodies of water for recreational purposes such as hunting, fishing, and camping.

2. All indemnity payments from insurance programs and companies.

3. Income from leasing grazing rights. This income is not treated the same way as that from renting land, however, because in leasing out grazing rights the owner retains the right to determine what is grown

on the land. Grazing rights on land planted to small grains for a few designated months is an example. Because the owner of the grazing livestock and the leaser of grazing rights are both members of the farm sector, this income is offset by an identical amount in miscellaneous expenses.

4. Patronage dividends received from farm cooperatives (refunds paid to a member on the basis of the quantity or value of business that the member did with the cooperative).

5. Contract production fees, in which a farm operator receives payments for producing livestock commodities owned by others. Examples are broilers, chickens, and hogs, which are generally produced by vertically integrated companies that own the animal from birth to slaughter. These companies contract with farmers to raise chicks or pigs and pay farmers a fee for their labor and management, based on criteria that ensure that both parties share in the risks of production. For example, depending on the contract, it is likely that the farmer would not receive payments for animals that die and would receive reduced fees for animals that gain less weight than expected. Contract fees are an intrasector transaction because the contractors are equivalent to farm operators in their acceptance of the risk associated with producing commodities. For this reason, contract fee income is offset by including an identical amount in miscellaneous expenses.

Forecasts of other farm income are calculated by multiplying the previous year's estimate by the change in forecast broiler production, cattle on feed, and the GDP deflator.

Gross Imputed Rental Value of Farm Dwellings

The land owned by and supporting the farm establishment often includes farm dwellings. The usual national income-accounting treatment of owned dwellings is to credit the stock of dwellings with a current flow of the net imputed rental value of the dwellings. Because farm dwellings are part of farm real estate, the imputed rental value represents the return on the dwelling portion of total assets. This noncash income accrues to the farm business. The rental value of farm dwellings must be imputed because no explicit rental transaction occurs.

Inclusion of the imputed rental value of farm dwellings in farm income corresponds to practices followed by the U.S Department of Commerce for owner-occupied nonfarm dwellings in the National Income and Product Accounts (NIPA). The ERS forecast of gross imputed rent uses a space-rent concept equivalent to the approach used by BEA for the nonfarm sector of the economy. Farmers are requested in ARMS to report the value of occupied dwellings located on the farm and owned by the operation. To calculate estimates of gross imputed rent, dwelling values are separated into classes, and the total dwelling value in each class is then multiplied by the average rent for dwellings in the particular class, as obtained from BEA.

Forecasts for gross imputed rental income from the operator's dwelling, other dwellings, and nonhired labor dwellings are made by assuming that the

income will change at the same rate as that forecast for all farm real estate assets. This forecast is calculated by multiplying the previous year's estimate of gross rental income from operator and other, nonhired labor dwellings by the ratio of the total value of farm real estate assets expected in the forecast year to the current year's value of farm real estate assets. Forecasts of future farm real estate asset values are obtained from ERS forecasts of asset values for the balance sheet of agriculture.

The value of imputed rent included in net value added and net farm income is net of expenses associated with the dwellings in the sector. These include repair and maintenance expenses reported in ARMS, an estimate of capital consumption and insurance, and a pro rata share of interest expense and property tax based on the farm dwelling share of the total value of land and buildings.

Farm operators choose to operate farms and live in rural areas for a variety of reasons. For some farms, usually those with very low sales, dwellings may comprise a disproportionately large share of the total value of land and buildings. In these cases, the primary component of the total value of goods and services generated by the farm may be the net imputed value of dwelling services supplied to the operator household.

Purchased Inputs

Expenses for purchased inputs are incurred to acquire intermediate inputs for use in production. All such expenses are cash purchases, and the inputs are normally used within a year. Purchased inputs have three components: farm-origin expenses, manufactured inputs, and other intermediate expenses.

Farm-origin expenses include purchases of feed, livestock and poultry, and seed. However, while these items are originally produced on farms, feed and seed, particularly genetically-modified seed, are normally bought from nonfarm establishments. Manufactured inputs include fertilizer, fuel and oils, electricity, and pesticides. Other intermediate input expenses are repair and maintenance; machine hire and customwork; marketing, storage, and transportation; contract labor; and miscellaneous inputs.

With the exception of almost all manufactured inputs, some portion of these expenses could be transactions with other participants in the farm sector, as opposed to a third party (broker, merchant, middleman, etc.) outside the sector. In the case of intrasector sales, there will be an offset in one of the output sections to avoid double counting for the sector, most often as farm-related income.

While crop and livestock, poultry, and dairy output estimates are computed with monthly price and quantity data available from ongoing USDA programs, expense estimates are mainly derived from expenses reported by individual farm operators on the annual ARMS. To arrive at sector estimates of production expenses, these individual reports are weighted to represent the number of farms in an area that produce similar output and are of similar size. In these estimates, it is not possible to separate price and quantity effects. As a result, only annual estimates and forecasts of expense items are available.

In most cases, expense forecasts are generated by moving a base-year estimate by the change in indexes of price and quantity factors derived from secondary data sources. As with animal cash receipts, the equations used in this procedure are termed recursive. The price and quantity factors used to create forecasts are representative of the prices and quantities that determine the expense. Quantity indicators implicitly assume that no factor substitution or technological change occur between the forecast and the previous year. Forecasts of prices paid indexes are most often used as the price indicators. (See section, "Prices Paid Indexes," p. 38.) The calculation of electricity expenses is the sole exception. The price indicator used in this formula is electricity rates obtained from the Department of Energy's Energy Information Administration (http://eia.doe.gov/emeu/steo/pub/2tab. html). The principal quantity factors that are used are: (1) forecasts of planted acreage and production of individual commodities from USDA's ongoing commodity outlook program, and (2) indexes of commodity output calculated in the model, using production and price forecasts from the commodity outlook program. (Figure 5 shows the information flows for production expense forecasts. The indexes of commodity output are described in the section "Farm Output Indexes," p. 41.) As an example of this process, the feed expense forecast is produced by multiplying the prior year's estimate by the year-to-year change in the feed prices paid index and the year-to-year change in the index of total livestock, poultry, and dairy output. Similarly,

Figure 5
Information flows in the forecasting of production expenses
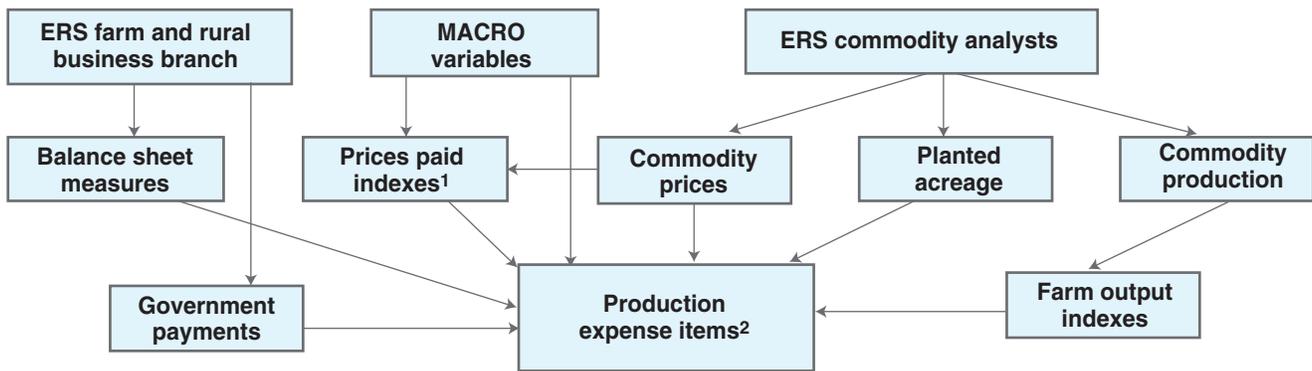
[1]The prices paid indexes forecast are listed in Table 14 in the section "Price Paid Indexes."
[2]The production expenses forecast are shown in Table 13 in the section Farm Income Accounting Framework."
Source: USDA, Economic Research Service.

the forecasts of seed, fertilizer, pesticide, and fuel expenses are generated by multiplying the prior year's estimate by the year-to-year change in each expense's prices paid index and the year-to-year change in planted acreage of 14 major crops. Table 5 provides examples of the formulas used in forecasting purchased-input expenses.

These forecasts may be adjusted, based on economists' expectations of likely future events in input markets. In addition, the equations used to forecast these outlays are periodically reviewed and revised to reflect changes in the availability of data. For instance, the formulas for computing feed and seed purchases have been greatly simplified since the 1993 documentation publication (Dubman et al.).

Table 5
Examples of production expense forecast equations

[Feed expenses] = [Feed prices paid index, current year] / [Feed prices paid index, previous year] * [Total livestock, poultry, and dairy output index, current year] / [Total livestock, poultry and dairy output index, previous year] * [Feed expenses, previous year]

[Fertilizer expenses] = [Fertilizer prices paid index, current year] / [Fertilizer prices paid index, previous year] * [Acres planted, 14 crops, current year] / [Acres planted, 14 crops, previous year] * [Fertilizer expenses, previous year]

Source: USDA, Short-term farm income forecast model.

Net Government Transactions

The Government sector is of special importance to the farm sector, and the accounting for transactions between the two is combined in a separate account. Its income item is Direct Government Payments. Its production expense items are Property Taxes and Motor Vehicle Registration and License Fees.

Property Taxes and Motor Vehicle Registration and License Fees

Farm sector payments to governments go mainly to local governments to pay those charges necessary for operating a farm business. The largest property taxes are real estate taxes, most of which are levied on farmland. Because the payments would not have occurred in the absence of the farm business, they are contributions made by the farm sector directly into the local economy. The most recent estimates or forecasts of property taxes and motor vehicle registration and license fees are used as a base from which forecasts are developed. The forecast is derived by multiplying the change in the NASS Taxes prices paid index between the year being forecast and the base year by the base year estimate or forecast.

Direct Government Payments

Direct Government payments (see appendix 2 for forecast equations by commodity) include only those funds paid directly to farmers and ranchers by the Federal Government to achieve objectives that support the income of farmers and ranchers who produce program commodities, engage in resource conservation, and receive compensation for natural disasters. State and local agricultural programs that provide direct payments to farmers and ranchers are not included in this item. During the final stages of bringing this document to publication, Congress passed the Food, Conservation and Energy Act of 2008. For the effects this action has on forecasting Government payments, see box, "Government Payment Forecasts and the 2008 Farm Act."

The income forecast uses data available from the ERS commodity and outlook programs and budget specialists from the Farm Service Agency (FSA), the Natural Resources Conservation Service (NRCS), and the CCC to forecast direct Government payments to farmers and ranchers (fig. 6). ERS commodity analysts provide estimates and forecasts of program crop production and quarterly prices received by farmers. FSA, NRCS, and CCC provide data concerning planned outlays and report monthly cash outlays for direct payments by program. The monthly data are used to construct calendar year estimates of program outlays that are not available elsewhere. Congress, other Government agencies, and relevant legislation primarily deal with program outlays on either a crop year or fiscal year basis. Historical payment patterns and legislatively mandated payment schedules are used to allocate payments to a calendar year for use in constructing the income accounts. Monthly data provide a continuous flow of information that enables the forecast to be refined throughout the year. Agricultural and budget legislation are tracked for any legislated changes in available programs or funding levels for programs.

The model generates a preliminary ERS forecast of direct Government payments. The model-based forecasts of Government payments are used as a base from which to interact with agricultural budget and program analysts to ensure that USDA agencies agree regarding Government programs and payments and that all available information has been incorporated into the

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Government Payment Forecasts and the 2008 Farm Act

Although the Farm Security and Rural Investment Act of 2002 (2002 Farm Act) expired in October 2007, a series of continuing resolutions extended its provisions until the passage of The Food, Conservation, and Energy Act of 2008 (2008 Farm Act) in June 2008. The 2008 Farm Act continues many of the commodity programs introduced in previous farm legislation, adjusting payment levels and eligibility, while introducing a new average crop revenue election program. The 2008 Farm Act introduces a disaster assistance program and adjusts some details of the longstanding crop insurance program. The parameters of equations forecasting Government payments are being updated for the 2008-09 crop year. Forecast equations for the new programs will be developed once they have been implemented by the Farm Services Agency (FSA). When new forecast equations have been developed, this documentation will be updated.

Figure 6
Forecasting direct Government payments
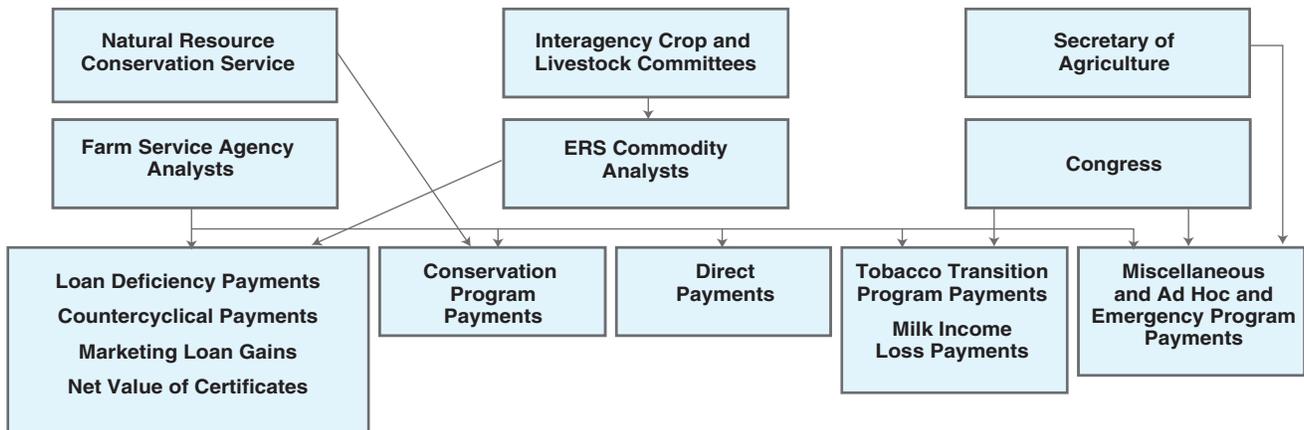
Source: USDA, Economic Research Service.

forecast. Results from the model are used in conversations with program agency analysts. As the forecast year progresses, ERS receives preliminary reports of program outlays that have occurred in the forecast year. This additional information is also incorporated into the forecast.

Commodities for which farmers can receive Government payments from commodity-based programs are listed in table 6. Readers are referred to the FSA Web site (www.fsa.usda.gov) and the NRCS web site (www.nrcs.usda.gov) if they require additional information concerning specific Government programs that are included in this model. Program fact sheets are available that provide an overall description of programs, including statutory authority, purpose, and operational details. Also available on the FSA Web site are daily reports of county-level alternative repayment rates or posted county prices (PCP) and loan deficiency payment rates, as well as weekly reports of marketing loan, marketing gain, and loan deficiency payment activity down to the county level.

The Farm Security and Rural Investment Act of 2002 (2002 Farm Act) extended direct payment program benefits to more crops. For crop years 2002

Table 6
Commodities in Government payment programs

Direct payments and countercyclical payments (CCP)	Loan deficiency payments, marketing loan gains, and net value of certificates
Commodities	
Wheat Sunflowers	Commodities on the left, plus
Rice Canola	Crambe (oilseed crop)
Corn Rapeseed	Dry peas
Sorghum Mustard seed	Lentils
Barley Peanuts	Small chickpeas
Oats Safflower	Wool
Upland cotton	Unshorn pelts
Soybeans	Mohair
Flaxseed	Honey

Source: Farm Service Agency.

through October 2008, direct payments have been available to producers on farms where program payment yields and base acres are established. Yields were updated only for countercyclical payments, not for direct payments. The model estimates direct payments following the process specified in the legislation. Direct payment rates have been fixed by crop through October 2008. Payment acres on participating farms are 85 percent of base acres. Direct payments are the product of payment acres, program payment yields, and the direct payment rate for each program crop (see table 7 for equations). Direct payments are made after October 1 of the year the crop is harvested. Producers may request up to 50 percent of the direct payment in advance, but no earlier than December 1 of the year before the crop is harvested. Thus far, about 7 percent of the advanced payment is received in December; the remainder is received in the year of harvest.

The specification of the model for direct payments for the 2004 through 2007 crop years is that 50 percent of the payment is received as advanced payment and about 7 percent of the advanced payment is received in December of the year before the crop is harvested. The balance of the direct payment is received in the year of harvest.

Countercyclical Payments

For 2002 through October 2008, counter-cyclical payments were available to producers on farms for which payment yields and base acres have been established for the program crops. Counter-cyclical payments are the product of payment acres, countercyclical program yields, and the counter-cyclical payment rate for each program crop. The countercyclical payment rate is the difference between a target price and an effective price for commodities. Target prices are fixed by crop through October 2008 (see table 8 for equations).

The effective price is the direct payment rate for a commodity plus the higher of that commodity's national average loan rate or the U.S. season-average price received by producers. If the effective price is greater than or equal to the target price, the countercyclical payment rate is zero.

The countercyclical payment cycle consists of two partial payments, if authorized, and a final payment. The first partial payment, based on up to 35 percent of the projected payment rate, is made after October 1 of the year the crop is harvested. A second partial payment, up to 70 percent of the projected payment rate less any first partial payments received, is made after February 1

Table 7
Direct payments equations

$[\text{Commodity payment acres}]_y{}^1 = 0.85 * [\text{Commodity base acres}]_y$

$[\text{Commodity direct payments}]_y = [\text{Commodity payment acres}]_y$
$* [\text{Commodity program payment yield}]_y * [\text{Commodity direct payment rate}]_y$

$[\text{Commodity direct payments}]_t{}^2 = (1.0 - (0.0675 * 0.50)) * [\text{Commodity direct payments}]_y + (0.0675 * 0.50) * [\text{Commodity direct payments}]_{y+1}$

[1] y = Crop or marketing year.
[2] t = Calendar year.
Source: USDA short-term income forecast model.

Table 8
Countercyclical payment equations

[Commodity effective price]$_y$ = MAX ([Commodity loan rate]$_y$, [Commodity average market price]$_y$) + [Commodity direct payment rate]$_y$

[Commodity counter-cyclical payment rate]$_y$ = MAX ((([Commodity target price]$_y$ – [Commodity effective price]$_y$), 0)

[Commodity counter-cyclical payments]$_y$ = [Commodity payment acres]$_y$ * [Commodity updated program payment yield]$_y$ * [Commodity counter-cyclical payment rate]$_y$

[Commodity counter-cyclical payments]$_t$ = (1.0 – (0.60 * 0.35)) * [Commodity counter-cyclical payments]$_{y-1}$ + (0.60 * 0.35) * [Commodity counter-cyclical payments]$_y$

Note: y = crop or marketing year; t = calendar year.
Source: USDA short-term income forecast model.

of the next calendar year. A final payment is made as soon as possible after the end of the marketing year when the payment rate is determined. Thus far, about 60 percent of the first partial payment is received in the calendar year the crop is harvested, with the rest of the first partial payment received in the following calendar year. The specification in the model for counter-cyclical payments is that 35 percent of the projected payment is received as first partial payment and 60 percent of the first partial payment is received the calendar year the crop is harvested. The balance of the countercyclical payment is received the following calendar year. Since the objective of the model is to estimate calendar year payments, there is no need to estimate the second partial payment.

Loan Deficiency Payments

The 2002 Farm Bill extended marketing assistance loan and loan deficiency payment benefits to more crops (table 6). By agreeing to forgo marketing assistance loans, eligible producers may receive loan deficiency payments. The loan deficiency payment is the payment rate times the quantity of the crop produced times a 3-year moving average of the percent of the crop receiving loan deficiency payments (see table 9 for equations). The payment rate is the amount by which the marketing loan rate exceeds the rate at which a marketing loan for the commodity may be repaid. For most crops, the loan repayment rate is the lower of: (1) the applicable county loan rate plus accrued interest and other charges, or (2) the CCC-determined local market price for the respective commodity. For rice and upland cotton, the loan repayment rate is the lower of: (1) the applicable county loan rate plus accrued interest and other charges, or (2) the adjusted world price. In the model, except for rice and cotton, the payment rate is forecast as the loan rate minus the minimum expected quarterly market price. The payment rate for rice and cotton is determined as the difference between the loan rate and the loan repayment rate. There is no payment if the payment rate is less than or equal to zero.

If a loan deficiency payment was realized with the previous crop, then the loan deficiency payment is forecast by adjusting the previous year's payment for year-to-year changes in payment rates and crop production. Forecasts of loan deficiency payments for the crops new to the program rely heavily on information from the USDA interagency estimates committees that generate

supply, utilization, and program activity estimates for program crops. FSA provides reports on loan deficiency payment activity by crop and crop year that are updated weekly and are available on FSA's Web site. This information is used to update forecasts of payments throughout the year. The weightings, which generate calendar year forecasts of loan deficiency payments from the crop year estimates, are a reflection of the historical timing of loan deficiency payments within the year.

Marketing Loan Gains

Marketing loan repayment provisions were in effect for the 1996 crop year through October 2008 for each of the marketing assistance loan commodities except ELS cotton. Market loan repayment provisions are active when the applicable alternative repayment rate, as determined by the CCC, is less than the per-unit principal plus accrued interest and other charges. The per-unit principal is the loan rate at which the CCC makes loans to a producer. The applicable loan rate is the relevant loan rate for the location where the commodity is stored, adjusted for per-unit premiums and discounts. Any portion of the principal and interest that does not have to be repaid because of the market loan repayment provisions is waived. The portion of the principal, if any, that is waived when a loan is repaid is referred to as a marketing loan gain for the producer.

The model determines the marketing loan gain repayment rate as the difference between the loan rate and the minimum expected average market price (see table 10 for equations). If the rate is less than or equal to zero, there is no marketing loan gain. If the rate is greater than zero, the amount of the crop placed under marketing assistance loans is forecast by multiplying a crop's production times a 3-year moving average of the share of crop under loan. Then the amount of the crop receiving marketing loan gains is forecast by multiplying the estimated amount of the crop under loan by a 3-year moving average of the share of crop under loan receiving marketing loan

Table 9
Loan deficiency payments equations

[Commodity loan deficiency payment rate]$_y$ = [Commodity loan rate]$_y$ - MIN([Commodity average market price]$_{Q1,y}$, [Commodity average market price]$_{Q2,y}$, [Commodity average market price]$_{Q3,y}$, [Commodity average market price]$_{Q4,y}$)

If [Commodity loan deficiency payment rate]$_y$ ≤ 0, then [Commodity loan deficiency payments]$_y$ = 0

If [Commodity loan deficiency payment rate]$_y$ > 0, and [Commodity loan deficiency payment rate]$_{y-1}$ = 0 then [Commodity loan deficiency payments]$_y$ = [Commodity production]$_y$ * [Commodity loan deficiency payment rate]$_y$ * [Commodity loan deficiency participation rate]$_{y-2}$

If [Commodity loan deficiency payment rate]$_y$ > 0, and [Commodity loan deficiency payment rate]$_{y-1}$ > 0 then [Commodity loan deficiency payments]$_y$ = [Commodity loan deficiency payment]$_{y-1}$ * (([Commodity production]$_y$ – [Commodity production]$_{y-1}$) / [Commodity production]$_{y-1}$) * (([Commodity loan deficiency payment rate]$_y$ – [Commodity loan deficiency payment rate]$_{y-1}$) / [Commodity loan deficiency payment rate]$_{y-1}$) * (([Commodity loan deficiency participation rate]$_y$ – [Commodity loan deficiency participation rate]$_{y-1}$) / [Commodity loan deficiency participation rate]$_{y-1}$)

Calendar year calculation[1]

[Commodity loan deficiency payments]$_t$ = [Commodity percent of total]$_{y-1}$ * [Commodity loan deficiency payments]$_{y-1}$ + [Commodity percent of total]$_y$ * [Commodity loan deficiency payments]$_y$

[1]Commodity percent of total varies by crop, e.g., [Corn percent of total]$_{y-1}$ = 0.2 and [Corn percent of total]$_y$ = 0.8.
Note: y = crop or marketing year; t = calendar year; Q = quarter.
Source: USDA short-term income forecast model.

Table 10
Marketing loan gains equations

Crop year calculations
Commodities other than rice and upland cotton:
[Commodity marketing loan gain rate]$_y$ = [Commodity loan rate]$_y$ - MIN([Commodity average market price]$_{Q1,y}$, [Commodity average market price]$_{Q2,y}$, [Commodity average market price]$_{Q3,y}$, [Commodity average market price]$_{Q4,y}$)

Rice, Upland cotton:
[Commodity marketing loan gain rate]$_y$ = [Commodity loan rate]$_y$ - MIN([Commodity average market price]$_y$, [Adjusted world price of Commodity]$_y$)

All commodities:
[Commodity under loan]$_y$ = [Commodity production]$_y$ * (([Commodity under loan]$_{y-1}$ / [Commodity production]$_{y-1}$) + ([Commodity under loan]$_{y-2}$ / [Commodity production]$_{y-2}$) + ([Commodity under loan]$_{y-3}$ / [Commodity production]$_{y-3}$)) / 3
[Commodity receiving marketing loan gains]$_y$ = [Commodity under loan]$_y$ * (([Commodity receiving marketing loan gains]$_{y-1}$ / [Commodity under loan]$_{y-1}$) + ([Commodity receiving marketing loan gains]$_{y-2}$ / [Commodity under loan]$_{y-2}$) + ([Commodity receiving marketing loan gains]$_{y-3}$ / [Commodity under loan]$_{y-3}$)) / 3

If [Commodity marketing loan gain rate]$_y$ ≤ 0, then [Commodity marketing loan gains]$_y$ = 0

If [Commodity marketing loan gain rate]$_y$ > 0, and [Commodity marketing loan gain rate]$_{y-1}$ = 0 then [Commodity marketing loan gains]$_y$ = [Commodity receiving marketing loan gains]$_y$ * [Commodity marketing loan gain rate]$_y$

If [Commodity marketing loan gain rate]$_y$ > 0, and [Commodity marketing loan gain rate]$_{y-1}$ > 0 then [Commodity marketing loan gains]$_y$ = [Commodity marketing loan gains]$_{y-1}$ * (([Commodity receiving marketing loan gains]$_y$ - [Commodity receiving marketing loan gains]$_{y-1}$) / [Commodity receiving marketing loan gains]$_{y-1}$) * (([Commodity marketing loan gain rate]$_y$ - [Commodity marketing loan gain rate]$_{y-1}$) / [Commodity marketing loan gain rate]$_{y-1}$)

Calendar-year equation[1]
[Commodity marketing loan gains]$_t$ = [Commodity percent of total]$_{y-1}$ * [Commodity marketing loan gains]$_{y-1}$ + [Commodity percent of total]$_y$ * [Commodity marketing loan gains]$_y$

[1]Commodity percent of total varies by crop, e.g., [Corn percent of total]$_{y-1}$ = 0.2 and [Corn percent of total]$_y$ = 0.8

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Note: Q = calendar year quarter; y = crop or marketing year; t = calendar year.
Source: USDA short-term income forecast model.

gains. The marketing loan gain is the amount of the crop receiving marketing loan gains times the market loan gain payment rate. If a marketing loan gain was realized with the previous crop, the marketing loan gain is forecast by adjusting the previous year's payment for changes in payment rates and crop production.

As with loan deficiency payments, estimates of marketing loan gains for the crops new to the program rely heavily on input from USDA's interagency estimates committees. FSA provides reports on marketing assistance loan activity by crop and crop year, which are updated weekly on FSA's Web site . This information is
used to update forecasts throughout the year. The weightings, which generate calendar year estimates of marketing loan gains from the crop year estimates, reflect the historical timing of marketing loans and marketing loan gains realized within the year.

Net Value of Commodity Certificates

In October 1999, Congress amended the 1996 Farm Act to include provisions for issuing commodity certificates. Commodity certificates are available for sale at FSA offices to producers with outstanding nonrecourse marketing assistance loans. These negotiable certificates are immediately exchanged for a commodity owned or controlled by the CCC.

The exchange rate is the effective adjusted world price for rice or upland cotton, or the posted county prices (PCPs), as applicable, for other commodities on the date the commodity certificate is purchased. Commodity certificate exchanges will be available when the exchange rate exceeds the applicable loan rate.

The model determines the commodity certificate exchange rate as the difference between the loan rate and the minimum expected average market price (adjusted world price for rice or cotton) (see table 11 for equations). If the rate is less than or equal to zero, there is no certificate purchase or exchange. If the rate is greater than zero, the amount of the crop placed under marketing assistance loans is forecast by multiplying a crop's production times a 3-year average crop under loan. Then the amount of the crop receiving marketing loan gains is forecast by multiplying the estimated amount of crop under loan by a 3-year moving average of the share of crop under loan that is realized certificate exchange gains. The certificate exchange gain is then the amount of the crop receiving marketing loan gains times the certificate exchange rate. If a marketing loan gain was realized with the previous crop, then the marketing loan gain is forecast by adjusting the previous year's payment for changes in payment rates and crop production.

Table 11
Net value of commodity certificates

Crop year calculations

Commodities other than rice and upland cotton:
$[\text{Commodity certificate exchange rate}]_y$ = $[\text{Commodity loan rate}]_y$ - MIN($[\text{Commodity average market price}]_{Q1,y}$, $[\text{Commodity average market price}]_{Q2,y}$, $[\text{Commodity average market price}]_{Q3,y}$, $[\text{Commodity average market price}]_{Q4,y}$)

Rice and Upland cotton:
$[\text{Commodity certificate exchange rate}]_y$ = $[\text{Commodity loan rate}]_y$ – MIN($[\text{Commodity loan repayment rate}]_y$, ($[\text{Adjusted world price of Commodity}]_y$)

All commodities:
$[\text{Commodity under loan}]_y$ = $[\text{Commodity production}]_y$ * (($[\text{Commodity under loan}]_{y-1}$ / $[\text{Commodity production}]_{y-1}$) + ($[\text{Commodity under loan}]_{y-2}$ / $[\text{Commodity production}]_{y-2}$) + ($[\text{Commodity under loan}]_{y-3}$ / $[\text{Commodity production}]_{y-3}$)) / 3

$[\text{Commodity receiving certificate exchange gains}]_y$ = $[\text{Commodity under loan}]_y$ * (($[\text{Commodity receiving certificate exchange gains}]_{y-1}$ / $[\text{Commodity under loan}]_{y-1}$) + ($[\text{Commodity receiving certificate exchange gains}]_{y-2}$ / $[\text{Commodity under loan}]_{y-2}$) + ($[\text{Commodity receiving certificate exchange gains}]_{y-3}$ / $[\text{Commodity under loan}]_{y-3}$)) / 3

If $[\text{Commodity certificate exchange rate}]_y \leq 0$, then $[\text{Commodity net value certificates}]_y = 0$

If $[\text{Commodity certificate exchange rate}]_y > 0$ and $[\text{Commodity certificate exchange rate}]_{y-1} = 0$, then $[\text{Commodity certificate exchange gains}]_y$ = $[\text{Commodity receiving certificate exchange gains}]_y$ * $[\text{Commodity certificate exchange rate}]_y$

If $[\text{Commodity certificate exchange rate}]_y > 0$ and $[\text{Commodity certificate exchange rate}]_{y-1} > 0$, then $[\text{Commodity net value certificates}]_y$ = $[\text{Commodity net value certificates}]_{y-1}$ * (($[\text{Commodity receiving certificate exchange gains}]_y$ - $[\text{Commodity receiving certificate exchange gains}]_{y-1}$) / $[\text{Commodity receiving certificate exchange gains}]_{y-1}$) * (($[\text{Commodity certificate exchange rate}]_y$ - $[\text{Commodity certificate exchange rate}]_{y-1}$) / $[\text{Commodity certificate exchange rate}]_{y-1}$)

Calendar-year calculation[1]
$[\text{Commodity net value of certificates}]_t$ = $[\text{Commodity percent of total}]_{y-1}$ * $[\text{Commodity net value of certificates}]_{y-1}$ + $[\text{Commodity percent of total}]_y$ * $[\text{Commodity net value of certificates}]_y$

[1]Commodity percent of total varies by crop, e.g., $[\text{Corn percent of total}]_{y-1} = 0.2$ and Corn percent of total$]_y = 0.8$.

Note: Q = calendar year quarter; y = crop or marketing year; t = calendar year.
Source: USDA short-term income forecast model.

As with loan deficiency payments and marketing loan gains, estimates of certificate exchange gains for crops new to the program rely heavily on input from USDA's interagency Commodity Estimates Committees. FSA, a participant agency, provides reports on marketing assistance loans, marketing loan gains, and certificate exchange gains activity by crop and crop year, which are updated weekly on FSA's web site.

This information is used to update forecasts throughout the year. The weightings, which generate calendar year estimates of net value of certificates from the crop year estimates, are a reflection of the historical timing of certificate gains realized within the year.

Tobacco Transition Payment Program (TTPP)

Program legislation specified that payments were to be made to tobacco quota holders and tobacco producers beginning in 2005 and ending in 2014. Quota holders are the landowners of the farm where a tobacco quota was assigned. Eligible tobacco quota holders receive $7 per pound based upon their basic quota for the 2002 marketing year. Producers include owners, operators, landlords, tenants, or sharecroppers who shared in the risk of producing tobacco during any of the 2002, 2003, or 2004 marketing years. Producers of quota tobacco receive a payment of up to $3 per pound, based on their share of the risk in producing crops of quota tobacco in those years.

The contract payments to tobacco quota owners and producers are made in annual installments over a 10-year period. TTPP payments were made between June and September 2005 for fiscal year 2005. For fiscal year 2006 through fiscal year 2014, payments are made in January of each year.

The CCC will not make lump-sum payments to individual tobacco quota holders or producers, but a private party may. A quota holder or tobacco producer can enter into an agreement (a successor-in-interest contract) with a third party to receive a lump-sum payment from the party in return for conveying to the third party all rights to future payments. Only the last 9 of the 10 payments, beginning with the 2006 payment, are eligible for a lump-sum payment. If an individual entered into an approved agreement, the first payment in 2005 went directly to the eligible quota holder or producer, with the remaining payments going directly to the third party. The quota owner or producer may do a successor-in-interest contract at any time during the payment period after the first payment. He could choose to take the first few payments directly from CCC, and then at a later date do a successor-in-interest contract for the remaining payments.

The model specification allows for contracts to be sold throughout the life of the program. This allows for flexibility, as quota owners and producers may chose to instigate a contract-in-interest at any point during the life of the program. For 2006 and beyond, the payment to quota holders and producers is reduced by the value of the contracts sold. The net present value of the income stream signed over to a third party in the current year is the estimated lump-sum payment to quota holders and producers in that forecast year. The maximum allowable discount rate is the prime rate plus 2 percent (rounded), as announced by USDA. The maximum discount rate is determined the first day of the month and is good for the entire month. FSA has made a program tool available on its web site for quota owners and producers to use to assess

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whether the terms of a payment meet acceptability criteria, as determined by FSA.

Milk Income Loss Payments

This program compensates dairy producers when domestic milk prices fall below a specified level. Eligible dairy producers are those who, from December 1, 2001, through September 30, 2007, commercially produced and marketed cow's milk. Payments are made monthly when the Boston Class I milk price falls below $16.94 per hundredweight (cwt). Program legislation limits the quantity of milk that receives payments to no more than 2.4 million pounds produced and marketed by the operation per fiscal year. FSA issues payments no later than 60 calendar days after FSA receives production evidence for the applicable month.

Based on NASS data regarding milk production in 2001, 37.4 percent of total milk output was on farms producing 2.4 million pounds or more. Adjusting for milk output on operations producing that amount, 53.4 percent of milk production was eligible for payments in 2001. This percentage is expected to decline as dairy operations become larger over time. Payment rates are determined by multiplying 45 percent of the difference between $16.94 and the Boston Class I price for that month. Producers are eligible to receive transition payments on milk marketed from December 1, 2001 through the last day of the month proceeding the month the operation's transition contract was submitted. Transition payments are made as a lump sum.

Conservation Program Payments

Conservation programs provide subsidies to eligible farmers for not growing crops on environmentally sensitive farmland, financial assistance for farmsite projects that protect the soil and water resource base, and technical assistance on adopting best practices. The forecast for conservation program payments in a given calendar year starts with the previous year's level of program expenditures. For the Conservation Reserve Program, the previous year's level of payment is adjusted by any expected change in the number of acres enrolled. For the other conservation programs, the previous year's level of payment is adjusted by any expected change in the budgeted funding level for the respective program.

Ad Hoc and Emergency Programs

This category includes all programs that provide emergency and disaster assistance payments to eligible farmers and ranchers. Although many of these programs are ongoing, other programs may be enacted by emergency legislation to provide supplemental assistance to eligible producers. The programs are prompted by a specific event to provide support to either a specified group of farmers and ranchers or producers of a specified commodity. For example, market loss assistance programs may be initiated to provide assistance to crop producers who have a loss of income because of drought. The national level of assistance and the means of allocating payments are usually specified in the legislation's provisions. Payments are usually made on a crop year or fiscal year basis. The payments are allocated across calendar years, based on information provided by the agency administrating the program.

Payments are not forecast unless and until they have been activated by the Secretary of Agriculture or legislated by Congress.

Miscellaneous Program Payments

Miscellaneous programs include any program not falling in one of the classifications discussed above. The forecast for payments in this category starts with the previous year's program expenditures. These expenditures are adjusted for expected changes in funding levels, program provisions, enacted legislation and the budgets of FSA and NRCS.

Gross Value Added

Gross value added is a measure of the income from the farm sector's production of all commodities and services before accounting for the capital consumption of buildings, vehicles, and farm machinery in the production process. It represents the value of goods and services produced during the year for use by other sectors of the economy, less cash expenses for goods and services purchased from other sectors. Because gross value added does not include an accounting for the value of the capital stock utilized, it represents, in effect, the selling-off of a portion of the sector's capital.

Capital Consumption

Capital consumption is an estimate of the cost of the portion of the useful service life of a capital item that is used in each year's production activities. It can also be conceptualized as an allowance for the maintenance of the capital stock capacity used by farm producers. Capital consumption is estimated separately for automobiles, trucks, tractors, farm machinery, farm service buildings, and operator dwellings. For each asset type except operator dwellings, a capital stock is maintained (capital stocks refer to the undepreciated aggregates of capital expenditures made in the current and prior years). Capital expenditure estimates contribute to each asset's stock. Estimates of capital consumption are calculated by multiplying the capital stock of each type of asset by a percentage derived from the asset's average service life. Forecasts of capital consumption, except for operator dwellings, are based on the change in the prices paid index for each type of asset. Capital consumption for operator dwellings is based on the change in the forecast value of sector operator dwellings.

Net Value Added

Net value added is the principal target statistic of value-added accounting. It is calculated by subtracting capital consumption from gross value added. Because net value added includes an accounting for the value of the capital stock used in the production of agricultural products and services, it better represents the value that the agricultural sector adds to the national economy than gross value added.

Payments to Stakeholders

Payments to stakeholders are that part of net value added that accrues to nonoperators who provide land, labor, and capital to agricultural production. For their contribution, stakeholders receive a predetermined amount and, therefore, do not bear the output and price risks that farm operators and contractors do. These payments equal the sum of hired labor, for labor inputs by individuals who are hired and directly compensated by farm operations; net rent to nonoperators, which is calculated as gross rent and Government payments to nonoperator landowners, less expenses such as real estate taxes paid by these landowners; and interest payments for capital inputs. Employee compensation accounts for about 24 percent of net value added, nonoperator landowners receive around 13 percent, and interest expenses claim around 14

percent. In traditional farm income accounts, payments to stakeholders are considered expenses.

Net Farm Income

Net farm income is the residual net value added after accounting for payments to stakeholders. It accrues to those who provide land, labor, and capital to agricultural production without any previously determined compensation and who, therefore, accept the quantity and price risks associated with agricultural production. Another criterion for being classified as a net farm income earner is ownership of the output of agricultural production and control of its disposition.

Net farm income is split between farm operations and contractors, including companies that pay farm operations to produce particular commodities under production contracts. Based on farm-level ARMS data over the last few years, farm operations, on average, receive approximately 70 percent of net farm income (34 percent of net value added), and the remaining 30 percent of net farm income (15 percent of net value added) is recouped by contractors.

Farm Income Accounting Framework

ERS calculates and publishes income accounts in the format of business income accounting (table 12). These accounts encompass the components of the value-added calculation, but they are grouped into different categories. In this form of accounting, net farm income is still the final statistic. However, the farm income accounting format also produces an estimate of net cash income. The estimate of net cash income is used to indicate the amount of cash earnings generated by farm businesses that are available to meet a variety of obligations such as debt payments (USDA, 1999).

The first component of total gross income is gross cash income, which includes crop and livestock cash receipts, Government payments, and farm-related income. The components of farm-related income include machine hire and customwork income, forest products, and other income from farm output and sales. Total gross income includes gross cash income, nonmoney income, and the value of change in both crop and animal inventories during the current year. Nonmoney income is the sum of the gross imputed rental value of dwellings and home consumption of crops and animals.

In farm income accounting, the expenses in farm-origin and manufactured inputs are identical to those under value-added accounting (tables 1 and 13). The group "other operating expenses" contains the same expenses as other intermediate expenses plus total labor, combining contract and hired labor expenses and motor vehicle registration and licensing fees, which are included in miscellaneous expenses. The group "overhead expenses" includes capital consumption, property taxes, and net rent received by nonoperators. Cash expenses exclude capital consumption, noncash benefits to hired labor (perquisites), and expenses associated with operator dwellings. In summary, net cash income equals gross cash income less cash expenses. Net farm income equals gross income less total production expenses.

Table 12
Farm income statement

Line	Source	Item	2004	2005	2006	2007	2008F[1]
					$ Billion		
		Cash income statement:					
1	2 + 3	Cash receipts	237.204	240.891	240.828	284.844	323.450
2	Value	Crops[2]	113.620	115.972	122.601	146.954	179.902
3	Value	Livestock	123.584	124.918	118.227	137.889	143.547
4	Value	Direct Government payments	12.970	24.396	15.789	11.903	12.492
5	Value	Farm-related income[3]	17.127	16.177	17.470	16.648	17.606
6	1 + 4 + 5	Gross cash income	267.301	281.463	274.087	313.394	353.548
7	Value	Cash expenses[4,5]	185.044	194.829	206.039	225.977	262.798
8	6 - 7	NET CASH INCOME	82.257	86.635	68.048	87.418	90.750
		Farm income statement:					
9	6	Gross cash income	267.301	281.463	274.087	313.394	353.548
10	Value	Nonmoney income[6]	17.094	19.171	21.330	24.011	25.337
11	Value	Value of inventory adjustment	11.242	0.470	-3.038	3.743	0.518
12	9 + 10 + 11	Total gross income	295.638	301.105	292.380	341.148	379.403
13	Value	Total expenses	209.837	221.770	233.870	254.371	292.531
14	12 - 13	NET FARM INCOME	85.801	79.335	58.509	86.778	86.872

F = Forecast. Totals may not add due to rounding.
[1]As of November 25, 2008.   [2]Includes CCC loans. [3]Income from custom work, machine hire, recreational activities, forest product sales, and other farm sources. [4]Excludes depreciation and perquisites to hired labor. [5]Excludes farm households. [6]Value of home consumption of farm products plus the imputed rental value of operator dwellings.
Source: USDA, Economic Research Service.

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Table 13
Production expenses, 2004-08F

Row	Source	Item	2004	2005	2006	2007	2008F[1]
					Million dollars		
1	Sum 2-4	Farm origin inputs	57,484.0	56,910.3	60,967.2	68,830.6	80,315.7
2	Value	Feed	29,731.6	28,029.0	31,425.1	38,124.9	46,868.3
3	Value	Livestock & poultry purchased	18,127.4	18,454.9	18,515.6	18,779.0	18,210.4
4	Value	Seed	9,625.0	10,426.4	11,026.5	11,926.8	15,237.0
5	Sum 6-9	Manufactured inputs	31,648.0	35,406.3	37,465.6	43,671.0	58,945.8
6	Value	Fertilizer & lime	11,425.0	12,829.1	13,330.9	16,731.5	27,450.7
7	Value	Fuels and oils	8,215.1	10,305.6	11,327.9	12,989.8	16,394.7
8	Value	Electricity	3,391.2	3,454.0	3,789.8	3,932.7	4,226.7
9	Value	Pesticides	8,616.7	8,817.6	9,017.0	10,017.0	10,873.7
10	Sum 11-12	Total interest charges	11,583.7	13,171.3	13,967.5	15,052.2	14,717.0
11	Value	Short-term interest	4,704.2	5,771.6	6,139.3	6,970.2	6,907.7
12	Value	Real estate interest	6,879.5	7,399.7	7,828.2	8,082.0	7,809.3
13	Sum 14-18	Other operating expenses	69,027.7	72,703.1	76,936.5	81,306.3	89,351.9
14	Value	Repair and maintenance	11,943.3	11,890.4	12,460.5	13,551.8	15,587.3
15	Value	Hired & contract labor expenses	23,314.2	23,555.9	24,229.8	25,642.7	26,789.2
16	Value	Machine hire & customwork	3,633.1	3,474.9	3,504.0	3,708.5	4,156.1
17	Value	Marketing, storage & transportation	7,193.0	8,820.5	9,022.8	9,784.0	10,910.2
18	Value	Miscellaneous expenses	22,944.1	24,961.3	27,719.4	28,619.3	31,909.2
19	Sum 20-22	Overhead expenses	40,093.6	43,578.9	44,533.6	45,510.5	49,200.6
20	Value	Capital consumption	23,085.2	24,938.1	26,086.6	26,894.2	28,408.5
21	Value	Property taxes	7,006.5	8,007.4	9,008.2	9,809.0	10,195.8
22	Value	Net rent to nonoperators	10,001.9	10,633.4	9,438.8	8,807.4	10,596.2
23	Sum 1, 5, 10, 13, 19	TOTAL PRODUCTION EXPENSES	209,837.0	221,769.8	233,870.3	254,370.7	292,531.0
24	Sum 25-26	Noncash expenses	16,598.5	17,641.5	18,109.7	18,159.6	18,552.4
25	Value	Labor perquisites	468.1	494.2	418.3	324.9	327.5
26	27-28	Net capital consumption[2]	16,130.4	17,147.2	17,691.5	17,834.7	18,224.8
27	20-30	Cap. cons. exc. dwellings	18,736.5	19,864.1	20,473.2	20,680.7	21,556.8
28	Value	Landlord capital consumption	2,606.2	2,716.9	2,781.7	2,846.0	3,329.0
29	Sum 30-34	Dwelling expenses	8,194.1	9,299.7	9,721.7	10,234.5	11,180.6
30	Value	Capital consumption	4,348.6	5,074.0	5,613.4	6,208.1	6,851.8
31	Value	Interest	771.7	768.8	714.2	737.4	712.5
32	Value	Taxes	1,068.8	1,246.1	1,368.1	1,451.0	1,508.3
33	Value	Repairs & maintenance	1,360.8	1,563.8	1,292.9	1,136.6	1,307.3
34	Value	Insurance	644.2	647.0	733.1	701.4	800.8
35	23 - (24+29)	CASH EXPENSES[3]	185,044.2	194,828.6	206,038.8	225,976.7	262,798.0

F = Forecast.
[1] As of November 25, 2008.
[2] Sector capital consumption minus landlord capital consumption equals net capital consumption excluding dwellings.
[3] Total expenses minus noncash and operator dwelling expenses.
Source: Economic Research Service.

Prices Paid Indexes

ERS forecasts 19 of the annual farm prices paid indexes constructed by NASS (table 14). Each of these indexes combines prices for a similar group of inputs. For instance, the NASS agricultural chemicals prices paid index combines prices for chemicals used to control all types of agricultural pests. The materials for which farmers spend the most have the heaviest weights in calculation of the indexes. Farmers spend more on chemicals for controlling weeds than for combating insects and plant diseases, so changes in the price of weed control chemicals would cause a larger increase in the agricultural chemicals prices paid index than changes in the price of other agricultural chemicals.

ERS uses the price indexes it forecasts in the equations for forecasting almost all production expenses. The methods for calculating current indexes were developed in 2003, when ERS analysts updated regression analyses for each of the price indexes. Table 15 gives examples of the resulting econometric equations. The work was based on the same procedure as the one used in 1997 to construct forecast equations for the prices paid indexes that the ERS Baseline uses in its long-term projections (Jinkins et al., 1997; U.S. Department of Agriculture, 2007). These estimation equations are based on the relationship of factors that influence the prices of inputs used in production, encompassing commodity input prices, land values, and several macroeconomic variables, such as the producer price index for finished goods, imported oil prices, and interest rates. This analysis also assumes that technology remains static.

In most cases, ERS analysts produce the forecast of the components that go into the formulas of the prices paid indexes. The one piece of data used in developing prices paid forecasts that is exogenous to ERS is average hourly earnings of private nonagricultural wage earners, which is obtained from the

Table 14
Prices-paid index categories

Feed
Livestock
Seed
Fertilizer
Agricultural chemicals
Fuels and energy
Farm and motor supplies
Autos and trucks
Tractors and self-propelled machinery
Other farm machinery
Building and fencing
Services and cash rent
Interest
Farmland taxes
Farm wage rates
Production items
Production items, interest, taxes, and wage rates (PITW)
Family living (CPI-U)[1]
Commodities and services, interest, taxes, and wage rates (PPITW)

[1]Consumer Price Index for all Urban Consumers.

Table 15
Examples of prices paid indexes forecast equations

[Fertilizer PPI] = EXP(3.6366 + 0.0177 * [Current year − 1975 + 1] + 0.1046 * [LN(RAC[1], current year)] + 0.4526 * [Average: LN(corn marketing year average price, current year), LN(corn marketing year average price, previous year)])

[Fuels PPI] = -23.5198 + 1.606 * [Refiners' Acquisition Cost[1], current year] + [Producer price index, finished goods, previous year]

[1]Refiners' Acquisition Cost is the annual average price of domestic imported oil.
Source: USDA short-term farm income forecast model.

Bureau of Labor Statistics. (Average hourly earnings, private nonagricultural wage rates, Series: CEU0500000006, from http://data.bls.gov./cgi-bin/srgate).

Some farm-input prices depend largely on the farm economy, while others are tied to the general economy. Livestock feed is a good example of a farm production input whose price can be explained by farm economic conditions, specifically commodity prices, because farmers themselves produce most of the items included in the feed producer price index. The price of corn has the largest influence on forecasts of this index. The prices of soymeal and hay are also part of the forecast equation. Changes in the livestock and poultry producer price index are also linked to farm commodity prices, especially beef cattle prices. About 80 percent of farmers' livestock expenditures go for young cattle that are fed for later resale. For this reason, the price for 750- to 800-pound feeder steers is the most important factor in the livestock and poultry prices paid index.

Conditions in the farm economy have little influence on prices farmers pay for fuel. Crop and livestock production accounts for only a small portion of the general economy's total fuel consumption, so the price is driven largely by factors in the general economy. In forecasting the farm producer price index for fuel, ERS considers both the crude oil price outlook generated by ERS macroeconomic analysts and forecasts of producer price inflation in the general economy.

General economic conditions also influence wages farmers pay their hired workers. A strong economy can lead to job creation, resulting in competition for workers with the farm sector and wage increases. Facing these factors, many farmers will likely be forced to raise the wages they pay to compete for workers. When forecasting the wage prices paid index, ERS looks at both the outlook for wages in the general economy and the tendency of farm wages to increase over time.

When forecasts are revised during the period for which they are forecast, approximately 18 months, the level and direction of movement in the NASS prices paid indexes are considered and may be used to adjust the results of the econometric equations. When the complete year of NASS monthly indexes becomes available in the January *Agricultural Prices*, these values are substituted for the forecast values.

Capital Expenditures

Capital expenditures represent gross additions to the capital stock used by farmers in production activities. These expenditures may be for new or used items or for capital improvements to previously owned items. Purchases may be used to expand productive capacity or to maintain existing capacity. ERS uses capital expenditure estimates from ARMS in its estimates of capital replacement (more commonly referred to as depreciation).

ERS forecasts capital expenditures for motor vehicles, farm machinery, and farm service buildings using time-series analyses. These analyses have shown that machinery expenditures are a linear function of farm numbers, acres planted, cash receipts, and the prime rate. (The forecast of the prime rate is obtained from the online *Monthly Economic Forecast* by Wachovia Bank at http://www.wachovia.com/corp_inst/page/0,,13_54_1067,00.html.) Building expenditures are a linear function of acreage, receipts, and the combined total debt of the farm sector. In both cases, the forecasting equations create values based on the relationship among these factors that move the previous year's capital expenditures by the ratio of these values in the forecast year to the values in the previous year.

Farm Output Indexes

The farm output indexes measure the year-to-year change in the output of 15 categories of commodities, including all crops and livestock and total output. These indexes are used in the calculation of production expenses.

To measure the year-to-year change in the output of the 15 groups of commodities, the model employs a Tornvist output index (Diewert, 1976). This is a chain-type index. The output level for a commodity group each year is calculated as the weighted change in the production of the commodities included in the group. An individual commodity's weight is the 2-year average of the ratio of the multiplication of its quantity produced in each year times each year's average price to the sum of the identical multiplication of all the commodities in the group. For example, the current and previous year's corn production is multiplied by the current and previous year's corn price and then divided by the sum of this multiplication for corn, sorghum, barley, and oats. The weight equation for corn is shown in table 16.

This weight is then multiplied by the log of the ratio of the quantity of the commodity produced in the current year to the quantity produced in the previous year. The exponent of the sum of the log multiplication for all the commodities in the group gives the change in the group's output. This change is then applied to the prior year's output index.

Table 16

Example of commodity weight calculation for corn

$[\text{Feed grains P*Q Sum}]_y = [\text{Corn price}]_y * [\text{Corn production}]_y + [\text{Sorghum price}]_y * [\text{Sorghum production}]_y + [\text{Barley price}]_y * [\text{Barley production}]_y + [\text{Oats price}]_y * [\text{Oats production}]_y$

$[\text{S1: Corn}]_y = \text{AVG}([\text{Corn price}]_y * [\text{Corn production}]_y / [\text{Feed grains P*Q Sum}]_y, [\text{Corn price}]_{y-1} * [\text{Corn production}]_{y-1} / [\text{Feed grains P*Q Sum}]_{y-1})$

y = Current year crop; y-1 = previous year crop.

Source: USDA short-term farm income forecast model.

Seasonally Adjusted Annual Cash Receipts

Quarterly seasonally adjusted annual cash receipts forecasts show what annual cash receipts would be if a quarter's economic performance was repeated in each of the year's other three quarters. Thus, the receipts are an indication of the variation in the pattern of an industry's performance over the course of a year.

Crop and livestock cash receipts are seasonally adjusted from the quarterly patterns of the previous 3 years, creating a historical ratio of each quarter's receipts to total annual receipts. The majority of terms in the complex equations are to ensure that the average of seasonally adjusted quarterly estimates equals the unadjusted annual total (table 17).

Quarterly seasonally adjusted annual cash receipts are used as the basis for estimating quarterly seasonally-adjusted annual gross value added and net farm income. These estimates are included in the gross domestic product estimates of the NIPA by the United States Department of Commerce (2006). They are also used by the Council of Economic Advisers in its monthly publication *Economic Indicators* and the annual *Economic Report of the President* (Council of Economic Advisers, various issues).

Table 17
Seasonally adjusted annual cash receipts, 2007

	Total	Livestock	Crops
	$ Million		
Quarter 1	270,836.1	138,810.9	132,025.2
Quarter 2	286,143.3	139,166.2	146,977.1
Quarter 3	287,255.9	138,012.9	149,243.1
Quarter 4	295,139.3	135,567.9	159,571.4
Average	284,843.6	137,889.4	146,954.2
Quarterly cash receipts, 2007			
Quarter 1	62,204.2	33,440.8	28,763.4
Quarter 2	63,877.1	34,311.1	29,566.0
Quarter 3	70,271.5	35,123.5	35,148.0
Quarter 4	88,490.8	35,014.0	53,476.9
Total	284,843.6	137,889.4	146,954.2
Quarterly cash receipts, 2006			
Quarter 1	53,341.7	28,412.6	24,929.0
Quarter 2	54,617.1	29,279.1	25,338.0
Quarter 3	59,626.8	30,192.6	29,434.2
Quarter 4	73,242.3	30,342.4	42,900.0
Total	240,828.0	118,226.7	122,601.3
Quarterly cash receipts, 2005			
Quarter 1	56,742.4	29,935.3	26,807.1
Quarter 2	54,951.8	30,953.3	23,998.6
Quarter 3	59,159.3	31,943.0	27,216.3
Quarter 4	70,037.3	32,086.8	37,950.5
Total	240,890.8	124,918.4	115,972.4
Quarterly cash receipts, 2004			
Quarter 1	55,897.5	29,980.2	25,917.2
Quarter 2	52,419.5	30,159.6	22,260.0
Quarter 3	58,249.3	31,169.9	27,079.4
Quarter 4	70,637.8	32,274.7	38,363.1
Total	237,204.1	123,584.3	113,619.7

Forecast Variation

Farm income forecasts for a particular year begin preparations for USDA's long-term projections, also known as its Baseline. This is typically in October or November preceding the year for which the income forecast is being prepared. The short-term income and finance forecasts are published in conjunction with the long-term projections, with followup review and discussion taking place at USDA's Agricultural Outlook Forum the following February. Using 2007 as an example year, the first forecast of income was released in February 2007. The estimate of income for 2007, based on observed data for both revenues and expenses, was published in August 2008. Updates to the February 2007 forecast were published in August 2007, November 2007, and February 2008 when the first forecast for 2008 was released. The entire forecast period for the 2007 calendar year farm financial indicators stretched over 19 months. A similar timeline applies to each annual forecast of income for farms and the farm sector of the U.S. economy.

There is an error associated with each forecast, which we measure as the difference between the final estimate for the year and its forecast at each release. This error typically decreases as time progresses and more complete data become available. Release dates for the updated forecasts are chosen to correspond with the availability of newer, more complete data to underpin forecasts of revenues and expenses. For example, in August following the first forecast, projections of crop production values and receipts can be updated to reflect USDA's reports of survey-based production and yields. The August update also includes survey-based expense data that transform the forecast into estimates. When combined with several months of input prices-paid information, this change improves the data underlying forecasts of production expenses. The November update includes information regarding crop harvests. The final forecast is presented in the following February, at which time 12 months of estimates and forecasts are available for some of the forecast components. Meanwhile, updated livestock production and marketing data become available on an ongoing monthly basis through the WASDE reports and ERS commodity analysts.

When income indicators are released at the end of the 19-month process, the income accounts are referred to as estimates because revenue and expense components of the accounts are then based on observed data. As statistical series, the income estimates are subject to revision as new and revised data become available. For example, release of the Census of Agriculture may affect published estimates of production and, as a result, estimates of receipts.

Components of the income account are forecast separately. The magnitude of differences between the forecast and the estimate vary (table 18). Revenue components vary more than expense components, with inventory adjustments and sources of farm-related income having the largest percentage of difference. Inventory adjustment is a residual component of total available supply, consisting of production and beginning-of-year stocks, after market and on-farm uses have been accounted for. Thus, the forecast of inventory adjustment results from the combination of other forecasts. Farm-related sources of income are derived from use of farm assets to generate income through means other than crop or livestock production. Some of these earning opportunities may arise unexpectedly and may be dependent upon a farmer's

available resources, including labor capacity. There are no ongoing data to monitor how farmers choose to take advantage of such income opportunities, but data are available only once a year through responses to questions in the ARMS. Crop and livestock receipts vary less than other sources of gross income. Receipt forecasts tighten significantly as additional production and price information become available during the forecast period.

In addition to inventory adjustment and farm-related income, other relatively large forecast errors are related to Government payments and net cash and net farm income. Government payments are not only a function of production, prices, and rules for participating in various commodity programs, but also of acreage and payment rates for environmental programs and legislation providing financial assistance after natural disasters. Many of these factors affect the level of payments in ways that cannot be anticipated in forecasts. Just as with inventory, net cash and net farm income are residual estimates. Net income is derived by subtracting expenses from sources of income. Thus, the net income measures are derived from other forecasts. Like components of gross revenue or expenses, by harvest time, the relative error drops to less than 4 percent for net cash income and 6 percent for net farm income (which also reflects the forecast for inventory adjustment and all other components of revenues and expenses not included in cash income). In absolute terms, this means an error range of $3-$4 billion across the farm sector.

Table 18
Variation In farm income forecasts, by forecast date (2003-07 average)

	Forecasts			
	February	August	November	February
	$ Billion			
Total cash receipts	17.494	5.405	3.086	2.144
Crop cash receipts	8.271	4.326	2.762	1.947
Livestock cash receipts	10.420	2.538	1.515	1.376
Direct Government payments	1.620	3.656	1.754	0.943
Farm-related income	1.021	0.811	0.488	0.927
Gross cash income	17.112	3.477	2.805	2.950
Nonmoney income	2.480	1.465	1.371	1.310
Inventory adjustment	3.310	2.556	1.125	1.073
Total gross income	19.764	6.369	4.152	5.313
Cash expenses	6.224	5.031	3.702	3.489
Total expenses	7.313	5.361	3.851	3.639
Net cash income	14.174	5.220	2.820	2.766
Net farm income	15.814	6.150	3.611	4.059
	Percent			
Total cash receipts	7.2	2.2	1.3	0.9
Crop cash receipts	6.8	3.6	2.3	1.6
Livestock cash receipts	8.5	2.1	1.2	1.1
Direct Government payments	10.0	22.5	10.8	5.8
Farm-related income	6.0	4.7	2.8	5.4
Gross cash income	6.2	1.3	1.0	1.1
Nonmoney income	14.0	8.3	7.8	7.4
Inventory adjustment	159.6	123.2	54.2	51.7
Total gross income	6.7	2.1	1.4	1.8
Cash expenses	3.1	2.5	1.9	1.8
Total expenses	3.3	2.4	1.7	1.6
Net cash income	18.3	6.7	3.6	3.6
Net farm income	22.0	8.6	5.0	5.7

Source: USDA, Economic Research Service.

References

Council of Economic Advisers. *Economic Indicators*. Various issues. (Internet address: http://www.gpoaccess.gov/indicators/index.html)

Diewert, W.E. "Exact and Superlative Index Numbers," *Journal of Econometrics* 4(1976):115-45.

Dubman, R., R. McElroy, and C. Dodson. *Forecasting Farm Income: Documenting USDA's Economic Model.* Technical Bulletin Number 1825, U.S. Department of Agriculture, Economic Research Service, Aug. 1993.

Jinkins, J., D. Torgerson, C. McGath, and D. Brinkman. "Forecasting Prices That Farmers Pay For Production Inputs," *Agricultural Income and Finance Situation and Outlook*, AIS-65, June 1997. (Internet address: http://usda.mannlib.cornell.edu/usda/ers/AIS//1990s/1997/AIS-07-08-1997.asc)

U.S. Department of Agriculture, Economic Research Service. *Farm Business Economics Report*, *1996*, ECI-1997, April 1999.

_____, National Agricultural Statistics Service. *Agricultural Prices*. Various issues. (Internet address: http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1002)

_____, Office of the Chief Economist, World Agricultural Outlook Board. *USDA Agricultural Baseline Projections to 2016*. Baseline OCE-2007-1, February 2007. (Internet address: http://usda.mannlib.cornell.edu/usda/ers/94005/2007/oce20071.pdf)

U. S. Department of Commerce, Bureau of Economic Analysis. *Survey of Current Business*, Tables 1.3.5 and 1.3.6. August 2006, Volume 86, Number 8, p. 49. (Internet address: http:/www.bea.gov/bea/ARTICLES/2006/08August/0806_NIPA-Tables-Account-01.pdf)

Appendix 1: Forecasting Equations

Value of Agricultural Sector Production[1]

Value of Crop Production

[Total Crop Output]$_t$ = [Food grains cash receipts]$_t$ + [Feed grains cash receipts]$_t$ + [Oilseeds cash receipts] $_t$ + [Total cotton cash receipts]$_t$ + [Tobacco cash receipts]$_t$ + [Total vegetable cash receipts]$_t$ + [Fruit and nut cash receipts]$_t$ + [All other crops cash receipts]$_t$ + [Home consumption of crops]$_t$ + [Value of inventory adjustment]$_t$

<div align="center">Food Grains Cash Receipts</div>

[Food grains cash receipts]$_{Q1}$ = [Wheat cash receipts]$_{Q1}$ + [Rice cash receipts]$_{Q1}$ + [Rye cash receipts]$_{Q1}$

[Food grains cash receipts]$_{Q2}$ = [Wheat cash receipts]$_{Q2}$ + [Rice cash receipts]$_{Q2}$ + [Rye cash receipts]$_{Q2}$

[Food grains cash receipts]$_{Q3}$ = [Wheat cash receipts]$_{Q3}$ + [Rice cash receipts]$_{Q3}$ + [Rye cash receipts]$_{Q3}$

[Food grains cash receipts]$_{Q4}$ = [Wheat cash receipts]$_{Q4}$ + [Rice cash receipts]$_{Q4}$ + [Rye cash receipts]$_{Q4}$

[Food grains cash receipts]$_t$ = [Wheat cash receipts]$_t$ + [Rice cash receipts]$_t$ + [Rye cash receipts]$_t$

<u>Wheat Cash Receipts</u>[2]

Commodity Credit Corporation (CCC) Activities

[Crop year CCC placements]$_y$ = If (Average: [Crop year CCC placements]$_{y-1 \text{ to } y-3}$ / [Wheat production $_{y-1 \text{ to } y-3}$] < 0.05, [Wheat production]$_y$ * (Average: [Crop year CCC placements]$_{y-1 \text{ to } y-3}$ / [Wheat production]$_{y-1 \text{ to } y-3}$]), [Wheat production]$_y$ * 0.05)

[CCC percent placed]$_{Q1}$ = Average: [CCC percent placed]$_{t-1 \text{ to } t-3, Q1}$
[CCC percent placed]$_{Q2}$ = Average: [CCC percent placed]$_{t-1 \text{ to } t-3, Q2}$
[CCC percent placed]$_{Q3}$ = Average: [CCC percent placed]$_{t-1 \text{ to } t-3, Q3}$
[CCC percent placed]$_{Q4}$ = Average: [CCC percent placed]$_{t-1 \text{ to } t-3, Q4}$

[CCC placements]$_{Q1}$ = [CCC placements]$_{y-1}$ * [CCC percent placed]$_{Q1}$
[CCC placements]$_{Q2}$ = [CCC placements]$_y$ * [CCC percent placed]$_{Q2}$
[CCC placements]$_{Q3}$ = [CCC placements]$_y$ * [CCC percent placed]$_{Q3}$
[CCC placements]$_{Q4}$ = [CCC placements]$_y$ * [CCC percent placed]$_{Q4}$

[CCC placements value]$_{Q1}$ = [CCC placements]$_{Q1}$ * [CCC loan rate]$_{y-1}$
[CCC placements value]$_{Q2}$ = [CCC placements]$_{Q2}$ * [CCC loan rate]$_y$
[CCC placements value]$_{Q3}$ = [CCC placements]$_{Q3}$ * [CCC loan rate]$_y$
[CCC placements value]$_{Q4}$ = [CCC placements]$_{Q4}$ * [CCC loan rate]$_y$

Open Market Activities

[Open–market quantity sold]$_y$ = [Wheat production]$_y$ * (1 – [Percent used on farm]$_y$) – [CCC placements]$_y$

[Percent marketed]$_{Q1,y-1}$[3] = Average: [Percent marketed]$_{Q1,y-2 \text{ to } y-4}$
[Percent marketed]$_{Q2,y-1}$ = Average: [Percent marketed]$_{Q2,y-2 \text{ ro } y-4}$

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[1]t = calendar year y = crop marketing year; Q = quarter. [2]Quantity and price units are bushels. [3]In quarterly percent marketed, [Percent sold]$_{Q1,y-1}$ indicates the portion of the previous year's open-market sales during the first quarter of the current year. [Percent sold]$_{Q3,y}$ indicates the portion of the current year's open-market sales during the third quarter of the current year.

$[\text{Percent marketed}]_{Q2,y} = \text{Average: } [\text{Percent marketed}]_{Q2,y-1 \text{ to y-3}}$
$[\text{Percent marketed}]_{Q3,y} = \text{Average: } [\text{Percent marketed}]_{Q3,y-1 \text{ to y-3}}$
$[\text{Percent marketed}]_{Q4,y} = \text{Average: } [\text{Percent marketed}]_{Q4,y-1 \text{ to y-3}}$

$[\text{Open–market quantity sold}]_{Q1} = [\text{Open–market quantity sold}]_{y-1} *$
$\quad [\text{Percent marketed}]_{Q1,y-1}$
$[\text{Open–market quantity sold}]_{Q2} = [\text{Open–market quantity sold}]_{y-1} *$
$\quad [\text{Percent marketed}]_{Q2,y-1} + [\text{Open–market quantity sold}]_{y} *$
$\quad [\text{Percent marketed}]_{Q2,y}$
$[\text{Open–market quantity sold}]_{Q3} = [\text{Open–market quantity sold}]_{y} * [\text{Percent marketed}]_{Q3,y}$
$[\text{Open–market quantity sold}]_{Q4} = [\text{Open–market quantity sold}]_{y} * [\text{Percent marketed}]_{Q4,y}$

$[\text{Open–market sales}]_{Q1} = [\text{Open–market quantity sold}]_{Q1}$
$\quad * [\text{Open–market price}]_{Q1}$
$[\text{Open–market sales}]_{Q2} = [\text{Open–market quantity sold}]_{Q2}$
$\quad * [\text{Open–market price}]_{Q2}$
$[\text{Open–market sales}]_{Q3} = [\text{Open–market quantity sold}]_{Q3}$
$\quad * [\text{Open–market price}]_{Q3}$
$[\text{Open–market sales}]_{Q4} = [\text{Open–market quantity sold}]_{Q4}$
$\quad * [\text{Open–market price}]_{Q4}$

$[\text{Wheat cash receipts}]_{Q1} = [\text{Open–market sales}]_{Q1} +$
$\quad [\text{CCC Placement values}]_{Q1}$
$[\text{Wheat cash receipts}]_{Q2} = [\text{Open–market sales}]_{Q2} +$
$\quad [\text{CCC Placement values}]_{Q2}$
$[\text{Wheat cash receipts}]_{Q3} = [\text{Open–market sales}]_{Q3} +$
$\quad [\text{CCC Placement values}]_{Q3}$
$[\text{Wheat cash receipts}]_{Q4} = [\text{Open–market sales}]_{Q4} +$
$\quad [\text{CCC Placement values}]_{Q4}$

$[\text{Wheat cash receipts}]_{t} = [\text{Total Wheat cash receipts}]_{Q1} + [\text{Total Wheat cash receipts}]_{Q2} + [\text{Total Wheat cash}$
$\quad \text{receipts}]_{Q3} + [\text{Total Wheat cash receipts}]_{Q4}$

Rice Cash Receipts[4]

Commodity Credit Corporation (CCC) Activities

$[\text{Crop year CCC placements}]_{y} = \text{IF(Average: } [\text{Crop year CCC placements}]_{y-1 \text{ to y-3}} /$
$\quad [\text{Rice production }_{y-1 \text{ to y-3}}] < 0.11, [\text{Rice production}]_{y} *$
$\quad (\text{Average: } [\text{Crop year CCC placements}]_{y-1 \text{ to y-3}} / [\text{Rice production}]_{y-1 \text{ to y-3}}),$
$\quad [\text{Rice production}]_{y} * 0.11)$

$[\text{CCC percent placed}]_{Q1} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3,Q1}$
$[\text{CCC percent placed}]_{Q2} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3,Q2}$
$[\text{CCC percent placed}]_{Q3} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3,Q3}$
$[\text{CCC percent placed}]_{Q4} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3,Q4}$

$[\text{CCC placements}]_{Q1} = [\text{CCC placements}]_{y-1} * [\text{CCC percent placed}]_{Q1}$

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[4]Quantity and price units are cwt.

$[\text{CCC placements}]_{Q2} = [\text{CCC placements}]_{y-1} * [\text{CCC percent placed}]_{Q2}$
$[\text{CCC placements}]_{Q3} = [\text{CCC placements}]_{y} * [\text{CCC percent placed}]_{Q3}$
$[\text{CCC placements}]_{Q4} = [\text{CCC placements}]_{y} * [\text{CCC percent placed}]_{Q4}$

$[\text{CCC placements value}]_{Q1} = [\text{CCC placements}]_{Q1} * [\text{CCC loan rate}]_{y-1}$
$[\text{CCC placements value}]_{Q2} = [\text{CCC placements}]_{Q2} * [\text{CCC loan rate}]_{y-1}$
$[\text{CCC placements value}]_{Q3} = [\text{CCC placements}]_{Q3} * [\text{CCC loan rate}]_{y}$
$[\text{CCC placements value}]_{Q4} = [\text{CCC placements}]_{Q4} * [\text{CCC loan rate}]_{y}$

Open Market Activities

$[\text{Open--market quantity sold}]_{y} = [\text{Rice production}]_{y} * (1 - [\text{Percent used on farm}]_{y}) -$
$\quad [\text{CCC placements}]_{y}$

$[\text{Percent marketed}]_{Q1,y-1} = \text{Average: } [\text{Percent marketed}]_{Q1,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q2,y-1} = \text{Average: } [\text{Percent marketed}]_{Q2,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q2,y} = \text{Average: } [\text{Percent marketed}]_{Q2,y-1 \text{ to } y-3}$
$[\text{Percent marketed}]_{Q3,y} = \text{Average: } [\text{Percent marketed}]_{Q3,y-1 \text{ to } y-3}$
$[\text{Percent marketed}]_{Q4,y} = \text{Average: } [\text{Percent marketed}]_{Q4,y-1 \text{ to } y-3}$

$[\text{Open--market quantity sold}]_{Q1} = [\text{Open--market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q1,y-1}$
$[\text{Open--market quantity sold}]_{Q2} = [\text{Open--market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q2,y-1} +$
$\quad [\text{Open--market quantity sold}]_{y} * [\text{Percent marketed}]_{Q2,y}$
$[\text{Open--market quantity sold}]_{Q3} = [\text{Open--market quantity sold}]_{y} * [\text{Percent marketed}]_{Q3,y}$
$[\text{Open--market quantity sold}]_{Q4} = [\text{Open--market quantity sold}]_{y} * [\text{Percent marketed}]_{Q4,y}$

$[\text{Open--market sales}]_{Q1} = [\text{Open--market quantity sold}]_{Q1} * [\text{Open--market price}]_{Q1}$
$[\text{Open--market sales}]_{Q2} = [\text{Open--market quantity sold}]_{Q2} * [\text{Open--market price}]_{Q2}$
$[\text{Open--market sales}]_{Q3} = [\text{Open--market quantity sold}]_{Q3} * [\text{Open--market price}]_{Q3}$
$[\text{Open--market sales}]_{Q4} = [\text{Open--market quantity sold}]_{Q4} * [\text{Open--market price}]_{Q4}$

$[\text{Rice cash receipts}]_{Q1} = [\text{Open--market sales}]_{Q1} + [\text{CCC Placement values}]_{Q1}$
$[\text{Rice cash receipts}]_{Q2} = [\text{Open--market sales}]_{Q2} + [\text{CCC Placement values}]_{Q2}$
$[\text{Rice cash receipts}]_{Q3} = [\text{Open--market sales}]_{Q3} + [\text{CCC Placement values}]_{Q3}$
$[\text{Rice cash receipts}]_{Q4} = [\text{Open--market sales}]_{Q4} + [\text{CCC Placement values}]_{Q4}$
$[\text{Rice cash receipts}]_{t} = [\text{Rice cash receipts}]_{Q1} + [\text{Rice cash receipts}]_{Q2} + [\text{Rice cash receipts}]_{Q3} +$
$\quad [\text{Rice cash receipts}]_{Q4}$

Rye Cash Receipts[5]

$[\text{Open--market quantity sold}]_{y} = [\text{Rye production}]_{y} * (1 - [\text{Percent used on farm}]_{y})$

$[\text{Percent marketed}]_{Q1,y-1} = \text{Average: } [\text{Percent marketed}]_{Q1,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q2,y-1} = \text{Average: } [\text{Percent marketed}]_{Q2,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q2,y} = \text{Average: } [\text{Percent marketed}]_{Q2,y-1 \text{ to } y-3}$
$[\text{Percent marketed}]_{Q3,y} = \text{Average: } [\text{Percent marketed}]_{Q3,y-1 \text{ to } y-3}$
$[\text{Percent marketed}]_{Q4,y} = \text{Average: } [\text{Percent marketed}]_{Q4,y1 \text{ to } y-3}$

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[5]Quantity and price units are bushels.

$[\text{Open–market quantity sold}]_{Q1} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q1,y-1}$

$[\text{Open–market quantity sold}]_{Q2} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q2,y-1} +$
$\qquad [\text{Open–market quantity sold}]_{y} * [\text{Percent marketed}]_{Q2,y}$

$[\text{Open–market quantity sold}]_{Q3} = [\text{Open–market quantity sold}]_{y} * [\text{Percent marketed}]_{Q3,y}$

$[\text{Open–market quantity sold}]_{Q4} = [\text{Open–market quantity sold}]_{y} * [\text{Percent marketed}]_{Q4,y}$

$[\text{Open–market sales}]_{Q1} = [\text{Open–market quantity sold}]_{Q1} * [\text{Open–market price}]_{Q1}$

$[\text{Open–market sales}]_{Q2} = [\text{Open–market quantity sold}]_{Q2} * [\text{Open–market price}]_{Q2}$

$[\text{Open–market sales}]_{Q3} = [\text{Open–market quantity sold}]_{Q3} * [\text{Open–market price}]_{Q3}$

$[\text{Open–market sales}]_{Q4} = [\text{Open–market quantity sold}]_{Q4} * [\text{Open–market price}]_{Q4}$

$[\text{Rye cash receipts}]_{Q1} = [\text{Open–market sales}]_{Q1}$

$[\text{Rye cash receipts}]_{Q2} = [\text{Open–market sales}]_{Q2}$

$[\text{Rye cash receipts}]_{Q3} = [\text{Open–market sales}]_{Q3}$

$[\text{Rye cash receipts}]_{Q4} = [\text{Open–market sales}]_{Q4}$

$[\text{Rye cash receipts}]_{t} = [\text{Rye cash receipts}]_{Q1} + [\text{Rye cash receipts}]_{Q2} + [\text{Rye cash receipts}]_{Q3} + [\text{Rye cash receipts}]_{Q4}$

Feed Grains Cash Receipts

$[\text{Feed grains cash receipts}]_{Q1} = [\text{Corn cash receipts}]_{Q1} + [\text{Sorghum cash receipts}]_{Q1} + [\text{Barley cash receipts}]_{Q1} +$
$\qquad [\text{Oats cash receipts}]_{Q1} + [\text{Hay cash receipts}]_{Q1}$

$[\text{Feed grains cash receipts}]_{Q2} = [\text{Corn cash receipts}]_{Q2} + [\text{Sorghum cash receipts}]_{Q2} + [\text{Barley cash receipts}]_{Q2} +$
$\qquad [\text{Oats cash receipts}]_{Q2} + [\text{Hay cash receipts}]_{Q2}$

$[\text{Feed grains cash receipts}]_{Q3} = [\text{Corn cash receipts}]_{Q3} + [\text{Sorghum cash receipts}]_{Q3} + [\text{Barley cash receipts}]_{Q3} +$
$\qquad [\text{Oats cash receipts}]_{Q3} + [\text{Hay cash receipts}]_{Q3}$

$[\text{Feed grains cash receipts}]_{Q4} = [\text{Corn cash receipts}]_{Q4} + [\text{Sorghum cash receipts}]_{Q4} + [\text{Barley cash receipts}]_{Q4} +$
$\qquad [\text{Oats cash receipts}]_{Q4} + [\text{Hay cash receipts}]_{Q4}$

$[\text{Feed grains cash receipts}]_{t} = [\text{Corn cash receipts}]_{t} + [\text{Sorghum cash receipts}]_{t} + [\text{Barley cash receipts}]_{t} +$
$\qquad [\text{Oats cash receipts}]_{t} + [\text{Hay cash receipts}]_{t}$

Corn Cash Receipts[6]

Commodity Credit Corporation (CCC) Activities

$[\text{Crop year CCC placements}]_{y} = \text{IF}(\text{Average: } [\text{Crop year CCC placements}]_{y-1 \text{ to } y-3} /$
$\qquad [\text{Corn production}]_{y-1 \text{ to } y-3} < 0.09, [\text{Corn production}]_{y} * (\text{Average: } [\text{Crop year CCC placements}]_{y-1 \text{ to } y-3} /$
$\qquad [\text{Corn production}]_{y-1 \text{ to } y-3}), [\text{Corn production}]_{y} * 0.09)$

$[\text{CCC percent placed}]_{Q1} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3, Q1}$

$[\text{CCC percent placed}]_{Q2} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3, Q2}$

$[\text{CCC percent placed}]_{Q3} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3, Q3}$

$[\text{CCC percent placed}]_{Q4} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3, Q4}$

$[\text{CCC placements}]_{Q1} = [\text{CCC crop year placements}]_{y-1} * [\text{CCC percent placed}]_{Q1}$

$[\text{CCC placements}]_{Q2} = [\text{CCC crop year placements}]_{y-1} * [\text{CCC percent placed}]_{Q2}$

$[\text{CCC placements}]_{Q3} = [\text{CCC crop year placements}]_{y} * [\text{CCC percent placed}]_{Q3}$

$[\text{CCC placements}]_{Q4} = [\text{CCC crop year placements}]_{y} * [\text{CCC percent placed}]_{Q4}$

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[6]Quantity and price units are bushels.

$[\text{CCC placements value}]_{Q1} = [\text{CCC placements}]_{Q1} * [\text{CCC loan rate}]_{y-1}$
$[\text{CCC placements value}]_{Q2} = [\text{CCC placements}]_{Q2} * [\text{CCC loan rate}]_{y-1}$
$[\text{CCC placements value}]_{Q3} = [\text{CCC placements}]_{Q3} * [\text{CCC loan rate}]_{y}$
$[\text{CCC placements value}]_{Q4} = [\text{CCC placements}]_{Q4} * [\text{CCC loan rate}]_{y}$

Open Market Activities

$[\text{Open–market quantity sold}]_{y} = [\text{Corn production}]_{y} * (1 - [\text{Percent used on farm}]_{y}) - [\text{CCC placements}]_{y}$

$[\text{Percent marketed}]_{Q1,y-1} = \text{Average: } [\text{Percent marketed}]_{Q1,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q2,y-1} = \text{Average: } [\text{Percent marketed}]_{Q2,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q3,y-1} = \text{Average: } [\text{Percent marketed}]_{Q3,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q3,y} = \text{Average: } [\text{Percent marketed}]_{Q3,y-1 \text{ to } y-3}$
$[\text{Percent marketed}]_{Q4,y} = \text{Average: } [\text{Percent marketed}]_{Q4,y-1 \text{ to } y-3}$

$[\text{Open–market quantity sold}]_{Q1} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q1,y-1}$
$[\text{Open–market quantity sold}]_{Q2} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q2,y-1}$
$[\text{Open–market quantity sold}]_{Q3} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q3,y-1} +$
$\qquad [\text{Open–market quantity sold}]_{y} * [\text{Percent marketed}]_{Q3,y}$
$[\text{Open–market quantity sold}]_{Q4} = [\text{Open–market quantity sold}]_{y} * [\text{Percent marketed}]_{Q4,y}$

$[\text{Open–market sales}]_{Q1} = [\text{Open–market quantity sold}]_{Q1} * [\text{Open–market price}]_{Q1}$
$[\text{Open–market sales}]_{Q2} = [\text{Open–market quantity sold}]_{Q2} * [\text{Open–market price}]_{Q2}$
$[\text{Open–market sales}]_{Q3} = [\text{Open–market quantity sold}]_{Q3} * [\text{Open–market price}]_{Q3}$
$[\text{Open–market sales}]_{Q4} = [\text{Open–market quantity sold}]_{Q4} * [\text{Open–market price}]_{Q4}$

$[\text{Corn cash receipts}]_{Q1} = [\text{Open–market sales}]_{Q1} + [\text{CCC Placement values}]_{Q1}$
$[\text{Corn cash receipts}]_{Q2} = [\text{Open–market sales}]_{Q2} + [\text{CCC Placement values}]_{Q2}$
$[\text{Corn cash receipts}]_{Q3} = [\text{Open–market sales}]_{Q3} + [\text{CCC Placement values}]_{Q3}$
$[\text{Corn cash receipts}]_{Q4} = [\text{Open–market sales}]_{Q4} + [\text{CCC Placement values}]_{Q4}$
$[\text{Corn cash receipts}]_{t} = [\text{Corn cash receipts}]_{Q1} + [\text{Corn cash receipts}]_{Q2} + [\text{Corn cash receipts}]_{Q3} +$
$\qquad [\text{Corn cash receipts}]_{Q4}$

Sorghum Cash Receipts[7]

Commodity Credit Corporation (CCC) Activities

$[\text{Crop year CCC placements}]_{y} = \text{IF(Average: } [\text{Crop year CCC placements}]_{y-1 \text{ to } y-3} /$
$\qquad [\text{Sorghum production}]_{y-1 \text{ to } y-3} < 0.01, [\text{Sorghum production}]_{y} * (\text{Average: } [\text{Crop year CCC}$
$\qquad \text{placements}]_{y-1 \text{ to } y-3} / [\text{Sorghum production}]_{y-1 \text{ to } y-3}), [\text{Sorghum production}]_{y} * 0.01)$

$[\text{CCC percent placed}]_{Q1} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3,Q1}$
$[\text{CCC percent placed}]_{Q2} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3,Q2}$
$[\text{CCC percent placed}]_{Q3} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3,Q3}$
$[\text{CCC percent placed}]_{Q4} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3,Q4}$

$[\text{CCC placements}]_{Q1} = [\text{CCC crop year placements}]_{y-1} * [\text{CCC percent placed}]_{Q1}$
$[\text{CCC placements}]_{Q2} = [\text{CCC crop year placements}]_{y-1} * [\text{CCC percent placed}]_{Q2}$
$[\text{CCC placements}]_{Q3} = [\text{CCC crop year placements}]_{y} * [\text{CCC percent placed}]_{Q3}$
$[\text{CCC placements}]_{Q4} = [\text{CCC crop year placements}]_{y} * [\text{CCC percent placed}]_{Q4}$

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[7]Quantity and price units are bushels.

$[\text{CCC placements value}]_{Q1} = [\text{CCC placements}]_{Q1} * [\text{CCC loan rate}]_{y-1}$
$[\text{CCC placements value}]_{Q2} = [\text{CCC placements}]_{Q2} * [\text{CCC loan rate}]_{y-1}$
$[\text{CCC placements value}]_{Q3} = [\text{CCC placements}]_{Q3} * [\text{CCC loan rate}]_{y}$
$[\text{CCC placements value}]_{Q4} = [\text{CCC placements}]_{Q4} * [\text{CCC loan rate}]_{y}$

Open Market Activities

$[\text{Open–market quantity sold}]_{y} = [\text{Sorghum production}]_{y} * (1 - [\text{Percent used on farm}]_{y}) - [\text{CCC placements}]_{y}$

$[\text{Percent marketed}]_{Q1,y-1} = \text{Average: } [\text{Percent marketed}]_{Q1,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q2,y-1} = \text{Average: } [\text{Percent marketed}]_{Q2,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q3,y-1} = \text{Average: } [\text{Percent marketed}]_{Q3,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q3,y} = \text{Average: } [\text{Percent marketed}]_{Q3,y-1 \text{ to } y-3}$
$[\text{Percent marketed}]_{Q4,y} = \text{Average: } [\text{Percent marketed}]_{Q4,y-1 \text{ to } y-3}$

$[\text{Open–market quantity sold}]_{Q1} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q1,y-1}$
$[\text{Open–market quantity sold}]_{Q2} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q2,y-1}$
$[\text{Open–market quantity sold}]_{Q3} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q3,y-1} + [\text{Open–market quantity sold}]_{y} * [\text{Percent marketed}]_{Q3,y}$
$[\text{Open–market quantity sold}]_{Q4} = [\text{Open–market quantity sold}]_{y} * [\text{Percent marketed}]_{Q4,y}$

$[\text{Open–market sales}]_{Q1} = [\text{Open–market quantity sold}]_{Q1} * [\text{Open–market price}]_{Q1}$
$[\text{Open–market sales}]_{Q2} = [\text{Open–market quantity sold}]_{Q2} * [\text{Open–market price}]_{Q2}$
$[\text{Open–market sales}]_{Q3} = [\text{Open–market quantity sold}]_{Q3} * [\text{Open–market price}]_{Q3}$
$[\text{Open–market sales}]_{Q4} = [\text{Open–market quantity sold}]_{Q4} * [\text{Open–market price}]_{Q4}$

$[\text{Sorghum cash receipts}]_{Q1} = [\text{Open–market sales}]_{Q1} + [\text{CCC Placement values}]_{Q1}$
$[\text{Sorghum cash receipts}]_{Q2} = [\text{Open–market sales}]_{Q2} + [\text{CCC Placement values}]_{Q2}$
$[\text{Sorghum cash receipts}]_{Q3} = [\text{Open–market sales}]_{Q3} + [\text{CCC Placement values}]_{Q3}$
$[\text{Sorghum cash receipts}]_{Q4} = [\text{Open–market sales}]_{Q4} + [\text{CCC Placement values}]_{Q4}$
$[\text{Sorghum cash receipts}]_{t} = [\text{Sorghum cash receipts}]_{Q1} + [\text{Sorghum cash receipts}]_{Q2} + [\text{Sorghum cash receipts}]_{Q3} + [\text{Sorghum cash receipts}]_{Q4}$

Barley Cash Receipts[8]

Commodity Credit Corporation (CCC) Activities

$[\text{Crop year CCC placements}]_{y} = \text{IF}(\text{Average: } [\text{Crop year CCC placements}]_{y-1 \text{ to } y-3} / [\text{Barley production }_{y-1 \text{ to } y-3}] < 0.02, [\text{Barley production}]_{y} * (\text{Average: } [\text{Crop year CCC placements}]_{y-1 \text{ to } y-3} / [\text{Barley production}]_{y-1 \text{ to } y-3}), [\text{Barley production}]_{y} * 0.02)$

$[\text{CCC percent placed}]_{Q1} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3, Q1}$
$[\text{CCC percent placed}]_{Q2} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3, Q2}$
$[\text{CCC percent placed}]_{Q3} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3, Q3}$
$[\text{CCC percent placed}]_{Q4} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3, Q4}$

$[\text{CCC placements}]_{Q1} = [\text{CCC crop year placements}]_{y-1} * [\text{CCC percent placed}]_{Q1}$
$[\text{CCC placements}]_{Q2} = [\text{CCC crop year placements}]_{y} * [\text{CCC percent placed}]_{Q2}$
$[\text{CCC placements}]_{Q3} = [\text{CCC crop year placements}]_{y} * [\text{CCC percent placed}]_{Q3}$
$[\text{CCC placements}]_{Q4} = [\text{CCC crop year placements}]_{y} * [\text{CCC percent placed}]_{Q4}$

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[8]Quantity and price units are bushels.

[CCC placements value]$_{Q1}$ = [CCC placements]$_{Q1}$ * [CCC loan rate]$_{y-1}$
[CCC placements value]$_{Q2}$ = [CCC placements]$_{Q2}$ * [CCC loan rate]$_y$
[CCC placements value]$_{Q3}$ = [CCC placements]$_{Q3}$ * [CCC loan rate]$_y$
[CCC placements value]$_{Q4}$ = [CCC placements]$_{Q4}$ * [CCC loan rate]$_y$

Open Market Activities

[Open–market quantity sold]$_y$ = [Barley production]$_y$ * (1 − [Percent used on farm]$_y$) − [CCC placements]$_y$

[Percent marketed]$_{Q1,y-1}$ = Average: [Percent marketed]$_{Q1,y-2\ to\ y-4}$
[Percent marketed]$_{Q2,y-1}$ = Average: [Percent marketed]$_{Q2,y-2\ ro\ y-4}$
[Percent marketed]$_{Q2,y}$ = Average: [Percent marketed]$_{Q2,y-1\ to\ y-3}$
[Percent marketed]$_{Q3,y}$ = Average: [Percent marketed]$_{Q3,y-1\ to\ y-3}$
[Percent marketed]$_{Q4,y}$ = Average: [Percent marketed]$_{Q4,y-1\ to\ y-3}$

[Open–market quantity sold]$_{Q1}$ = [Open–market quantity sold]$_{y-1}$ * [Percent marketed]$_{Q1,y-1}$
[Open–market quantity sold]$_{Q2}$ = [Open–market quantity sold]$_{y-1}$ * [Percent marketed]$_{Q2,y-1}$ +
     [Open–market quantity sold]$_y$ * [Percent marketed]$_{Q2,y}$
[Open–market quantity sold]$_{Q3}$ = [Open–market quantity sold]$_y$ * [Percent marketed]$_{Q3,y}$
[Open–market quantity sold]$_{Q4}$ = [Open–market quantity sold]$_y$ * [Percent marketed]$_{Q4,y}$

[Open–market sales]$_{Q1}$ = [Open–market quantity sold]$_{Q1}$ * [Open–market price]$_{Q1}$
[Open–market sales]$_{Q2}$ = [Open–market quantity sold]$_{Q2}$ * [Open–market price]$_{Q2}$
[Open–market sales]$_{Q3}$ = [Open–market quantity sold]$_{Q3}$ * [Open–market price]$_{Q3}$
[Open–market sales]$_{Q4}$ = [Open–market quantity sold]$_{Q4}$ * [Open–market price]$_{Q4}$

[Barley cash receipts]$_{Q1}$ = [Open–market sales]$_{Q1}$ + [CCC Placement values]$_{Q1}$
[Barley cash receipts]$_{Q2}$ = [Open–market sales]$_{Q2}$ + [CCC Placement values]$_{Q2}$
[Barley cash receipts]$_{Q3}$ = [Open–market sales]$_{Q3}$ + [CCC Placement values]$_{Q3}$
[Barley cash receipts]$_{Q4}$ = [Open–market sales]$_{Q4}$ + [CCC Placement values]$_{Q4}$
[Barley cash receipts]$_t$ = [Barley cash receipts]$_{Q1}$ + [Barley cash receipts]$_{Q2}$ +
     [Barley cash receipts]$_{Q3}$ + [Barley cash receipts]$_{Q4}$

Oats Cash Receipts[9]

Commodity Credit Corporation (CCC) Activities

[Crop year CCC placements]$_y$ = IF(Average: [Crop year CCC placements]$_{y-1\ to\ y-3}$ /
     [Oats production $_{y-1\ to\ y-3}$] < 0.01, [Oats production]$_y$ * (Average: [Crop year CCC placements]$_{y-1\ to\ y-3}$ /
     [Oats production]$_{y-1\ to\ y-3}$]), [Oats production]$_y$ * 0.01)

[CCC percent placed]$_{Q1}$ = Average: [CCC percent placed]$_{t-1\ to\ t-3,\ Q1}$
[CCC percent placed]$_{Q2}$ = Average: [CCC percent placed]$_{t-1\ to\ t-3,\ Q2}$
[CCC percent placed]$_{Q3}$ = Average: [CCC percent placed]$_{t-1\ to\ t-3,\ Q3}$
[CCC percent placed]$_{Q4}$ = Average: [CCC percent placed]$_{t-1\ to\ t-3,\ Q4}$

[CCC placements]$_{Q1}$ = [CCC placements]$_{y-1}$ * [CCC percent placed]$_{Q1}$
[CCC placements]$_{Q2}$ = [CCC placements]$_y$ * [CCC percent placed]$_{Q2}$
[CCC placements]$_{Q3}$ = [CCC placements]$_y$ * [CCC percent placed]$_{Q3}$
[CCC placements]$_{Q4}$ = [CCC placements]$_y$ * [CCC percent placed]$_{Q4}$

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[9]Quantity and price units are bushels.

$[\text{CCC placements value}]_{Q1} = [\text{CCC placements}]_{Q1} * [\text{CCC loan rate}]_{y-1}$
$[\text{CCC placements value}]_{Q2} = [\text{CCC placements}]_{Q2} * [\text{CCC loan rate}]_{y}$
$[\text{CCC placements value}]_{Q3} = [\text{CCC placements}]_{Q3} * [\text{CCC loan rate}]_{y}$
$[\text{CCC placements value}]_{Q4} = [\text{CCC placements}]_{Q4} * [\text{CCC loan rate}]_{y}$

Open Market Activities

$[\text{Open--market quantity sold}]_{y} = [\text{Oats production}]_{y} * (1 - [\text{Percent used on farm}]_{y}) - [\text{CCC placements}]_{y}$

$[\text{Percent marketed}]_{Q1,y-1} = \text{Average: } [\text{Percent marketed}]_{Q1,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q2,y-1} = \text{Average: } [\text{Percent marketed}]_{Q2,y-2 \text{ ro } y-4}$
$[\text{Percent marketed}]_{Q2,y} = \text{Average: } [\text{Percent marketed}]_{Q2,y-1 \text{ to } y-3}$
$[\text{Percent marketed}]_{Q3,y} = \text{Average: } [\text{Percent marketed}]_{Q3,y-1 \text{ to } y-3}$
$[\text{Percent marketed}]_{Q4,y} = \text{Average: } [\text{Percent marketed}]_{Q4,y-1 \text{ to } y-3}$

$[\text{Open--market quantity sold}]_{Q1} = [\text{Open--market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q1,y-1}$
$[\text{Open--market quantity sold}]_{Q2} = [\text{Open--market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q2,y-1} +$
$\quad [\text{Open--market quantity sold}]_{y} * [\text{Percent marketed}]_{Q2,y}$
$[\text{Open--market quantity sold}]_{Q3} = [\text{Open--market quantity sold}]_{y} * [\text{Percent marketed}]_{Q3,y}$
$[\text{Open--market quantity sold}]_{Q4} = [\text{Open--market quantity sold}]_{y} * [\text{Percent marketed}]_{Q4,y}$

$[\text{Open--market sales}]_{Q1} = [\text{Open--market quantity sold}]_{Q1} * [\text{Open--market price}]_{Q1}$
$[\text{Open--market sales}]_{Q2} = [\text{Open--market quantity sold}]_{Q2} * [\text{Open--market price}]_{Q2}$
$[\text{Open--market sales}]_{Q3} = [\text{Open--market quantity sold}]_{Q3} * [\text{Open--market price}]_{Q3}$
$[\text{Open--market sales}]_{Q4} = [\text{Open--market quantity sold}]_{Q4} * [\text{Open--market price}]_{Q4}$

$[\text{Oats cash receipts}]_{Q1} = [\text{Open--market sales}]_{Q1} + [\text{CCC Placement values}]_{Q1}$
$[\text{Oats cash receipts}]_{Q2} = [\text{Open--market sales}]_{Q2} + [\text{CCC Placement values}]_{Q2}$
$[\text{Oats cash receipts}]_{Q3} = [\text{Open--market sales}]_{Q3} + [\text{CCC Placement values}]_{Q3}$
$[\text{Oats cash receipts}]_{Q4} = [\text{Open--market sales}]_{Q4} + [\text{CCC Placement values}]_{Q4}$
$[\text{Oats cash receipts}]_{t} = [\text{Oats cash receipts}]_{Q1} + [\text{Oats cash receipts}]_{Q2} + [\text{Oats cash receipts}]_{Q3} +$
$\quad [\text{Oats cash receipts}]_{Q4}$

Hay Cash Receipts[10]

$[\text{Open--market quantity sold}]_{y} = [\text{Hay production}]_{y} * (1 - [\text{Percent used on farm}]_{y})$

$[\text{Percent marketed}]_{Q1,y-1} = \text{Average: } [\text{Percent marketed}]_{Q1,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q2,y-1} = \text{Average: } [\text{Percent marketed}]_{Q2,y-2 \text{ ro } y-4}$
$[\text{Percent marketed}]_{Q2,y} = \text{Average: } [\text{Percent marketed}]_{Q2,y-1 \text{ to } y-3}$
$[\text{Percent marketed}]_{Q3,y} = \text{Average: } [\text{Percent marketed}]_{Q3,y-1 \text{ to } y-3}$
$[\text{Percent marketed}]_{Q4,y} = \text{Average: } [\text{Percent marketed}]_{Q4,y-1 \text{ to } y-3}$

$[\text{Open--market quantity sold}]_{Q1} = [\text{Open--market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q1,y-1}$
$[\text{Open--market quantity sold}]_{Q2} = [\text{Open--market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q2,y-1} +$
$\quad [\text{Open--market quantity sold}]_{y} * [\text{Percent marketed}]_{Q2,y}$
$[\text{Open--market quantity sold}]_{Q3} = [\text{Open--market quantity sold}]_{y} * [\text{Percent marketed}]_{Q3,y}$
$[\text{Open--market quantity sold}]_{Q4} = [\text{Open--market quantity sold}]_{y} * [\text{Percent marketed}]_{Q4,y}$

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[10]Quantity and price units are tons.

$[\text{Open–market sales}]_{Q1} = [\text{Open–market quantity sold}]_{Q1} * [\text{Open–market price}]_{Q1}$
$[\text{Open–market sales}]_{Q2} = [\text{Open–market quantity sold}]_{Q2} * [\text{Open–market price}]_{Q2}$
$[\text{Open–market sales}]_{Q3} = [\text{Open–market quantity sold}]_{Q3} * [\text{Open–market price}]_{Q3}$
$[\text{Open–market sales}]_{Q4} = [\text{Open–market quantity sold}]_{Q4} * [\text{Open–market price}]_{Q4}$

$[\text{Hay cash receipts}]_{Q1} = [\text{Open–market sales}]_{Q1}$
$[\text{Hay cash receipts}]_{Q2} = [\text{Open–market sales}]_{Q2}$
$[\text{Hay cash receipts}]_{Q3} = [\text{Open–market sales}]_{Q3}$
$[\text{Hay cash receipts}]_{Q4} = [\text{Open–market sales}]_{Q4}$
$[\text{Hay cash receipts}]_{t} = [\text{Hay cash receipts}]_{Q1} + [\text{Hay cash receipts}]_{Q2} + [\text{Hay cash receipts}]_{Q3} + [\text{Hay cash receipts}]_{Q4}$

Oilseeds Cash Receipts

$[\text{Oilseeds cash receipts}]_{Q1} = [\text{Soybean cash receipts}]_{Q1} + [\text{Peanut cash receipts}]_{Q1} + [\text{Sunflowerseed cash receipts}]_{Q1}$
$\quad + [\text{Other oilseed cash receipts}]_{Q1}$
$[\text{Oilseeds cash receipts}]_{Q2} = [\text{Soybean cash receipts}]_{Q2} + [\text{Sunflowerseed cash receipts}]_{Q2}$
$\quad + [\text{Other oilseed cash receipts}]_{Q2}$
$[\text{Oilseeds cash receipts}]_{Q3} = [\text{Soybean cash receipts}]_{Q3} + [\text{Peanut cash receipts}]_{Q3} + [\text{Sunflowerseed cash receipts}]_{Q3}$
$\quad + [\text{Other oilseed cash receipts}]_{Q3}$
$[\text{Oilseeds cash receipts}]_{Q4} = [\text{Soybean cash receipts}]_{Q4} + [\text{Peanut cash receipts}]_{Q4} + [\text{Sunflowerseed cash receipts}]_{Q4}$
$\quad + [\text{Other oilseed cash receipts}]_{Q4}$
$[\text{Oilseeds cash receipts}]_{t} = [\text{Oilseeds cash receipts}]_{Q1} + [\text{Oilseeds cash receipts}]_{Q2} +$
$\quad [\text{Oilseeds cash receipts}]_{Q3} + [\text{Oilseeds cash receipts}]_{Q4}$

Soybean Cash Receipts[11]

Commodity Credit Corporation (CCC) Activities

$[\text{Crop year CCC placements}]_{y} = \text{IF(Average: } [\text{Crop year CCC placements}]_{y\text{-1 to y-3}} /$
$\quad [\text{Soybean production}_{y\text{-1 to y-3}}] < 0.05, [\text{Soybean production}]_{y} * (\text{Average: } [\text{Crop year CCC}$
$\quad \text{placements}]_{y\text{-1 to y-3}} / [\text{Soybean production}]_{y\text{-1 to y-3}}), [\text{Soybean production}]_{y} * 0.05)$

$[\text{CCC percent placed}]_{Q1} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3, Q1}$
$[\text{CCC percent placed}]_{Q2} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3, Q2}$
$[\text{CCC percent placed}]_{Q3} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3, Q3}$
$[\text{CCC percent placed}]_{Q4} = \text{Average: } [\text{CCC percent placed}]_{t-1 \text{ to } t-3, Q4}$

$[\text{CCC placements}]_{Q1} = [\text{CCC crop year placements}]_{y-1} * [\text{CCC percent placed}]_{Q1}$
$[\text{CCC placements}]_{Q2} = [\text{CCC crop year placements}]_{y-1} * [\text{CCC percent placed}]_{Q2}$
$[\text{CCC placements}]_{Q3} = [\text{CCC crop year placements}]_{y} * [\text{CCC percent placed}]_{Q3}$
$[\text{CCC placements}]_{Q4} = [\text{CCC crop year placements}]_{y} * [\text{CCC percent placed}]_{Q4}$

$[\text{CCC placements value}]_{Q1} = [\text{CCC placements}]_{Q1} * [\text{CCC loan rate}]_{y-1}$
$[\text{CCC placements value}]_{Q2} = [\text{CCC placements}]_{Q2} * [\text{CCC loan rate}]_{y-1}$
$[\text{CCC placements value}]_{Q3} = [\text{CCC placements}]_{Q3} * [\text{CCC loan rate}]_{y}$
$[\text{CCC placements value}]_{Q4} = [\text{CCC placements}]_{Q4} * [\text{CCC loan rate}]_{y}$

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[11]Quantity and price units are bushels.

Open Market Activities

$[\text{Open–market quantity sold}]_y = [\text{Soybean production}]_y * (1 - [\text{Percent used on farm}]_y) - [\text{CCC Placements quantity}]_y$

$[\text{Percent marketed}]_{Q1,y-1} = \text{Average: } [\text{Percent marketed}]_{Q1,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q2,y-1} = \text{Average: } [\text{Percent marketed}]_{Q2,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q3,y-1} = \text{Average: } [\text{Percent marketed}]_{Q3,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q3,y} = \text{Average: } [\text{Percent marketed}]_{Q3,y-1 \text{ to } y-3}$
$[\text{Percent marketed}]_{Q4,y} = \text{Average: } [\text{Percent marketed}]_{Q4,y-1 \text{ to } y-3}$

$[\text{Open–market quantity sold}]_{Q1} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q1,y-1}$
$[\text{Open–market quantity sold}]_{Q2} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q2,y-1}$
$[\text{Open–market quantity sold}]_{Q3} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q3,y-1}$
$\quad + [\text{Open–market quantity sold}]_y * [\text{Percent marketed}]_{Q3,y}$
$[\text{Open–market quantity sold}]_{Q4} = [\text{Open–market quantity sold}]_y * [\text{Percent marketed}]_{Q4,y}$

$[\text{Open–market sales}]_{Q1} = [\text{Open–market quantity sold}]_{Q1} * [\text{Open–market price}]_{Q1}$
$[\text{Open–market sales}]_{Q2} = [\text{Open–market quantity sold}]_{Q2} * [\text{Open–market price}]_{Q2}$
$[\text{Open–market sales}]_{Q3} = [\text{Open–market quantity sold}]_{Q3} * [\text{Open–market price}]_{Q3}$
$[\text{Open–market sales}]_{Q4} = [\text{Open–market quantity sold}]_{Q4} * [\text{Open–market price}]_{Q4}$

$[\text{Soybean cash receipts}]_{Q1} = [\text{Open–market sales}]_{Q1} + [\text{CCC Placement values}]_{Q1}$
$[\text{Soybean cash receipts}]_{Q2} = [\text{Open–market sales}]_{Q2} + [\text{CCC Placement values}]_{Q2}$
$[\text{Soybean cash receipts}]_{Q3} = [\text{Open–market sales}]_{Q3} + [\text{CCC Placement values}]_{Q3}$
$[\text{Soybean cash receipts}]_{Q4} = [\text{Open–market sales}]_{Q4} + [\text{CCC Placement values}]_{Q4}$
$[\text{Soybean cash receipts}]_t = [\text{Soybean cash receipts}]_{Q1} + [\text{Soybean cash receipts}]_{Q2} + [\text{Soybean cash receipts}]_{Q3} + [\text{Soybean cash receipts}]_{Q4}$

Peanut Cash Receipts[12]

$[\text{Open–market quantity sold}]_y = [\text{Peanut production}]_y$

$[\text{Percent marketed}]_{Q1,y-1} = \text{Average: } [\text{Percent marketed}]_{Q1,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q3,y} = \text{Average: } [\text{Percent marketed}]_{Q3,y-1 \text{ to } y-3}$
$[\text{Percent marketed}]_{Q4,y} = \text{Average: } [\text{Percent marketed}]_{Q4,y-1 \text{ ro } y-3}$

$[\text{Open–market quantity sold}]_{Q1} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q1,y-1}$
$[\text{Open–market quantity sold}]_{Q3} = [\text{Open–market quantity sold}]_y * [\text{Percent marketed}]_{Q3,y}$
$[\text{Open–market quantity sold}]_{Q4} = [\text{Open–market quantity sold}]_y * [\text{Percent marketed}]_{Q4,y}$

$[\text{Open–market sales}]_{Q1} = [\text{Open–market quantity sold}]_{Q1} * [\text{Open–market price}]_{Q1}$
$[\text{Open–market sales}]_{Q3} = [\text{Open–market quantity sold}]_{Q3} * [\text{Open–market price}]_{Q3}$
$[\text{Open–market sales}]_{Q4} = [\text{Open–market quantity sold}]_{Q4} * [\text{Open–market price}]_{Q4}$

$[\text{Peanut cash receipts}]_{Q1} = [\text{Open–market sales}]_{Q1}$
$[\text{Peanut cash receipts}]_{Q3} = [\text{Open–market sales}]_{Q3}$
$[\text{Peanut cash receipts}]_{Q4} = [\text{Open–market sales}]_{Q4}$

$[\text{Peanut cash receipts}]_t = [\text{Peanut cash receipts}]_{Q1} + [\text{Peanut cash receipts}]_{Q3} + [\text{Peanut cash receipts}]_{Q4}$

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[12]Quantity and price units are pounds.

<u>Sunflowerseed Cash Receipts</u>[13]

$[\text{Open–market quantity sold}]_y = [\text{Sunflowerseed production}]_y$

$[\text{Percent marketed}]_{Q1,y-1} = \text{Average: } [\text{Percent marketed}]_{Q1,y-2 \text{ to y-4}}$
$[\text{Percent marketed}]_{Q2,y-1} = \text{Average: } [\text{Percent marketed}]_{Q2,y-2 \text{ to y-4}}$
$[\text{Percent marketed}]_{Q3,y-1} = \text{Average: } [\text{Percent marketed}]_{Q3,y-2 \text{ to y-4}}$
$[\text{Percent marketed}]_{Q3,y} = \text{Average: } [\text{Percent marketed}]_{Q3,y-1 \text{ to y-3}}$
$[\text{Percent marketed}]_{Q4,y} = \text{Average: } [\text{Percent marketed}]_{Q4,y-1 \text{ to y-3}}$

$[\text{Open–market quantity sold}]_{Q1} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q1,y-1}$
$[\text{Open–market quantity sold}]_{Q2} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q2,y-1}$
$[\text{Open–market quantity sold}]_{Q3} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q3,y-1} +$
$\qquad [\text{Open–market quantity sold}]_y * [\text{Percent marketed}]_{Q3,y}$
$[\text{Open–market quantity sold}]_{Q4} = [\text{Open–market quantity sold}]_y * [\text{Percent marketed}]_{Q4,y}$

$[\text{Open–market sales}]_{Q1} = [\text{Open–market quantity sold}]_{Q1} * [\text{Open–market price}]_{Q1} * 0.024$
$[\text{Open–market sales}]_{Q2} = [\text{Open–market quantity sold}]_{Q2} * [\text{Open–market price}]_{Q2} * 0.024$
$[\text{Open–market sales}]_{Q3} = [\text{Open–market quantity sold}]_{Q3} * [\text{Open–market price}]_{Q3} * 0.024$
$[\text{Open–market sales}]_{Q4} = [\text{Open–market quantity sold}]_{Q4} * [\text{Open–market price}]_{Q4} * 0.024$

$[\text{Sunflowerseed cash receipts}]_{Q1} = [\text{Open–market sales}]_{Q1}$
$[\text{Sunflowerseed cash receipts}]_{Q2} = [\text{Open–market sales}]_{Q2}$
$[\text{Sunflowerseed cash receipts}]_{Q3} = [\text{Open–market sales}]_{Q3}$
$[\text{Sunflowerseed cash receipts}]_{Q4} = [\text{Open–market sales}]_{Q4}$
$[\text{Sunflowerseed cash receipts}]_t = [\text{Sunflowerseed cash receipts}]_{Q1} + [\text{Sunflowerseed cash receipts}]_{Q2} +$
$\qquad [\text{Sunflowerseed cash receipts}]_{Q3} + [\text{Sunflowerseed cash receipts}]_{Q4}$

<u>Other Oilseed Crop Cash Receipts</u>

$[\text{Other oilseed crop cash receipts}]_{Q1} = [\text{Other oilseed crop cash receipts}]_{Q1,t-1} *$
$\qquad [\text{Soybean cash receipts}]_{Q1,t} / [\text{Soybean cash receipts}]_{Q1,t-1}$
$[\text{Other oilseed crop cash receipts}]_{Q2} = [\text{Other oilseed crop cash receipts}]_{Q2,t-1} *$
$\qquad [\text{Soybean cash receipts}]_{Q2,t} / [\text{Soybean cash receipts}]_{Q2,t-1}$
$[\text{Other oilseed crop cash receipts}]_{Q3} = [\text{Other oilseed crop cash receipts}]_{Q3,t-1} *$
$\qquad [\text{Soybean cash receipts}]_{Q3,t} / [\text{Soybean cash receipts}]_{Q3,t-1}$
$[\text{Other oilseed crop cash receipts}]_{Q4} = [\text{Other oilseed crop cash receipts}]_{Q4,t-1} *$
$\qquad [\text{Soybean cash receipts}]_{Q4,t} / [\text{Soybean cash receipts}]_{Q4,t-1}$
$[\text{Other oilseed crop cash receipts}]_t = [\text{Other oilseed crop cash receipts}]_{Q1} + [\text{Other oilseed crop cash receipts}]_{Q2} +$
$\qquad [\text{Other oilseed crop cash receipts}]_{Q3} + [\text{Other oilseed crop cash receipts}]_{Q4}$

<u>Cotton Cash Receipts</u>

$[\text{Cotton cash receipts}]_{Q1} = [\text{Cotton lint cash receipts}]_{Q1} + [\text{Cottonseed cash receipts}]_{Q1}$
$[\text{Cotton cash receipts}]_{Q2} = [\text{Cotton lint cash receipts}]_{Q2}$
$[\text{Cotton cash receipts}]_{Q3} = [\text{Cotton lint cash receipts}]_{Q3} + [\text{Cottonseed cash receipts}]_{Q3}$
$[\text{Cotton cash receipts}]_{Q4} = [\text{Cotton lint cash receipts}]_{Q4} + [\text{Cottonseed cash receipts}]_{Q4}$
$[\text{Cotton cash receipts}]_t = [\text{Total Cotton cash receipts}]_{Q1} + [\text{Total Cotton cash receipts}]_{Q2} +$
$\qquad [\text{Total Cotton cash receipts}]_{Q3} + [\text{Total Cotton cash receipts}]_{Q4}$

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[13]Quantity units are metric tons. Price units are per cwt. This difference creates need for conversion in the calculation of Open-market sales.

Cotton Lint Cash Receipts[14]

Commodity Credit Corporation (CCC) Activities

[Crop year CCC placements]$_y$ = IF(Average: [Crop year CCC placements]$_{y\text{-}1 \text{ to } y\text{-}3}$ /
        [Cotton production $_{y\text{-}1 \text{ to } y\text{-}3}$] < 0.14, [Cotton production]$_y$ * (Average: [Crop year CCC placements]$_{y\text{-}1 \text{ to } y\text{-}3}$ /
        [Cotton production]$_{y\text{-}1 \text{ to } y\text{-}3}$]), [Cotton production]$_y$ * 0.14)

[CCC percent placed]$_{Q1}$ = Average: [CCC percent placed]$_{t\text{–}1 \text{ to } t\text{–}3, Q1}$
[CCC percent placed]$_{Q2}$ = Average: [CCC percent placed]$_{t\text{–}1 \text{ to } t\text{–}3, Q2}$
[CCC percent placed]$_{Q3}$ = Average: [CCC percent placed]$_{t\text{–}1 \text{ to } t\text{–}3, Q3}$
[CCC percent placed]$_{Q4}$ = Average: [CCC percent placed]$_{t\text{–}1 \text{ to } t\text{–}3, Q4}$

[CCC placements]$_{Q1}$ = [CCC crop year placements]$_{y\text{–}1}$ * [CCC percent placed]$_{Q1}$
[CCC placements]$_{Q2}$ = [CCC crop year placements]$_{y\text{–}1}$ * [CCC percent placed]$_{Q2}$
[CCC placements]$_{Q3}$ = [CCC crop year placements]$_y$ * [CCC percent placed]$_{Q3}$
[CCC placements]$_{Q4}$ = [CCC crop year placements]$_y$ * [CCC percent placed]$_{Q4}$

[CCC placements value]$_{Q1}$ = [CCC placements]$_{Q1}$ * [CCC loan rate]$_{y\text{–}1}$
[CCC placements value]$_{Q2}$ = [CCC placements]$_{Q2}$ * [CCC loan rate]$_{y\text{–}1}$
[CCC placements value]$_{Q3}$ = [CCC placements]$_{Q3}$ * [CCC loan rate]$_y$
[CCC placements value]$_{Q4}$ = [CCC placements]$_{Q4}$ * [CCC loan rate]$_y$

Open Market Activities

[Open–market quantity sold]$_y$ = [Cotton lint production]$_y$ – [CCC Placements quantity]$_y$

[Percent marketed]$_{Q1, y\text{–}1}$ = Average: [Percent marketed]$_{Q1, y\text{–}2 \text{ to } y\text{-}4}$
[Percent marketed]$_{Q2, y\text{–}1}$ = Average: [Percent marketed]$_{Q2, y\text{–}2 \text{ to } y\text{-}4}$
[Percent marketed]$_{Q3, y\text{–}1}$ = Average: [Percent marketed]$_{Q3, y\text{–}2 \text{ to } y\text{-}4}$
[Percent marketed]$_{Q3, y}$ = Average: [Percent marketed]$_{Q3, y\text{–}1 \text{ to } y\text{-}3}$
[Percent marketed]$_{Q4, y}$ = Average: [Percent marketed]$_{Q4, y\text{–}1 \text{ to } y\text{-}3}$

[Open–market quantity sold]$_{Q1}$ = [Open–market quantity sold]$_{y\text{–}1}$ * [Percent marketed]$_{Q1, y\text{–}1}$
[Open–market quantity sold]$_{Q2}$ = [Open–market quantity sold]$_{y\text{–}1}$ * [Percent marketed]$_{Q2, y\text{–}1}$
[Open–market quantity sold]$_{Q3}$ = [Open–market quantity sold]$_{y\text{–}1}$ * [Percent marketed]$_{Q3, y\text{–}1}$ +
        [Open–market quantity sold]$_y$ * [Percent marketed]$_{Q3, y}$
[Open–market quantity sold]$_{Q4}$ = [Open–market quantity sold]$_y$ * [Percent marketed]$_{Q4, y}$

[Open–market sales]$_{Q1}$ = [Open–market quantity sold]$_{Q1}$ * [Open–market price]$_{Q1}$ * 0.48
[Open–market sales]$_{Q2}$ = [Open–market quantity sold]$_{Q2}$ * [Open–market price]$_{Q2}$ * 0.48
[Open–market sales]$_{Q3}$ = [Open–market quantity sold]$_{Q3}$ * [Open–market price]$_{Q3}$ * 0.48
[Open–market sales]$_{Q4}$ = [Open–market quantity sold]$_{Q4}$ * [Open–market price]$_{Q4}$ * 0.48

[Cotton lint cash receipts]$_{Q1}$ = [Open–market sales]$_{Q1}$ + [CCC Placement values]$_{Q1}$
[Cotton lint cash receipts]$_{Q2}$ = [Open–market sales]$_{Q2}$ + [CCC Placement values]$_{Q2}$
[Cotton lint cash receipts]$_{Q3}$ = [Open–market sales]$_{Q3}$ + [CCC Placement values]$_{Q3}$
[Cotton lint cash receipts]$_{Q4}$ = [Open–market sales]$_{Q4}$ + [CCC Placement values]$_{Q4}$
[Cotton lint cash receipts]$_t$ = [Cotton lint cash receipts]$_{Q1}$ + [Cotton lint cash receipts]$_{Q2}$ + [Cotton lint cash
        receipts]$_{Q3}$ + [Cotton lint cash receipts]$_{Q4}$

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[14]Quantity units are bales. Price units are pounds. This difference creates need for conversion in the calculation of Open-market sales.

Cottonseed Cash Receipts[15]

$[\text{Open–market quantity sold}]_y = [\text{Cottonseed production}]_y * (1 - [\text{Percent used on farm}]_y)$

$[\text{Percent marketed}]_{Q1,y-1} = \text{Average: } [\text{Percent marketed}]_{Q1,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q3,y} = \text{Average: } [\text{Percent marketed}]_{Q3,y-1 \text{ to } y-3}$
$[\text{Percent marketed}]_{Q4,y} = \text{Average: } [\text{Percent marketed}]_{Q4,y-1 \text{ to } y-3}$

$[\text{Open–market quantity sold}]_{Q1} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q1,y-1}$
$[\text{Open–market quantity sold}]_{Q3} = [\text{Open–market quantity sold}]_y * [\text{Percent marketed}]_{Q3,y}$
$[\text{Open–market quantity sold}]_{Q4} = [\text{Open–market quantity sold}]_y * [\text{Percent marketed}]_{Q4,y}$

$[\text{Open–market sales}]_{Q1} = [\text{Open–market quantity sold}]_{Q1} * [\text{Open–market price}]_{Q1}$
$[\text{Open–market sales}]_{Q3} = [\text{Open–market quantity sold}]_{Q3} * [\text{Open–market price}]_{Q3}$
$[\text{Open–market sales}]_{Q4} = [\text{Open–market quantity sold}]_{Q4} * [\text{Open–market price}]_{Q4}$

$[\text{Cottonseed cash receipts}]_{Q1} = [\text{Open–market sales}]_{Q1}$
$[\text{Cottonseed cash receipts}]_{Q3} = [\text{Open–market sales}]_{Q3}$
$[\text{Cottonseed cash receipts}]_{Q4} = [\text{Open–market sales}]_{Q4}$
$[\text{Cottonseed cash receipts}]_t = [\text{Cottonseed cash receipts}]_{Q1} + [\text{Cottonseed cash receipts}]_{Q3} + [\text{Cottonseed cash receipts}]_{Q4}$

Tobacco Cash Receipts[16]

$[\text{Open–market quantity sold}]_y = [\text{Tobacco production}]_y$

$[\text{Percent marketed}]_{Q1,y-1} = \text{Average: } [\text{Percent marketed}]_{Q1,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q2,y-1} = \text{Average: } [\text{Percent marketed}]_{Q2,y-2 \text{ to } y-4}$
$[\text{Percent marketed}]_{Q3,y} = \text{Average: } [\text{Percent marketed}]_{Q3,y-1 \text{ to } y-3}$
$[\text{Percent marketed}]_{Q4,y} = \text{Average: } [\text{Percent marketed}]_{Q4,y-1 \text{ to } y-3}$

$[\text{Open–market quantity sold}]_{Q1} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q1,y-1}$
$[\text{Open–market quantity sold}]_{Q2} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q2,y-1}$
$[\text{Open–market quantity sold}]_{Q3} = [\text{Open–market quantity sold}]_y * [\text{Percent marketed}]_{Q3,y}$
$[\text{Open–market quantity sold}]_{Q4} = [\text{Open–market quantity sold}]_y * [\text{Percent marketed}]_{Q4,y}$

$[\text{Open–market sales}]_{Q1} = [\text{Open–market quantity sold}]_{Q1} * [\text{Open–market price}]_{Q1}$
$[\text{Open–market sales}]_{Q2} = [\text{Open–market quantity sold}]_{Q2} * [\text{Open–market price}]_{Q2}$
$[\text{Open–market sales}]_{Q3} = [\text{Open–market quantity sold}]_{Q3} * [\text{Open–market price}]_{Q3}$
$[\text{Open–market sales}]_{Q4} = [\text{Open–market quantity sold}]_{Q4} * [\text{Open–market price}]_{Q4}$

$[\text{Tobacco cash receipts}]_{Q1} = [\text{Open–market sales}]_{Q1}$
$[\text{Tobacco cash receipts}]_{Q2} = [\text{Open–market sales}]_{Q2}$
$[\text{Tobacco cash receipts}]_{Q3} = [\text{Open–market sales}]_{Q3}$
$[\text{Tobacco cash receipts}]_{Q4} = [\text{Open–market sales}]_{Q4}$
$[\text{Tobacco cash receipts}]_t = [\text{Tobacco cash receipts}]_{Q1} + [\text{Tobacco cash receipts}]_{Q2} + [\text{Tobacco cash receipts}]_{Q3} + [\text{Tobacco cash receipts}]_{Q4}$

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[15] Quantity and price units are tons.
[16] Quantity and price units are pounds.

<u>Vegetables—Total Cash Receipts</u>

[Total Vegetable cash receipts]$_{Q1}$ = [Potato cash receipts]$_{Q1}$ + [Dry bean cash receipts]$_{Q1}$ +
      [Other vegetables cash receipts]$_{Q1}$
[Total Vegetable cash receipts]$_{Q2}$ = [Potato cash receipts]$_{Q2}$ + [Dry bean cash receipts]$_{Q2}$ +
      [Other vegetables cash receipts]$_{Q2}$
[Total Vegetable cash receipts]$_{Q3}$ = [Potato cash receipts]$_{Q3}$ + [Dry bean cash receipts]$_{Q3}$ +
       [Other vegetables cash receipts]$_{Q3}$
[Total Vegetable cash receipts]$_{Q4}$ = [Potato cash receipts]$_{Q4}$ + [Dry bean cash receipts]$_{Q4}$ +
      [Other vegetables cash receipts]$_{Q4}$
[Total Vegetable cash receipts]$_t$ = [Potato cash receipts]$_t$ + [Dry bean cash receipts]$_t$ +
      [Other vegetables cash receipts]$_t$

<u>Potato Cash Receipts</u>[17]

[Open–market quantity sold]$_y$ = [Potato production]$_y$

[Percent marketed]$_{Q1,y-1}$ = Average: [Percent marketed]$_{Q1,y-2 \text{ to } y-4}$
[Percent marketed]$_{Q2,y-1}$ = Average: [Percent marketed]$_{Q2,y-2 \text{ to } y-4}$
[Percent marketed]$_{Q2,y}$ = Average: [Percent marketed]$_{Q2,y-1 \text{ to } y-3}$
[Percent marketed]$_{Q3,y}$ = Average: [Percent marketed]$_{Q3,y-1 \text{ to } y-3}$
[Percent marketed]$_{Q4,y}$ = Average: [Percent marketed]$_{Q4,y-1 \text{ to } y-3}$

[Open–market quantity sold]$_{Q1}$ = [Open–market quantity sold]$_{y-1}$ * [Percent marketed]$_{Q1,y-1}$
[Open–market quantity sold]$_{Q2}$ = [Open–market quantity sold]$_{y-1}$ * [Percent marketed]$_{Q2,y-1}$ +
      [Open–market quantity sold]$_y$ * [Percent marketed]$_{Q2,y}$
[Open–market quantity sold]$_{Q3}$ = [Open–market quantity sold]$_y$ * [Percent marketed]$_{Q3,y}$
[Open–market quantity sold]$_{Q4}$ = [Open–market quantity sold]$_y$ * [Percent marketed]$_{Q4,y}$

[Open–market sales]$_{Q1}$ = [Open–market quantity sold]$_{Q1}$ * [Open–market price]$_{Q1}$
[Open–market sales]$_{Q2}$ = [Open–market quantity sold]$_{Q2}$ * [Open–market price]$_{Q2}$
[Open–market sales]$_{Q3}$ = [Open–market quantity sold]$_{Q3}$ * [Open–market price]$_{Q3}$
[Open–market sales]$_{Q4}$ = [Open–market quantity sold]$_{Q4}$ * [Open–market price]$_{Q4}$

[Potato cash receipts]$_{Q1}$ = [Open–market sales]$_{Q1}$
[Potato cash receipts]$_{Q2}$ = [Open–market sales]$_{Q2}$
[Potato cash receipts]$_{Q3}$ = [Open–market sales]$_{Q3}$
[Potato cash receipts]$_{Q4}$ = [Open–market sales]$_{Q4}$
[Potato cash receipts]$_t$ = [Potato cash receipts]$_{Q1}$ + [Potato cash receipts]$_{Q2}$ +
      [Potato cash receipts]$_{Q3}$ + [Potato cash receipts]$_{Q4}$

<u>Dry Bean Cash Receipts</u>[18]

[Open–market quantity sold]$_y$ = [Dry bean production]$_y$

[Percent marketed]$_{Q1,y-1}$ = Average: [Percent marketed]$_{Q1,y-2 \text{ to } y-4}$
[Percent marketed]$_{Q2,y-1}$ = Average: [Percent marketed]$_{Q2,y-2 \text{ to } y-4}$
[Percent marketed]$_{Q3,y-1}$ = Average: [Percent marketed]$_{Q3,y-2 \text{ to } y-4}$
[Percent marketed]$_{Q3,y}$ = Average: [Percent marketed]$_{Q3,y-1 \text{ to } y-3}$
[Percent marketed]$_{Q4,y}$ = Average: [Percent marketed]$_{Q4,y-1 \text{ to } y-3}$

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[17] Quantity and price units are cwt.
[18] Quantity and price units are cwt.

$[\text{Open–market quantity sold}]_{Q1} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q1,y-1}$

$[\text{Open–market quantity sold}]_{Q2} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q2,y-1}$

$[\text{Open–market quantity sold}]_{Q3} = [\text{Open–market quantity sold}]_{y-1} * [\text{Percent marketed}]_{Q3,y-1} +$
$\quad [\text{Open–market quantity sold}]_{y} * [\text{Percent marketed}]_{Q3,y}$

$[\text{Open–market quantity sold}]_{Q4} = [\text{Open–market quantity sold}]_{y} * [\text{Percent marketed}]_{Q4,y}$

$[\text{Open–market sales}]_{Q1} = [\text{Open–market quantity sold}]_{Q1} * [\text{Open–market price}]_{Q1}$

$[\text{Open–market sales}]_{Q2} = [\text{Open–market quantity sold}]_{Q2} * [\text{Open–market price}]_{Q2}$

$[\text{Open–market sales}]_{Q3} = [\text{Open–market quantity sold}]_{Q3} * [\text{Open–market price}]_{Q3}$

$[\text{Open–market sales}]_{Q4} = [\text{Open–market quantity sold}]_{Q4} * [\text{Open–market price}]_{Q4}$

$[\text{Dry bean cash receipts}]_{Q1} = [\text{Open–market sales}]_{Q1}$

$[\text{Dry bean cash receipts}]_{Q2} = [\text{Open–market sales}]_{Q2}$

$[\text{Dry bean cash receipts}]_{Q3} = [\text{Open–market sales}]_{Q3}$

$[\text{Dry bean cash receipts}]_{Q4} = [\text{Open–market sales}]_{Q4}$

$[\text{Dry bean cash receipts}]_{t} = [\text{Dry bean cash receipts}]_{Q1} + [\text{Dry bean cash receipts}]_{Q2} +$
$\quad [\text{Dry bean cash receipts}]_{Q3} + [\text{Dry bean cash receipts}]_{Q4}$

Other Vegetables Cash Receipts

$[\text{Other vegetable cash receipts}]_{Q1} = [\text{Other vegetable cash receipts}]_{Q1,t-1} * [\text{Production index}]_{t} / [\text{Production index}]_{t-1}$
$\quad * [\text{Price index}]_{Q1,t} / [\text{Price index}]_{Q1,t-1}$

$[\text{Other vegetable cash receipts}]_{Q2} = [\text{Other vegetable cash receipts}]_{Q2,t-1} * [\text{Production index}]_{t} / [\text{Production index}]_{t-1}$
$\quad * [\text{Price index}]_{Q2,t} / [\text{Price index}]_{Q2,t-1}$

$[\text{Other vegetable cash receipts}]_{Q3} = [\text{Other vegetable cash receipts}]_{Q3,t-1} * [\text{Production index}]_{t} / [\text{Production index}]_{t-1}$
$\quad * [\text{Price index}]_{Q3,t} / [\text{Price index}]_{Q3,t-1}$

$[\text{Other vegetable cash receipts}]_{Q4} = [\text{Other vegetable cash receipts}]_{Q4,t-1} * [\text{Production index}]_{t} / [\text{Production index}]_{t-1}$
$\quad * [\text{Price index}]_{Q4,t} / [\text{Price index}]_{Q4,t-1}$

$[\text{Other vegetable cash receipts}]_{t} = [\text{Other vegetable cash receipts}]_{Q1} + [\text{Other vegetable cash receipts}]_{Q2} +$
$\quad [\text{Other vegetable cash receipts}]_{Q3} + [\text{Other vegetable cash receipts}]_{Q4}$

Fruits and Nut Cash Receipts

$[\text{Fruit and nut cash receipts}]_{Q1} = [\text{Fruit and nut cash receipts}]_{Q1,t-1} * [\text{Annual output, 15 crops}]_{t} / [\text{Annual output,}$
$\quad \text{15 crops}]_{t-1} * [\text{Price index}]_{Q1,t} / [\text{Price index}]_{Q1,t-1}$

$[\text{Fruit and nut cash receipts}]_{Q2} = [\text{Fruit and nut cash receipts}]_{Q2,t-1} * [\text{Annual output, 15 crops}]_{t} / [\text{Annual output,}$
$\quad \text{15 crops}]_{t-1} * [\text{Price index}]_{Q2,t} / [\text{Price index}]_{Q2,t-1}$

$[\text{Fruit and nut cash receipts}]_{Q3} = [\text{Fruit and nut cash receipts}]_{Q3,t-1} * [\text{Annual output, 15 crops}]_{t} / [\text{Annual output,}$
$\quad \text{15 crops}]_{t-1} * [\text{Price index}]_{Q3,t} / [\text{Price index}]_{Q3,t-1}$

$[\text{Fruit and nut cash receipts}]_{Q4} = [\text{Fruit and nut cash receipts}]_{Q4,t-1} * [\text{Annual output, 15 crops}]_{t} / [\text{Annual output,}$
$\quad \text{15 crops}]_{t-1} * [\text{Price index}]_{Q4,t} / [\text{Price index}]_{Q4,t-1}$

$[\text{Fruit and nut cash receipts}]_{t} = [\text{Fruit and nut cash receipts}]_{Q1} + [\text{Fruit and nut cash receipts}]_{Q2} + [\text{Fruit and nut}$
$\quad \text{cash receipts}]_{Q3} + [\text{Fruit and nut cash receipts}]_{Q4}$

All Other Crops Cash Receipts

$[\text{All Other Crops Cash Receipts}]_{Q1} = [\text{Greenhouse and nursery cash receipts}]_{Q1} + [\text{Other crop cash receipts}]_{Q1}$

$[\text{All Other Crops Cash Receipts}]_{Q1} = [\text{Greenhouse and nursery cash receipts}]_{Q1} + [\text{Other crop cash receipts}]_{Q1}$

$[\text{All Other Crops Cash Receipts}]_{Q1} = [\text{Greenhouse and nursery cash receipts}]_{Q1} + [\text{Other crop cash receipts}]_{Q1}$

$[\text{All Other Crops Cash Receipts}]_{Q1} = [\text{Greenhouse and nursery cash receipts}]_{Q1} + [\text{Other crop cash receipts}]_{Q1}$

Greenhouse and Nursery Cash Receipts

[Greenhouse and nursery cash receipts]$_{Q1}$ = [Greenhouse and nursery cash receipts]$_{Q1,t-1}$ * [Production index]$_t$ /
    [Production index]$_{t-1}$ * [Price index]$_{Q1,t}$ / [Price index]$_{Q1,t-1}$

[Greenhouse and nursery cash receipts]$_{Q2}$ = [Greenhouse and nursery cash receipts]$_{Q2,t-1}$ * [Production index]$_t$ /
    [Production index]$_{t-1}$ * [Price index]$_{Q2,t}$ / [Price index]$_{Q2,t-1}$

[Greenhouse and nursery cash receipts]$_{Q3}$ = [Greenhouse and nursery cash receipts]$_{Q3,t-1}$ * [Production index]$_t$ /
    [Production index]$_{t-1}$ * [Price index]$_{Q3,t}$ / [Price index]$_{Q3,t-1}$

[Greenhouse and nursery cash receipts]$_{Q4}$ = [Greenhouse and nursery cash receipts]$_{Q4,t-1}$ * [Production index]$_t$ /
    [Production index]$_{t-1}$ * [Price index]$_{Q4,t}$ / [Price index]$_{Q4,t-1}$

[Greenhouse and nursery cash receipts]$_t$ = [Greenhouse and nursery cash receipts]$_{Q1}$ + [Greenhouse and nursery
    cash receipts]$_{Q2}$ + [Greenhouse and nursery cash receipts]$_{Q3}$ + [Greenhouse and nursery cash receipts]$_{Q4}$

Other Crop Cash Receipts

[Other crop cash receipts]$_{Q1}$ = [Other crop cash receipts]$_{Q1,t-1}$ *
    [Prices received for all crops index]$_{Q1,t}$ / [Prices received for all crops index]$_{Q1,t-1}$

[Other crop cash receipts]$_{Q2}$ = [Other crop cash receipts]$_{Q2,t-1}$ *
    [Prices received for all crops index]$_{Q2,t}$ / [Prices received for all crops index]$_{Q2,t-1}$

[Other crop cash receipts]$_{Q3}$ = [Other crop cash receipts]$_{Q3,t-1}$ *
    [Prices received for all crops index]$_{Q3,t}$ / [Prices received for all crops index]$_{Q3,t-1}$

[Other crop cash receipts]$_{Q4}$ = [Other crop cash receipts]$_{Q4,t-1}$ *
    [Prices received for all crops index]$_{Q4,t}$ / [Prices received for all crops index]$_{Q4,t-1}$

[Other crop cash receipts]$_t$ = [Other crop cash receipts]$_{Q1}$ + [Other crop cash receipts]$_{Q2}$ +
    [Other crop cash receipts]$_{Q3}$ + [Other crop cash receipts]$_{Q4}$

Home Consumption of Crops

[Home consumption of crops]$_t$ = ([Total crop cash receipts]$_t$ + [Total crop inventory change]$_t$) /
    ([Total crop cash receipts]$_{t-1}$ + [Total crop inventory change]$_{t-1}$) * [Home consumption of crops]$_{t-1}$

Value of Inventory Adjustment—Crops

[Value of Inventory Adjustment]t = [Wheat inventory change]$_t$ + [Rice inventory change]$_t$ + [Rye inventory
    change]$_t$ + [Corn inventory change]$_t$ + [Sorghum inventory change]$_t$ + [Barley inventory change]$_t$ +
    [Oats inventory change]$_t$ + [Hay inventory change]$_t$ + [Soybean inventory change]$_t$ + [Sunflowerseed
    inventory change]$_t$ + [Cotton lint inventory change]$_t$ + [Cottonseed inventory change]$_t$ + [Tobacco inventory
    change]$_t$ + [Potato inventory change]$_t$ + [Dry beans inventory change]$_t$

[Wheat inventory change]$_t$ = ([Wheat production]$_y$ – ([Quantity sold in open market]$_t$ + [CCC placements]$_t$ +
    [Quantity used on farm]$_y$ * [Share fed before January 1]$_t$)) * [Weighted calendar year price for wheat]$_t$

[Rice inventory change]$_t$ = ([Rice production]$_y$ – ([Quantity sold in open market]$_t$ + [CCC placements]$_t$ +
    [Quantity used on farm]$_y$ * [Share fed before January 1]$_t$)) * [Weighted calendar year price for rice]$_t$

[Rye inventory change]$_t$ = ([Rye production]$_y$ – ([Quantity sold in open market]$_t$ + [Quantity used on farm]$_y$
    * [Share fed before January 1]$_t$)) * [Weighted calendar year price for rye]$_t$

[Corn inventory change]$_t$ = ([Corn production]$_y$ – ([Quantity sold in open market]$_t$ + [CCC placements]$_t$ +
    [Quantity used on farm]$_y$ * [Share fed before January 1]$_t$)) * [Weighted calendar year price for corn]$_t$

[Sorghum inventory change]$_t$ = ([Sorghum production]$_y$ – ([Quantity sold in open market]$_t$ + [CCC placements]$_t$ +
    [Quantity used on farm]$_y$ * [Share fed before January 1]$_t$)) * [Weighted calendar year price for sorghum]$_t$

[Barley inventory change]$_t$ = ([Barley production]$_y$ – ([Quantity sold in open market]$_t$ + [CCC placements]$_t$ + [Quantity used on farm]$_y$ * [Share fed before January 1]$_t$)) * [Weighted calendar year price for barley]$_t$

[Oats inventory change]$_t$ = ([Oats production]$_y$ – ([Quantity sold in open market]$_t$ + [CCC placements]$_t$ + [Quantity used on farm]$_y$ * [Share fed before January 1]$_t$)) * [Weighted calendar year price for oats]$_t$

[Hay inventory change]$_t$ = ([Hay production]$_y$ – ([Quantity sold in open market]$_t$ + [Quantity used on farm]$_y$ * [Share fed before January 1]$_t$)) * [Weighted calendar year price for hay]$_t$

[Soybean inventory change]$_t$ = ([Soybean production]$_y$ – ([Quantity sold in open market]$_t$ + [CCC placements]$_t$ + [Quantity used on farm]$_y$ * [Share fed before January 1]$_t$)) * [Weighted calendar year price for soybeans]$_t$

[Sunflowerseed inventory change]$_t$ = ([Sunflowerseed production]$_y$ – ([Quantity sold in open market]$_t$)) * [Weighted calendar year price for sunflowerseed]$_t$

Other oilseed inventory change = ([Flaxseed production]$_t$ – SUM([Other oilseed cash receipts]$_{Q1}$ / [Flaxseed price]$_{Q1}$, [Other oilseed cash receipts]$_{Q2}$ / [Flaxseed price]$_{Q2}$, [Other oilseed cash receipts]$_{Q3}$ / [Flaxseed price]$_{Q3}$, / [Other oilseed cash receipts]$_{Q4}$ / [Flaxseed price]$_{Q4}$)) * [Flaxseed calendar year average price]$_t$

[Cotton lint inventory change]$_t$ = ([Cotton lint production]$_y$ – ([Quantity sold in open market]$_t$ + [CCC placements]$_t$)) * [Weighted calendar year price for cotton lint]$_t$

[Cottonseed inventory change]$_t$ = ([Cottonseed production]$_y$ – ([Quantity sold in open market]$_t$ + [CCC placements]$_t$ + [Quantity used on farm]$_y$ * [Share fed before January 1]$_t$)) * [Weighted calendar year price for cottonseed]$_t$

[Tobacco inventory change]$_t$ = ([Tobacco production]$_y$ – [Quantity sold in open market]$_t$) * [Weighted calendar year price for tobacco]$_t$

[Potato inventory change]$_t$ = ([Potato production]$_y$ – [Quantity sold in open market]$_t$) * [Weighted calendar year price for potatoes]$_t$

[Dry beans inventory change]$_t$ = ([Dry beans production]$_y$ – [Quantity sold in open market]$_t$) * [Weighted calendar year price for dry beans]$_t$

Value of Livestock Production

[Total Animal Output]$_t$ = [Meat Animals Cash Receipts]$_t$ + [Dairy products cash receipts]$_t$ + [Poultry and Egg cash receipts]$_t$ + [Miscellaneous livestock cash receipts]$_t$ + [Home consumption of animal products]$_t$ + [Value of inventory adjustment]$_t$

<u>Meat Animal Cash Receipts</u>

[Meat Animals Cash Receipts]t = [Cattle cash receipts]$_t$ + [Calves cash receipts]$_t$ + [Hog cash receipts]$_t$ + [Sheep and lamb cash receipts]$_t$

Cattle Cash Receipts

$\text{[Cattle cash receipts]}_{Q1} = \text{[Cattle cash receipts]}_{Q1,t-1} * \text{[Commercial beef production]}_{Q1,t} /$
$\quad \text{[Commercial beef production]}_{Q1,t-1} * \text{[Farm price]}_{Q1,t} / \text{[Farm price]}_{Q1,t-1}$
$\text{[Cattle cash receipts]}_{Q2} = \text{[Cattle cash receipts]}_{Q2,t-1} * \text{[Commercial beef production]}_{Q2,t} /$
$\quad \text{[Commercial beef production]}_{Q2,t-1} * \text{[Farm price]}_{Q2,t} / \text{[Farm price]}_{Q2,t-1}$
$\text{[Cattle cash receipts]}_{Q3} = \text{[Cattle cash receipts]}_{Q3,t-1} * \text{[Commercial beef production]}_{Q3,t} /$
$\quad \text{[Commercial beef production]}_{Q3,t-1} * \text{[Farm price]}_{Q3,t} / \text{[Farm price]}_{Q3,t-1}$
$\text{[Cattle cash receipts]}_{Q4} = \text{[Cattle cash receipts]}_{Q4,t-1} * \text{[Commercial beef production]}_{Q4,t} /$
$\quad \text{[Commercial beef production]}_{Q4,t-1} * \text{[Farm price]}_{Q4,t} / \text{[Farm price]}_{Q4,t-1}$
$\text{[Cattle cash receipts]}_{t} = \text{[Cattle cash receipts]}_{Q1} + \text{[Cattle cash receipts]}_{Q2} + \text{[Cattle cash receipts]}_{Q3} +$
$\quad \text{[Cattle cash receipts]}_{Q4}$

Calves Cash Receipts

$\text{[Calves cash receipts]}_{Q1} = \text{[Calves cash receipts]}_{Q1,t-1} * \text{[Total veal production]}_{Q1,t} /$
$\quad \text{[Total veal production]}_{Q1,t-1} * \text{[Farm price]}_{Q1,t} / \text{[Farm price]}_{Q1,t-1}$
$\text{[Calves cash receipts]}_{Q2} = \text{[Calves cash receipts]}_{Q2,t-1} * \text{[Total veal production]}_{Q2,t} /$
$\quad \text{[Total veal production]}_{Q2,t-1} * \text{[Farm price]}_{Q2,t} / \text{[Farm price]}_{Q2,t-1}$
$\text{[Calves cash receipts]}_{Q3} = \text{[Calves cash receipts]}_{Q3,t-1} * \text{[Total veal production]}_{Q3,t} /$
$\quad \text{[Total veal production]}_{Q3,t-1} * \text{[Farm price]}_{Q3,t} / \text{[Farm price]}_{Q3,t-1}$
$\text{[Calves cash receipts]}_{Q4} = \text{[Calves cash receipts]}_{Q4,t-1} * \text{[Total veal production]}_{Q4,t} /$
$\quad \text{[Total veal production]}_{Q4,t-1} * \text{[Farm price]}_{Q4,t} / \text{[Farm price]}_{Q4,t-1}$
$\text{[Calves cash receipts]}_{t} = \text{[Calves cash receipts]}_{Q1} + \text{[Calves cash receipts]}_{Q2} +$
$\quad \text{[Calves cash receipts]}_{Q3} + \text{[Calves cash receipts]}_{Q4}$

Hogs Cash Receipts

$\text{[Hog cash receipts]}_{Q1} = \text{[Hog cash receipts]}_{Q1,t-1} * \text{[Commercial pork production]}_{Q1,t} /$
$\quad \text{[Commercial pork production]}_{Q1,t-1} * \text{[Farm price]}_{Q1,t} / \text{[Farm price]}_{Q1,t-1}$
$\text{[Hog cash receipts]}_{Q2} = \text{[Hog cash receipts]}_{Q2,t-1} * \text{[Commercial pork production]}_{Q2,t} /$
$\quad \text{[Commercial pork production]}_{Q2,t-1} * \text{[Farm price]}_{Q2,t} / \text{[Farm price]}_{Q2,t-1}$
$\text{[Hog cash receipts]}_{Q3} = \text{[Hog cash receipts]}_{Q3,t-1} * \text{[Commercial pork production]}_{Q3,t} /$
$\quad \text{[Commercial pork production]}_{Q3,t-1} * \text{[Farm price]}_{Q3,t} / \text{[Farm price]}_{Q3,t-1}$
$\text{[Hog cash receipts]}_{Q4} = \text{[Hog cash receipts]}_{Q4,t-1} * \text{[Commercial pork production]}_{Q4,t} /$
$\quad \text{[Commercial pork production]}_{Q4,t-1} * \text{[Farm price]}_{Q4,t} / \text{[Farm price]}_{Q4,t-1}$
$\text{[Hog cash receipts]}_{t} = \text{[Hog cash receipts]}_{Q1} + \text{[Hog cash receipts]}_{Q2} + \text{[Hog cash receipts]}_{Q3} +$
$\quad \text{[Hog cash receipts]}_{Q4}$

Sheep and Lamb Cash Receipts

$\text{[Sheep and lamb cash receipts]}_{Q1} = \text{[Sheep and lamb cash receipts]}_{Q1,t-1} * \text{[Commercial sheep and lamb production]}_{Q1,t} /$
$\quad \text{[Commercial sheep and lamb production]}_{Q1,t-1} * \text{[Farm price, lambs]}_{Q1,t} / \text{[Farm price, lambs]}_{Q1,t-1}$
$\text{[Sheep and lamb cash receipts]}_{Q2} = \text{[Sheep and lamb cash receipts]}_{Q2,t-1} * \text{[Commercial sheep and lamb production]}_{Q2,t} /$
$\quad \text{[Commercial sheep and lamb production]}_{Q2,t-1} * \text{[Farm price, lambs]}_{Q2,t} / \text{[Farm price, lambs]}_{Q2,t-1}$
$\text{[Sheep and lamb cash receipts]}_{Q3} = \text{[Sheep and lamb cash receipts]}_{Q3,t-1} * \text{[Commercial sheep and lamb production]}_{Q3,t} /$
$\quad \text{[Commercial sheep and lamb production]}_{Q3,t-1} * \text{[Farm price, lambs]}_{Q3,t} / \text{[Farm price, lambs]}_{Q3,t-1}$
$\text{[Sheep and lamb cash receipts]}_{Q4} = \text{[Sheep and lamb cash receipts]}_{Q4,t-1} * \text{[Commercial sheep and lamb production]}_{Q4,t} /$
$\quad \text{[Commercial sheep and lamb production]}_{Q4,t-1} * \text{[Farm price, lambs]}_{Q4,t} / \text{[Farm price, lambs]}_{Q4,t-1}$
$\text{[Sheep and lamb cash receipts]}_{t} = \text{[Sheep and lamb cash receipts]}_{Q1} + \text{[Sheep and lamb cash receipts]}_{Q2} +$
$\quad \text{[Sheep and lamb cash receipts]}_{Q3} + \text{[Sheep and lamb cash receipts]}_{Q4}$

Dairy Products Cash Receipts

$[\text{Dairy products cash receipts}]_t = [\text{Milk cash receipts}]_t$

Milk Cash Receipts

$[\text{Milk cash receipts}]_{Q1} = [\text{Milk production}]_{Q1,t} * 1000/100 * [\text{Farm price}]_{Q1,t}$
$[\text{Milk cash receipts}]_{Q1} = [\text{Milk production}]_{Q2,t} * 1000/100 * [\text{Farm price}]_{Q2,t}$
$[\text{Milk cash receipts}]_{Q1} = [\text{Milk production}]_{Q3,t} * 1000/100 * [\text{Farm price}]_{Q3,t}$
$[\text{Milk cash receipts}]_{Q1} = [\text{Milk production}]_{Q4,t} * 1000/100 * [\text{Farm price}]_{Q4,t}$
$[\text{Milk cash receipts}]_t = [\text{Milk cash receipts}]_{Q1} + [\text{Milk cash receipts}]_{Q2} + [\text{Milk cash receipts}]_{Q3} + [\text{Milk cash receipts}]_{Q4}$

Poultry and Egg Cash Receipts

$[\text{Poultry and Egg cash receipts}]_t + [\text{Broiler cash receipts}]_t + [\text{Turkey cash receipts}]_t + [\text{Egg cash receipts}]_t + [\text{Other chicken cash receipts}]_t$

Broiler cash receipts

$[\text{Broiler cash receipts}]_{Q1} = [\text{Broiler cash receipts}]_{Q1,t-1} * [\text{Federally inspected broiler production}]_{Q1,t} / [\text{Federally inspected broiler production}]_{Q1,t-1} * [\text{Farm price}]_{Q1,t} / [\text{Farm price}]_{Q1,t-1}$
$[\text{Broiler cash receipts}]_{Q2} = [\text{Broiler cash receipts}]_{Q2,t-1} * [\text{Federally inspected broiler production}]_{Q2,t} / [\text{Federally inspected broiler production}]_{Q2,t-1} * [\text{Farm price}]_{Q2,t} / [\text{Farm price}]_{Q2,t-1}$
$[\text{Broiler cash receipts}]_{Q3} = [\text{Broiler cash receipts}]_{Q3,t-1} * [\text{Federally inspected broiler production}]_{Q3,t} / [\text{Federally inspected broiler production}]_{Q3,t-1} * [\text{Farm price}]_{Q3,t} / [\text{Farm price}]_{Q3,t-1}$
$[\text{Broiler cash receipts}]_{Q4} = [\text{Broiler cash receipts}]_{Q4,t-1} * [\text{Federally inspected broiler production}]_{Q4,t} / [\text{Federally inspected broiler production}]_{Q4,t-1} * [\text{Farm price}]_{Q4,t} / [\text{Farm price}]_{Q4,t-1}$
$[\text{Broiler cash receipts}]_t = [\text{Broiler cash receipts}]_{Q1} + [\text{Broiler cash receipts}]_{Q2} + [\text{Broiler cash receipts}]_{Q3} + [\text{Broiler cash receipts}]_{Q4}$

Turkey Cash Receipts

$[\text{Turkey cash receipts}]_{Q1} = [\text{Turkey cash receipts}]_{Q1,t-1} * [\text{Federally inspected turkey production}]_{Q1,t} / [\text{Federally inspected turkey production}]_{Q1,t-1} * [\text{Farm price}]_{Q1,t} / [\text{Farm price}]_{Q1,t-1}$
$[\text{Turkey cash receipts}]_{Q2} = [\text{Turkey cash receipts}]_{Q2,t-1} * [\text{Federally inspected turkey production}]_{Q2,t} / [\text{Federally inspected turkey production}]_{Q2,t-1} * [\text{Farm price}]_{Q2,t} / [\text{Farm price}]_{Q2,t-1}$
$[\text{Turkey cash receipts}]_{Q3} = [\text{Turkey cash receipts}]_{Q3,t-1} * [\text{Federally inspected turkey production}]_{Q3,t} / [\text{Federally inspected turkey production}]_{Q3,t-1} * [\text{Farm price}]_{Q3,t} / [\text{Farm price}]_{Q3,t-1}$
$[\text{Turkey cash receipts}]_{Q4} = [\text{Turkey cash receipts}]_{Q4,t-1} * [\text{Federally inspected turkey production}]_{Q4,t} / [\text{Federally inspected turkey production}]_{Q4,t-1} * [\text{Farm price}]_{Q4,t} / [\text{Farm price}]_{Q4,t-1}$
$[\text{Turkey cash receipts}]_t = [\text{Turkey cash receipts}]_{Q1} + [\text{Turkey cash receipts}]_{Q2} + [\text{Turkey cash receipts}]_{Q3} + [\text{Turkey cash receipts}]_{Q4}$

Eggs Cash Receipts

$[\text{Egg cash receipts}]_{Q1} = [\text{Egg cash receipts}]_{Q1,t-1} * [\text{Total chicken egg production}]_{Q1,t} / [\text{Total chicken egg production}]_{Q1,t-1} * [\text{Farm price}]_{Q1,t} / [\text{Farm price}]_{Q1,t-1}$
$[\text{Egg cash receipts}]_{Q2} = [\text{Egg cash receipts}]_{Q2,t-1} * [\text{Total chicken egg production}]_{Q2,t} / [\text{Total chicken egg production}]_{Q2,t-1} * [\text{Farm price}]_{Q2,t} / [\text{Farm price}]_{Q2,t-1}$
$[\text{Egg cash receipts}]_{Q3} = [\text{Egg cash receipts}]_{Q3,t-1} * [\text{Total chicken egg production}]_{Q3,t} / [\text{Total chicken egg production}]_{Q3,t-1} * [\text{Farm price}]_{Q3,t} / [\text{Farm price}]_{Q3,t-1}$

$$[\text{Egg cash receipts}]_{Q4} = [\text{Egg cash receipts}]_{Q4,t-1} * [\text{Total chicken egg production}]_{Q4,t} /$$
$$[\text{Total chicken egg production}]_{Q4,t-1} * [\text{Farm price}]_{Q4,t} / [\text{Farm price}]_{Q4,t-1}$$
$$[\text{Egg cash receipts}]_t = [\text{Egg cash receipts}]_{Q1} + [\text{Egg cash receipts}]_{Q2} + [\text{Egg cash receipts}]_{Q3} + [\text{Egg cash receipts}]_{Q4}$$

Other Chicken Cash Receipts

$$[\text{Other chicken cash receipts}]_{Q1} = [\text{Other chicken cash receipts}]_{Q1,t-1} * [\text{Total Other chicken production}]_{Q1,t} /$$
$$[\text{Total Other chicken production}]_{Q1,t-1} * ([\text{Farm price}]_{Q1,t-1} * [\text{Farm price, broilers}]_{Q1,t} / [\text{Farm price,}$$
$$\text{broilers}]_{Q1,t-1}) / [\text{Farm price}]_{Q1,t-1}$$
$$[\text{Other chicken cash receipts}]_{Q2} = [\text{Other chicken cash receipts}]_{Q2,t-1} * [\text{Total Other chicken production}]_{Q2,t} /$$
$$[\text{Total Other chicken production}]_{Q2,t-1} * ([\text{Farm price}]_{Q2,t-1} * [\text{Farm price, broilers}]_{Q2,t} / [\text{Farm price,}$$
$$\text{broilers}]_{Q2,t-1}) / [\text{Farm price}]_{Q2,t-1}$$
$$[\text{Other chicken cash receipts}]_{Q3} = [\text{Other chicken cash receipts}]_{Q3,t-1} * [\text{Total Other chicken production}]_{Q3,t} /$$
$$[\text{Total Other chicken production}]_{Q3,t-1} * ([\text{Farm price}]_{Q3,t-1} * [\text{Farm price, broilers}]_{Q3,t} / [\text{Farm price,}$$
$$\text{broilers}]_{Q3,t-1}) / [\text{Farm price}]_{Q3,t-1}$$
$$[\text{Other chicken cash receipts}]_{Q4} = [\text{Other chicken cash receipts}]_{Q4,t-1} * [\text{Total Other chicken production}]_{Q4,t} /$$
$$[\text{Total Other chicken production}]_{Q4,t-1} * ([\text{Farm price}]_{Q4,t-1} * [\text{Farm price, broilers}]_{Q4,t} / [\text{Farm price,}$$
$$\text{broilers}]_{Q4,t-1}) / [\text{Farm price}]_{Q4,t-1}$$
$$[\text{Other chicken cash receipts}]_t = [\text{Other chicken cash receipts}]_{Q1} + [\text{Other chicken cash receipts}]_{Q2} +$$
$$[\text{Other chicken cash receipts}]_{Q3} + [\text{Other chicken cash receipts}]_{Q4}$$

Miscellaneous Livestock Cash Receipts

Forecast equals previous year until new estimate is calculated because no quantity or price indicators are available.

Home Consumption of Animal Products

$$[\text{Home consumption of livestock}]_t + = ([\text{Total livestock cash receipts}]_t + [\text{Total livestock inventory change}]_t) /$$
$$([\text{Total livestock cash receipts}]_{t-1} + [\text{Total livestock inventory change}]_{t-1}) * [\text{Home consumption of}$$
$$\text{livestock}]_{t-1}$$

Value of Inventory Adjustment

$$[\text{Value of inventory adjustment}]_t + [\text{Cattle and calves inventory change}]_t + [\text{Hogs inventory change}]_t +$$
$$[\text{Sheep and lamb inventory change}]_t + [\text{Chicken inventory change}]_t$$

$$[\text{Cattle and calves inventory change}]_t = ([\text{Cattle and calves on farms, Dec. 31}]_t -$$
$$[\text{Cattle and calves on farms, Dec. 31}]_{t-1}) * [\text{Mid–year dollars per head}]_t$$

$$[\text{Hogs inventory change}]_t = ([\text{Hog inventory, Dec. 1}]_t - [\text{Hog inventory, Dec. 1}]_{t-1}) * [\text{Mid–year dollars per head}]_t$$

$$[\text{Sheep and lamb inventory change}]_t = ([\text{Sheep and lamb inventory, Jan. 1}]_{t+1} - [\text{Sheep and lamb inventory, Jan. 1}]_t)$$
$$* [\text{Mid–year dollars per head}]_t$$

$$[\text{Chicken inventory change}]_t = ([\text{Chicken inventory, Dec.1}]_t - [\text{Chicken inventory, Dec 1}]_{t-1}) *$$
$$[\text{Dollars per head. Dec. 1}]_t$$

Revenues from Services and Forestry

$$[\text{Revenues from Services and Forestry}]_t = [\text{Machine hire and customwork income}]_t + [\text{Forest products}]_t +$$
$$[\text{Other farm–related income}]_t + [\text{Gross imputed rental value of farm housing}]_t$$

$$[\text{Machine hire and customwork income}]_t = ([\text{All crops output index}]_t / [\text{All crops output index}]_{t-1}$$
$$* [\text{PITW prices paid index}]_t / [\text{PITW prices paid index}]_{t-1}) * [\text{Machine hire and customwork income}]_{t-1}$$

[Forest products]$_t$ = [Forest products]$_{t-1}$ * ([Greenhouse and nursery cash receipts]$_t$ / [Greenhouse and nursery cash receipts]$_{t-1}$ + [Building materials PPI]$_t$ / [Building materials PPI]$_{t-1}$-1)

[Other farm–related income]$_t$ = ([Total supply, cattle on feed]$_t$ / [Total supply, cattle on feed]$_{t-1}$ * 0.3 + [Broiler production]$_t$ / [Broiler production]$_{t-1}$ * 0.7) * [GDP Deflator]$_t$ /[GDP Deflator]$_{t-1}$ * [Other farm–related income]$_{t-1}$

[Gross imputed rental value of farm housing]$_t$ = [Gross imputed rental value of operator dwellings]$_t$ + [Gross imputed rental value of farm laborer dwellings]$_t$

[Gross imputed rental value of operator dwellings]$_t$ = [Operator dwellings value]$_t$ * 0.0072[19] * 0.1720[20] + [Operator dwellings value]$_t$ * 0.0266 * 0.1040 + [Operator dwellings value]$_t$ * 0.0558 * 0.0866 + [Operator dwellings value]$_t$ * 0.0878 * 0.0811 + [Operator dwellings value]$_t$ * 0.0968 * 0.0750 + [Operator dwellings value]$_t$ * 0.1024 * 0.0648 + [Operator dwellings value]$_t$ * 0.1277 * 0.0750 + [Operator dwellings value]$_t$ * 0.1530 * 0.0586 + [Operator dwellings value]$_t$ * 0.3427 * 0.0614

[Gross imputed rental value of farm laborer dwellings]$_t$ = [Labor perquisites]$_t$

Final Agricultural Sector Output

[Final agricultural sector output]$_t$ = [Final crop output]$_t$ + [Final animal output]$_t$ + [Services and forestry]$_t$

Purchased Inputs

[Purchased inputs]$_t$ = [Farm origin expenses]$_t$ + [Manufactured inputs expenses]$_t$ + [Other purchased inputs]$_t$

[Farm–origin input expenses]$_t$ = [Feed expenses]$_t$ + [Livestock and poultry expenses]$_t$ + [Seed expenses]$_t$

[Feed expenses]$_t$ = [Feed prices paid index]$_t$ / [Feed prices paid index]$_{t-1}$ * [All livestock, poultry, and dairy output index]$_t$ / [All livestock, poultry, and dairy output index]$_{t-1}$ * [Feed expenses]$_{t-1}$

[Livestock and poultry purchases]$_t$ = ((([Cattle Oklahoma feeder price]$_t$ / [Cattle Oklahoma feeder price]$_{t-1}$ * [Cattle and calves on feed, net placements]$_t$ / [Cattle and calves on feed, net placements]$_{t-1}$) * 752 + ([Hog feeder price]$_t$ / [Hog feeder price]$_{t-1}$ * [Hog inventory, Dec. 1]$_t$ / [Hog inventory, Dec. l]$_{t-1}$) * 92 + ([Broiler annual wholesale price]$_t$ / [Broiler annual wholesale price]$_{t-1}$, * [Broiler annual production]$_t$ / [Broiler annual production]$_{t-1}$) * 133 + ([Turkey annual price, 8–16 lbs.]$_t$ / [Turkey annual price, 8–16 lbs.]$_{t-1}$ * [Turkey annual production)$_t$ / [Turkey annual production]$_{t-1}$) * 23) / [Sum of weights (1000)] * [Livestock and poultry expenses]$_{t-1}$

[Seed expenses]$_t$ = [Seed prices paid index]$_t$ / [Seed prices paid index]$_{t-1}$ * [Acres planted, 14 crops]$_t$ / [Acres planted, 14 crops]$_{t-1}$ * [Seed expenses]$_{t-1}$

[Manufactured inputs expenses]$_t$ = [Fertilizer expenses]$_t$ + [Fuels and oils expenses]$_t$ + [Electricity expense]$_t$ + [Pesticides expenses]$_t$

[Fertilizer expenses]$_t$ = ([Fertilizer prices paid index]$_t$ / [Fertilizer prices paid index]$_{t-1}$ * [Acres planted, 14 crops]$_t$ / [Acres planted, 14 crops]$_{t-1}$) * [Fertilizer expenses]$_{t-1}$

[Fuels and oils expenses]$_t$ = ([Fuels prices paid index]$_t$ / [Fuels prices paid index]$_{t-1}$ * [Acres planted, 14 crops]$_t$ / [Acres planted, 14 crops]$_{t-1}$) * [Fuels and oils expenses]$_{t-1}$

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[19]Equals portion of operator dwellings value in value class. In $1000, classes are: Less than 20; 20-40; 40–60; 60-80; 80-100; 100-120; 120-150; 150-200; 200 and over. Source: ARMS.
[20]Equals rent per dollar of value. Figures are those used by the Bureau of Economic Analysis. Classes are the same as in footnote 19.

[Electricity expense]$_t$ = ([Electricity cost per kilowatt–hour]$_t$ / [Electricity cost per kilowatt –hour]$_{t-1}$ *
 [Total farm output index]$_t$ / [Total farm output index]$_{t-1}$) * [Electricity expense]$_{t-1}$

[Pesticides expenses]$_t$ = ([Agricultural chemicals prices paid index]$_t$ / [Agricultural chemicals prices paid index]$_{t-1}$ *
 [Acres planted, 14 crops]$_t$ / [Acres planted, 14 crops]$_{t-1}$) * [Pesticides expenses]$_{t-1}$

[Other Purchased inputs]$_t$ = [Repair and maintenance expenses]$_t$ + [Machine hire and customwork expenses]$_t$ +
 [Marketing, storage and transportation expenses]$_t$ + [Contract labor expenses]$_t$ + [Miscellaneous expenses,
 excluding Motor vehicle registration and licensing fees]$_t$

[Repair and maintenance expenses]$_t$ = (([PITW[21] prices paid index]$_t$ / [PITW prices paid index]$_{t-1}$) * ([Supplies and
 repairs prices paid index]$_t$ + [Autos and trucks price paid index]$_t$ + [Farm machinery prices paid index]$_t$ +
 [Buildings materials]$_t$) / ([Supplies and repairs prices paid index]$_{t-1}$ + [Autos and trucks price paid index]$_{t-1}$
 + [Farm machinery prices paid index]$_{t-1}$ + [Buildings materials]$_{t-1}$)) * [Repair and maintenance expenses]$_{t-1}$

[Machine hire and customwork expenses]$_t$ = ([PITW prices paid index]$_t$ / [PITW prices paid index]$_{t-1}$
 * [Acres planted, 14 crops]$_t$ / [Acres planted, 14 crops]$_{t-1}$) * [Machine hire and customwork expenses]$_{t-1}$

[Marketing, storage, and transportation expenses]$_t$ = ([PITW prices paid index]$_t$ /[PITW prices paid index]$_{t-1}$
 * [All crops output index]$_t$ / [All crops output index]$_{t-1}$) * [Marketing, storage, and transportation
 expenses]$_{t-1}$

[Contract labor expenses]$_t$ = [Contract labor expenses]$_{t-1}$ * [Farm wage rates prices paid index]$_t$ / [Farm wage rates
 prices paid index]$_{t-1}$ * (Average percent change from previous year: [Fruit and nut annual output index]$_t$,
 [Other vegetable production index]$_t$)

[Miscellaneous expenses excluding Motor vehicle registration and licensing fees]$_t$ = ([PITW prices paid index]$_t$ /
 [PITW prices paid index]$_{t-1}$ * [Total farm output index]$_t$ / [Total farm output index]$_{t-1}$) * [Miscellaneous
 expenses]$_{t-1}$ - [Motor vehicle registration and licensing fees]$_t$

Net Government Transactions

[Net Government Transactions]$_t$ = [Direct Government payments]$_t$ - [Property taxes]$_t$ - Motor vehicle
 registration and licensing fees]$_t$

Direct Government payments

 For Direct Government payments equations, go to Appendix 2, p. 84.

[Property taxes expense]$_t$ = [Taxes prices paid index]$_t$ / [Taxes prices paid index]$_{t-1}$ * [Property taxes expense]$_{t-1}$

[Motor vehicle registration and licensing fees]$_t$ = [Motor vehicle registration and licensing fees]$_{t-1}$
 * [Property taxes]$_t$ / [Property taxes]$_{t-1}$

Gross Value Added

[Gross value added]$_t$ = [Final agricultural sector output]$_t$ – [Purchased inputs]$_t$ + [Net government transactions]$_t$

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[21]Production items, Interest, Taxes, and Wages prices paid indexes. Production items comprise Feed, Livestock, and Poultry purchased,
Seed, Fertilizer, Fuels and oil, Electricity, Pesticides, Repair and maintenance, Machine hire and customwork, Marketing, storage and transpor-
tation, and Miscellaneous.

Capital Consumption

[Capital consumption expense, total]$_t$ = [Operator dwellings capital consumption expense]$_t$ + [Buildings capital consumption expense]$_t$ + [Automobile capital consumption expense]$_t$ + [Truck capital consumption expense]$_t$ + [Tractor capital consumption expense]$_t$ + [Farm machinery capital consumption expense]$_t$

[Buildings capital consumption expense]$_t$ = ([Building materials prices paid index]$_t$ * 0.85 + [Wage rate prices paid index]$_t$ * 0.15) / ([Building materials prices paid index]$_{t-1}$ * 0.85 + [Wage rate prices paid index]$_{t-1}$ * 0.15) * [Buildings capital consumption expense]$_{t-1}$

[Autos capital consumption expense]$_t$ = [Autos and Trucks prices paid index]$_t$ / [Autos and Trucks prices paid index]$_{t-1}$ * [Autos capital consumption expense]$_{t-1}$

[Trucks capital consumption expense]$_t$ = [Autos and Trucks prices paid index]$_t$ / [Autos and Trucks prices paid index]$_{t-1}$ * [Trucks capital consumption expense]$_{t-1}$

[Tractors capital consumption expense]$_t$ = [Farm machinery prices paid index]$_t$ / [Farm Machinery prices paid index]$_{t-1}$ * [Tractors capital consumption expense]$_{t-1}$

[Farm machinery capital consumption expense]$_t$ = [Farm machinery prices paid index]$_t$ / [Farm Machinery prices paid index]$_{t-1}$ * [Farm machinery capital consumption expense]$_{t-1}$

Net Value Added

[Net value added]$_t$ = [Gross value added]$_t$ – [Capital consumption expenses]$_t$

Payments to Stakeholders

[Payments to stakeholders]$_t$ = [Employee compensation (Hired labor expenses)]$_t$ + Net rent received by nonoperator landowners]$_t$ + [Real estate and nonreal estate interest expenses]$_t$

[Employee compensation (Hired labor expenses)]$_t$ = ([Wage rates prices paid index]$_t$ / [Wage rates prices paid index]$_{t-1}$ * [Total farm output index]$_t$ / [Total farm output index]$_{t-1}$) * [Total labor expenses]$_{t-1}$ - [Contract labor]$_t$

[Net rent to nonoperators]$_t$ = ([Cash rent]$_t$ + [Share rent]$_t$ + [Landlord Government payments]$_t$) / ([Cash rent]$_{t-1}$ + [Share rent]$_{t-1}$ + [Landlord Government payments]$_{t-1}$) * [Net rent to nonoperators]$_{t-1}$

[Cash rent]t = [Acres planted, 14 crops]$_t$ / [Acres planted, 14 crops]$_{t-1}$ * [Average cash rent per acre]$_t$ / Average cash rent per acre]$_{t-1}$ * [Cash rent]$_{t-1}$

[Average cash rent per acre]$_t$ = [Composite land value]$_t$ / [Composite land value]$_{t-1}$ * [Average cash rent per acre]$_{t-1}$

[Share rent]$_t$ = ([Value of Crop Output]$_t$ – [Home consumption]$_t$) / ([Value of Crop Output]$_t$ – [Home consumption]$_{t-1}$) * [Share rent]$_{t-1}$

[Landlord Government payments]$_t$ = ([Total Government payments]$_t$ – [Loan deficiency payments]$_t$) * 0.1738 + [Loan deficiency payments]$_t$ * 0.137

[Interest expenses]$_t$ = [Nonreal estate interest expenses]$_t$ + [Real estate interest expenses]$_t$

[Nonreal estate interest expense]$_t$ = ([EOY real estate debt]$_t$[22] + [EOY real estate debt]$_{t-1}$) / 2 * [Annual average interest rate, real estate debt]$_t$

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[22]EOY = End-of-year, i.e. December 31.

[Real estate interest expense]$_t$ = ([EOY real estate debt]$_t$ + [EOY real estate debt]$_{t-1}$) / 2 * [Annual average interest rate, real estate debt]$_t$

Net Farm Income

[Net farm income]$_t$ = [Net value added]$_t$ – [Payments to stakeholders]$_t$

Net Income Statement

Gross Cash Income

[Gross cash income]$_t$ = [Total cash receipts]$_t$ + [Direct Government payments]$_t$ + [Farm–related income]$_t$

Total Cash Receipts

[Total cash receipts]$_{Q1}$ = [Total livestock, dairy and poultry cash receipts]$_{Q1}$ +[Total crop cash receipts]$_{Q1}$

[Total cash receipts]$_{Q2}$ = [Total livestock, dairy and poultry cash receipts]$_{Q2}$ + [Total crop cash receipts]$_{Q2}$

[Total cash receipts]$_{Q3}$ = [Total livestock, dairy and poultry cash receipts]$_{Q3}$ + [Total crop cash receipts]$_{Q3}$

[Total cash receipts]$_{Q4}$ = [Total livestock, dairy and poultry cash receipts]$_{Q4}$ + [Total crop cash receipts]$_{Q4}$

[Total cash receipts]$_t$ = [Total livestock, dairy and poultry cash receipts]$_t$ + [Total crop cash receipts]$_t$

Total Livestock, Dairy and Poultry Cash Receipts

[Total livestock, dairy and poultry cash receipts]$_{Q1}$ = [Meat animals cash receipts]$_{Q1}$ + [Dairy products cash receipts]$_{Q1}$ + [Poultry and eggs receipts]$_{Q1}$ + [Miscellaneous livestock cash receipts]$_{Q1}$

[Total livestock, dairy and poultry cash receipts]$_{Q2}$ = [Meat animals cash receipts]$_{Q2}$ + [Dairy products cash receipts]$_{Q2}$ + [Poultry and eggs receipts]$_{Q2}$ + [Miscellaneous livestock cash receipts]$_{Q2}$

[Total livestock, dairy and poultry cash receipts]$_{Q3}$ = [Meat animals cash receipts]$_{Q3}$ + [Dairy products cash receipts]$_{Q3}$ + [Poultry and eggs receipts]$_{Q3}$ + [Miscellaneous livestock cash receipts]$_{Q3}$

[Total livestock, dairy and poultry cash receipts]$_{Q4}$ = [Meat animals cash receipts]$_{Q4}$ + [Dairy products cash receipts]$_{Q4}$ + [Poultry and eggs receipts]$_{Q4}$ + [Miscellaneous livestock cash receipts]$_{Q4}$

[Total livestock, dairy and poultry cash receipts]$_t$ = [Total livestock, dairy and poultry cash receipts]$_{Q1}$ + [Total livestock, dairy and poultry cash receipts]$_{Q2}$ + [Total livestock, dairy and poultry cash receipts]$_{Q3}$ + [Total livestock, dairy and poultry cash receipts]$_{Q4}$

Total Crop Cash Receipts

[Total crop cash receipts]$_{Q1}$ = [Food grain cash receipts]$_{Q1}$ + [Feed grain cash receipts]$_{Q1}$ + [Oilseed cash receipts]$_{Q1}$ + [Total cotton cash receipts]$_{Q1}$ + [Tobacco cash receipts]$_{Q1}$ + [Total vegetable cash receipts]$_{Q1}$ + [Fruit and nut cash receipts]$_{Q1}$ + [All other crops cash receipts]$_{Q1}$

[Total crop cash receipts]$_{Q2}$ = [Food grain cash receipts]$_{Q2}$ + [Feed grain cash receipts]$_{Q2}$ + [Oilseed cash receipts]$_{Q2}$ + [Total cotton cash receipts]$_{Q2}$ + [Tobacco cash receipts]$_{Q2}$ + [Total vegetable cash receipts]$_{Q2}$ + [Fruit and nut cash receipts]$_{Q2}$ + [All other crops cash receipts]$_{Q2}$

[Total crop cash receipts]$_{Q3}$ = [Food grain cash receipts]$_{Q3}$ + [Feed grain cash receipts]$_{Q3}$ + [Oilseed cash receipts]$_{Q3}$ + [Total cotton cash receipts]$_{Q3}$ + [Tobacco cash receipts]$_{Q3}$ + [Total vegetable cash receipts]$_{Q3}$ + [Fruit and nut cash receipts]$_{Q3}$ + [All other crops cash receipts]$_{Q3}$

[Total crop cash receipts]$_{Q4}$ = [Food grain cash receipts]$_{Q4}$ + [Feed grain cash receipts]$_{Q4}$ + [Oilseed cash receipts]$_{Q4}$ + [Total cotton cash receipts]$_{Q4}$ + [Tobacco cash receipts]$_{Q4}$ + [Total vegetable cash receipts]$_{Q4}$ + [Fruit and nut cash receipts]$_{Q4}$ + [All other crops cash receipts]$_{Q4}$

[Total crop cash receipts]$_t$ = [Total crop cash receipts]$_{Q1}$ + [Total crop cash receipts]$_{Q2}$ + [Total crop cash receipts]$_{Q3}$ + [Total crop cash receipts]$_{Q4}$

Direct Government Payments

Government payments equations: See Appendix 2, p. 84.

Farm-Related Income

[Farm-related income]$_t$ = [Machine hire and customwork]$_t$ + [Forest products receipts]$_t$ + [Other farm-related income]$_t$

Machine hire and customwork income formula: p. 66.

Forest products receipts formula: p. 67.

Other farm–related income formula: p. 67.

Cash Expenses

[Cash expenses]$_t$ = [Total production expenses]$_t$ – [Noncash expenses]$_t$

Total production expenses formula: p. 73.

[Noncash expenses]$_t$ = [Labor perquisites]$_t$ + [Net capital consumption expenses]$_t$

[Labor perquisites]$_t$ = [Wage rates prices paid index]$_t$ / [Wage rates prices paid index]$_{t-1}$ + [Hired farm workers number]$_t$ / [Hired farm workers number]$_{t-1}$ – 1) * [Labor perquisites]$_{t-1}$

[Net capital consumption expenses]$_t$ = [Capital consumption expenses, excluding dwellings]$_t$ – [Landlord capital consumption expense]$_t$

[Capital consumption expenses, excluding dwellings]$_t$ = [Capital consumption expenses, total]$_t$ – [Operator dwellings capital consumption expense]$_t$

[Landlord capital consumption expense]$_t$ = ([Land value/acre]$_t$ / [Land value/acre]$_{t-1}$ * 0.4 + [Total crops cash receipts]$_t$ / [Total crops cash receipts]$_{t-1}$ * 0.6) * [Landlord capital consumption expense]$_{t-1}$

[Operator dwellings capital consumption expense]$_t$ = [Operator dwellings capital replacement expense]$_t$ + [Operator dwellings accidental damage expense]$_t$

[Operator dwellings capital replacement expense]$_t$ = [Balance sheet value, operator dwellings]$_t$ * 0.02

[Operator dwellings accidental damage expense]$_t$ = [Operator dwellings accidental damage expense]$_{t-1 \text{ to } t-3}$ / [Operator dwellings capital replacement expense]$_{t-1 \text{ to } t-3}$ * [Operator dwellings capital replacement expense]$_t$

[Operator dwellings interest expense]$_t$ = [Real estate interest expense]$_t$ / [Real estate interest expense]$_{t-1}$
  * [Operator dwellings interest expense]$_{t-1}$

[Operator dwellings real estate taxes expense]$_t$ = [Taxes prices paid index]$_t$ / [Taxes prices paid index]$_{t-1}$
  * [Operator dwellings real estate taxes expense]$_{t-1}$

[Operator dwellings repair and maintenance expense]$_t$ = [Repair and maintenance expense]$_t$ /
  [Repair and maintenance expense]$_{t-1}$ * [Operator dwellings repair and maintenance expense]$_{t-1}$

[Operator dwellings insurance expense]$_t$ = [PPITW prices paid index]$_t$ / [PPITW prices paid index]$_{t-1}$
  * [Operator dwellings insurance expense]$_{t-1}$

[Operator dwellings expense, total]$_t$ = [Operator dwellings capital consumption expense]$_t$ +
  [Operator dwellings interest expense]$_t$ + [Operator dwellings real estate taxes expense]$_t$ +
  [Operator dwellings repair and maintenance expense]$_t$ + [Operator dwellings insurance expense]$_t$

Net Cash Income

[Net cash income]$_t$ = [Gross cash income]$_t$ – [Cash expenses]$_t$

Total Gross Income

[Total gross income]$_t$ = [Gross cash income]$_t$ + [Nonmoney income]$_t$ + [Value of change in inventory]$_t$

Nonmoney income

[Nonmoney income]$_t$ = [Gross imputed rental value of farm housing]$_t$ + [Total Home consumption]$_t$

  Gross imputed rental value of farm housing: p. 67.

[Total Home consumption]$_t$ = [Home consumption of crops]$_t$ + [Home consumption of animal products]$_t$

  Home consumption of crops: p. 62

  Home consumption of animal products: p. 66.

Farm Production Expenses

[Farm–origin input expenses]$_t$ = [Feed expenses]$_t$ + [Livestock and poultry expenses]$_t$ + [Seed expenses]$_t$

  Component expenses: p. 67.

[Manufactured inputs expenses]$_t$ = [Fertilizer expenses]$_t$ + [Fuels and oils expenses]$_t$ + [Electricity expense]$_t$ +
  [Pesticides expenses]$_t$

  Component expenses: p. 67.

[Interest expenses]$_t$ = [Nonreal estate interest expenses]$_t$ + [Real estate interest expenses]$_t$

  Component expenses: p. 69.

[Other operating expenses]$_t$ = [Hired and contract labor expenses]$_t$ + [Repair and maintenance expenses]$_t$ +
  [Machine hire and customwork expenses]$_t$ + [Marketing, storage, and transportation expenses]$_t$ +
  [Miscellaneous expenses, including Motor vehicle registration and licensing fees]$_t$

[Hired and contract labor expenses]$_t$ = [Hired labor expenses]$_t$ + [Contract labor]$_t$

    Hired labor expenses: p. 69.

    Contract labor expenses: p. 68.

    Repair and maintenance expenses: p. 68.

    Machine hire and customwork expenses: p. 68.

    Marketing, storage, and transportation expenses: p. 68.

    Miscellaneous expenses, excluding Motor vehicle registration and licensing fees: p. 68

    Motor vehicle registration and licensing fees: p. 68.

[Overhead expenses]$_t$ = [Net rent to nonoperators expense]$_t$ + [Capital consumption expense]$_t$ + [Property taxes expense]$_t$

    Net rent to nonoperators expense: p. 69.

    Capital consumption expense: pp. 69.

    Property taxes expense: p. 68.

[Total production expenses]$_t$ = [Farm origin expenses]$_t$ + [Manufactured inputs expenses]$_t$ + [Interest expenses]$_t$ + [Other operating expenses]$_t$ + [Overhead expenses]$_t$

Net Farm Income

[Net farm income]$_t$ = [Total gross income]$_t$ − [Farm production expenses]$_t$

Indexes of Prices Paid by Farmers, 1990–92=100[23]

[Feed prices paid index]$_t$ = EXP(LN([Feed prices paid index]$_{t-1}$) + 0.07909 * LN([Corn marketing year average price]$_y$ / [Corn marketing year average price]$_{y-1}$) + 0.29474 * LN([[Corn marketing year average price]$_{y-1}$ / [Corn marketing year average price]$_{y-2}$) + 0.16037 * LN ([Soymeal marketing year average price]$_{y-1}$ / [Soymeal marketing year average price]$_{y-2}$) + 0.24575 * LN([Hay marketing year average price]$_y$ / [Hay marketing year average price]$_{y-1}$))

[Livestock prices paid index]$_t$ = 1.00579 * [Feeder steer price, 750-800 lb.]$_t$ + 0.07621 * Feeder steer price, 750-800 lb.]$_{t-1}$ − 2.32684 * [Corn marketing year average price]$_{y-1}$ + 1.03678 * [Milk annual average price]$_t$

[Seeds prices paid index]$_t$ = 0..05856 * ([Corn planted acres]$_{t-1}$ + [Wheat planted acres]$_{t-1}$ + [Soybean planted acres]$_{t-1}$) − 0.07872 * [Corn yield]$_{t-1}$ + 0.84921 * [Producer price index, finished goods]$_{t-1}$

[Fertilizer prices paid index]$_t$ = EXP(3.63661 + 0.01774 * ([Year]$_t$ − 1975 + 1) + 0.10456 * LN(Composite refiner's acquisition cost]$_t$ + 0.45257 * AVG(LN([Corn marketing year average price]$_y$), LN([Corn marketing year average price]$_{y-1}$)))

[Agricultural chemicals prices paid index]$_t$ = EXP(2.29206 + 0.01766 * ([Year]$_t$ − 1975 + 1) − 0.09033 * AVG(LN([Composite refiner's acquisition cost]$_t$), LN([Composite refiner's acquisition cost]$_{t-1}$)) + 0.08048 *

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[23]All coefficients in this section are the result of regression analysis, except for the weights in the rent prices paid index.

AVG(LN([Corn marketing year average price]$_y$), LN([Corn marketing year average price]$_{y-1}$)) + 0.48077 * [Fertilizer prices paid index]$_{t-1}$)

[Fuels prices paid index]$_t$ = –23.51956 + 1.60602 * [Composite refiner's acquisition cost]$_t$ + 0.72889 * [Producer price index, finished goods]$_{t-1}$

[Farm supplies and repairs prices paid index]$_t$ = 17.34968 – 60.24675[24] + 0.72229 * [Producer price index, finished goods]$_t$ + 0.48737 * [Producer price index, finished goods, 1987ff]$_t$

[Autos and trucks prices paid index]$_t$ = 0.57447 + 0.75582 * [Consumer price index-U]$_{t-1}$

[Farm machinery prices paid index]$_t$ = –27.49248 + 1.143 * [Producer price index, finished goods]$_{t-1}$

[Building materials prices paid index]$_t$ = 16.40353 – 4.73108[25] + 0.77341 * [Producer price index, finished goods]$_t$

[Farm services prices paid index]$_t$ = 16.32686 + 0.60954 * [Consumer price index-U]$_t$

[Rent prices paid index]$_t$ = [Rent prices paid index]$_{t-1}$ * ((0.5 * (Land value per acre, Jan. 1]$_t$ / Land value per acre, Jan. 1]$_{t-1}$ – 1) * 0.54) + (0.5 * ([Value of production: corn, soybeans, wheat]$_t$ / [Value of production: corn, soybeans, wheat]$_{t-1}$ – 1) * 0.46))

[Production items prices paid index]$_t$ = (SUM((([Individual prices paid indexes in Production items]$_t$[26]/ [Average individual prices paid indexes in Production items]$_{t-1 \text{ to } t-5}$ * 100) * [Relative importance, individual prices paid indexes in Production items]$_t$) / SUM([Relative importance, individual prices paid indexes in Production items]$_t$)) / SUM((([Average individual prices paid indexes in Production items]$_{1990-92}$ / [Average individual prices paid indexes in Production items]$_{t-1 \text{ to } t-5}$ * 100) * [Relative importance, individual prices paid indexes in Production items]$_t$ / 100) / (SUM([Relative importance, individual prices paid indexes in Production items]$_t$) / 100) * 100

[Interest prices paid index]$_t$ = –14.8 + 5.2385 * [Average agricultural nonreal estate interest rate]$_t$ + 1.005 * [Land value per acre]$_t$ * [Average agricultural real estate interest rate]$_t$

[Taxes prices paid index]$_t$ = 21.03301 + 0.58245 * [Consumer price index-U]$_t$

[Wage rates prices paid index]$_t$ = 21.37248 + 12.72668 * [Private nonagricultural average hourly earnings]$_t$ – 9.97742 * [Private nonagricultural average hourly earnings]$_{t-2}$ + 2.64085 * ([Year]$_t$ – 1975 + 1).

[Production items, Interest, Taxes, and Wage rates prices paid index (PITW)]$_t$ = (SUM((([Individual prices paid indexes in PITW]$_t$ / [Average individual prices paid indexes in PITW]$_{t-1 \text{ to } t-5}$ * 100) * [Relative importance, individual prices paid indexes in PITW]$_t$) / SUM([Relative importance, individual prices paid indexes in PITW]$_t$)) / SUM((([Average individual prices paid indexes in PITW]$_{1990-92}$ / [Average individual prices paid indexes in PITW]$_{t-1 \text{ to } t-5}$ * 100) * [Relative importance, individual prices paid indexes in PITW]$_t$ / 100) / (SUM([Relative importance, individual prices paid indexes in PITW]$_t$) / 100) * 100

[Family living prices paid index]$_t$ = [Consumer price index-U]$_t$

[Commodities & Services, Interest, Taxes & Wage Rates prices paid index (PPITW) = (SUM((([Individual prices paid indexes in PPITW]$_t$ / [Average individual prices paid indexes in PPITW]$_{t-1 \text{ to } t-5}$ * 100) * [Relative importance, individual prices paid indexes in PPITW]$_t$) / SUM([Relative importance, individual prices paid ndexes in

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[24]Intercept shift, 1987ff.

[25] Intercept shift, 1986ff.

[26]The individual prices paid indexes included in Production items are Feed, Livestock, Seed, Fertilizer, Agricultural Chemicals, Fuels, Farm supplies and repairs, Autos and trucks, Farm machinery, Building materials, Farm services, and Rent.

PPITW]$_t$)) / SUM(([Average individual prices paid indexes in PPITW]$_{1990–92}$ / [Average individual prices paid indexes in PPITW]$_{t–1 \text{ to } t–5}$ * 100) * [Relative importance, individual prices paid indexes in PPITW]$_t$ / 100) / (SUM([Relative importance, individual prices paid indexes in PPITW]$_t$) / 100) * 100

Capital Expenditures[27]

<u>Motor Vehicles and Farm Machinery</u>

[Tractor purchases]$_t$ = (–13392 + 2209 * [Number of farms]$_t$ + .026954 * [Acres planted, 14 crops]$_t$ + .0033197 * [Total crop cash receipts]$_t$ + .06031 * [Total livestock cash receipts]$_t$ – 166.89 * [Prime rate]$_t$) / (–13392 + 2209 * [Number of farms]$_{t–1}$ + .026954 * [Acres planted, 14 crops]$_{t–1}$ + .0033197 * [Total crop cash receipts]$_{t–1}$ + .06031 * [Total livestock cash receipts]$_{t–1}$ – 166.89 * [Prime rate]$_{t–1}$) * [Tractor purchases]$_{t–1}$

[Truck purchases]$_t$ = (–1269 – 0.019662665 * [Acres planted,14 crops]$_t$ + 4.9633 [Total crop cash receipts]$_t$ – 0.00808 * [Total livestock cash receipts]$_t$ + 0.0358 * ([Real estate debt, including operator dwell-ings]$_t$ + [Nonreal estate debt]$_t$)) / (-1296-0.01962665 * [Acres planted,14 crops]$_{t–1}$ + 4.9633 * – 0.00808 * [Total livestock cash receipts]$_{t–1}$ + 0.0358 * ([Real estate debt, including operator dwellings]$_{t–1}$ + [Non real estate debt]$_{t–1}$)) * [Truck purchases]$_{t–1}$

[Auto purchases]$_t$ = (-255 + 2.788 * [Number of farms]$_t$ – 0.007* [Acres planted,14 crops]$_t$ + 0.0042323 * [Total crop cash receipts]$_t$ + 6.64E-005 * [Total livestock cash receipts]$_t$ – 18.307 * [Prime rate]$_t$) / (-255 + 2.788 * [Number of farms]$_{t–1}$ – 0.007* [Acres planted, 14 crops]$_{t–1}$ + 0.0042323 * [Total crop cash receipts]$_{t–1}$ + 6.64E-005 * [Total livestock cash receipts]$_{t–1}$ – 18.307 * [Prime rate]$_{t–1}$) * [Auto purchases]$_{t–1}$

[Farm machinery purchases]$_t$ = (-31119.7 + 5241 * [Number of farms]$_t$ + 0.062 * [Acres planted, 14 crops]$_t$ –0.0308 * [Total crop cash receipts]$_t$ + 0.16378 * [Total livestock cash receipts]$_t$ – 167 * [Prime rate]$_t$) / (-31119.7 + 5241 * [Number of farms]$_{t–1}$ + 0.062 * [Acres planted, 14 crops]$_{t–1}$ –0.0308 * [Total crop cash receipts]$_{t–1}$ + 0.16378 * [Total livestock cash receipts]$_{t–1}$ – 167 * [Prime rate]$_{t–1}$) * [Farm machinery]$_{t–1}$

[Total motor vehicle and farm machinery purchases]$_t$ = [Tractor purchases]$_t$ + [Truck purchases]$_t$ + [Auto purchases]$_t$ + [Farm machinery purchases]$_t$

<u>Buildings</u>

[Service buildings construction]$_t$ = [Total motor vehicle and farm machinery purchases]$_t$ / Total motor vehicle and farm machinery purchases]$_{t–1}$ * [Service buildings construction]$_{t–1}$

[Operator dwelling construction]$_t$ = (-1571.5 + 0.0085 * [Acres planted, 14 crops]$_t$ + 0.00874 * [Total crop cash receipts]$_t$ + 0.0009116 * [Total livestock cash receipts]$_t$ –0.000969 * ([Real estate debt, including operator dwellings]$_t$ + [Nonreal estate debt]$_t$)) / (-1571.5 + 0.0085 * [Acres planted, 14 crops]$_{t–1}$ + 0.00874 * [Total crop cash receipts]$_{t–1}$ + 0.0009116 * [Total livestock cash receipts]$_{t–1}$ – 0.000969 * ([Real estate debt, including operator dwellings]$_{t–1}$ + [Nonreal estate debt]$_{t–1}$)) * [Operator dwelling construction]$_{t–1}$

[Total capital expenditures]$_t$ = [Total motor vehicle and farm machinery purchases]$_t$ + [Service buildings construction]$_t$ + [Operator dwelling construction]$_t$

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[27]Linear equations in this section are the result of time-series analysis..

P = marketing year price or index; Q = marketing year production

Crops

<u>Food Grains Output Index</u>

(1) $[\text{Food grains P*Q Sum}]_y$ = $[\text{Wheat price}]_y$ * $[\text{Wheat production}]_y$ + $[\text{Rice price}]_y$ * $[\text{Rice production}]_y$ + $[\text{Rye price}]_y$ * $[\text{Rye production}]_y$

(2) $[\text{S1: Wheat}]_y$ = AVG($[\text{Wheat price}]_y$ * $[\text{Wheat production}]_y$ / $[\text{Food grains P*Q Sum}]_y$, $[\text{Wheat price}]_{y-1}$ * $[\text{Wheat production}]_{y-1}$ / $[\text{Food grains P*Q Sum}]_{y-1}$)

$[\text{S1: Rice}]_y$ = AVG($[\text{Rice price}]_y$ * $[\text{Rice production}]_y$ / $[\text{Food grains P*Q Sum}]_y$, $[\text{Rice price}]_{y-1}$ * $[\text{Rice production}]_{y-1}$ / $[\text{Food grains P*Q Sum}]_{y-1}$)

$[\text{S1: Rye}]_y$ = AVG($[\text{Rye price}]_y$ * $[\text{Rye production}]_y$ / $[\text{Food grains P*Q Sum}]_y$, $[\text{Rye price}]_{y-1}$ * $[\text{Rye production}]_{y-1}$ / $[\text{Food grains P*Q Sum}]_{y-1}$)

(3) $[\text{S1: Individual Food grains} * LN(Q_y / Q_{y-1})]$ = SUM($[\text{S1: Wheat}]_y$ * LN($[\text{Wheat production}]_y$ / $[\text{Wheat production}]_{y-1}$), $[\text{S1: Rice}]_y$ * LN($[\text{Rice production}]_y$ / $[\text{Rice production}]_{y-1}$), $[\text{S1: Rye}]_y$ * LN($[\text{Rye production}]_y$ / $[\text{Rye production}]_{y-1}$))

(4) $[\text{Food grains index mover}]_y$ = EXP($[\text{S1: Individual Food grains} * LN(Q_y / _{y-1})]_y$)

(5) $[\text{Food grains output index}]_y$ = $[\text{Food grains output index}]_{y-1}$ * $[\text{Food grains index mover}]_y$

<u>Feed Grains Output Index</u>

(1) $[\text{Feed grains P*Q Sum}]_y$ = $[\text{Corn price}]_y$ * $[\text{Corn production}]_y$ + $[\text{Sorghum price}]_y$ * $[\text{Sorghum production}]_y$ + $[\text{Barley price}]_y$ * $[\text{Barley production}]_y$ + $[\text{Oats price}]_y$ * $[\text{Oats production}]_y$

(2) $[\text{S1: Corn}]_y$ = AVG($[\text{Corn price}]_y$ * $[\text{Corn production}]_y$ / $[\text{Feed grains P*Q Sum}]_y$, $[\text{Corn price}]_{y-1}$ * $[\text{Corn production}]_{y-1}$ / $[\text{Feed grains P*Q Sum}]_{y-1}$)

$[\text{S1: Sorghum}]_y$ = AVG($[\text{Sorghum price}]_y$ * $[\text{Sorghum production}]_y$ / $[\text{Feed grains P*Q Sum}]_y$, $[\text{Sorghum price}]_{y-1}$ * $[\text{Sorghum production}]_{y-1}$ / $[\text{Feed grains P*Q Sum}]_{y-1}$)

$[\text{S1: Barley}]_y$ = AVG($[\text{Barley price}]_y$ * $[\text{Barley production}]_y$ / $[\text{Feed grains P*Q Sum}]_y$, $[\text{Barley price}]_{y-1}$ * $[\text{Barley production}]_{y-1}$ / $[\text{Feed grains P*Q Sum}]_{y-1}$)

$[\text{S1: Oats}]_y$ = AVG($[\text{Oats price}]_y$ * $[\text{Oats production}]_y$ / $[\text{Feed grains P*Q Sum}]_y$, $[\text{Oats price}]_{y-1}$ * $[\text{Oats production}]_{y-1}$ / $[\text{Feed grains P*Q Sum}]_{y-1}$)

(3) $[\text{S1: Individual Feed grains} * LN(Q_y / Q_{y-1})]$ = SUM($[\text{S1: Corn}]_y$ * LN($[\text{Corn production}]_y$ / $[\text{Corn production}]_{y-1}$), $[\text{S1: Sorghum}]_y$ * LN($[\text{Sorghum production}]_y$ / $[\text{Sorghum production}]_{y-1}$), $[\text{S1: Barley}]_y$ * LN($[\text{Barley production}]_y$ / $[\text{Barley production}]_{y-1}$), $[\text{S1: Oats}]_y$ * LN($[\text{Oats production}]_y$ / $[\text{Oats production}]_{y-1}$))

(4) $[\text{Feed grains index mover}]_y$ = EXP($[\text{S1: Individual Feed grains} * LN(Q_y / Q_{y-1})]_y$)

(5) $[\text{Feed grains output index}]_y$ = $[\text{Feed grains output index}]_{y-1}$ * $[\text{Feed grains index mover}]_y$

Hay Output Index

(1) $[\text{S1: Hay}]_y = 1.0$

(2) $[\text{S1: Hay} * \text{LN}(Q_y / Q_{y-1}] = [\text{S1: Hay}]_y * \text{LN}([\text{Hay production}]_y / [\text{Hay production}]_{y-1})$

(3) $[\text{Hay index mover}]_y = \text{EXP}([\text{S1: Hay} * \text{LN}(Q_y / Q_{y-1})]_y)$

(4) $[\text{Hay output index}]_y = [\text{Hay output index}]_{y-1} * [\text{Hay index mover}]_y$

Oilseeds Output Index

(1) $[\text{Oilseeds P*Q Sum}]_y = [\text{Soybeans price}]_y * [\text{Soybeans production}]_y + [\text{Peanuts price}]_y * [\text{Peanuts production}]_y + [\text{Sunflowers price}]_y * [\text{Sunflowers production}]_y + [\text{Flaxseed price}]_y * [\text{Flaxseed production}]_y$

(2) $[\text{S1: Soybeans}]_y = \text{AVG}([\text{Soybeans price}]_y * [\text{Soybeans production}]_y / [\text{Oilseeds P*Q Sum}]_y, [\text{Soybeans price}]_{y-1} * [\text{Soybeans production}]_{y-1} / [\text{Oilseeds P*Q Sum}]_{y-1})$

   $[\text{S1: Peanuts}]_y = \text{AVG}([\text{Peanuts price}]_y * [\text{Peanuts production}]_y / [\text{Oilseeds P*Q Sum}]_y, [\text{Peanuts price}]_{y-1} * [\text{Peanuts production}]_{y-1} / [\text{Oilseeds P*Q Sum}]_{y-1})$

   $[\text{S1: Sunflowers}]_y = \text{AVG}([\text{Sunflowers price}]_y * [\text{Sunflowers production}]_y / [\text{Oilseeds P*Q Sum}]_y, [\text{Sunflowers price}]_{y-1} * [\text{Sunflowers production}]_{y-1} / [\text{Oilseeds P*Q Sum}]_{y-1})$

   $[\text{S1: Flaxseed}]_y = \text{AVG}([\text{Flaxseed price}]_y * [\text{Flaxseed production}]_y / [\text{Oilseeds P*Q Sum}]_y, [\text{Flaxseed price}]_{y-1} * [\text{Flaxseed production}]_{y-1} / [\text{Oilseeds P*Q Sum}]_{y-1})$

(3) $[\text{S1: Individual Oilseeds} * \text{LN}(Q_y / Q_{y-1}] = \text{SUM}([\text{S1: Soybeans}]_y * \text{LN}([\text{Soybeans production}]_y / [\text{Soybeans production}]_{y-1}), [\text{S1: Peanuts}]_y * \text{LN}([\text{Peanuts production}]_y / [\text{Peanuts production}]_{y-1}), [\text{S1: Sunflowers}]_y * \text{LN}([\text{Sunflowers production}]_y / [\text{Sunflowers production}]_{y-1}), [\text{S1: Flaxseed}]_y * \text{LN}([\text{Flaxseed production}]_y / [\text{Flaxseed production}]_{y-1}))$

(4) $[\text{Oilseeds index mover}]_y = \text{EXP}([\text{S1: Individual Oilseeds} * \text{LN}(Q_y / Q_{y-1})]_y)$

(5) $[\text{Oilseeds output index}]_y = [\text{Oilseeds output index}]_{y-1} * [\text{Oilseeds index mover}]_y$

Cotton Output Index

(1) $[\text{Cotton P*Q Sum}]_y = [\text{Cotton lint price}]_y * [\text{Cotton lint production}]_y + [\text{Cottonseed price}]_y * [\text{Cottonseed production}]_y$

(2) $[\text{S1: Cotton lint}]_y = \text{AVG}([\text{Cotton lint price}]_y * [\text{Cotton lint production}]_y / [\text{Cotton P*Q Sum}]_y, [\text{Cotton lint price}]_{y-1} * [\text{Cotton lint production}]_{y-1} / [\text{Cotton P*Q Sum}]_{y-1})$

   $[\text{S1: Cottonseed}]_y = \text{AVG}([\text{Cottonseed price}]_y * [\text{Cottonseed production}]_y / [\text{Cotton P*Q Sum}]_y, [\text{Cottonseed price}]_{y-1} * [\text{Cottonseed production}]_{y-1} / [\text{Cotton P*Q Sum}]_{y-1})$

(3) $[\text{S1: Individual Cotton} * \text{LN}(Q_y / Q_{y-1}] = \text{SUM}([\text{S1: Cotton lint}]_y * \text{LN}([\text{Cotton lint production}]_y / [\text{Cotton lint production}]_{y-1}), [\text{S1: Cottonseed}]_y * \text{LN}([\text{Cottonseed production}]_y / [\text{Cottonseed production}]_{y-1}))$

(4) $[\text{Cotton index mover}]_y = \text{EXP}([\text{S1: Individual Cotton} * \text{LN}(Q_y / Q_{y-1})]_y)$

(5) $[\text{Cotton output index}]_y = [\text{Cotton output index}]_{y-1} * [\text{Cotton index mover}]_y$

<u>Tobacco Output Index</u>

(1) $[\text{S1: Tobacco}]_y = 1.0$

(2) $[\text{S1: Tobacco} * \text{LN}(Q_y / Q_{y-1})] = [\text{S1: Tobacco}]_y * \text{LN}([\text{Tobacco production}]_y / [\text{Tobacco production}]_{y-1})$

(3) $[\text{Tobacco index mover}]_y = \text{EXP}([\text{S1: Tobacco} * \text{LN}(Q_y / Q_{y-1})]_y)$

(4) $[\text{Tobacco output index}]_y = [\text{Tobacco output index}]_{y-1} * [\text{Tobacco index mover}]_y$

<u>Vegetables Output Index</u>

(1) $[\text{Vegetables P*Q Sum}]_y = [\text{Potatoes price}]_y * [\text{Potatoes production}]_y + [\text{Dry beans price}]_y * [\text{Dry beans production}]_y + [\text{Other vegetables price}]_y * [\text{Other vegetables production}]_y$

(2) $[\text{S1: Potatoes}]_y = \text{AVG}([\text{Potatoes price}]_y * [\text{Potatoes production}]_y / [\text{Vegetables P*Q Sum}]_y, [\text{Potatoes price}]_{y-1} * [\text{Potatoes production}]_{y-1} / [\text{Vegetables P*Q Sum}]_{y-1})$

$[\text{S1: Dry beans}]_y = \text{AVG}([\text{Dry beans price}]_y * [\text{Dry beans production}]_y / [\text{Vegetables P*Q Sum}]_y, [\text{Dry beans price}]_{y-1} * [\text{Dry beans production}]_{y-1} / [\text{Vegetables P*Q Sum}]_{y-1})$

$[\text{S1: Other vegetables}]_y = \text{AVG}([\text{Other vegetables price}]_y * [\text{Other vegetables production}]_y / [\text{Vegetables P*Q Sum}]_y, [\text{Other vegetables price}]_{y-1} * [\text{Other vegetables production}]_{y-1} / [\text{Vegetables P*Q Sum}]_{y-1})$

(3) $[\text{S1: Individual Vegetables} * \text{LN}(Q_y / Q_{y-1})] = \text{SUM}([\text{S1: Potatoes}]_y * \text{LN}([\text{Potatoes production}]_y / [\text{Potatoes production}]_{y-1}), [\text{S1: Dry beans}]_y * \text{LN}([\text{Dry beans production}]_y / [\text{Dry beans production}]_{y-1}), [\text{S1: Other vegetables}]_y * \text{LN}([\text{Other vegetables production}]_y / [\text{Other vegetables production}]_{y-1}))$

(4) $[\text{Vegetables index mover}]_y = \text{EXP}([\text{S1: Individual Vegetables} * \text{LN}(Q_y / Q_{y-1})]_y)$

(5) $[\text{Vegetables output index}]_y = [\text{Vegetables output index}]_{y-1} * [\text{Vegetables index mover}]_y$

<u>Fruits and Nuts Output Index</u>

(1) $[\text{S1: Fruits and nuts}]_y = 1.0$

(2) $[\text{S1: Fruits and nuts} * \text{LN}(Q_y / Q_{y-1})] = [\text{S1: Fruits and nuts}]_y * \text{LN}([\text{Fruits and nuts production}]_y / [\text{Fruits and nuts production}]_{y-1})$

(3) $[\text{Fruits and nuts index mover}]_y = \text{EXP}([\text{S1: Fruits and nuts} * \text{LN}(Q_y / Q_{y-1})]_y)$

(4) $[\text{Fruits and nuts output index}]_y = [\text{Fruits and nuts output index}]_{y-1} * [\text{Fruits and nuts index mover}]_y$

<u>Greenhouse and Nursery Output Index</u>

(1) $[\text{S1: Greenhouse and nursery}]_y = 1.0$

(2) $[\text{S1: Greenhouse and nursery} * \text{LN}(Q_y / Q_{y-1})] = [\text{S1: Greenhouse and nursery}]_y * \text{LN}([\text{Greenhouse and nursery production index}]_y / [\text{Greenhouse and nursery production index}]_{y-1})$

(3) $[\text{Greenhouse and nursery index mover}]_y = \text{EXP}([\text{S1: Greenhouse and nursery} * \text{LN}(Q_y / Q_{y-1})]_y)$

(4) $[\text{Greenhouse and nursery output index}]_y = [\text{Greenhouse and nursery output index}]_{y-1} * [\text{Greenhouse and nursery index mover}]_y$

<u>Total Crops Output Index</u>

(1) $[\text{Total Crops P*Q Sum}]_y = [\text{Food grains P*Q Sum}]_y + [\text{Feed grains P*Q Sum}]_y + [\text{Hay P*Q}]_y + [\text{Oilseeds P*Q Sum}]_y + [\text{Cotton P*Q Sum}]_y + [\text{Tobacco P*Q}]_y + [\text{Vegetables P*Q Sum}]_y + [\text{Fruits and nuts P*Q}]_y + [\text{Greenhouse and nursery P*Q}]_y$

(2) $[\text{S2: Food grains}]_y = \text{AVG}([\text{Food grains P*Q Sum}]_y / [\text{Total Crops P*Q Sum}]_y, [\text{Food grains P*Q Sum}]_{y-1} / [\text{Total Crops P*Q Sum}]_{y-1})$

$[\text{S2: Feed grains}]_y = \text{AVG}([\text{Feed grains P*Q Sum}]_y / [\text{Total Crops P*Q Sum}]_y, [\text{Feed grains P*Q Sum}]_y / [\text{Total Crops P*Q Sum}]_{y-1})$

$[\text{S2: Hay}]_y = \text{AVG}([\text{Hay P*Q}]_y / [\text{Total Crops P*Q Sum}]_y, [\text{Hay P*Q}]_{y-1} / [\text{Total Crops P*Q Sum}]_{y-1})$

$[\text{S2: Oilseeds}]_y = \text{AVG}([\text{Oilseeds P*Q Sum}]_y / [\text{Total Crops P*Q Sum}]_y, [\text{Oilseeds P*Q Sum}]_{y-1} / [\text{Total Crops P*Q Sum}]_{y-1})$

$[\text{S2: Cotton}]_y = \text{AVG}([\text{Cotton P*Q Sum}]_y / [\text{Total Crops P*Q Sum}]_y, [\text{Cotton P*Q Sum}]_{y-1} / [\text{Total Crops P*Q Sum}]_{y-1})$

$[\text{S2: Tobacco}]_y = \text{AVG}([\text{Tobacco P*Q}]_y / [\text{Total Crops P*Q Sum}]_y, [\text{Tobacco P*Q}]_{y-1} / [\text{Total Crops P*Q Sum}]_{y-1})$

$[\text{S2: Vegetables}]_y = \text{AVG}([\text{Vegetables P*Q Sum}]_y / [\text{Total Crops P*Q Sum}]_y, [\text{Vegetables P*Q Sum}]_{y-1} / [\text{Total Crops P*Q Sum}]_{y-1})$

$[\text{S2: Fruits and nuts}]_y = \text{AVG}([\text{Fruits and nuts P*Q}]_y / [\text{Total Crops P*Q Sum}]_y, [\text{Fruits and nuts P*Q}]_{y-1} / [\text{Total Crops P*Q Sum}]_{y-1})$

$[\text{S2: Greenhouse and nursery}]_y = \text{AVG}([\text{Greenhouse and nursery P*Q}]_y / [\text{Total Crops P*Q Sum}]_y, [\text{Greenhouse and nursery P*Q}]_{y-1} / [\text{Total Crops P*Q Sum}]_{y-1})$

(3) $[\text{S2: Individual Crops} * \text{LN}(Q_y / Q_{y-1}] = \text{SUM}([\text{S2: Food grains}]_y * \text{LN}([\text{Food grains output index}]_y / [\text{Food grains output index}]_{y-1}), [\text{S2: Feed grains}]_y * \text{LN}([\text{Feed grains output index}]_y / [\text{Feed grains output index}]_{y-1}), [\text{S2: Hay}]_y * \text{LN}(\text{Hay output index}]_y / [\text{Hay output index}]_{y-1}), [\text{S2: Oilseeds}]_y * \text{LN}(\text{Oilseeds output index}]_y / [\text{Oilseeds output index}]_{y-1}), [\text{S2: Cotton}]_y * \text{LN}([\text{Cotton output index}]_y / [\text{Cotton output index}]_{y-1}), [\text{S2: Tobacco}]_y * \text{LN}([\text{Tobacco output index}]_y / [\text{Tobacco output index}]_{y-1}), [\text{S2: Vegetables}]_y * \text{LN}([\text{Vegetables output index}]_y / [\text{Vegetables output index}]_{y-1}), [\text{S2: Fruits and nuts}]_y * \text{LN}([\text{Fruits and nuts output index}]_y / [\text{Fruits and nuts output index}]_{y-1}), [\text{S2: Greenhouse and nursery}]_y * \text{LN}([\text{Greenhouse and nursery output index}]_y / [\text{Greenhouse and nursery output index}]_{y-1}))$

(4) $[\text{Total Crops index mover}]_y = \text{EXP}([\text{S2: Individual Crops}] * \text{LN}(Q_y / Q_{y-1}])$

(5) $[\text{Total Crops output index}]_y = [\text{Total Crops output index}]_{y-1} * [\text{Total Crops index mover}]_y$

Livestock

<u>Meat Animals Output Index</u>

(1) $[\text{Meat animals P*Q Sum}]_y = [\text{Cattle price}]_y * [\text{Cattle production}]_y + [\text{Calves price}]_y * [\text{Calves production}]_y + [\text{Hogs price}]_y * [\text{Hogs production}]_y + [\text{Sheep price}]_y * [\text{Sheep production}]_y$

(2) $[\text{S1: Cattle}]_y = \text{AVG}([\text{Cattle price}]_y * [\text{Cattle production}]_y / [\text{Meat animals P*Q Sum}]_y, [\text{Cattle price}]_{y-1} * [\text{Cattle production}]_{y-1} / [\text{Meat animals P*Q Sum}]_{y-1})$

$[\text{S1: Calves}]_y = \text{AVG}([\text{Calves price}]_y * [\text{Calves production}]_y / [\text{Meat animals P*Q Sum}]_y, [\text{Calves price}]_{y-1} * [\text{Calves production}]_{y-1} / [\text{Meat animals P*Q Sum}]_{y-1})$

$[\text{S1: Hogs}]_y = \text{AVG}([\text{Hogs price}]_y * [\text{Hogs production}]_y / [\text{Meat animals P*Q Sum}]_y, [\text{Hogs price}]_{y-1} * [\text{Hogs production}]_{y-1} / [\text{Meat animals P*Q Sum}]_{y-1})$

$[\text{S1: Sheep}]_y = \text{AVG}([\text{Sheep price}]_y * [\text{Sheep production}]_y / [\text{Meat animals P*Q Sum}]_y, [\text{Sheep price}]_{y-1} * [\text{Sheep production}]_{y-1} / [\text{Meat animals P*Q Sum}]_{y-1})$

(3) $[\text{S1: Individual Meat animals} * \text{LN}(Q_y / Q_{y-1})] = \text{SUM}([\text{S1: Cattle}]_y * \text{LN}([\text{Cattle production}]_y / [\text{Cattle production}]_{y-1}), [\text{S1: Calves}]_y * \text{LN}([\text{Calves production}]_y / [\text{Calves production}]_{y-1}), [\text{S1: Hogs}]_y * \text{LN}([\text{Hogs production}]_y / [\text{Hogs production}]_{y-1}), [\text{S1: Sheep}]_y * \text{LN}([\text{Sheep production}]_y / [\text{Sheep production}]_{y-1}))$

(4) $[\text{Meat animals index mover}]_y = \text{EXP}([\text{S1: Individual Meat animals} * \text{LN}(Q_y / Q_{y-1})]_y)$

(5) $[\text{Meat animals output index}]_y = [\text{Meat animals output index}]_{y-1} * [\text{Meat animals index mover}]_y$

<u>Milk Ouput Index</u>

(1) $[\text{S1: Milk}]_y = 1.0$

(2) $[\text{S1: Milk} * \text{LN}(Q_y / Q_{y-1})] = [\text{S1: Milk}]_y * \text{LN}([\text{Milk production}]_y / [\text{Milk production}]_{y-1})$

(3) $[\text{Milk index mover}]_y = \text{EXP}([\text{S1: Milk} * \text{LN}(Q_y / Q_{y-1})]_y)$

(4) $[\text{Milk output index}]_y = [\text{Milk output index}]_{y-1} * [\text{Milk index mover}]_y$

<u>Poultry Output Index</u>

(1) $[\text{Poultry P*Q Sum}]_y = [\text{Broilers price}]_y * [\text{Broilers production}]_y + [\text{Turkeys price}]_y * [\text{Turkeys production}]_y + [\text{Eggs price}]_y * [\text{Eggs production}]_y$

(2) $[\text{S1: Broilers}]_y = \text{AVG}([\text{Broilers price}]_y * [\text{Broilers production}]_y / [\text{Poultry P*Q Sum}]_y, [\text{Broilers price}]_{y-1} * [\text{Broilers production}]_{y-1} / [\text{Poultry P*Q Sum}]_{y-1})$

$[\text{S1: Turkeys}]_y = \text{AVG}([\text{Turkeys price}]_y * [\text{Turkeys production}]_y / [\text{Poultry P*Q Sum}]_y, [\text{Turkeys price}]_{y-1} * [\text{Turkeys production}]_{y-1} / [\text{Poultry P*Q Sum}]_{y-1})$

$[\text{S1: Eggs}]_y = \text{AVG}([\text{Eggs price}]_y * [\text{Eggs production}]_y / [\text{Poultry P*Q Sum}]_y, [\text{Eggs price}]_{y-1} * [\text{Eggs production}]_{y-1} / [\text{Poultry P*Q Sum}]_{y-1})$

(3) $[\text{S1: Individual Poultry} * \text{LN}(Q_y / Q_{y-1})] = \text{SUM}([\text{S1: Broilers}]_y * \text{LN}([\text{Broilers production}]_y / [\text{Broilers production}]_{y-1}), [\text{S1: Turkeys}]_y * \text{LN}([\text{Turkeys production}]_y / [\text{Turkeys production}]_{y-1}), [\text{S1: Eggs}]_y * \text{LN}([\text{Eggs production}]_y / [\text{Eggs production}]_{y-1}))$

(4) $[\text{Poultry index mover}]_y = \text{EXP}([\text{S1: Individual Poultry} * \text{LN}(Q_y / Q_{y-1})]_y)$

(5) $[\text{Poultry output index}]_y = [\text{Poultry output index}]_{y-1} * [\text{Poultry index mover}]_y$

Total Livestock Output Index

(1) $[\text{Total Livestock P*Q Sum}]_y = [\text{Meat animals P*Q Sum}]_y + [\text{Dairy P*Q Sum}]_y + [\text{Poultry P*Q}]_y$

(2) $[\text{S2: Meat animals}]_y = \text{AVG}([\text{Meat animals P*Q Sum}]_y / [\text{Total Livestock P*Q Sum}]_y, [\text{Meat animals P*Q Sum}]_{y-1} / [\text{Total Livestock P*Q Sum}]_{y-1})$

$[\text{S2: Dairy}]_y = \text{AVG}([\text{Dairy P*Q Sum}]_y / [\text{Total Livestock P*Q Sum}]_y, [\text{Dairy P*Q Sum}]_y / [\text{Total Livestock P*Q Sum}]_{y-1})$

$[\text{S2: Poultry}]_y = \text{AVG}([\text{Poultry P*Q}]_y / [\text{Total Livestock P*Q Sum}]_y, [\text{Poultry P*Q}]_{y-1} / [\text{Total Livestock P*Q Sum}]_{y-1})$

(3) $[\text{S2: Individual Livestock} * \text{LN}(Q_y / Q_{y-1})] = \text{SUM}([\text{S2: Meat animals}]_y * \text{LN}([\text{Meat animals output index}]_y / [\text{Meat animals output index}]_{y-1}), [\text{S2: Dairy}]_y * \text{LN}([\text{Dairy output index}]_y / [\text{Dairy output index}]_{y-1}), [\text{S2: Poultry}]_y * \text{LN}(\text{Poultry output index}]_y / [\text{Poultry output index}]_{y-1}))$

(4) $[\text{Total Livestock index mover}]_y = \text{EXP}([\text{S2: Individual Livestock}] * \text{LN}(Q_y / Q_{y-1}))$

(5) $[\text{Total Livestock output index}]_y = [\text{Total Livestock output index}]_{y-1} * [\text{Total Livestock index mover}]_y$

Total Output

(1) $[\text{Total Output P*Q Sum}]_y = [\text{Total Crops P*Q Sum}]_y + [\text{Total Livestock P*Q Sum}]_y$

(2) $[\text{S2: Total Crops}]_y = \text{AVG}([\text{Total Crops P*Q Sum}]_y / [\text{Total Output P*Q Sum}]_y, [\text{Total Crops P*Q Sum}]_{y-1} / [\text{Total Output P*Q Sum}]_{y-1})$

$[\text{S2: Total Livestock}]_y = \text{AVG}([\text{Total Livestock P*Q Sum}]_y / [\text{Total P*Q Sum}]_y, [\text{Total Livestock P*Q Sum}]_y / [\text{Total P*Q Sum}]_{y-1})$

(3) $[\text{S2: Individual Total Output} * \text{LN}(Q_y / Q_{y-1})] = \text{SUM}([\text{S2: Total Crops}]_y * \text{LN}([\text{Total Crops output index}]_y / [\text{Total Crops output index}]_{y-1}), [\text{S2: Total Livestock}]_y * \text{LN}([\text{Total Livestock output index}]_y / [\text{Livestock output index}]_{y-1}))$

(4) $[\text{Total Output index mover}]_y = \text{EXP}([\text{S2: Individual Total Output}] * \text{LN}(Q_y / Q_{y-1}))$

(5) $[\text{Total Output index}]_y = [\text{Total Output index}]_{y-1} * [\text{Total Output index mover}]_y$

Cash Receipts at Seasonally Adjusted Annual Rates (SAAR)

$[\text{Crop cash receipts, SAAR}]_{Q1,t} = [\text{Crop cash receipts}]_t + ([\text{Crop cash receipts}]_{t-3} / [\text{Crop cash receipts}]_{Q1,t-3} + [\text{Crop cash receipts}]_{t-2} / [\text{Crop cash receipts}]_{Q1,t-2} + [\text{Crop cash receipts}]_{t-1} / [\text{Crop cash receipts}]_{Q1,t-1}) / 4 * [\text{Crop cash receipts}]_{Q1,t} -([\text{Crop cash receipts}]_{t-3} / [\text{Crop cash receipts}]_{Q2,t-3} + [\text{Crop cash receipts}]_{t-2} / [\text{Crop cash receipts}]_{Q2,t-2} + [\text{Crop cash receipts}]_{t-1} / [\text{Crop cash receipts}]_{Q2,t-1}) / 12 * [\text{Crop cash receipts}]_{Q2,t} -[\text{Crop cash receipts}]_{t-3} / [\text{Crop cash receipts}]_{Q3,t-3} + [\text{Crop cash receipts}]_{t-2} / [\text{Crop cash receipts}]_{Q3,t-2} +. [\text{Crop cash receipts}]_{t-1} / [\text{Crop cash receipts}]_{Q3,t-1}) / 12 * [\text{Crop cash receipts}]_{Q3,t} -([\text{Crop cash receipts}]_{t-3} / [\text{Crop cash receipts}]_{Q4,t-3} + [\text{Crop cash receipts}]_{t-2} / [\text{Crop cash receipts}]_{Q4,t-2} + [\text{Crop cash receipts}]_{t-1} / [\text{Crop cash receipts} I}_{Q4,t-1}) / 12 * [\text{Crop cash receipts}]_{Q4,t}$

$$[\text{Crop cash receipts, SAAR}]_{Q2,t} = [\text{Crop cash receipts}]_t - ([\text{Crop cash receipts}]_{t-3} / [\text{Crop cash receipts}]_{Q1,t-3} + [\text{Crop cash receipts}]_{t-2} / [\text{Crop cash receipts}]_{Q1,t-2} + [\text{Crop cash receipts}]_{t-1} / [\text{Crop cash receipts}]_{Q1,t-1}) / 12 * [\text{Crop cash receipts}]_{Q1,t} + ([\text{Crop cash receipts}]_{t-3} / [\text{Crop cash receipts}]_{Q2,t-3} + [\text{Crop cash receipts}]_{t-2} / [\text{Crop cash receipts}]_{Q2,t-2} + [\text{Crop cash receipts}]_{t-1} / [\text{Crop cash receipts}]_{Q2,t-1}) / 4 * [\text{Crop cash receipts}]_{Q2,t} - ([\text{Crop cash receipts}]_{t-3} / [\text{Crop cash receipts}]_{Q3,t-3} + [\text{Crop cash receipts}]_{t-2} / [\text{Crop cash receipts}]_{Q3,t-2} + [\text{Crop cash receipts}]_{t-1} / [\text{Crop cash receipts}]_{Q3,t-1}) / 12 * [\text{Crop cash receipts}]_{Q3,t} - ([\text{Crop cash receipts}]_{t-3} / [\text{Crop cash receipts}]_{Q4,t-3} + [\text{Crop cash receipts}]_{t-2} / [\text{Crop cash receipts}]_{Q4,t-2} + [\text{Crop cash receipts}]_{t-1} / [\text{Crop cash receipts}I_{Q4,t-1}]) / 12 * [\text{Crop cash receipts}]_{Q4,t}$$

$$[\text{Crop cash receipts, SAAR}]_{Q3,t} = [\text{Crop cash receipts}]_t - ([\text{Crop cash receipts}]_{t-3} / [\text{Crop cash receipts}]_{Q1,t-3} + [\text{Crop cash receipts}]_{t-2} / [\text{Crop cash receipts}]_{Q1,t-2} + [\text{Crop cash receipts}]_{t-1} / [\text{Crop cash receipts}]_{Q1,t-1}) / 12 * [\text{Crop cash receipts}]_{Q1,t} - ([\text{Crop cash receipts}]_{t-3} / [\text{Crop cash receipts}]_{Q2,t-3} + [\text{Crop cash receipts}]_{t-2} / [\text{Crop cash receipts}]_{Q2,t-2} + [\text{Crop cash receipts}]_{t-1} / [\text{Crop cash receipts}]_{Q2,t-1}) / 12 * [\text{Crop cash receipts}]_{Q2,t} + ([\text{Crop cash receipts}]_{t-3} / [\text{Crop cash receipts}]_{Q3,t-3} + [\text{Crop cash receipts}]_{t-2} / [\text{Crop cash receipts}]_{Q3,t-2} + [\text{Crop cash receipts}]_{t-1} / [\text{Crop cash receipts}]_{Q3,t-1}) / 4 * [\text{Crop cash receipts}]_{Q3,t} - ([\text{Crop cash receipts}]_{t-3} / [\text{Crop cash receipts}]_{Q4,t-3} + [\text{Crop cash receipts}]_{t-2} / [\text{Crop cash receipts}]_{Q4,t-2} + [\text{Crop cash receipts}]_{t-1} / [\text{Crop cash receipts}I_{Q4,t-1}]) / 12 * [\text{Crop cash receipts}]_{Q4,t}$$

$$[\text{Crop cash receipts, SAAR}]_{Q4,t} = [\text{Crop cash receipts}]_t - ([\text{Crop cash receipts}]_{t-3} / [\text{Crop cash receipts}]_{Q1,t-3} + [\text{Crop cash receipts}]_{t-2} / [\text{Crop cash receipts}]_{Q1,t-2} + [\text{Crop cash receipts}]_{t-1} / [\text{Crop cash receipts}]_{Q1,t-1}) / 12 * [\text{Crop cash receipts}]_{Q1,t} - ([\text{Crop cash receipts}]_{t-3} / [\text{Crop cash receipts}]_{Q2,t-3} + [\text{Crop cash receipts}]_{t-2} / [\text{Crop cash receipts}]_{Q2,t-2} + [\text{Crop cash receipts}]_{t-1} / [\text{Crop cash receipts}]_{Q2,t-1}) / 12 * [\text{Crop cash receipts}]_{Q2,t} - ([\text{Crop cash receipts}]_{t-3} / [\text{Crop cash receipts}]_{Q3,t-3} + [\text{Crop cash receipts}]_{t-2} / [\text{Crop cash receipts}]_{Q3,t-2} + [\text{Crop cash receipts}]_{t-1} / [\text{Crop cash receipts}]_{Q3,t-1}) / 12 * [\text{Crop cash receipts}]_{Q3,t} + ([\text{Crop cash receipts}]_{t-3} / [\text{Crop cash receipts}]_{Q4,t-3} + [\text{Crop cash receipts}]_{t-2} / [\text{Crop cash receipts}]_{Q4,t-2} + [\text{Crop cash receipts}]_{t-1} / [\text{Crop cash receipts}I_{Q4,t-1}]) / 4 * [\text{Crop cash receipts}]_{Q4,t}$$

$$[\text{Livestock receipts, SAAR}]_{Q1,t} = [\text{Livestock receipts}]_t + ([\text{Livestock receipts}]_{t-3} / [\text{Livestock receipts}]_{Q1,t-3} + [\text{Livestock receipts}]_{t-2} / [\text{Livestock receipts}]_{Q1,t-2} + [\text{Livestock receipts}]_{t-1} / [\text{Livestock receipts}]_{Q1,t-1}) / 4 * [\text{Livestock receipts}]_{Q1,t} - ([\text{Livestock receipts}]_{t-3} / [\text{Livestock receipts}]_{Q2,t-3} + [\text{Livestock receipts}]_{t-2} / [\text{Livestock receipts}]_{Q2,t-2} + [\text{Livestock receipts}]_{t-1} / [\text{Livestock receipts}]_{Q2,t-1}) / 12 * [\text{Livestock receipts}]_{Q2,t} - ([\text{Livestock receipts}]_{t-3} / [\text{Livestock receipts}]_{Q3,t-3} + [\text{Livestock receipts}]_{t-2} / [\text{Livestock receipts}]_{Q3,t-2} + [\text{Livestock receipts}]_{t-1} / [\text{Livestock receipts}]_{Q3,t-1}) / 12 * [\text{Livestock receipts}I_{Q3,t}] - ([\text{Livestock receipts}]_{t-3} / [\text{Livestock receipts}]_{Q4,t-3} + [\text{Livestock receipts}]_{t-2} / [\text{Livestock receipts}]_{Q4,t-2} + [\text{Livestock receipts}]_{t-1} / [\text{Livestock receipts}]_{Q4,t-1}) / 12 * [\text{Livestock receipts}]_{Q4,t}$$

$$[\text{Livestock receipts, SAAR}]_{Q2,t} = [\text{Livestock receipts}]_t - ([\text{Livestock receipts}]_{t-3} / [\text{Livestock receipts}]_{Q1,t-3} + [\text{Livestock receipts}]_{t-2} / [\text{Livestock receipts}]_{Q1,t-2} + [\text{Livestock receipts}]_{t-1} / [\text{Livestock receipts}]_{Q1,t-1}) / 12 * [\text{Livestock receipts}]_{Q1,t} + ([\text{Livestock receipts}]_{t-3} / [\text{Livestock receipts}]_{Q2,t-3} + [\text{Livestock receipts}]_{t-2} / [\text{Livestock receipts}]_{Q2,t-2} + [\text{Livestock receipts}]_{t-1} / [\text{Livestock receipts}]_{Q2,t-1}) / 4 * [\text{Livestock receipts}]_{Q2,t} - ([\text{Livestock receipts}]_{t-3} / [\text{Livestock receipts}]_{Q3,t-3} + [\text{Livestock receipts}]_{t-2} / [\text{Livestock receipts}]_{Q3,t-2} + [\text{Livestock receipts}]_{t-1} / [\text{Livestock receipts}]_{Q3,t-1}) / 12 * [\text{Livestock receipts}I_{Q3,t}] - ([\text{Livestock receipts}]_{t-3} / [\text{Livestock receipts}]_{Q4,t-3} + [\text{Livestock receipts}]_{t-2} / [\text{Livestock receipts}]_{Q4,t-2} + [\text{Livestock receipts}]_{t-1} / [\text{Livestock receipts}]_{Q4,t-1}) / 12 * [\text{Livestock receipts}]_{Q4,t}$$

$$[\text{Livestock receipts, SAAR}]_{Q3,t} = [\text{Livestock receipts}]_t - ([\text{Livestock receipts}]_{t-3} / [\text{Livestock receipts}]_{Q1,t-3} + [\text{Livestock receipts}]_{t-2} / [\text{Livestock receipts}]_{Q1,t-2} + [\text{Livestock receipts}]_{t-1} / [\text{Livestock receipts}]_{Q1,t-1}) / 12 * [\text{Livestock receipts}]_{Q1,t} - ([\text{Livestock receipts}]_{t-3} / [\text{Livestock receipts}]_{Q2,t-3} + [\text{Livestock receipts}]_{t-2} / [\text{Livestock receipts}]_{Q2,t-2} + [\text{Livestock receipts}]_{t-1} / [\text{Livestock receipts}]_{Q2,t-1}) / 12 * [\text{Livestock receipts}]_{Q2,t} + ([\text{Livestock receipts}]_{t-3} / [\text{Livestock receipts}]_{Q3,t-3} + [\text{Livestock receipts}]_{t-2} / [\text{Livestock receipts}]_{Q3,t-2} + [\text{Livestock receipts}]_{t-1} / [\text{Livestock receipts}]_{Q3,t-1}) / 4 * [\text{Livestock receipts}I_{Q3,t}] - [\text{Livestock receipts}]_{t-3} / [\text{Livestock receipts}]_{Q4,t-3} + [\text{Livestock receipts}]_{t-2} / [\text{Livestock receipts}]_{Q4,t-2} + [\text{Livestock receipts}]_{t-1} / [\text{Livestock receipts}]_{Q4,t-1}) / 12 * [\text{Livestock receipts}]_{Q4,t}$$

[Livestock receipts, SAAR]$_{Q4,t}$ = [Livestock receipts]$_t$ - ([Livestock receipts]$_{t-3}$ / [Livestock receipts]$_{Q1,t-3}$ + [Livestock receipts]$_{t-2}$ / [Livestock receipts]$_{Q1,t-2}$ + [Livestock receipts]$_{t-1}$ / [Livestock receipts]$_{Q1,t-1}$) / 12 * [Livestock receipts]$_{Q1,t}$ - ([Livestock receipts]$_{t-3}$ / [Livestock receipts]$_{Q2,t-3}$ + [Livestock receipts]$_{t-2}$ / [Livestock receipts]$_{Q2,t-2}$ + [Livestock receipts]$_{t-1}$ / [Livestock receipts]$_{Q2,t-1}$) / 12 * [Livestock receipts]$_{Q2,t}$ - ([Livestock receipts]$_{t-3}$ / [Livestock receipts]$_{Q3,t-3}$ + [Livestock receipts]$_{t-2}$ / [Livestock receipts]$_{Q3,t-2}$ + [Livestock receipts]$_{t-1}$ / [Livestock receipts]$_{Q3,t-1}$) / 12 * [Livestock receiptsI$_{Q3,t}$ + ([Livestock receipts]$_{t-3}$ / [Livestock receipts]$_{Q4,t-3}$ + [Livestock receipts]$_{t-2}$ / [Livestock receipts]$_{Q4,t-2}$ + [Livestock receipts]$_{t-1}$ / [Livestock receipts]$_{Q4,t-1}$) / 4 * [Livestock receipts]$_{Q4,t}$

[Total cash receipts, SAAR]$_{Q1}$ = [Crop cash receipts, SAAR]$_{Q1}$ + [Livestock receipts, SAAR]$_{Q1}$
[Total cash receipts, SAAR]$_{Q2}$ = [Crop cash receipts, SAAR]$_{Q2}$ + [Livestock receipts, SAAR]$_{Q2}$
[Total cash receipts, SAAR]$_{Q3}$ = [Crop cash receipts, SAAR]$_{Q3}$ + [Livestock receipts, SAAR]$_{Q3}$
[Total cash receipts, SAAR]$_{Q4}$ = [Crop cash receipts, SAAR]$_{Q4}$ +[Livestock receipts, SAAR]$_{Q4}$

Appendix 2: Direct Government Payments

Direct Payments

Wheat Direct Payments

[Wheat payment acres]$_{1996}$ = 0.85 * [Wheat base acres]$_{1996}$

[Wheat direct payments, crop year]$_t$ = [Wheat payment acres]$_{1996}$ * [Wheat program payment yield]$_t$ * [Wheat direct payment rate]$_{2002}$

[Wheat direct payments, calendar year]$_t$ = 0.5 * [Wheat direct payments, crop year]$_t$ + 0.5 * [Wheat direct payments, crop year]$_{t+1}$

Rice Direct Payments

[Rice payment acres]$_{1996}$ = 0.85 * [Rice base acres]$_{1996}$

[Rice direct payments, crop year]$_t$ = [Rice payment acres]$_{1996}$ * [Rice program payment yield]$_t$ * [Rice direct payment rate]$_{2002}$

[Rice direct payments, calendar year]$_t$ = 0.5 * [Rice direct payments, crop year]$_t$ + 0.5 * [Rice direct payments, crop year]$_{t+1}$

Corn Direct Payments

[Corn payment acres]$_{1996}$ = 0.85 * [Corn base acres]$_{1996}$

[Corn direct payments, crop year]$_t$ = [Corn payment acres]$_{1996}$ * [Corn program payment yield]$_t$ * [Corn direct payment rate]$_{2002}$

[Corn direct payments, calendar year]$_t$ = 0.5 * [Corn direct payments, crop year]$_t$ + 0.5 * [Corn direct payments, crop year]$_{t+1}$

Sorghum Direct Payments

[Sorghum payment acres]$_{1996}$ = 0.85 * [Sorghum base acres]$_{1996}$

[Sorghum direct payments, crop year]$_t$ = [Sorghum payment acres]$_{1996}$ * [Sorghum program payment yield]$_t$ * [Sorghum direct payment rate]$_{2002}$

[Sorghum direct payments, calendar year]$_t$ = 0.5 * [Sorghum direct payments, crop year]$_t$ + 0.5 * [Sorghum direct payments, crop year]$_{t+1}$

Barley Direct Payments

[Barley payment acres]$_{1996}$ = 0.85 * [Barley base acres]$_{1996}$

[Barley direct payments, crop year]$_t$ = [Barley payment acres]$_{1996}$ * [Barley program payment yield]$_t$ * [Barley direct payment rate]$_{2002}$

[Barley direct payments, calendar year]$_t$ = 0.5 * [Barley direct payments, crop year]$_t$ + 0.5 * [Barley direct payments, crop year]$_{t+1}$

Oats Direct Payments

[Oats payment acres]$_{1996}$ = 0.85 * [Oats base acres]$_{1996}$

[Oats direct payments, crop year]$_t$ = [Oats payment acres]$_{1996}$ * [Oats program payment yield]$_t$ * [Oats direct payment rate]$_{2002}$

[Oats direct payments, calendar year]$_t$ = 0.5 * [Oats direct payments, crop year]$_t$ + 0.5 * [Oats direct payments, crop year]$_{t+1}$

Soybean Direct Payments

[Soybean payment acres]$_{2002}$ = 0.85 * [Soybean base acres]$_{2002}$

[Soybean direct payments, crop year]$_t$ = [Soybean payment acres]$_{2002}$ * [Soybean program payment yield]$_t$ * [Soybean direct payment rate]$_{2002}$

[Soybean direct payments, calendar year]$_t$ = 0.5 * [Soybean direct payments, crop year]$_t$ + 0.5 * [Soybean direct payments, crop year]$_{t+1}$

Sunflower Direct Payments

[Sunflower payment acres]$_{2002}$ = 0.85 * [Sunflower base acres]$_{2002}$

[Sunflower direct payments, crop year]$_t$ = [Sunflower payment acres]$_{2002}$ * [Sunflower program payment yield]$_t$ * [Sunflower direct payment rate]$_{2002}$

[Sunflower direct payments, calendar year]$_t$ = 0.5 * [Sunflower direct payments, crop year]$_t$ + 0.5 * [Sunflower direct payments, crop year]$_{t+1}$

Canola Direct Payments

[Canola payment acres]$_t$ = 0.85 * [Canola base acres]$_t$

[Canola direct payments, crop year]$_t$ = [Canola payment acres]$_t$ * [Canola program payment yield]$_{t *}$ [Canola direct payment rate]$_t$

[Canola direct payments, calendar year]$_t$ = 0.5 * [Canola direct payments, crop year]$_t$ + 0.5 * [Canola direct payments, crop year]$_{t+1}$

Flaxseed Direct Payments

[Flaxseed payment acres]$_t$ = 0.85 * [Flaxseed base acres]$_t$

[Flaxseed direct payments, crop year]$_t$ = [Flaxseed payment acres]$_t$ * [Flaxseed program payment yield]$_t$ * [Flaxseed direct payment rate]$_t$

[Flaxseed direct payments, calendar year]$_t$ = 0.5 * [Flaxseed direct payments, crop year]$_t$ + 0.5 * [Flaxseed direct payments, crop year]$_{t+1}$

Safflower Direct Payments

[Safflower payment acres]$_t$ = 0.85 * [Safflower base acres]$_t$

[Safflower direct payments, crop year]$_t$ = [Safflower payment acres]$_t$ * [Safflower program payment yield]$_t$ * [Safflower direct payment rate]$_t$

[Safflower direct payments, calendar year]$_t$ = 0.5 * [Safflower direct payments, crop year]$_t$ + 0.5 * [Safflower direct payments, crop year]$_{t+1}$

Mustard Seed Direct Payments

[Mustard seed payment acres]$_t$ = 0.85 * [Mustard seed base acres]$_t$

[Mustard seed direct payments, crop year]$_t$ = [Mustard seed payment acres]$_t$ * [Mustard seed program payment yield]$_t$ * [Mustard seed direct payment rate]$_t$

[Mustard seed direct payments, calendar year]$_t$ = 0.5 * [Mustard seed direct payments, crop year]$_t$ + 0.5 * [Mustard seed direct payments, crop year]$_{t+1}$

Rapeseed Direct Payments

[Rapeseed payment acres]$_t$ = 0.85 * [Rapeseed base acres]$_t$

[Rapeseed direct payments, crop year]$_t$ = [Rapeseed payment acres]$_t$ * [Rapeseed program payment yield]$_t$ * [Rapeseed direct payment rate]$_t$

[Rapeseed direct payments, calendar year]$_t$ = 0.5 * [Rapeseed direct payments, crop year]$_t$ + 0.5 * [Rapeseed direct payments, crop year]$_{t+1}$

Upland Cotton Direct Payments

[Upland cotton payment acres]$_t$ = 0.85 * [Upland cotton base acres]$_t$

[Upland cotton direct payments, crop year]$_t$ = [Upland cotton payment acres]$_t$ * [Upland cotton program payment yield]$_t$ * [Upland cotton direct payment rate]$_t$

[Upland cotton direct payments, calendar year]$_t$ = 0.5 * [Upland cotton direct payments, crop year]$_t$ + 0.5 * [Upland cotton direct payments, crop year]$_{t+1}$

Peanuts Direct Payments

[Peanuts payment acres]$_t$ = 0.85 * [Peanuts base acres]$_t$

[Peanuts direct payments, crop year]$_t$ = [Peanuts payment acres]$_t$ * [Peanuts program payment yield]$_t$ * [Peanuts direct payment rate]$_t$

$$\text{[Peanuts direct payments, calendar year]}_t = 0.5 * \text{[Peanuts direct paayments, crop year]}_t + 0.5 * \text{[Peanuts direct payments, crop year]}_{t+1}$$

Total Direct Payments

$$\text{[Total direct payments]}_t = \text{[Wheat direct payments]}_t + \text{[Rice direct payments]}_t + \text{[Corn direct payments]}_t + \text{[Sorghum direct payments]}_t + \text{[Barley direct payments]}_t + \text{[Oats direct payments]}_t + \text{[Soybeans direct payments]}_t + \text{[Sunflower direct payments]}_t + \text{[Canola direct payments]}_t + \text{[Flaxseed direct payments]}_t + \text{[Safflower direct payments]}_t + \text{[Mustard seed direct payments]}_t + \text{[Rapeseed direct payments]}_t + \text{[Upland cotton direct payments]}_t + \text{[Peanuts direct payments]}_t$$

Countercyclical Payments

Wheat Countercyclical Payments

$$\text{[Wheat effective price]}_t = \text{Maximum ([Wheat loan rate]}_t, \text{[Wheat national average market price]}_t) + \text{[Wheat direct payment rate]}_t$$

$$\text{[Wheat countercyclical payment rate]}_t = \text{Maximum (([Wheat target price]}_t - \text{[Wheat effective price]}_t), 0)$$

$$\text{[Wheat countercyclical payments, crop year]}_t = \text{[Wheat payment acres]}_t * \text{[Wheat updated program payment yield]}_t * \text{[Wheat counter-cyclical payment rate]}_t$$

$$\text{[Wheat countercyclical payments, calendar year]}_t = 0.65 * \text{[Wheat countercyclical payments, crop year]}_{t-1} + 0.35 * \text{[Wheat countercyclical payments, crop year]}_t$$

Rice Countercyclical Payments

$$\text{[Rice effective price]}_t = \text{Maximum ([Rice loan rate]}_t, \text{[Rice national average market price]}_t) + \text{[Rice direct payment rate]}_t$$

$$\text{[Rice counter-cyclical payment rate]}_t = \text{Maximum (([Rice target price]}_t - \text{[Rice effective price]}_t), 0)$$

$$\text{[Rice counter-cyclical payments, crop year]}_t = \text{[Rice payment acres]}_t * \text{[Rice updated program payment yield]}_t * \text{[Rice counter-cyclical payment rate]}_t$$

$$\text{[Rice counter-cyclical payments, calendar year]}_t = 0.65 * \text{[Rice counter-cyclical payments, crop year]}_{t-1} + 0.35 * \text{[Rice counter-cyclical payments, crop year]}_t$$

Corn Countercyclical Payments

$$\text{[Corn effective price]}_t = \text{Maximum ([Corn loan rate]}_t, \text{[Corn national average market price]}_t) + \text{[Corn direct payment rate]}_t$$

$$\text{[Corn countercyclical payment rate]}_t = \text{Maximum (([Corn target price]}_t - \text{[Corn effective price]}_t), 0)$$

$$\text{[Corn countercyclical payments, crop year]}_t = \text{[Corn payment acres]}_t * \text{[Corn updated program payment yield]}_t * \text{[Corn countercyclical payment rate]}_t$$

$$\text{[Corn counter-cyclical payments, calendar year]}_t = 0.65 * \text{[Corn countercyclical payments, crop year]}_{t-1} + 0.35 * \text{[Corn counter-cyclical payments, crop year]}_t$$

Sorghum Countercyclical Payments

[Sorghum effective price]$_t$ = Maximum ([Sorghum loan rate]$_t$, [Sorghum national average market price]$_t$) + [Sorghum direct payment rate]$_t$

[Sorghum countercyclical payment rate]$_t$ = Maximum ((([Sorghum target price]$_t$ - [Sorghum effective price]$_t$), 0)

[Sorghum countercyclical payments, crop year]$_t$ = [Sorghum payment acres]$_t$ * [Sorghum updated program payment yield]$_t$ * [Sorghum countercyclical payment rate]$_t$

[Sorghum counter-cyclical payments, calendar year]$_t$ = 0.65 * [Sorghum counter-cyclical payments, crop year]$_{t-1}$ + 0.35 * [Sorghum countercyclical payments, crop year]$_t$

Barley Countercyclical Payments

[Barley effective price]$_t$ = Maximum ([Barley loan rate]$_t$, [Barley national average market price]$_t$) + [Barley direct payment rate]$_t$

[Barley countercyclical payment rate]$_t$ = Maximum ((([Barley target price]$_t$ - [Barley effective price]$_t$), 0)

[Barley countercyclical payments, crop year]$_t$ = [Barley payment acres]$_t$ * [Barley updated program payment yield]$_t$ * [Barley countercyclical payment rate]$_t$

[Barley countercyclical payments, calendar year]$_t$ = 0.65 * [Barley countercyclical payments, crop year]$_{t-1}$ + 0.35 * [Barley countercyclical payments, crop year]$_t$

Oats Countercyclical Payments

[Oats effective price]$_t$ = Maximum ([Oats loan rate]$_t$, [Oats national average market price]$_t$) + [Oats direct payment rate]$_t$

[Oats countercyclical payment rate]$_t$ = Maximum ((([Oats target price]$_t$ - [Oats effective price]$_t$), 0)

[Oats countercyclical payments, crop year]$_t$ = [Oats payment acres]$_t$ * [Oats updated program payment yield]$_t$ * [Oats countercyclical payment rate]$_t$

[Oats countercyclical payments, calendar year]$_t$ = 0.65 * [Oats countercyclical payments, crop year]$_{t-1}$ + 0.35 * [Oats counter-cyclical payments, crop year]$_t$

Soybeans Countercyclical Payments

[Soybeans effective price]$_t$ = Maximum ([Soybeans loan rate]$_t$, [Soybeans national average market price]$_t$) + [Soybeans direct payment rate]$_t$

[Soybeans countercyclical payment rate]$_t$ = Maximum ((([Soybeans target price]$_t$ - [Soybeans effective price]$_t$), 0)

[Soybeans countercyclical payments, crop year]$_t$ = [Soybeans payment acres]$_t$ * [Soybeans updated program payment yield]$_t$ * [Soybeans counter-cyclical payment rate]$_t$

[Soybeans countercyclical payments, calendar year]$_t$ = 0.65 * [Soybeans countercyclical payments, crop year]$_{t-1}$ + 0.35 * [Soybeans countercyclical payments, crop year]$_t$

Sunflower Countercyclical Payments

[Sunflower effective price]$_t$ = Maximum ([Sunflower loan rate]$_t$, [Sunflower national average market price]$_t$) + [Sunflower direct payment rate]$_t$

[Sunflower countercyclical payment rate]$_t$ = Maximum ((([Sunflower target price]$_t$ - [Sunflower effective price]$_t$), 0)

[Sunflower countercyclical payments, crop year]$_t$ = [Sunflower payment acres]$_t$ * [Sunflower updated program payment yield]$_t$ * [Sunflower counter-cyclical payment rate]$_t$

[Sunflower countercyclical payments, calendar year]$_t$ = 0.65 * [Sunflower counter-cyclical payments, crop year]$_{t-1}$ + 0.35 * [Sunflower counter-cyclical payments, crop year]$_t$

Canola Countercyclical Payments

[Canola effective price]$_t$ = Maximum ([Canola loan rate]$_t$, [Canola national average market price]$_t$) + [Canola direct payment rate]$_t$

[Canola countercyclical payment rate]$_t$ = Maximum ((([Canola target price]$_t$ - [Canola effective price]$_t$), 0)

[Canola countercyclical payments, crop year]$_t$ = [Canola payment acres]$_t$ * [Canola updated program payment yield]$_t$ * [Canola counter-cyclical payment rate]$_t$

[Canola countercyclical payments, calendar year]$_t$ = 0.65 * [Canola counter-cyclical payments, crop year]$_{t-1}$ + 0.35 * [Canola countercyclical payments, crop year]$_t$

Flaxseed Countercyclical Payments

[Flaxseed effective price]$_t$ = Maximum ([Flaxseed loan rate]$_t$, [Flaxseed national average market price]$_t$) + [Flaxseed direct payment rate]$_t$

[Flaxseed countercyclical payment rate]$_t$ = Maximum ((([Flaxseed target price]$_t$ - [Flaxseed effective price]$_t$), 0)

[Flaxseed countercyclical payments, crop year]$_t$ = [Flaxseed payment acres]$_t$ * [Flaxseed updated program payment yield]$_t$ * [Flaxseed countercyclical payment rate]$_t$

[Flaxseed countercyclical payments, calendar year]$_t$ = 0.65 * [Flaxseed countercyclical payments, crop year]$_{t-1}$ + 0.35 * [Flaxseed countercyclical payments, crop year]$_t$

Safflower Countercyclical Payments

[Safflower effective price]$_t$ = Maximum ([Safflower loan rate]$_t$, [Safflower national average market price]$_t$) + [Safflower direct payment rate]$_t$

[Safflower countercyclical payment rate]$_t$ = Maximum ((([Safflower target price]$_t$ - [Safflower effective price]$_t$), 0)

[Safflower countercyclical payments, crop year]$_t$ = [Safflower payment acres]$_t$ * [Safflower updated program payment yield]$_t$ * [Safflower countercyclical payment rate]$_t$

[Safflower countercyclical payments, calendar year]$_t$ = 0.65 * [Safflower countercyclical payments, crop year]$_{t-1}$ + 0.35 * [Safflower countercyclical payments, crop year]$_t$

Mustardseed Countercyclical Payments

[Mustard seed effective price]$_t$ = Maximum ([Mustard seed loan rate]$_t$, [Mustard seed national average market price]$_t$) + [Mustard seed direct payment rate]$_t$

[Mustard seed countercyclical payment rate]$_t$ = Maximum ((([Mustard seed target price]$_t$ - [Mustard seed effective price]$_t$), 0)

[Mustard seed countercyclical payments, crop year]$_t$ = [Mustard seed payment acres]$_t$ * [Mustard seed updated program payment yield]$_t$ * [Mustard seed counter-cyclical payment rate]$_t$

[Mustard seed countercyclical payments, calendar year]$_t$ = 0.65 * [Mustard seed countercyclical payments, crop year]$_{t-1}$ + 0.35 * [Mustard seed countercyclical payments, crop year]$_t$

Rapeseed Countercyclical Payments

[Rapeseed effective price]$_t$ = Maximum ([Rapeseed loan rate]$_t$, [Rapeseed national average market price]$_t$) + [Rapeseed direct payment rate]$_t$

[Rapeseed countercyclical payment rate]$_t$ = Maximum ((([Rapeseed target price]$_t$ - [Rapeseed effective price]$_t$), 0)

[Rapeseed countercyclical payments, crop year]$_t$ = [Rapeseed payment acres]$_t$ * [Rapeseed updated program payment yield]$_t$ * [Rapeseed countercyclical payment rate]$_t$

[Rapeseed countercyclical payments, calendar year]$_t$ = 0.65 * [Rapeseed countercyclical payments, crop year]$_{t-1}$ + 0.35 * [Rapeseed countercyclical payments, crop year]$_t$

Upland Cotton Countercyclical Payments

[Upland cotton effective price]$_t$ = Maximum ([Upland cotton loan rate]$_t$, [Upland cotton national average market price]$_t$) + [Upland cotton direct payment rate]$_t$

[Upland cotton countercyclical payment rate]$_t$ = Maximum ((([Upland cotton target price]$_t$ - [Upland cotton effective price]$_t$), 0)

[Upland cotton countercyclical payments, crop year]$_t$ = [Upland cotton payment acres]$_{t}$ * [Upland cotton updated program payment yield]$_{t}$ * [Upland cotton countercyclical payment rate]$_t$

[Upland cotton countercyclical payments, calendar year]$_t$ = 0.65 * [Upland cotton countercyclical payments, crop year]$_{t-1}$ + 0.35 * [Upland cotton countercyclical payments, crop year]$_t$

Peanuts Countercyclical Payments

[Peanuts effective price]$_t$ = Maximum ([Peanuts loan rate]$_t$, [Peanuts national average market price]$_t$) + [Peanuts direct payment rate]$_t$

[Peanuts countercyclical payment rate]$_t$ = Maximum ((([Peanuts target price]$_t$ - [Peanuts effective price]$_t$), 0)

[Peanuts countercyclical payments, crop year]$_t$ = [Peanuts payment acres]$_t$ * [Peanuts updated program payment yield]$_t$ * [Peanuts counter-cyclical payment rate]$_t$

[Peanuts countercyclical payments, calendar year]$_t$ = 0.65 * [Peanuts countercyclical payments, crop year]$_{t-1}$ + 0.35 * [Peanuts countercyclical payments, crop year]$_t$

Total Countercyclical Payments

[Total countercyclical payments]$_t$ = [Wheat countercyclical payments]$_t$ + [Rice countercyclical payments]$_t$ + [Corn countercyclical payments]$_t$ + [Sorghum countercyclical payments]$_t$ + [Barley countercyclical payments]$_t$ + [Oats countercyclical payments]$_t$ + [Soybeans countercyclical payments]$_t$ + [Sunflower countercyclical payments]$_t$ + [Canola countercyclical payments]$_t$ + [Flaxseed countercyclical payments]$_t$ + [Safflower countercyclical payments]$_t$ + [Mustard seed countercyclical payments]$_t$ + [Rapeseed countercyclical payments]$_t$ + [Upland cotton countercyclical payments]$_t$ + [Peanuts countercyclical payments]$_t$

Loan Deficiency Payments

Wheat Loan Deficiency Payments

[Expected wheat loan deficiency payment rate]$_t$ = [Wheat loan rate]$_t$ - MIN([Expected wheat average price]$_{Q1,t}$, [Expected wheat average price]$_{Q2,t}$, [Expected wheat average price]$_{Q3,t}$, [Expected wheat average price]$_{Q4,t}$)

If [Expected wheat loan deficiency payment rate]$_t$ ≤ 0 then [Wheat loan deficiency payment, crop year]$_t$ = 0

If [Expected wheat loan deficiency payment rate]$_t$ > 0 and [Wheat loan deficiency payment, crop year]$_{t-1}$ = 0 then [Wheat loan deficiency payment, crop year]$_t$ = [Expected wheat production]$_t$ * [Expected wheat loan deficiency payment rate]$_t$ * [Expected wheat loan deficiency participation rate based on previous years' experience]$_t$

If [Expected wheat loan deficiency payment rate]$_t$ > 0 and [Wheat loan deficiency payment, crop year]$_{t-1}$ > 0 then [Wheat loan deficiency payment, crop year]$_t$ = [Wheat loan deficiency payment]$_{t-1}$ * [Expected percent change in wheat production]$_t$ * [Expected percent change in wheat loan deficiency payment]$_t$ * [Expected percent change in wheat loan deficiency participation rate based on previous years' experience]$_t$

[Wheat loan deficiency payment, calendar year]$_t$ = 0.03 * [Wheat loan deficiency payment, crop year]$_{t-1}$ + 0.97 * [Wheat loan deficiency payment, crop year]$_t$

Rice Loan Deficiency Payments

[Expected rice loan deficiency payment rate]$_t$ = [Rice loan rate]$_t$ - MIN([Expected rice average price]$_{Q1,t}$, [Expected rice average price]$_{Q2,t}$, [Expected rice average price]$_{Q3,t}$, [Expected rice average price]$_{Q4,t}$)

If [Expected rice loan deficiency payment rate]$_t$ ≤ 0 then [Rice loan deficiency payment, crop year]$_t$ = 0

If [Expected rice loan deficiency payment rate]$_t$ > 0 and [Rice loan deficiency payment, crop year]$_{t-1}$ = 0 then [Rice loan deficiency payment, crop year]$_t$ = [Expected rice production]$_t$ * [Expected rice loan deficiency payment rate]$_t$ * [Expected rice loan deficiency participation rate based on previous years' experience]$_t$

If [Expected rice loan deficiency payment rate]$_t$ > 0 and [Rice loan deficiency payment, crop year]$_{t-1}$ > 0 then [Rice loan deficiency payment, crop year]$_t$ = [Rice loan deficiency payment, crop year]$_{t-1}$ * [Expected percent change in rice production]$_t$ * [Expected percent change in rice loan deficiency payment]$_t$ * [Expected percent change in rice loan deficiency participation rate based on previous years' experience]$_t$

[Rice loan deficiency payment, calendar year]$_t$ = 0.20 * [Rice loan deficiency payment, crop year]$_{t-1}$ + 0.80 * [Rice loan deficiency payment, crop year]$_t$

Corn Loan Deficiency Payments

[Expected corn loan deficiency payment rate]$_t$ = [Corn loan rate]$_t$ - MIN([Expected corn average price]$_{Q1,t}$, [Expected corn average price]$_{Q2,t}$, [Expected corn average price]$_{Q3,t}$, [Expected corn average price]$_{Q4,t}$)

If [Expected corn loan deficiency payment rate]$_t$ ≤ 0 then [Corn loan deficiency payment, crop year]$_t$ = 0

If [Expected corn loan deficiency payment rate]$_t$ > 0 and [Corn loan deficiency payment, crop year]$_{t-1}$ = 0 then [Corn loan deficiency payment, crop year]$_t$ = [Expected corn production]$_t$ * [Expected corn loan deficiency payment rate]$_t$ * [Expected corn loan deficiency participation rate based on previous years' experience]$_t$

If [Expected corn loan deficiency payment rate]$_t$ > 0 and [Corn loan deficiency payment, crop year]$_{t-1}$ > 0 then [Corn loan deficiency payment, crop year]$_t$ = [Corn loan deficiency payment]$_{t-1}$ * [Expected percent change in corn production]$_t$ * [Expected percent change in corn loan deficiency payment rate]$_t$ * [Expected percent change in corn loan deficiency participation rate based on previous years' experience]$_t$

[Corn loan deficiency payment, calendar year]$_t$ = 0.20 * [Corn loan deficiency payment, crop year]$_{t-1}$ + 0.80 * [Corn loan deficiency payment, crop year]$_t$

Sorghum Loan Deficiency Payments

[Expected sorghum loan deficiency payment rate]$_t$ = [Sorghum loan rate]$_t$ -MIN([Expected sorghum average price]$_{Q1,t}$, [Expected sorghum average price]$_{Q2,t}$, [Expected sorghum average price]$_{Q3,t}$, [Expected sorghum average price]$_{Q4,t}$)

If [Expected sorghum loan deficiency payment rate]$_t$ ≤ 0 then [Sorghum loan deficiency payment, crop year]$_t$ = 0

If [Expected sorghum loan deficiency payment rate]$_t$ > 0 and [Sorghum loan deficiency payment, crop year]$_{t-1}$ = 0 then [Sorghum loan deficiency payment, crop year]$_t$ = [Expected sorghum production]$_t$ * [Expected sorghum loan deficiency payment rate]$_t$ * [Expected sorghum loan deficiency participation rate based on previous years' experience]$_t$

If [Expected sorghum loan deficiency payment rate]$_t$ > 0 and [Sorghum loan deficiency payment, crop year]$_{t-1}$ > 0 then [Sorghum loan deficiency payment, crop year]$_t$ = [Sorghum loan deficiency payment]$_{t-1}$ * [Expected percent change in sorghum production]$_t$ * [Expected percent change in sorghum loan deficiency payment rate]$_t$ * [Expected percent change in sorghum loan deficiency participation rate based on previous years' experience]$_t$

[Sorghum loan deficiency payment, calendar year]$_t$ = 0.10 * [Sorghum loan deficiency payment, crop year]$_{t-1}$ + 0.90 * [Sorghum loan deficiency payment, crop year]$_t$

Barley Loan Deficiency Payments

[Expected barley loan deficiency payment rate]$_t$ = [Barley loan rate]$_t$ - MIN([Expected barley average price]$_{Q1,t}$, [Expected barley average price]$_{Q2,t}$, [Expected barley average price]$_{Q3,t}$, [Expected barley average price]$_{Q4,t}$)

If [Expected barley loan deficiency payment rate]$_t$ ≤ 0 then [Barley loan deficiency payment, crop year]$_t$ = 0

If [Expected barley deficiency payment rate]$_t$ > 0 and [Barley loan deficiency payment, crop year]$_{t-1}$ = 0 then [Barley loan deficiency payment, crop year]$_t$ = [Expected barley production]$_t$ * [Expected barley loan deficiency payment rate]$_t$ * [Expected barley loan deficiency participation rate based on previous years' experience]$_t$

If [Expected barley loan deficiency payment rate]$_t$ > 0 and [Barley loan deficiency payment, crop year]$_{t-1}$ > 0 then [Barley loan deficiency payment, crop year]$_t$ = [Barley loan deficiency payment]$_{t-1}$ * [Expected percent change in barley production]$_t$ * [Expected percent change in barley loan deficiency payment]$_t$ * [Expected percent change in barley loan deficiency participation rate based on previous years' experience]$_t$

[Barley loan deficiency payment, calendar year]$_t$ = 0.05 * [Barley loan deficiency payment, crop year]$_{t-1}$ + 0.95 * [Barley loan deficiency payment, crop year]$_t$

Oats Loan Deficiency Payments

[Expected oats loan deficiency payment rate]$_t$ = [Oats loan rate]$_t$ - MIN([Expected oats average price]$_{Q1,t}$, [Expected oats average price]$_{Q2,t}$, [Expected oats average price]$_{Q3,t}$, [Expected oats average price]$_{Q4,t}$)

If [Expected oats loan deficiency payment rate]$_t$ ≤ 0 then [Oats loan deficiency payment]$_t$ = 0

If [Expected oats loan deficiency payment rate]$_t$ > 0 and [Oats loan deficiency payment, crop year]$_{t-1}$ = 0 then [Oats loan deficiency payment, crop year]$_t$ = [Expected oats production]$_t$ * [Expected oats loan deficiency payment rate]$_t$ * [Expected oats loan deficiency participation rate based on previous years' experience]$_t$

If [Expected oats loan deficiency payment rate]$_t$ > 0 and [Oats loan deficiency payment, crop year]$_{t-1}$ > 0 then [Oats loan deficiency payment, crop year]$_t$ = [Oats loan deficiency payment]$_{t-1}$ * [Expected percent change in oats production]$_t$ * [Expected percent change in oats loan deficiency payment rate]$_t$ * [Expected percent change in oats loan deficiency participation rate based on previous years' experience]$_t$

[Oats loan deficiency payment, calendar year]$_t$ = 0.05 * [Oats loan deficiency payment, crop year]$_{t-1}$ + 0.95 * [Oats loan deficiency payment, crop year]$_t$

Upland Cotton Loan Deficiency Payments

[Expected upland cotton loan deficiency payment rate]$_t$ = [Upland cotton loan rate]$_t$ - MIN([Expected upland cotton average price]$_{Q1,t}$, [Expected upland cotton average price]$_{Q2,t}$, [Expected upland cotton average price]$_{Q3,t}$, [Expected upland cotton average price]$_{Q4,t}$)

If [Expected upland cotton loan deficiency payment rate]$_t$ ≤ 0 then [Upland cotton loan deficiency payment, crop year]$_t$ = 0

If [Expected upland cotton loan deficiency payment rate]$_t$ > 0 and [Upland cotton loan deficiency payment, crop year]$_{t-1}$ = 0 then [Upland cotton loan deficiency payment, crop year]$_t$ = [Expected upland cotton production]$_t$ * [Expected upland cotton loan deficiency payment rate]$_t$ * [Expected upland cotton loan deficiency participation rate based on previous years' experience]$_t$

If [Expected upland cotton loan deficiency payment rate]$_t$ > 0 and [Upland cotton loan deficiency payment, crop year]$_{t-1}$ > 0 then [Upland cotton loan deficiency payment, crop year]$_t$ = [Upland cotton loan deficiency payment]$_{t-1}$ * [Expected percent change in upland cotton production]$_t$ * [Expected percent change in upland cotton loan deficiency payment rate]$_t$ * [Expected percent change in upland cotton loan deficiency participation rate based on previous years' experience]$_t$

[Upland cotton loan deficiency payment, calendar year]$_t$ = 0.40 * [Upland cotton loan deficiency payment, crop year]$_{t-1}$ + 0.60 * [Upland cotton loan deficiency payment, crop year]$_t$

Soybeans Loan Deficiency Payments

[Expected soybeans loan deficiency payment rate]$_t$ = [Soybeans loan rate]$_t$ - MIN([Expected soybeans average price]$_{Q1,t}$, [([Expected soybeans average price]$_{Q2,t}$, [([Expected soybeans average price]$_{Q3,t}$, [(([Expected soybeans average price]$_{Q4,t}$)

If [Expected soybeans loan deficiency payment rate]$_t$ ≤ 0 then [Soybeans loan deficiency payment, crop year]$_t$ = 0

If [Expected soybeans loan deficiency payment rate]$_t$ > 0 and [Soybeans loan deficiency payment, crop year]$_{t-1}$ = 0 then [Soybeans loan deficiency payment, crop year]$_t$ = [Expected soybeans production]$_t$ * [Expected soybeans loan deficiency payment rate]$_t$ * [Expected soybeans loan deficiency participation rate based on previous years' experience]$_t$

If [Expected soybeans loan deficiency payment rate]$_t$ > 0 and [Soybeans loan deficiency payment, crop year]$_{t-1}$ > 0 then [Soybeans loan deficiency payment, crop year]$_t$ = [Soybeans loan deficiency payment]$_{t-1}$ * [Expected percent change in soybean production]$_t$ * [Expected percent change in soybeans loan deficiency payment rate]$_t$ * [Expected percent change in soybeans loan deficiency participation rate based on previous years' experience]$_t$

[Soybeans loan deficiency payment, calendar year]$_t$ = 0.15 * [Soybeans loan deficiency payment, crop year]$_{t-1}$ + 0.85 * [Soybeans loan deficiency payment, crop year]$_t$

Flaxseed Loan Deficiency Payments

[Expected flaxseed loan deficiency payment rate]$_t$ = [Flaxseed loan rate]$_t$ - MIN([Expected flaxseed average price]$_{Q1,t}$, [Expected flaxseed average price]$_{Q2,t}$, [Expected flaxseed average price]$_{Q3,t}$, [Expected flaxseed average price]$_{Q4,t}$)

If [Expected flaxseed loan deficiency payment rate]$_t$ ≤ 0 then [Flaxseed loan deficiency payment, crop year]$_t$ = 0

If [Expected flaxseed loan deficiency payment rate]$_t$ > 0 and [Flaxseed loan deficiency payment, crop year]$_{t-1}$ = 0 then [Flaxseed loan deficiency payment, crop year]$_t$ = [Expected flaxseed production]$_t$ * [Expected flaxseed loan deficiency payment rate]$_t$ * [Expected flaxseed loan deficiency participation rate based on previous years' experience]$_t$

If [Expected flaxseed loan deficiency payment rate]$_t$ > 0 and [Flaxseed loan deficiency payment, crop year]$_{t-1}$ > 0 then [Flaxseed loan deficiency payment, crop year]$_t$ = [Flaxseed loan deficiency payment]$_{t-1}$ * [Expected percent change in flaxseed production]$_t$ * [Expected percent change in flaxseed loan deficiency payment rate]$_t$ * [Expected percent change in flaxseed loan deficiency participation rate based on previous years' experience]$_t$

[Flaxseed loan deficiency payment, calendar year]$_t$ = 0.15 * [Flaxseed loan deficiency payment, crop year]$_{t-1}$ + 0.85 * [Flaxseed loan deficiency payment, crop year]$_t$

Sunflower Seed (Oil) Loan Deficiency Payments

[Expected sunflower seed (oil) loan deficiency payment rate]$_t$ = [Sunflower seed (oil) loan rate]$_t$ - MIN([Expected sunflower seed (oil) average price]$_{Q1,t}$, [Expected sunflower seed (oil) average price]$_{Q2,t}$, [Expected sunflower seed (oil) average price]$_{Q3,t}$, [Expected sunflower seed (oil) average price]$_{Q4,t}$)

If [Expected sunflower seed (oil) loan deficiency payment rate]$_t$ ≤ 0 then [Sunflower seed (oil) loan deficiency payment, crop year]$_t$ = 0

If [Expected sunflower seed (oil) loan deficiency payment rate]$_t$ > 0 and [Sunflower seed (oil) loan deficiency payment, crop year]$_{t-1}$ = 0 then [Sunflower seed (oil) loan deficiency payment, crop year]$_t$ = [Expected sunflower seed (oil) production]$_t$ * [Expected sunflower seed (oil) loan deficiency payment rate]$_t$ * [Expected sunflower seed (oil) loan deficiency participation rate based on previous years' experience]$_t$

If [Expected sunflower seed (oil) loan deficiency payment rate]$_t$ > 0 and [Sunflower seed (oil) loan deficiency payment, crop year]$_{t-1}$ > 0 then [Sunflower seed (oil) loan deficiency payment, crop year]$_t$ = [Sunflower seed (oil) loan deficiency payment]$_{t-1}$ * [Expected percent change in sunflower seed (oil) production]$_t$ * [Expected percent change in sunflower seed (oil) loan deficiency payment rate]$_t$ * [Expected percent change in sunflower seed (oil) loan deficiency participation rate based on previous years' experience]$_t$

[Sunflower seed (oil) loan deficiency payment, calendar year]$_t$ = 0.15 * [Sunflower seed (oil) loan deficiency payment, crop year]$_{t-1}$ + 0.85 * [Sunflower seed (oil) loan deficiency payment, crop year]$_t$

Sunflower Seed (Non-oil) Loan Deficiency Payments

[Expected sunflower seed (non-oil) loan deficiency payment rate]$_t$ = [Sunflower seed (non-oil) loan rate]$_t$ - MIN([Expected sunflower seed (non-oil) average price]$_{Q1,t}$, [Expected sunflower seed (non-oil) average price]$_{Q2,t}$, [Expected sunflower seed (non-oil) average price]$_{Q3,t}$, [Expected sunflower seed (non-oil) average price]$_{Q4,t}$)

If [Expected sunflower seed (non-oil) loan deficiency payment rate]$_t$ ≤ 0 then [Sunflower seed (non-oil) loan deficiency payment, crop year]$_t$ = 0

If [Expected sunflower seed (non-oil) loan deficiency payment rate]$_t$ > 0 and [Sunflower seed (non-oil) loan deficiency payment, crop year]$_{t-1}$ = 0 then [Sunflower seed (non-oil) loan deficiency payment, crop year]$_t$ = [Expected sunflower seed (non-oil) production]$_t$ * [Expected sunflower seed (non-oil) loan deficiency payment rate]$_t$ * [Expected sunflower seed (non-oil) loan deficiency participation rate based on previous years' experience]$_t$

If [Expected sunflower seed (non-oil) loan deficiency payment rate]$_t$ > 0 and [Sunflower seed (non-oil) loan deficiency payment, crop year]$_{t-1}$ > 0 then [Sunflower seed (non-oil) loan deficiency payment, crop year]$_t$ = [Sunflower seed (non-oil) loan deficiency payment]$_{t-1}$ * [Expected percent change in sunflower seed (non-oil) production]$_t$ * [Expected percent change in sunflower seed (non-oil) loan deficiency payment rate]$_t$ * [Expected percent change in sunflower seed (non-oil) loan deficiency participation rate based on previous years' experience]$_t$

[Sunflower seed (non-oil) loan deficiency payment, calendar year]$_t$ = 0.15 * [Sunflower seed (non-oil) loan deficiency payment, crop year]$_{t-1}$ + 0.85 * [Sunflower seed (non-oil) loan deficiency payment, crop year]$_t$

Canola Loan Deficiency Payments

[Expected canola loan deficiency payment rate]$_t$ = [Canola loan rate]$_t$ - MIN([Expected canola average price]$_{Q1,t}$, [Expected canola average price]$_{Q2,t}$, [Expected canola average price]$_{Q3,t}$, [Expected canola average price]$_{Q4,t}$)

If [Expected canola loan deficiency payment rate]$_t$ ≤ 0 then [Canola loan deficiency payment, crop year]$_t$ = 0

If [Expected canola loan deficiency payment rate]$_t$ > 0 and [Canola loan deficiency payment, crop year]$_{t-1}$ = 0 then [Canola loan deficiency payment, crop year]$_t$ = [Expected canola production]$_t$ * [Expected canola loan deficiency payment rate]$_t$ * [Expected canola loan deficiency participation rate based on previous years' experience]$_t$

If [Expected canola loan deficiency payment rate]$_t$ > 0 and [Canola loan deficiency payment, crop year]$_{t-1}$ > 0 then [Canola deficiency payment, crop year]$_t$ = [Canola loan deficiency payment]$_{t-1}$ * [Expected percent change in canola production]$_t$ * [Expected percent change in canola loan deficiency payment rate]$_t$ * [Expected percent change canola loan deficiency participation rate based on previous years' experience]$_t$

[Canola loan deficiency payment, calendar year]$_t$ = 0.15 * [Canola loan deficiency payment, crop year]$_{t-1}$ + 0.85 * [Canola loan deficiency payment, crop year]$_t$

Rapeseed Loan Deficiency Payments

[Expected rapeseed loan deficiency payment rate]$_t$ = [Rapeseed loan rate]$_t$ - MIN([Expected rapeseed average price]$_{Q1,t}$, [Expected rapeseed average price]$_{Q2,t}$, [Expected rapeseed average price]$_{Q3,t}$, [Expected rapeseed average price]$_{Q4,t}$)

If [Expected rapeseed loan deficiency payment rate]$_t$ ≤ 0 then [Rapeseed loan deficiency payment, crop year]$_t$ = 0

If [Expected rapeseed loan deficiency payment rate]$_t$ > 0 and [Rapeseed loan deficiency payment, crop year]$_{t-1}$ = 0 then [Rapeseed loan deficiency payment, crop year]$_t$ = [Expected rapeseed production]$_t$ * [Expected rapeseed loan deficiency payment rate]$_t$ * [Expected rapeseed loan deficiency participation rate based on previous years' experience]$_t$

If [Expected rapeseed loan deficiency payment rate]$_t$ > 0 and [Rapeseed loan deficiency payment, crop year]$_{t-1}$ > 0 then [Rapeseed deficiency payment, crop year]$_t$ = [Rapeseed loan deficiency payment]$_{t-1}$ * [Expected percent change in rapeseed production]$_t$ * [Expected percent change in rapeseed loan deficiency payment rate]$_t$ * [Expected percent change rapeseed loan deficiency participation rate based on previous years' experience]$_t$

[Rapeseed loan deficiency payment, calendar year]$_t$ = 0.15 * [Rapeseed loan deficiency payment, crop year]$_{t-1}$ + 0.85 * [Rapeseed loan deficiency payment, crop year]$_t$

Mustard Seed Loan Deficiency Payments

[Expected mustard seed loan deficiency payment rate]$_t$ = [Mustard seed loan rate]$_t$ - MIN([Expected mustard seed average price]$_{Q1,t}$, [Expected mustard seed average price]$_{Q2,t}$, [Expected mustard seed average price]$_{Q3,t}$, [Expected mustard seed average price]$_{Q4,t}$)

If [Expected mustard seed loan deficiency payment rate]$_t$ ≤ 0 then [Mustard seed loan deficiency payment, crop year]$_t$ = 0

If [Expected mustard seed loan deficiency payment rate]$_t$ > 0 and [Mustard seed loan deficiency payment, crop year]$_{t-1}$ = 0 then [Mustard seed loan deficiency payment, crop year]$_t$ = [Expected mustard seed production]$_t$ * [Expected mustard seed loan deficiency payment rate]$_t$ * [Expected mustard seed loan deficiency participation rate based on previous years' experience]$_t$

If [Expected mustard seed loan deficiency payment rate]$_t$ > 0 and [Mustard seed loan deficiency payment, crop year]$_{t-1}$ > 0 then [Mustard seed deficiency payment, crop year]$_t$ = [Mustard seed loan deficiency payment]$_{t-1}$ * [Expected percent change in mustard seed production]$_t$ * [Expected percent change in mustard seed loan deficiency payment rate]$_t$ * [Expected percent change mustard seed loan deficiency participation rate based on previous years' experience]$_t$

[Mustard seed loan deficiency payment, calendar year]$_t$ = 0.15 * [Mustard seed loan deficiency payment, crop year]$_{t-1}$ + 0.85 * [Mustard seed loan deficiency payment, crop year]$_t$

Crambe Loan Deficiency Payments

[Expected crambe loan deficiency payment rate]$_t$ = [Crambe loan rate]$_t$ - MIN([Expected crambe average price]$_{Q1,t}$, [Expected crambe average price]$_{Q2,t}$, [Expected crambe average price]$_{Q3,t}$, [Expected crambe average price]$_{Q4,t}$)

If [Expected crambe loan deficiency payment rate]$_t$ ≤ 0 then [Crambe loan deficiency payment, crop year]$_t$ = 0

If [Expected crambe loan deficiency payment rate]$_t$ > 0 and [Crambe loan deficiency payment, crop year]$_{t-1}$ = 0 then [Canola loan deficiency payment, crop year]$_t$ = [Expected crambe production]$_t$ * [Expected crambe loan deficiency payment rate]$_t$ * [Expected crambe loan deficiency participation rate based on previous years' experience]$_t$

If [Expected crambe loan deficiency payment rate]$_t$ > 0 and [Crambe loan deficiency payment, crop year]$_{t-1}$ > 0 then [Crambe deficiency payment, crop year]$_t$ = [Crambe loan deficiency payment]$_{t-1}$ * [Expected percent change in crambe production]$_t$ * [Expected percent change in crambe loan deficiency payment rate]$_t$ * [Expected percent change crambe loan deficiency participation rate based on previous years' experience]$_t$

[Crambe loan deficiency payment, calendar year]$_t$ = 0.15 * [Crambe loan deficiency payment, crop year]$_{t-1}$ + 0.85 * [Crambe loan deficiency payment, crop year]$_t$

Safflower Loan Deficiency Payments

[Expected safflower loan deficiency payment rate]$_t$ = [Safflower loan rate]$_t$ - MIN([Expected safflower average price]$_{Q1,t}$, [Expected safflower average price]$_{Q2,t}$, [Expected safflower average price]$_{Q3,t}$, [Expected safflower average price]$_{Q4,t}$)

If [Expected safflower loan deficiency payment rate]$_t$ ≤ 0 then [Safflower loan deficiency payment, crop year]$_t$ = 0

If [Expected safflower loan deficiency payment rate]$_t$ > 0 and [Safflower loan deficiency payment, crop year]$_{t-1}$ = 0 then [Safflower loan deficiency payment, crop year]$_t$ = [Expected safflower production]$_t$ * [Expected safflower loan deficiency payment rate]$_t$ * [Expected safflower loan deficiency participation rate based on previous years' experience]$_t$

If [Expected safflower loan deficiency payment rate]$_t$ > 0 and [Safflower loan deficiency payment, crop year]$_{t-1}$ > 0 then [Safflower deficiency payment, crop year]$_t$ = [Safflower loan deficiency payment]$_{t-1}$ * [Expected percent change in safflower production]$_t$ * [Expected percent change in safflower loan deficiency payment rate]$_t$ * [Expected percent change safflower loan deficiency participation rate based on previous years' experience]$_t$

[Safflower loan deficiency payment, calendar year]$_t$ = 0.15 * [Safflower loan deficiency payment, crop year]$_{t-1}$ + 0.85 * [Safflower loan deficiency payment, crop year]$_t$

Peanuts Loan Deficiency Payments

[Expected peanuts loan deficiency payment rate]$_t$ = [Peanuts loan rate]$_t$ - MIN([Expected peanuts average price]$_{Q1,t}$, [Expected peanuts average price]$_{Q2,t}$, [Expected peanuts average price]$_{Q3,t}$, [Expected peanuts average price]$_{Q4,t}$)

If [Expected peanuts loan deficiency payment rate]$_t$ ≤ 0 then [Peanuts loan deficiency payment, crop year]$_t$ = 0

If [Expected peanuts loan deficiency payment rate]$_t$ > 0 and [Peanuts loan deficiency payment, crop year]$_{t-1}$ = 0 then [Peanuts loan deficiency payment, crop year]$_t$ = [Expected peanuts production]$_t$ * [Expected peanuts loan

deficiency payment rate]$_t$ * [Expected peanuts loan deficiency participation rate based on previous years' experience]$_t$

If [Expected peanuts loan deficiency payment rate]$_t$ > 0 and [Peanuts loan deficiency payment, crop year]$_{t-1}$ > 0 then [Peanuts deficiency payment, crop year]$_t$ = [Peanuts loan deficiency payment]$_{t-1}$ * [Expected percent change in peanuts production]$_t$ * [Expected percent change in peanuts loan deficiency payment rate]$_t$ * [Expected percent change peanuts loan deficiency participation rate based on previous years' experience]$_t$

[Peanuts loan deficiency payment, calendar year]$_t$ = 0.15 * [Peanuts loan deficiency payment, crop year]$_{t-1}$ + 0.85 * [Peanuts loan deficiency payment, crop year]$_t$

Wool (graded) Loan Deficiency Payments

[Expected wool (graded) loan deficiency payment rate]$_t$ = [Wool (graded) loan rate]$_t$ - MIN([Expected wool (graded) average price]$_{Q1,t}$, [Expected wool (graded) average price]$_{Q2,t}$, [Expected wool (graded) average price]$_{Q3,t}$, [Expected wool (graded) average price]$_{Q4,t}$)

If [Expected wool (graded) loan deficiency payment rate]$_t$ ≤ 0 then [Wool (graded) loan deficiency payment]$_t$ = 0

If [Expected wool (graded) loan deficiency payment rate]$_t$ > 0 and [Wool (graded) loan deficiency payment]$_{t-1}$ = 0 then [Wool (graded) loan deficiency payment]$_t$ = [Expected wool (graded) production]$_t$ * [Expected wool loan deficiency payment rate]$_t$ * [Expected wool (graded) loan deficiency participation rate based on previous years' experience]$_t$

If [Expected wool (graded) loan deficiency payment rate]$_t$ > 0 and [Wool (graded) loan deficiency payment]$_{t-1}$ > 0 then [Wool (graded) deficiency payment]$_t$ = [Wool (graded) loan deficiency payment]$_{t-1}$ * [Expected percent change in wool (graded) production]$_t$ * [Expected percent change in wool (graded) loan deficiency payment rate]$_t$ * [Expected percent change wool (graded) loan deficiency participation rate based on previous years' experience]$_t$

Wool (not graded) Loan Deficiency Payments

[Expected wool (not graded) loan deficiency payment rate]$_t$ = [Wool (not graded) loan rate]$_t$ - MIN([Expected wool (not graded) average price]$_{Q1,t}$, [Expected wool (not graded) average price]$_{Q2,t}$, [Expected wool (not graded) average price]$_{Q3,t}$, [Expected wool (not graded) average price]$_{Q4,t}$)

If [Expected wool (not graded) loan deficiency payment rate]$_t$ ≤ 0 then [Wool (not graded) loan deficiency payment]$_t$ = 0

If [Expected wool (not graded) loan deficiency payment rate]$_t$ > 0 and [Wool (not graded) loan deficiency payment]$_{t-1}$ = 0 then [Wool (not graded) loan deficiency payment]$_t$ = [Expected wool (not graded) production]$_t$ * [Expected wool (not graded) loan deficiency payment rate]$_t$ * [Expected wool (not graded) loan deficiency participation rate based on previous years' experience]$_t$

If [Expected wool (not graded) loan deficiency payment rate]$_t$ > 0 and [Wool (not graded) loan deficiency payment]$_{t-1}$ > 0 then [Wool (not graded) deficiency payment]$_t$ = [Wool (not graded) loan deficiency payment]$_{t-1}$ * [Expected percent change in wool (not graded) production]$_t$ * [Expected percent change in wool (not graded) loan deficiency payment rate]$_t$ * [Expected percent change wool (not graded) loan deficiency participation rate based on previous years' experience]$_t$

Mohair Loan Deficiency Payments

[Expected mohair loan deficiency payment rate]$_t$ = [Mohair loan rate]$_t$ - MIN([Expected mohair average price]$_{Q1,t}$, [Expected mohair average price]$_{Q2,t}$, [Expected mohair average price]$_{Q3,t}$, [Expected mohair average price]$_{Q4,t}$)

If [Expected mohair loan deficiency payment rate]$_t$ ≤ 0 then [Mohair loan deficiency payment]$_t$ = 0

If [Expected mohair loan deficiency payment rate]$_t$ > 0 and [Mohair loan deficiency payment]$_{t-1}$ = 0 then [Wool loan deficiency payment]$_t$ = [Expected mohair production]$_t$ * [Expected mohair loan deficiency payment rate]$_t$ * [Expected mohair loan deficiency participation rate based on previous years' experience]$_t$

If [Expected wool loan deficiency payment rate]$_t$ > 0 and [Mohair loan deficiency payment]$_{t-1}$ > 0 then [Mohair deficiency payment]$_t$ = [Mohair loan deficiency payment]$_{t-1}$ * [Expected percent change in mohair production]$_t$ * [Expected percent change in mohair loan deficiency payment rate]$_t$ * [Expected percent change mohair loan deficiency participation rate based on previous years' experience]$_t$

Dry Peas Loan Deficiency Payments

[Expected dry peas loan deficiency payment rate]$_t$ = [Dry peas loan rate]$_t$ - MIN([Expected dry peas average price]$_{Q1,t}$, [Expected dry peas average price]$_{Q2,t}$, [Expected dry peas average price]$_{Q3,t}$, [Expected dry peas average price]$_{Q4,t}$)

If [Expected dry peas loan deficiency payment rate]$_t$ ≤ 0 then [Dry peas loan deficiency payment, crop year]$_t$ = 0

If [Expected dry peas loan deficiency payment rate]$_t$ > 0 and [Dry peas loan deficiency payment, crop year]$_{t-1}$ = 0 then [Dry peas loan deficiency payment, crop year]$_t$ = [Expected dry peas production]$_t$ * [Expected mohair loan deficiency payment rate]$_t$ * [Expected dry peas loan deficiency participation rate based on previous years' experience]$_t$

If [Expected dry peas loan deficiency payment rate]$_t$ > 0 and [Dry peas loan deficiency payment, crop year]$_{t-1}$ > 0 then [Dry peas deficiency payment, crop year]$_t$ = [Dry peas loan deficiency payment, crop year]$_{t-1}$ * [Expected percent change in dry peas production]$_t$ * [Expected percent change in dry peas loan deficiency payment rate]$_t$ * [Expected percent change dry peas loan deficiency participation rate based on previous years' experience]$_t$

[Dry peas loan deficiency payment, calendar year]$_t$ = 0.05 * [Dry peas loan deficiency payment, crop year]$_{t-1}$ + 0.95 * [Lentils loan deficiency payment, crop year]$_t$

Lentils Loan Deficiency Payments

[Expected lentils loan deficiency payment rate]$_t$ = [Lentils loan rate]$_t$ - MIN([Expected lentils average price]$_{Q1,t}$, [Expected lentils average price]$_{Q2,t}$, [Expected lentils average price]$_{Q3,t}$, [Expected lentils average price]$_{Q4,t}$)

If [Expected lentils loan deficiency payment rate]$_t$ ≤ 0 then [Lentils loan deficiency payment, crop year]$_t$ = 0

If [Expected lentils loan deficiency payment rate]$_t$ > 0 and [Lentils loan deficiency payment, crop year]$_{t-1}$ = 0 then [Lentils loan deficiency payment, crop year]$_t$ = [Expected lentils production]$_t$ * [Expected lentils loan deficiency payment rate]$_t$ * [Expected lentils loan deficiency participation rate based on previous years' experience]$_t$

If [Expected lentils loan deficiency payment rate]$_t$ > 0 and [Lentils loan deficiency payment, crop year]$_{t-1}$ > 0 then [Lentils deficiency payment, crop year]$_t$ = [Lentils loan deficiency payment]$_{t-1}$ * [Expected percent change in

lentils production]$_t$ * [Expected percent change in lentils loan deficiency payment rate]$_t$ * [Expected percent change lentils loan deficiency participation rate based on previous years' experience]$_t$

[Lentils loan deficiency payment, calendar year]$_t$ = 0.05 * [Lentils loan deficiency payment, crop year]$_{t-1}$ + 0.95 * [Lentils loan deficiency payment, crop year]$_t$

Small Chickpeas Loan Deficiency Payments

[Expected small chick peas loan deficiency payment rate]$_t$ = [Small chick peas loan rate]$_t$ - MIN([Expected small chick peas average price]$_{Q1,t}$, [Expected small chick peas average price]$_{Q2,t}$, [Expected small chick peas average price]$_{Q3,t}$, [Expected small chick peas average price]$_{Q4,t}$)

If [Expected small chick peas loan deficiency payment rate]$_t$ ≤ 0 then [Small chick peas loan deficiency payment, crop year]$_t$ = 0

If [Expected small chick peas loan deficiency payment rate]$_t$ > 0 and [Small chick peas loan deficiency payment, crop year]$_{t-1}$ = 0 then [Small chick peas loan deficiency payment, crop year]$_t$ = [Expected small chick peas production]$_t$ * [Expected small chick peas loan deficiency payment rate]$_t$ * [Expected small chick peas loan deficiency participation rate based on previous years' experience]$_t$

If [Expected small chick peas loan deficiency payment rate]$_t$ > 0 and [Small chick peas loan deficiency payment, crop year]$_{t-1}$ > 0 then [Small chick peas loan deficiency payment, crop year]$_t$ = [Small chick peas loan deficiency payment]$_{t-1}$ * [Expected percent change small chick peas production]$_t$ * [Expected percent change in small chick peas loan deficiency payment rate]$_t$ * [Expected percent change in small chick peas loan deficiency participation rate based on previous years' experience]$_t$

[Small chick peas loan deficiency payment, calendar year]$_t$ = 0.05 * [Small chick peas loan deficiency payment, crop year]$_{t-1}$ + 0.95 * [Small chick peas loan deficiency payment, crop year]$_t$

Total Loan Deficiency Payments

[Total loan deficiency payments]$_t$ = [Wheat loan deficiency payments]$_t$ + [Rice loan deficiency payments]$_t$ + [Corn loan deficiency payments]$_t$ + [Sorghum loan deficiency payments]$_t$ + [Barley loan deficiency payments]$_t$ + [Oats loan deficiency payments]$_t$ + [Upland cotton loan deficiency payments]$_t$ + [Soybeans loan deficiency payments]$_t$ + [Flaxseed loan deficiency payments]$_t$ + [Sunflower seed (oil) loan deficiency payments]$_t$ + [Sunflower seed (non-oil) loan deficiency payments]$_t$ + [Canola loan deficiency payments]$_t$ + [Rapeseed loan deficiency payments]$_t$ + [Mustard seed loan deficiency payments]$_t$ + [Crambe loan deficiency payments]$_t$ + [Safflower loan deficiency payments]$_t$ + [Peanuts loan deficiency payments]$_t$ + [Wool (graded) loan deficiency payments]$_t$ + [Wool (not graded) loan deficiency payments]$_t$ + [Mohair loan deficiency payments]$_t$ + [Honey loan deficiency payments]$_t$ + [Dry peas loan deficiency payments]$_t$ + [Lentils loan deficiency payments]$_t$ + [Small chickpeas loan deficiency payments]$_t$

Marketing Loan Gains

Wheat Marketing Loan Gains

[Expected wheat marketing loan gain payment rate]$_t$ = [Wheat loan rate]$_t$ - MIN([Expected wheat average price]$_{Q1,t}$, [Expected wheat average price]$_{Q2,t}$, [Expected wheat average price]$_{Q3,t}$, [Expected wheat average price]$_{Q4,t}$)

[Expected quantity of wheat under loan]$_t$ = [Quantity of wheat production]$_{t-1}$ * (([Quantity of wheat under loan]$_{t-1}$ / [Quantity of wheat production]$_{t-1}$) + ([Quantity of wheat under loan]$_{t-2}$ / [Quantity of wheat production]$_{t-2}$) + ([Quantity of wheat under loan]$_{t-3}$ / [Quantity of wheat production]$_{t-3}$)) / 3

[Expected quantity of wheat receiving marketing loan gains]$_t$ = [Expected quantity of wheat under loan]$_t$ * (([Quantity of wheat receiving marketing loan gains]$_{t-1}$ / [Quantity of wheat under loan]$_{t-1}$) + ([Quantity of wheat receiving marketing loan gains]$_{t-2}$ / [Quantity of wheat under loan]$_{t-2}$) + ([Quantity of wheat receiving marketing loan gains]$_{t-3}$ / [Quantity of wheat under loan]$_{t-3}$)) / 3

If [Expected wheat marketing loan gain payment rate]$_t$ ≤ 0 then [Wheat marketing loan gains, crop year]$_t$ = 0

If [Expected wheat marketing loan gain payment rate]$_t$ > 0 and [Wheat marketing loan gains, crop year]$_{t-1}$ = 0 then [Wheat marketing loan gains, crop year]$_t$ = [Expected quantity of wheat receiving marketing loan gains]$_t$ * [Expected wheat marketing loan gain payment rate]$_t$

If [Expected wheat marketing loan gain payment rate]$_t$ > 0 and [Wheat marketing loan gains, crop year]$_{t-1}$ > 0 then [Wheat marketing loan gains, crop year]$_t$ = [Wheat marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of wheat receiving marketing loan gains]$_t$ * [Expected change in wheat marketing loan gain payment rate]$_t$

[Wheat marketing loan gains, calendar year]$_t$ = 0.03 * [Wheat marketing loan gains, crop year]$_{t-1}$ + 0.97 * [Wheat marketing loan gains, crop year]$_t$

Rice Marketing Loan Gains

[Expected rice marketing loan gain payment rate]$_t$ = [Rice loan rate]$_t$ - MIN([Expected rice average price]$_{Q1,t}$, [Expected rice average price]$_{Q2,t}$, [Expected rice average price]$_{Q3,t}$, [Expected rice average price]$_{Q4,t}$)

[Expected quantity of rice under loan]$_t$ = [Quantity of rice production]$_t$ * (([Quantity of rice under loan]$_{t-1}$ / [Quantity of rice production]$_{t-1}$) + ([Quantity of rice under loan]$_{t-2}$ / [Quantity of rice production]$_{t-2}$) + ([Quantity of rice under loan]$_{t-3}$ / [Quantity of rice production]$_{t-3}$)) / 3

[Expected quantity of rice receiving marketing loan gains]$_t$ = [Expected quantity of rice under loan]$_t$ * (([Quantity of rice receiving marketing loan gains]$_{t-1}$ / [Quantity of rice under loan]$_{t-1}$) + ([Quantity of rice receiving marketing loan gains]$_{t-2}$ / [Quantity of rice under loan]$_{t-2}$) + ([Quantity of rice receiving marketing loan gains]$_{t-3}$ / [Quantity of rice under loan]$_{t-3}$)) / 3

If [Expected rice marketing loan gain payment rate]$_t$ ≤ 0 then [Rice marketing loan gains, crop year]$_t$ = 0

If [Expected rice marketing loan gain payment rate]$_t$ > 0 and [Rice marketing loan gains, crop year]$_{t-1}$ = 0 then [Rice marketing loan gains, crop year]$_t$ = [Expected quantity of rice receiving marketing loan gains]$_t$ * [Expected rice marketing loan gain payment rate]$_t$

If [Expected rice marketing loan gain payment rate]$_t$ > 0 and [Rice marketing loan gains, crop year]$_{t-1}$ > 0 then [Rice marketing loan gains, crop year]$_t$ = [Rice marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of rice receiving marketing loan gains]$_t$ * [Expected change in rice marketing loan gain payment rate]$_t$

[Rice marketing loan gains, calendar year]$_t$ = 0.20 * [Rice marketing loan gains, crop year]$_{t-1}$ + 0.80 * [Rice marketing loan gains, crop year]$_t$

Corn Marketing Loan Gains

[Expected corn marketing loan gain payment rate]$_t$ = [Corn loan rate]$_t$ - MIN([Expected corn average price]$_{Q1,t}$, [Expected corn average price]$_{Q2,t}$, [Expected corn average price]$_{Q3,t}$, [Expected corn average price]$_{Q4,t}$)

[Expected quantity of corn under loan]$_t$ = [Quantity of corn production]$_t$ * (([Quantity of corn under loan]$_{t-1}$ / [Quantity of corn production]$_{t-1}$) + ([Quantity of corn under loan]$_{t-2}$ / [Quantity of corn production]$_{t-2}$) + ([Quantity of corn under loan $_{t-3}$ / [Quantity of corn production]$_{t-3}$)) / 3

[Expected quantity of corn receiving marketing loan gains]$_t$ = [Expected quantity of corn under loan]$_t$ * (([Quantity of corn receiving marketing loan gains]$_{t-1}$ / [Quantity of corn under loan]$_{t-1}$) + ([Quantity of corn receiving marketing loan gains]$_{t-2}$ / [Quantity of corn under loan]$_{t-2}$) + ([Quantity of corn receiving marketing loan gains $_{t-3}$ / [Quantity of corn under loan]$_{t-3}$)) / 3

If [Expected corn marketing loan gain payment rate]$_t$ ≤ 0 then [Corn marketing loan gains, crop year]$_t$ = 0

If [Expected corn marketing loan gain payment rate]$_t$ > 0 and [Corn marketing loan gains, crop year]$_{t-1}$ = 0 then [Corn marketing loan gains, crop year]$_t$ = [Expected quantity of corn receiving marketing loan gains]$_t$ * [Expected corn marketing loan gain payment rate]$_t$

If [Expected corn marketing loan gain payment rate]$_t$ > 0 and [Corn marketing loan gains, crop year]$_{t-1}$ > 0 then [Corn marketing loan gains, crop year]$_t$ = [Corn marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of corn receiving marketing loan gains]$_t$ * [Expected change in corn marketing loan gain payment rate]$_t$

[Corn marketing loan gains, calendar year]$_t$ = 0.20 * [Corn marketing loan gains, crop year]$_{t-1}$ + 0.80 * [Corn marketing loan gains, crop year]$_t$

Sorghum Marketing Loan Gains

[Expected sorghum marketing loan gain payment rate]$_t$ = [Sorghum loan rate]$_t$ - MIN([Expected sorghum average price]$_{Q1,t}$, [Expected sorghum average price]$_{Q2,t}$, [Expected sorghum average price]$_{Q3,t}$, [Expected sorghum average price]$_{Q4,t}$)

[Expected quantity of sorghum under loan]$_t$ = [Quantity of sorghum production]$_t$ * (([Quantity of sorghum under loan]$_{t-1}$ / [Quantity of sorghum production]$_{t-1}$) + ([Quantity of sorghum under loan]$_{t-2}$ / [Quantity of sorghum production]$_{t-2}$) + ([Quantity of sorghum under loan $_{t-3}$ / [Quantity of sorghum production]$_{t-3}$)) / 3

[Expected quantity of sorghum receiving marketing loan gains]$_t$ = [Expected quantity of sorghum under loan]$_t$ * (([Quantity of sorghum receiving marketing loan gains]$_{t-1}$ / [Quantity of sorghum under loan]$_{t-1}$) + ([Quantity of sorghum receiving marketing loan gains]$_{t-2}$ / [Quantity of sorghum under loan]$_{t-2}$) + ([Quantity of sorghum receiving marketing loan gains $_{t-3}$ / [Quantity of sorghum under loan]$_{t-3}$)) / 3

If [Expected sorghum marketing loan gain payment rate]$_t$ ≤ 0 then [Sorghum marketing loan gains, crop year]$_t$ = 0

If [Expected sorghum marketing loan gain payment rate]$_t$ > 0 and [Sorghum marketing loan gains, crop year]$_{t-1}$ = 0 then [Sorghum marketing loan gains, crop year]$_t$ = [Expected quantity of sorghum receiving marketing loan gains]$_t$ * [Expected sorghum marketing loan gain payment rate]$_t$

If [Expected sorghum marketing loan gain payment rate]$_t$ > 0 and [Sorghum marketing loan gains, crop year]$_{t-1}$ > 0 then [Sorghum marketing loan gains, crop year]$_t$ = [Sorghum marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of sorghum receiving marketing loan gains]$_t$ * [Expected change in sorghum marketing loan gain payment rate]$_t$

[Sorghum marketing loan gains, calendar year]$_t$ = 0.10 * [Sorghum marketing loan gains, crop year]$_{t-1}$ + 0.90 * [Sorghum marketing loan gains, crop year]$_t$

Barley Marketing Loan Gains

[Expected barley marketing loan gain payment rate]$_t$ = [Barley loan rate]$_t$ - MIN([Expected barley average price]$_{Q1,t}$, [Expected barley average price]$_{Q2,t}$, [Expected barley average price]$_{Q3,t}$, [Expected barley average price]$_{Q4,t}$)

[Expected quantity of barley under loan]$_t$ = [Quantity of barley production]$_t$ * (([Quantity of barley under loan]$_{t-1}$ / [Quantity of barley production]$_{t-1}$) + ([Quantity of barley under loan]$_{t-2}$ / [Quantity of barley production]$_{t-2}$) + ([Quantity of barley under loan]$_{t-3}$ / [Quantity of barley production]$_{t-3}$)) / 3

[Expected quantity of barley receiving marketing loan gains]$_t$ = [Expected quantity of barley under loan]$_t$ * (([Quantity of barley receiving marketing loan gains]$_{t-1}$ / [Quantity of barley under loan]$_{t-1}$) + ([Quantity of barley receiving marketing loan gains]$_{t-2}$ / [Quantity of barley under loan]$_{t-2}$) + ([Quantity of barley receiving marketing loan gains]$_{t-3}$ / [Quantity of barley under loan]$_{t-3}$)) / 3

If [Expected barley marketing loan gain payment rate]$_t$ ≤ 0 then [Barley marketing loan gains, crop year]$_t$ = 0

If [Expected barley marketing loan gain payment rate]$_t$ > 0 and [Barley marketing loan gains, crop year]$_{t-1}$ = 0 then [Barley marketing loan gains, crop year]$_t$ = [Expected quantity of barley receiving marketing loan gains]$_t$ * [Expected barley marketing loan gain payment rate]$_t$

If [Expected barley marketing loan gain payment rate]$_t$ > 0 and [Barley marketing loan gains, crop year]$_{t-1}$ > 0 then [Barley marketing loan gains, crop year]$_t$ = [Barley marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of barley receiving marketing loan gains]$_t$ * [Expected change in barley marketing loan gain payment rate]$_t$

[[Barley marketing loan gains, calendar year]$_t$ = 0.05 * [[Barley marketing loan gains, crop year]$_{t-1}$ + 0.95 * [[Barley marketing loan gains, crop year]$_t$

Oats Marketing Loan Gains

[Expected oats marketing loan gain payment rate]$_t$ = [Oats loan rate]$_t$ - MIN([Expected oats average price]$_{Q1,t}$, [Expected oats average price]$_{Q2,t}$, [Expected oats average price]$_{Q3,t}$, [Expected oats average price]$_{Q4,t}$)

[Expected quantity of oats under loan]$_t$ = [Quantity of oats production]$_t$ * (([Quantity of oats under loan]$_{t-1}$ / [Quantity of oats production]$_{t-1}$) + ([Quantity of oats under loan]$_{t-2}$ / [Quantity of oats production]$_{t-2}$) + ([Quantity of oats under loan]$_{t-3}$ / [Quantity of oats production]$_{t-3}$)) / 3

[Expected quantity of oats receiving marketing loan gains]$_t$ = [Expected quantity of oats under loan]$_t$ * (([Quantity of oats receiving marketing loan gains]$_{t-1}$ / [Quantity of oats under loan]$_{t-1}$) + ([Quantity of oats receiving marketing loan gains]$_{t-2}$ / [Quantity of oats under loan]$_{t-2}$) + ([Quantity of oats receiving marketing loan gains]$_{t-3}$ / [Quantity of oats under loan]$_{t-3}$)) / 3

If [Expected oats marketing loan gain payment rate]$_t$ ≤ 0 then [Oats marketing loan gains, crop year]$_t$ = 0

If [Expected oats marketing loan gain payment rate]$_t$ > 0 and [Oats marketing loan gains, crop year]$_{t-1}$ = 0 then [Oats marketing loan gains, crop year]$_t$ = [Expected quantity of oats receiving marketing loan gains]$_t$ * [Expected oats marketing loan gain payment rate]$_t$

If [Expected oats marketing loan gain payment rate]$_t$ > 0 and [Oats marketing loan gains, crop year]$_{t-1}$ > 0 then [Oats marketing loan gains, crop year]$_t$ = [Oats marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of oats receiving marketing loan gains]$_t$ * [Expected change in oats marketing loan gain payment rate]$_t$

[Oats marketing loan gains, calendar year]$_t$ = 0.05 * [Oats marketing loan gains, crop year]$_{t-1}$ + 0.95 * [Oats marketing loan gains, crop year]$_t$

Upland Cotton Marketing Loan Gains

[Expected upland cotton marketing loan gain payment rate]$_t$ = [Upland cotton loan rate]$_t$ - MIN([Expected upland cotton average price]$_{Q1,t}$, [Expected upland cotton average price]$_{Q2,t}$, [Expected upland cotton average price]$_{Q3,t}$, [Expected upland cotton average price]$_{Q4,t}$)

[Expected quantity of upland cotton under loan]$_t$ = [Quantity of upland cotton production]$_t$ * (([Quantity of upland cotton under loan]$_{t-1}$ / [Quantity of upland cotton production]$_{t-1}$) + ([Quantity of upland cotton under loan]$_{t-2}$ / [Quantity of upland cotton production]$_{t-2}$) + ([Quantity of upland cotton under loan]$_{t-3}$ / [Quantity of upland cotton production]$_{t-3}$)) / 3

[Expected quantity of upland cotton receiving marketing loan gains]$_t$ = [Expected quantity of upland cotton under loan]$_t$ * (([Quantity of upland cotton receiving marketing loan gains]$_{t-1}$ / [Quantity of upland cotton under loan]$_{t-1}$) + ([Quantity of upland cotton receiving marketing loan gains]$_{t-2}$ / [Quantity of upland cotton under loan]$_{t-2}$) + ([Quantity of upland cotton receiving marketing loan gains]$_{t-3}$ / [Quantity of upland cotton under loan]$_{t-3}$)) / 3

If [Expected upland cotton marketing loan gain payment rate]$_t$ ≤ 0 then [Upland cotton marketing loan gains, crop year]$_t$ = 0

If [Expected upland cotton marketing loan gain payment rate]$_t$ > 0 and [Upland cotton marketing loan gains, crop year]$_{t-1}$ = 0 then [Upland cotton marketing loan gains, crop year]$_t$ = [Expected quantity of upland cotton receiving marketing loan gains]$_t$ * [Expected upland cotton marketing loan gain payment rate]$_t$

If [Expected upland cotton marketing loan gain payment rate]$_t$ > 0 and [Upland cotton marketing loan gains, crop year]$_{t-1}$ > 0 then [Upland cotton marketing loan gains, crop year]$_t$ = [Upland cotton marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of upland cotton receiving marketing loan gains]$_t$ * [Expected change in upland cotton marketing loan gain payment rate]$_t$

[Upland cotton marketing loan gains, calendar year]$_t$ = 0.40 * [Upland cotton marketing loan gains, crop year]$_{t-1}$ + 0.60 * [Upland cotton marketing loan gains, crop year]$_t$

Soybeans Marketing Loan Gains

[Expected soybeans marketing loan gain payment rate]$_t$ = [Soybeans loan rate]$_t$ - MIN([Expected soybeans average price]$_{Q1,t}$, [([Expected soybeans average price]$_{Q2,t}$, [([Expected soybeans average price]$_{Q3,t}$, [([Expected soybeans average price]$_{Q4,t}$)

[Expected quantity of soybeans under loan]$_t$ = [Quantity of soybeans production]$_t$ * (([Quantity of soybeans under loan]$_{t-1}$ / [Quantity soybeans production]$_{t-1}$) + ([Quantity of soybeans under loan]$_{t-2}$ / [Quantity soybeans production]$_{t-2}$) + ([Quantity of soybeans under loan]$_{t-3}$ / [Quantity soybeans production]$_{t-3}$)) / 3

[Expected quantity of soybeans receiving marketing loan gains]$_t$ = [Expected quantity of soybeans under loan]$_t$ * (([Quantity of soybeans receiving marketing loan gains]$_{t-1}$ / [Quantity soybeans under loan]$_{t-1}$) + ([Quantity

of soybeans receiving marketing loan gains]$_{t-2}$ / [Quantity soybeans under loan]$_{t-2}$) + ([Quantity of soybeans receiving marketing loan gains]$_{t-3}$ / [Quantity soybeans under loan]$_{t-3}$)) / 3

If [Expected soybeans marketing loan gain payment rate]$_t$ ≤ 0 then [Soybeans marketing loan gains, crop year]$_t$ = 0

If [Expected soybeans marketing loan gain payment rate]$_t$ > 0 and [Soybeans marketing loan gains, crop year]$_{t-1}$ = 0 then [Soybeans marketing loan gains, crop year]$_t$ = [Expected quantity of soybeans receiving marketing loan gains]$_t$ * [Expected soybeans marketing loan gain payment rate]$_t$

If [Expected soybeans marketing loan gain payment rate]$_t$ > 0 and [Soybeans marketing loan gains, crop year]$_{t-1}$ > 0 then [Soybeans marketing loan gains, crop year]$_t$ = [Soybeans marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of soybeans receiving marketing loan gains]$_t$ * [Expected change in soybeans marketing loan gain payment rate]$_t$

[Soybeans marketing loan gains, calendar year]$_t$ = 0.15 * [Soybeans marketing loan gains, crop year]$_{t-1}$ + 0.85 * [Soybeans marketing loan gains, crop year]$_t$

Flaxseed Marketing Loan Gains

[Expected flaxseed marketing loan gain payment rate]$_t$ = [Flaxseed loan rate]$_t$ - MIN([Expected flaxseed average price]$_{Q1,t}$, [Expected flaxseed average price]$_{Q2,t}$, [Expected flaxseed average price]$_{Q3,t}$, [Expected flaxseed average price]$_{Q4,t}$)

[Expected quantity of flaxseed under loan]$_t$ = [Quantity of flaxseed production]$_t$ * (([Quantity of flaxseed under loan]$_{t-1}$ / [Quantity of flaxseed production]$_{t-1}$) + ([Quantity of flaxseed under loan]$_{t-2}$ / [Quantity of flaxseed production]$_{t-2}$) + ([Quantity of flaxseed under loan]$_{t-3}$ / [Quantity of flaxseed production]$_{t-3}$)) / 3

[Expected quantity of flaxseed receiving marketing loan gains]$_t$ = [Expected quantity of flaxseed under loan]$_t$ * (([Quantity of flaxseed receiving marketing loan gains]$_{t-1}$ / [Quantity of flaxseed under loan]$_{t-1}$) + ([Quantity of flaxseed receiving marketing loan gains]$_{t-2}$ / [Quantity of flaxseed under loan]$_{t-2}$) + ([Quantity of flaxseed receiving marketing loan gains]$_{t-3}$ / [Quantity of flaxseed under loan]$_{t-3}$)) / 3

If [Expected flaxseed marketing loan gain payment rate]$_t$ ≤ 0 then [Flaxseed marketing loan gains, crop year]$_t$ = 0

If [Expected flaxseed marketing loan gain payment rate]$_t$ > 0 and [Flaxseed marketing loan gains, crop year]$_{t-1}$ = 0 then [Flaxseed marketing loan gains, crop year]$_t$ = [Expected quantity of flaxseed receiving marketing loan gains]$_t$ * [Expected flaxseed marketing loan gain payment rate]$_t$

If [Expected flaxseed marketing loan gain payment rate]$_t$ > 0 and [Flaxseed marketing loan gains, crop year]$_{t-1}$ > 0 then [Flaxseed marketing loan gains, crop year]$_t$ = [Flaxseed marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of flaxseed receiving marketing loan gains]$_t$ * [Expected change in flaxseed marketing loan gain payment rate]$_t$

[Flaxseed marketing loan gains, calendar year]$_t$ = 0.15 * [Flaxseed marketing loan gains, crop year]$_{t-1}$ + 0.85 * [Flaxseed marketing loan gains, crop year]$_t$

Sunflower Seed (Oil) Marketing Loan Gains

[Expected sunflower (oil) marketing loan gain payment rate]$_t$ = [Sunflower seed (oil) loan rate]$_t$ - MIN([Expected sunflower seed (oil) average price]$_{Q1,t}$, [Expected sunflower seed (oil) average price]$_{Q2,t}$, [Expected sunflower seed (oil) average price]$_{Q3,t}$, [Expected sunflower seed (oil) average price]$_{Q4,t}$)

[Expected quantity of sunflower seed (oil) under loan]$_t$ = [Quantity of sunflower seed (oil) production]$_t$ * (([Quantity of sunflower seed (oil) under loan]$_{t-1}$ / [Quantity of sunflower seed (oil) production]$_{t-1}$) + ([Quantity of sunflower seed (oil) under loan]$_{t-2}$ / [Quantity of sunflower seed (oil) production]$_{t-2}$) + ([Quantity of sunflower seed (oil) under loan]$_{t-3}$ / [Quantity of sunflower seed (oil) production]$_{t-3}$)) / 3

[Expected quantity of sunflower seed (oil) receiving marketing loan gains]$_t$ = [Expected quantity of sunflower seed (oil) under loan]$_t$ * (([Quantity of sunflower seed (oil) receiving marketing loan gains]$_{t-1}$ / [Quantity of sunflower seed (oil) under loan]$_{t-1}$) + ([Quantity of sunflower seed (oil) receiving marketing loan gains]$_{t-2}$ / [Quantity of sunflower seed (oil) under loan]$_{t-2}$) + ([Quantity of sunflower seed (oil) receiving marketing loan gains]$_{t-3}$ / [Quantity of sunflower seed (oil) under loan]$_{t-3}$)) / 3

If [Expected sunflower seed (oil) marketing loan gain payment rate]$_t$ ≤ 0 then [Sunflower seed (oil) marketing loan gains, crop year]$_t$ = 0

If [Expected sunflower seed (oil) marketing loan gain payment rate]$_t$ > 0 and [Sunflower seed (oil) marketing loan gains, crop year]$_{t-1}$ = 0 then [Sunflower seed (oil) marketing loan gains, crop year]$_t$ = [Expected quantity of sunflower seed (oil) receiving marketing loan gains]$_t$ * [Expected sunflower seed (oil) marketing loan gain payment rate]$_t$

If [Expected sunflower seed (oil) marketing loan gain payment rate]$_t$ > 0 and [Sunflower seed (oil) marketing loan gains, crop year]$_{t-1}$ > 0 then [Sunflower seed (oil) marketing loan gains, crop year]$_t$ = [Sunflower seed (oil) marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of sunflower seed (oil) receiving marketing loan gains]$_t$ * [Expected change in sunflower seed (oil) marketing loan gain payment rate]$_t$

[Sunflower seed (oil) marketing loan gains, calendar year]$_t$ = 0.15 * [Sunflower seed (oil marketing loan gains, crop year]$_{t-1}$ + 0.85 * [Sunflower seed (oil) marketing loan gains, crop year]$_t$

Sunflower Seed (Non-oil) Marketing Loan Gains

[Expected sunflower seed (non-oil) marketing loan gain payment rate]$_t$ = [Sunflower seed (non-oil) loan rate]$_t$ - MIN([Expected sunflower seed (non-oil) average price]$_{Q1,t}$, [Expected sunflower seed (non-oil) average price]$_{Q2,t}$, [Expected sunflower seed (non-oil) average price]$_{Q3,t}$, [Expected sunflower seed (non-oil) average price]$_{Q4,t}$)

[Expected quantity of sunflower seed (non-oil) under loan]$_t$ = [Quantity of sunflower seed (non-oil) production]$_t$ * (([Quantity of sunflower seed (non-oil) under loan]$_{t-1}$ / [Quantity of sunflower seed (non-oil) production]$_{t-1}$) + ([Quantity of sunflower seed (non-oil) under loan]$_{t-2}$ / [Quantity of sunflower seed (non-oil) production]$_{t-2}$) + ([Quantity of sunflower seed (non-oil) under loan]$_{t-3}$ / [Quantity of sunflower seed (non-oil) production]$_{t-3}$))/3

[Expected quantity of sunflower seed (non-oil) receiving marketing loan gains]$_t$ = [Expected quantity of sunflower seed (non-oil) under loan]$_t$ * (([Quantity of sunflower seed (non-oil) receiving marketing loan gains]$_{t-1}$ / [Quantity of sunflower seed (non-oil) under loan]$_{t-1}$) + ([Quantity of sunflower seed (non-oil) receiving marketing loan gains]$_{t-2}$ / [Quantity of sunflower seed (non-oil) under loan]$_{t-2}$) + ([Quantity of sunflower seed (non-oil) receiving marketing loan gains]$_{t-3}$ / [Quantity of sunflower seed (non-oil) under loan]$_{t-3}$)) / 3

If [Expected sunflower seed (non-oil) marketing loan gain payment rate]$_t$ ≤ 0 then [Sunflower seed (non-oil) marketing loan gains, crop year]$_t$ = 0

If [Expected sunflower seed (non-oil) marketing loan gain payment rate]$_t$ > 0 and [Sunflower seed (non-oil) marketing loan gains, crop year]$_{t-1}$ = 0 then [Sunflower seed (non-oil) marketing loan gains, crop year]$_t$ = [Expected quantity of sunflower seed (non-oil) receiving marketing loan gains]$_t$ * [Expected sunflower seed (non-oil) marketing loan gain payment rate]$_t$

If [Expected sunflower seed (non-oil) marketing loan gain payment rate]$_t$ > 0 and [Sunflower seed (non-oil) marketing loan gains, crop year]$_{t-1}$ > 0 then [Sunflower seed (non-oil) marketing loan gains, crop year]$_t$ = [Sunflower seed (non-oil) marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of sunflower seed (non-oil) receiving marketing loan gains]$_t$ * [Expected change in sunflower seed (non-oil) marketing loan gain payment rate]$_t$

[Sunflower seed (non-oil) loan deficiency payment, calendar year]$_t$ = 0.15 * [Sunflower seed (non-oil) loan deficiency payment, crop year]$_{t-1}$ + 0.85 * [Sunflower seed (non-oil) seed loan deficiency payment, crop year]$_t$

Canola Marketing Loan Gains

[Expected canola marketing loan gain payment rate]$_t$ = [Canola loan rate]$_t$ - MIN([Expected canola average price]$_{Q1,t}$, [Expected canola average price]$_{Q2,t}$, [Expected canola average price]$_{Q3,t}$, [Expected canola average price]$_{Q4,t}$)

[Expected quantity of canola under loan]$_t$ = [Quantity of canola production]$_t$ * (([Quantity of canola under loan]$_{t-1}$ / [Quantity of canola production]$_{t-1}$) + ([Quantity of canola under loan]$_{t-2}$ / [Quantity of canola production]$_{t-2}$) + ([Quantity of canola under loan]$_{t-3}$ / [Quantity of canola production]$_{t-3}$)) / 3

[Expected quantity of canola receiving marketing loan gains]$_t$ = [Expected quantity of canola under loan]$_t$ * (([Quantity of canola receiving marketing loan gains]$_{t-1}$ / [Quantity of canola under loan]$_{t-1}$) + ([Quantity of canola receiving marketing loan gains]$_{t-2}$ / [Quantity of canola under loan]$_{t-2}$) + ([Quantity of canola receiving marketing loan gains]$_{t-3}$ / [Quantity of canola under loan]$_{t-3}$)) / 3

If [Expected canola marketing loan gain payment rate]$_t$ ≤ 0 then [Canola marketing loan gains, crop year]$_t$ = 0

If [Expected canola marketing loan gain payment rate]$_t$ > 0 and [Canola marketing loan gains, crop year]$_{t-1}$ = 0 then [Canola marketing loan gains, crop year]$_t$ = [Expected quantity of canola receiving marketing loan gains]$_t$ * [Expected canola marketing loan gain payment rate]$_t$

If [Expected canola marketing loan gain payment rate]$_t$ > 0 and [Canola marketing loan gains, crop year]$_{t-1}$ > 0 then [Canola marketing loan gains, crop year]$_t$ = [Canola marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of canola receiving marketing loan gains]$_t$ * [Expected change in canola marketing loan gain payment rate]$_t$

[Canola loan deficiency payment, calendar year]$_t$ = 0.15 * [Canola loan deficiency payment, crop year]$_{t-1}$ + 0.85 * [Canola loan deficiency payment, crop year]$_t$

Rapeseed Marketing Loan Gains

[Expected rapeseed marketing loan gain payment rate]$_t$ = [Rapeseed loan rate]$_t$ - MIN([Expected rapeseed average price]$_{Q1,t}$, [Expected rapeseed average price]$_{Q2,t}$, [Expected rapeseed average price]$_{Q3,t}$, [Expected rapeseed average price]$_{Q4,t}$)

[Expected quantity of rapeseed under loan]$_t$ = [Quantity of rapeseed production]$_t$ * ([Quantity of rapeseed under loan]$_{t-1}$ / [Quantity of rapeseed production]$_{t-1}$ + [Quantity of rapeseed under loan]$_{t-2}$ / [Quantity of rapeseed production]$_{t-2}$ + [Quantity of rapeseed under loan]$_{t-3}$ / [Quantity of rapeseed production]$_{t-3}$) / 3

[Expected quantity of rapeseed receiving marketing loan gains]$_t$ = [Expected quantity of rapeseed under loan]$_t$ * (([Quantity of rapeseed receiving marketing loan gains]$_{t-1}$ / [Quantity of rapeseed under loan]$_{t-1}$) + ([Quantity of rapeseed receiving marketing loan gains]$_{t-2}$ / [Quantity of rapeseed under loan]$_{t-2}$) + ([Quantity of rapeseed receiving marketing loan gains]$_{t-3}$ / [Quantity of rapeseed under loan]$_{t-3}$)) / 3

If [Expected rapeseed marketing loan gain payment rate]$_t$ ≤ 0 then [Rapeseed marketing loan gains, crop year]$_t$ = 0

If [Expected rapeseed marketing loan gain payment rate]$_t$ > 0 and [Rapeseed marketing loan gains, crop year]$_{t-1}$ = 0 then [Rapeseed marketing loan gains, crop year]$_t$ = [Expected quantity of rapeseed receiving marketing loan gains]$_t$ * [Expected rapeseed marketing loan gain payment rate]$_t$

If [Expected rapeseed marketing loan gain payment rate]$_t$ > 0 and [Rapeseed marketing loan gains, crop year]$_{t-1}$ > 0 then [Rapeseed marketing loan gains, crop year]$_t$ = [Rapeseed marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of rapeseed receiving marketing loan gains]$_t$ * [Expected change in rapeseed marketing loan gain payment rate]$_t$

[Rapeseed loan deficiency payment, calendar year]$_t$ = 0.15 * [Rapeseed loan deficiency payment, crop year]$_{t-1}$ + 0.85 * [Rapeseed loan deficiency payment, crop year]$_t$

Mustard seed Marketing Loan Gains

[Expected mustard seed marketing loan gain payment rate]$_t$ = [Mustard seed loan rate]$_t$ - MIN([Expected mustard seed average price]$_{Q1,t}$, [Expected mustard seed average price]$_{Q2,t}$, [Expected mustard seed average price]$_{Q3,t}$, [Expected mustard seed average price]$_{Q4,t}$)

[Expected quantity of mustard seed under loan]$_t$ = [Quantity of mustard seed production]$_t$ * (([Quantity of mustard seed under loan]$_{t-1}$ / [Quantity of mustard seed production]$_{t-1}$) + ([Quantity of mustard seed under loan]$_{t-2}$ / [Quantity of mustard seed production]$_{t-2}$) + ([Quantity of mustard seed under loan]$_{t-3}$ / [Quantity of mustard seed production]$_{t-3}$)) / 3

[Expected quantity of mustard seed receiving marketing loan gains]$_t$ = [Expected quantity of mustard seed under loan]$_t$ * (([Quantity of mustard seed receiving marketing loan gains]$_{t-1}$ / [Quantity of mustard seed under loan]$_{t-1}$) + ([Quantity of mustard seed receiving marketing loan gains]$_{t-2}$ / [Quantity of mustard seed under loan]$_{t-2}$) + ([Quantity of mustard seed receiving marketing loan gains]$_{t-3}$ / [Quantity of mustard seed under loan]$_{t-3}$)) / 3

If [Expected mustard seed marketing loan gain payment rate]$_t$ ≤ 0 then [Mustard seed marketing loan gains, crop year]$_t$ = 0

If [Expected mustard seed marketing loan gain payment rate]$_t$ > 0 and [Mustard seed marketing loan gains, crop year]$_{t-1}$ = 0 then [Mustard seed marketing loan gains, crop year]$_t$ = [Expected quantity of mustard seed receiving marketing loan gains]$_t$ * [Expected mustard seed marketing loan gain payment rate]$_t$

If [Expected mustard seed marketing loan gain payment rate]$_t$ > 0 and [Mustard seed marketing loan gains, crop year]$_{t-1}$ > 0 then [Mustard seed marketing loan gains, crop year]$_t$ = [Mustard seed marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of mustard seed receiving marketing loan gains]$_t$ * [Expected change in mustard seed marketing loan gain payment rate]$_t$

[Mustard seed marketing loan gains, calendar year]$_t$ = 0.15 * [Mustard seed marketing loan gains, crop year]$_{t-1}$ + 0.85 * [Mustard seed marketing loan gains, crop year]$_t$

Crambe Marketing Loan Gains

[Expected crambe marketing loan gain payment rate]$_t$ = [Crambe loan rate]$_t$ - MIN([Expected crambe average price]$_{Q1,t}$, [Expected crambe average price]$_{Q2,t}$, [Expected crambe average price]$_{Q3,t}$, [Expected crambe average price]$_{Q4,t}$)

[Expected quantity of crambe under loan]$_t$ = [Quantity of crambe production]$_t$ * ((([Quantity of crambe under loan]$_{t-1}$ / [Quantity of crambe production]$_{t-1}$) + ([Quantity of crambe under loan]$_{t-2}$ / [Quantity of crambe production]$_{t-2}$) + ([Quantity of crambe under loan]$_{t-3}$ / [Quantity of crambe production]$_{t-3}$)) / 3

[Expected quantity of crambe receiving marketing loan gains]$_t$ = [Expected quantity of crambe under loan]$_t$ * (([Quantity of crambe receiving marketing loan gains]$_{t-1}$ / [Quantity of crambe under loan]$_{t-1}$) + ([Quantity of crambe receiving marketing loan gains]$_{t-2}$ / [Quantity of crambe under loan]$_{t-2}$) + ([Quantity of crambe receiving marketing loan gains]$_{t-3}$ /Quantity of crambe under loan]$_{t-3}$)) / 3

If [Expected crambe marketing loan gain payment rate]$_t$ ≤ 0 then [Crambe marketing loan gains, crop year]$_t$ = 0

If [Expected crambe marketing loan gain payment rate]$_t$ > 0 and [Crambe marketing loan gains, crop year]$_{t-1}$ = 0 then [Crambe marketing loan gains, crop year]$_t$ = [Expected quantity of crambe receiving marketing loan gains]$_t$ * [Expected crambe marketing loan gain payment rate]$_t$

If [Expected crambe marketing loan gain payment rate]$_t$ > 0 and [Crambe marketing loan gains, crop year]$_{t-1}$ > 0 then [Crambe marketing loan gains, crop year]$_t$ = [Crambe marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of crambe receiving marketing loan gains]$_t$ * [Expected change in crambe marketing loan gain payment rate]$_t$

[Crambe marketing loan gains, calendar year]$_t$ = 0.15 * [Crambe marketing loan gains, crop year]$_{t-1}$ + 0.85 * [Crambe marketing loan gains, crop year]$_t$

Safflower Marketing Loan Gains

[Expected safflower marketing loan gain payment rate]$_t$ = [Safflower loan rate]$_t$ - MIN([Expected safflower average price]$_{Q1,t}$, [Expected safflower average price]$_{Q2,t}$, [Expected safflower average price]$_{Q3,t}$, [Expected safflower average price]$_{Q4,t}$)

[Expected quantity of safflower under loan]$_t$ = [Quantity of safflower production]$_t$ * ((([Quantity of safflower under loan]$_{t-1}$ / [Quantity of safflower production]$_{t-1}$) + ([Quantity of safflower under loan]$_{t-2}$ / [Quantity of safflower production]$_{t-2}$) + ([Quantity of safflower under loan]$_{t-3}$ / [Quantity of safflower production]$_{t-3}$)) / 3

[Expected quantity of safflower receiving marketing loan gains]$_t$ = [Expected quantity of safflower under loan]$_t$ * (([Quantity of safflower receiving marketing loan gains]$_{t-1}$ / [Quantity of safflower under loan]$_{t-1}$) + ([Quantity of safflower receiving marketing loan gains]$_{t-2}$ / [Quantity of safflower under loan]$_{t-2}$) + ([Quantity of safflower receiving marketing loan gains]$_{t-3}$ / [Quantity of safflower under loan]$_{t-3}$)) / 3

If [Expected safflower marketing loan gain payment rate]$_t$ ≤ 0 then [Safflower marketing loan gains, crop year]$_t$ = 0

If [Expected safflower marketing loan gain payment rate]$_t$ > 0 and [Safflower marketing loan gains, crop year]$_{t-1}$ = 0 then [Safflower marketing loan gains, crop year]$_t$ = [Expected quantity of safflower receiving marketing loan gains]$_t$ * [Expected safflower marketing loan gain payment rate]$_t$

If [Expected safflower marketing loan gain payment rate]$_t$ > 0 and [Safflower marketing loan gains, crop year]$_{t-1}$ > 0 then [Safflower marketing loan gains, crop year]$_t$ = [Safflower marketing loan gains, crop year]$_{t-1}$ * [Expected

change in quantity of safflower receiving marketing loan gains]$_t$ * [Expected change in safflower marketing loan gain payment rate]$_t$

[Safflower marketing loan gain, calendar year]$_t$ = 0.15 * [Safflower marketing loan gain, crop year]$_{t-1}$ + 0.85 * [Safflower marketing loan gain, crop year]$_t$

Peanuts Marketing Loan Gains

[Expected peanuts marketing loan gain payment rate]$_t$ = [Peanuts loan rate]$_t$ - MIN([Expected peanuts average price]$_{Q1,t}$, [Expected peanuts average price]$_{Q2,t}$, [Expected peanuts average price]$_{Q3,t}$, [Expected peanuts average price]$_{Q4,t}$)

[Expected quantity of peanuts under loan]$_t$ = [Quantity of peanuts production]$_t$ * ([Quantity of peanuts under loan]$_{t-1}$ / [Quantity of peanuts production]$_{t-1}$ + [Quantity of peanuts under loan]$_{t-2}$ / [Quantity of peanuts production]$_{t-2}$ + [Quantity of peanuts under loan]$_{t-3}$ / [Quantity of peanuts production]$_{t-3}$) / 3

[Expected quantity of peanuts receiving marketing loan gains]$_t$ = [Expected quantity of peanuts under loan]$_t$ * (([Quantity of peanuts receiving marketing loan gains]$_{t-1}$ / [Quantity of peanuts under loan]$_{t-1}$) + ([Quantity of peanuts receiving marketing loan gains]$_{t-2}$ / [Quantity of peanuts under loan]$_{t-2}$) + ([Quantity of peanuts receiving marketing loan gains]$_{t-3}$ / [Quantity of peanuts under loan]$_{t-3}$)) / 3

If [Expected peanuts marketing loan gain payment rate]$_t$ ≤ 0 then [Peanuts marketing loan gains, crop year]$_t$ = 0

If [Expected peanuts marketing loan gain payment rate]$_t$ > 0 and [Peanuts marketing loan gains, crop year]$_{t-1}$ = 0 then [Peanuts marketing loan gains, crop year]$_t$ = [Expected quantity of peanuts receiving marketing loan gains]$_t$ * [Expected peanuts marketing loan gain payment rate]$_t$

If [Expected peanuts marketing loan gain payment rate]$_t$ > 0 and [Peanuts marketing loan gains, crop year]$_{t-1}$ > 0 then [Peanuts marketing loan gains, crop year]$_t$ = [Peanuts marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of peanuts receiving marketing loan gains]$_t$ * [Expected change in peanuts marketing loan gain payment rate]$_t$

[Peanuts marketing loan gains, calendar year]$_t$ = 0.15 * [Peanuts marketing loan gains, crop year]$_{t-1}$ + 0.85 * [Peanuts marketing loan gains, crop year]$_t$

Wool (graded) Marketing Loan Gains

[Expected wool (graded) marketing loan gain payment rate]$_t$ = [Wool (graded) loan rate]$_t$ - MIN([Expected wool (graded) average price]$_{Q1,t}$, [Expected wool (graded) average price]$_{Q2,t}$, [Expected wool (graded) average price]$_{Q3,t}$, [Expected wool (graded) average price]$_{Q4,t}$)

[Expected quantity of wool (graded) under loan]$_t$ = [Quantity of wool (graded) production]$_t$ * (([Quantity of wool (graded) under loan]$_{t-1}$ / [Quantity wool (graded) production]$_{t-1}$) + ([Quantity of wool (graded) under loan]$_{t-2}$ / [Quantity wool (graded) production]$_{t-2}$) + ([Quantity of wool (graded) under loan]$_{t-3}$ / [Quantity wool (graded) production]$_{t-3}$)) / 3

[Expected quantity of wool (graded) receiving marketing loan gains]$_t$ = [Expected quantity of wool (graded) under loan]$_t$ * (([Quantity of wool (graded) receiving marketing loan gains]$_{t-1}$ / [Quantity wool (graded) under loan]$_{t-1}$) + ([Quantity of wool (graded) receiving marketing loan gains]$_{t-2}$ / [Quantity wool (graded) under loan]$_{t-2}$) + ([Quantity of wool (graded) receiving marketing loan gains]$_{t-3}$ / [Quantity wool (graded) under loan]$_{t-3}$)) / 3

If [Expected wool (graded) marketing loan gain payment rate]$_t$ ≤ 0 then [Wool (graded) marketing loan gains, crop year]$_t$ = 0

If [Expected wool (graded) marketing loan gain payment rate]$_t$ > 0 and [Wool (graded) marketing loan gains, crop year]$_{t-1}$ = 0 then [Wool (graded) marketing loan gains, crop year]$_t$ = [Expected quantity of wool (graded) receiving marketing loan gains]$_t$ * [Expected wool (graded) marketing loan gain payment rate]$_t$

If [Expected wool (graded) marketing loan gain payment rate]$_t$ > 0 and [Wool (graded) marketing loan gains, crop year]$_{t-1}$ > 0 then [Wool (graded) marketing loan gains, crop year]$_t$ = [Wool (graded) marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of wool (graded) receiving marketing loan gains]$_t$ * [Expected change in wool (graded) marketing loan gain payment rate]$_t$

Wool (not graded) Marketing Loan Gains

[Expected wool (not graded) marketing loan gain payment rate]$_t$ = [Wool (not graded) loan rate]$_t$ - MIN([Expected wool (not graded) average price]$_{Q1,t}$, [Expected wool (not graded) average price]$_{Q2,t}$, [Expected wool (not graded) average price]$_{Q3,t}$, [Expected wool (not graded) average price]$_{Q4,t}$)

[Expected quantity of wool (not graded) under loan]$_t$ = [Quantity of wool (not graded) production]$_t$ * (([Quantity of wool (not graded) under loan]$_{t-1}$ / [Quantity wool (not graded) production]$_{t-1}$) + ([Quantity of wool (not graded) under loan]$_{t-2}$ / [Quantity wheat production]$_{t-2}$) + ([Quantity of wool (not graded) under loan]$_{t-3}$ / [Quantity wool (not graded) production]$_{t-3}$)) / 3

[Expected quantity of wool (not graded) receiving marketing loan gains]$_t$ = [Expected quantity of wool (not graded) under loan]$_t$ * (([Quantity of wool (not graded) receiving marketing loan gains]$_{t-1}$ / [Quantity wool (not graded) under loan]$_{t-1}$) + ([Quantity of wool (not graded) receiving marketing loan gains]$_{t-2}$ / [Quantity wool (not graded) under loan]$_{t-2}$) + ([Quantity of wool (not graded) receiving marketing loan gains]$_{t-3}$ / [Quantity wool (not graded) under loan]$_{t-3}$)) / 3

If [Expected wool (not graded) marketing loan gain payment rate]$_t$ ≤ 0 then [Wool (not graded) marketing loan gains, crop year]$_t$ = 0

If [Expected wool (not graded) marketing loan gain payment rate]$_t$ > 0 and [Wool (not graded) marketing loan gains, crop year]$_{t-1}$ = 0 then [Wool (not graded) marketing loan gains, crop year]$_t$ = [Expected quantity of wool (not graded) receiving marketing loan gains]$_t$ * [Expected wool (not graded) marketing loan gain payment rate]$_t$

If [Expected wool (not graded) marketing loan gain payment rate]$_t$ > 0 and [Wool (not graded) marketing loan gains, crop year]$_{t-1}$ > 0 then [Wool (not graded) marketing loan gains, crop year]$_t$ = [Wool (not graded) marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of wool (not graded) receiving marketing loan gains]$_t$ * [Expected change in wool (not graded) marketing loan gain payment rate]$_t$

Mohair Marketing Loan Gains

[Expected mohair marketing loan gain payment rate]$_t$ = [Mohair loan rate]$_t$ - MIN([Expected mohair average price]$_{Q1,t}$, [Expected mohair average price]$_{Q2,t}$, [Expected mohair average price]$_{Q3,t}$, [Expected mohair average price]$_{Q4,t}$)

[Expected quantity of mohair under loan]$_t$ = [Quantity of mohair production]$_t$ * (([Quantity of mohair under loan/ Quantity mohair production]$_{t-1}$) + ([Quantity of mohair under loan / Quantity wheat production]$_{t-2}$) + ([Quantity of mohair under loan / Quantity mohair production]$_{t-3}$)) / 3

[Expected quantity of mohair receiving marketing loan gains]$_t$ = [Expected quantity of mohair under loan]$_t$ * (([Quantity of mohair receiving marketing loan gains / Quantity mohair under loan]$_{t-1}$) + ([Quantity of mohair receiving marketing loan gains / Quantity mohair under loan]$_{t-2}$) + ([Quantity of mohair receiving marketing loan gains / Quantity mohair under loan]$_{t-3}$)) / 3

If [Expected mohair marketing loan gain payment rate]$_t$ ≤ 0 then [Mohair marketing loan gains, crop year]$_t$ = 0

If [Expected mohair marketing loan gain payment rate]$_t$ > 0 and [Mohair marketing loan gains, crop year]$_{t-1}$ = 0 then [Mohair marketing loan gains, crop year]$_t$ = [Expected quantity of mohair receiving marketing loan gains]$_t$ * [Expected mohair marketing loan gain payment rate]$_t$

If [Expected mohair marketing loan gain payment rate]$_t$ > 0 and [Mohair marketing loan gains, crop year]$_{t-1}$ > 0 then [Mohair marketing loan gains, crop year]$_t$ = [Mohair marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of mohair receiving marketing loan gains]$_t$ * [Expected change in mohair marketing loan gain payment rate]$_t$

Dry Peas Marketing Loan Gains

[Expected dry peas marketing loan gain payment rate]$_t$ = [Dry peas loan rate]$_t$ - MIN([Expected dry peas average price]$_{Q1,t}$, [Expected dry peas average price]$_{Q2,t}$, [Expected dry peas average price]$_{Q3,t}$, [Expected dry peas average price]$_{Q4,t}$)

[Expected quantity of dry peas under loan]$_t$ = [Quantity of dry peas production]$_t$ * (([Quantity of dry peas under loan / Quantity dry peas production]$_{t-1}$) + ([Quantity of dry peas under loan / Quantity dry peas production]$_{t-2}$) + ([Quantity of dry peas under loan / Quantity wheat production]$_{t-3}$)) / 3

[Expected quantity of dry peas receiving marketing loan gains]$_t$ = [Expected quantity of dry peas under loan]$_t$ * (([Quantity of dry peas receiving marketing loan gains / Quantity dry peas under loan]$_{t-1}$) + ([Quantity of dry peas receiving marketing loan gains / Quantity dry peas under loan]$_{t-2}$) + ([Quantity of dry peas receiving marketing loan gains / Quantity dry peas under loan]$_{t-3}$)) / 3

If [Expected dry peas marketing loan gain payment rate]$_t$ ≤ 0 then [Dry peas marketing loan gains, crop year]$_t$ = 0

If [Expected dry peas marketing loan gain payment rate]$_t$ > 0 and [Dry peas marketing loan gains, crop year]$_{t-1}$ = 0 then [Dry peas marketing loan gains, crop year]$_t$ = [Expected quantity of dry peas receiving marketing loan gains]$_t$ * [Expected dry peas marketing loan gain payment rate]$_t$

If [Expected dry peas marketing loan gain payment rate]$_t$ > 0 and [Dry peas marketing loan gains, crop year]$_{t-1}$ > 0 then [Dry peas marketing loan gains, crop year]$_t$ = [Dry peas marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of dry peas receiving marketing loan gains]$_t$ * [Expected change in dry peas marketing loan gain payment rate]$_t$

[Dry peas marketing loan gains, calendar year]$_t$ = 0.05 * [Dry peas marketing loan gains, crop year]$_{t-1}$ + 0.95 * [Dry peas marketing loan gains, crop year]$_t$

Lentils Marketing Loan Gains

[Expected lentils marketing loan gain payment rate]$_t$ = [Lentils loan rate]$_t$ - MIN([Expected lentils average price]$_{Q1,t}$, [Expected lentils average price]$_{Q2,t}$, [Expected lentils average price]$_{Q3,t}$, [Expected lentils average price]$_{Q4,t}$)

[Expected quantity of lentils under loan]$_t$ = [Quantity of lentils production]$_t$ * (([Quantity of lentils under loan]$_{t-1}$ / [Quantity lentils production]$_{t-1}$) + ([Quantity of lentils under loan]$_{t-2}$ / [Quantity lentils production]$_{t-2}$) + ([Quantity of lentils under loan]$_{t-3}$ / [Quantity lentils production]$_{t-3}$)) / 3

[Expected quantity of lentils receiving marketing loan gains]$_t$ = [Expected quantity of lentils under loan]$_t$ * (([Quantity of lentils receiving marketing loan gains]$_{t-1}$ / [Quantity lentils under loan]$_{t-1}$) + ([Quantity of lentils receiving marketing loan gains]$_{t-2}$ / [Quantity lentils under loan]$_{t-2}$) + ([Quantity of lentils receiving marketing loan gains]$_{t-3}$ / [Quantity lentils under loan]$_{t-3}$)) / 3

If [Expected lentils marketing loan gain payment rate]$_t$ ≤ 0 then [Lentils marketing loan gains, crop year]$_t$ = 0

If [Expected lentils marketing loan gain payment rate]$_t$ > 0 and [Lentils marketing loan gains, crop year]$_{t-1}$ = 0 then [Lentils marketing loan gains, crop year]$_t$ = [Expected quantity of lentils receiving marketing loan gains]$_t$ * [Expected lentils marketing loan gain payment rate]$_t$

If [Expected lentils marketing loan gain payment rate]$_t$ > 0 and [Lentils marketing loan gains, crop year]$_{t-1}$ > 0 then [Lentils marketing loan gains, crop year]$_t$ = [Lentils marketing loan gains, crop year]$_{t-1}$ * [Expected change in quantity of lentils receiving marketing loan gains]$_t$ * [Expected change in lentils marketing loan gain payment rate]$_t$

[Lentils marketing loan gains, calendar year]$_t$ = 0.05 * [Lentils marketing loan gains, crop year]$_{t-1}$ + 0.95 * [Lentils marketing loan gains, crop year]$_t$

Small Chickpeas Marketing Loan Gains

[Expected small chick peas marketing loan gain payment rate]$_t$ = [Small chick peas loan rate]$_t$ - MIN([Expected small chick peas average price]$_{Q1,t}$, [Expected small chick peas average price]$_{Q2,t}$, [Expected small chick peas average price]$_{Q3,t}$, [Expected small chick peas average price]$_{Q4,t}$)

[Expected quantity of small chick peas under loan]$_t$ = [Quantity of small chick peas production]$_t$ * (([Quantity of small chick peas under loan]$_{t-1}$ / [Quantity small chick peas production]$_{t-1}$) + ([Quantity of small chick peas under loan]$_{t-2}$ / [Quantity small chick peas production]$_{t-2}$) + ([Quantity of small chick peas under loan]$_{t-3}$ / [Quantity small chick peas production]$_{t-3}$)) / 3

[Expected quantity of small chick peas receiving marketing loan gains]$_t$ = [Expected quantity of small chick peas under loan]$_t$ * (([Quantity of small chick peas receiving marketing loan gains]$_{t-1}$ / [Quantity small chick peas under loan]$_{t-1}$) + ([Quantity of small chick peas receiving marketing loan gains]$_{t-2}$ / [Quantity small chick peas under loan]$_{t-2}$) + ([Quantity of small chick peas receiving marketing loan gains]$_{t-3}$ / [Quantity small chick peas under loan]$_{t-3}$)) / 3

If [Expected small chick peas marketing loan gain payment rate]$_t$ ≤ 0 then [Small chick peas marketing loan gains, crop year]$_t$ = 0

If [Expected small chick peas marketing loan gain payment rate]$_t$ > 0 and [Small chick peas marketing loan gains, crop year]$_{t-1}$ = 0 then [Small chick peas marketing loan gains, crop year]$_t$ = [Expected quantity of small chick peas receiving marketing loan gains]$_t$ * [Expected small chick peas marketing loan gain payment rate]$_t$

If [Expected small chick peas marketing loan gain payment rate]$_t$ > 0 and [Small chick peas marketing loan gains, crop year]$_{t-1}$ > 0 then [Small chick peas marketing loan gains, crop year]$_t$ = [Small chick peas marketing loan gains, crop year]$_{t-1}$ * [Expected change in small chick peas receiving marketing loan gains]$_t$ * [Expected change in small chick peas marketing loan alternative repayment rate]$_t$

[Small chick peas marketing loan gains, calendar year]$_t$ = 0.05 * [Small chick peas marketing loan gains, crop year]$_{t-1}$ + 0.95 * [Small chick peas marketing loan gains, crop year]$_t$

Total Marketing Loan Gains

[Total marketing loan gains]$_t$ = [Wheat marketing loans gains]$_t$ + [Rice marketing loan gains]$_t$ + [Corn marketing loan gains]$_t$ + [Sorghum marketing loan gains]$_t$ + [marketing loan gains]$_t$ + [Oats marketing loan gains]$_t$ + [Upland cotton marketing loan gains]$_t$ + [Soybeans marketing loan gains]$_t$ + [Flaxseed marketing loan gains]$_t$ + [Sunflower seed (oil) marketing loans gains]$_t$ + [Sunflower seed (non-oil) marketing loans gains]$_t$ + [Canola marketing loans gains]$_t$ + [Rapeseed marketing loans gains]$_t$ + [Mustard marketing loans gains]$_t$ + [Crambe marketing loans gains]$_t$ + [Safflower marketing loans gains]$_t$ + [Peanuts marketing loans gains]$_t$ + [Wool (graded) marketing loans gains]$_t$ + [Wool (not graded) marketing loans gains]$_t$ + [Mohair marketing loans gains]$_t$ + [Honey marketing loans gains]$_t$ + [Dry peas marketing loans gains]$_t$ + [Lentils marketing loans gains]$_t$ + [Small chickpeas marketing loans gains]$_t$

Net Value of Certificates

Wheat Net Value of Certificates

[Wheat certificate exchange rate]$_y$ = [Wheat loan rate]$_y$ - MIN([Wheat average market price]$_{Q1,y}$, [Wheat average market price]$_{Q2,y}$, [Wheat average market price]$_{Q3,y}$, [Wheat average market price]$_{Q4,y}$)

[Wheat under loan]$_y$ = [Wheat production]$_y$ * (([Wheat under loan]$_{y-1}$ / [Wheat production]$_{y-1}$) + ([Wheat under loan]$_{y-2}$ / [Wheat production]$_{y-2}$) + ([Wheat under loan]$_{y-3}$ / [Wheat production]$_{y-3}$)) / 3

[Wheat receiving certificate exchange gains]$_y$ = [Wheat under loan]$_y$ * (([Wheat receiving certificate exchange gains]$_{y-1}$ / [Wheat under loan]$_{y-1}$) + ([Wheat receiving certificate exchange gains]$_{y-2}$ / [Wheat under loan]$_{y-2}$) + ([Wheat receiving certificate exchange gains]$_{y-3}$ / [Wheat under loan]$_{y-3}$)) / 3

If [Wheat certificate exchange rate]$_y$ ≤ 0 then [Wheat net value certificates]$_y$ = 0

If [Wheat certificate exchange rate]$_y$ > 0 and [Wheat certificate exchange rate]$_{y-1}$ = 0 then [Wheat certificate exchange gains]$_y$ = [Wheat receiving certificate exchange gains]$_y$ * [Wheat certificate exchange rate]$_y$

If [Wheat certificate exchange rate]$_y$ > 0 and [Wheat certificate exchange rate]$_{y-1}$ > 0 then [Wheat net value certificates]$_y$ = [Wheat net value certificates]$_{y-1}$ * (([Wheat receiving certificate exchange gains]$_y$ - [Wheat receiving certificate exchange gains]$_{y-1}$) / [Wheat receiving certificate exchange gains]$_{y-1}$ * (([Wheat certificate exchange rate]$_y$ - [Wheat certificate exchange rate]$_{y-1}$) / [Wheat certificate exchange rate]$_{y-1}$)

[Wheat net value of certificates]$_t$ = 0.03 * [Wheat net value of certificates]$_{y-1}$ + 0.97 * [Wheat net value of certificates]$_y$

Rice Net Value of Certificates

[Rice certificate exchange rate]$_y$ = [Rice loan rate]$_y$ – MIN([Rice loan repayment rate]$_y$, ([Adjusted world price of rice]$_y$)

[Rice under loan]$_y$ = [Rice production]$_t$ * (([Rice under loan]$_{y-1}$ / [Rice production]$_{y-1}$) + ([Rice under loan]$_{y-2}$ / [Rice production]$_{y-2}$) + ([Rice under loan]$_{y-3}$ / [Rice production]$_{y-3}$)) / 3

[Rice receiving certificate exchange gains]$_y$ = [Rice under loan]$_y$ * (([Rice receiving certificate exchange gains]$_{y-1}$ / [Rice under loan]$_{y-1}$) + ([Rice receiving certificate exchange gains]$_{y-2}$ Rice under loan]$_{y-2}$) + ([Rice receiving certificate exchange gains]$_{y-3}$ / [Rice under loan]$_{y-3}$)) / 3

If [Rice certificate exchange rate]$_y$ ≤ 0 then [Rice net value of certificates]$_y$ = 0

If [Rice certificate exchange rate]$_y$ > 0 and [Rice certificate exchange rate]$_{t-1}$ = 0 then [Rice net value of certificates]$_y$ = [Rice receiving marketing loan gains]$_y$ * [Rice certificate exchange rate]$_y$

If [Rice certificate exchange rate]$_y$ > 0 and [Rice certificate exchange rate]$_{y-1}$ > 0 then [Rice net value of certificates]$_y$ = [Rice net value of certificates]$_{y-1}$ * (([Rice receiving certificate exchange]$_y$ - [Rice receiving certificate exchange gains]$_{y-1}$) / [Rice receiving certificate exchange gains]$_{y-1}$ * (([Rice certificate exchange rate]$_y$ - [Rice certificate exchange rate]$_{y-1}$) / [Rice certificate exchange rate]$_{y-1}$)

[Rice net value of certificates]$_t$ = 0.20 * [Rice net value of certificates]$_{y-1}$ + 0.80 * [Rice net value of certificates]$_y$

Corn Net Value of Certificates

[Corn certificate exchange rate]$_y$ = [Corn loan rate]$_y$ - MIN([Corn average market price]$_{Q1,y}$, [Corn average market price]$_{Q2,y}$, [Corn average market price]$_{Q3,y}$, [Corn average market price]$_{Q4,y}$)

[Corn under loan]$_t$ = [Corn production]$_y$ * (([Corn under loan]$_{y-1}$ / [Corn production]$_{y-1}$) + ([Corn under loan]$_{y-2}$ / [Corn production]$_{y-2}$) + ([Corn under loan]$_{y-3}$ / [Corn production]$_{y-3}$)) / 3

[Corn receiving marketing loan gains]$_t$ = [Corn under loan]$_y$ * (([Corn receiving certificate exchange gains]$_{y-1}$ / [Corn under loan]$_{y-1}$) + ([Corn receiving certificate exchange gains]$_{y-2}$ / [Corn under loan]$_{y-2}$) + ([Corn receiving certificate exchange gains]$_{y-3}$ / [Corn under loan]$_{y-3}$)) / 3

If [Corn certificate exchange rate]$_y$ ≤ 0 then [Corn net value of certificates]$_y$ = 0

If [Corn certificate exchange rate]$_y$ > 0 and [Corn certificate exchange rate]$_{y-1}$ = 0 then [Corn net value of certificates]$_y$ = [Corn receiving certificate exchange gains]$_y$ * [Corn certificate exchange rate]$_y$

If [Corn certificate exchange rate]$_y$ > 0 and [Corn certificate exchange rate]$_{y-1}$ > 0 then [Corn net value of certificates]$_y$ = [Corn net value of certificate exchange gains]$_{y-1}$ * (([Corn receiving certificate exchange gains]$_y$ - [Corn receiving certificate exchange gains]$_{y-1}$) / [Corn receiving certificate exchange gains]$_{y-1}$) * (([Corn certificate exchange rate]$_y$ - [Corn certificate exchange rate]$_{y-1}$) / [Corn certificate exchange rate]$_{y-1}$)

[Corn net value of certificates]$_t$ = 0.20 * [Corn net value of certificates]$_{y-1}$ + 0.80 * [Corn net value of certificates]$_y$

Sorghum Net Value of Certificates

[Sorghum certificate exchange rate]$_y$ = [Sorghum loan rate]$_y$ - MIN([Sorghum average market price]$_{Q1,y}$, [Sorghum average market price]$_{Q2,y}$, [Sorghum average market price]$_{Q3,y}$, [Sorghum average market price]$_{Q4,y}$)

[Sorghum under loan]$_y$ = [Sorghum production]$_y$ * (([Sorghum under loan]$_{y-1}$ / [Sorghum production]$_{y-1}$) + ([Sorghum under loan]$_{y-2}$ / [Sorghum production]$_{y-2}$) + ([Sorghum under loan]$_{y-3}$ / [Sorghum production]$_{y-3}$)) / 3

[Sorghum receiving certificate exchange gains]$_y$ = [Sorghum under loan]$_y$ * (([Sorghum receiving certificate exchange gains]$_{y-1}$ / [Sorghum under loan]$_{y-1}$) + ([Sorghum receiving certificate exchange gains]$_{y-2}$ / [Sorghum under loan]$_{y-2}$) + ([Sorghum receiving certificate exchange gains]$_{y-3}$ / [Sorghum under loan]$_{y-3}$)) / 3

If [Sorghum certificate exchange rate]$_y \leq 0$ then [Sorghum net value of certificates]$_y = 0$

If [Sorghum certificate exchange rate]$_t > 0$ and [certificate exchange rate]$_{y-1} = 0$ then [Sorghum net value of certificates]$_y$ = [Sorghum receiving certificate exchange gains]$_y$ * [Sorghum certificate exchange rate]$_y$

If [Sorghum certificate exchange rate]$_y > 0$ and [Sorghum certificate exchange rate]$_{y-1} > 0$ then [Sorghum net value of certificates]$_y$ = [Sorghum net value of certificates]$_{y-1}$ * ((([Sorghum receiving certificate exchange gains]$_y$ - [Sorghum receiving certificate exchange gains]$_{y-1}$) / [Sorghum receiving certificate exchange gains]$_{y-1}$) * (([Sorghum certificate exchange rate]$_y$ - [Sorghum certificate exchange rate]$_{y-1}$) / [Sorghum certificate exchange rate]$_{y-1}$)

[Sorghum net value of certificates]$_t$ = 0.10 * [Sorghum net value of certificates]$_{y-1}$ + 0.90 * [Sorghum net value of certificates]$_y$

Barley Net Value of Certificates

[Barley certificate exchange rate]$_y$ = [Barley loan rate]$_y$ - MIN([Barley average market price]$_{Q1,y}$, [Barley average market price]$_{Q2,y}$, [Barley average market price]$_{Q3,y}$, [Barley average market price]$_{Q4,y}$)

[Barley under loan]$_t$ = [Barley production]$_y$ * (([Barley under loan]$_{y-1}$ / [Barley production]$_{y-1}$) + ([Barley under loan]$_{y-2}$ / [Barley production]$_{y-2}$) + ([Barley under loan]$_{y-3}$ / [Barley production]$_{y-3}$)) / 3

[Barley receiving certificate exchange gains]$_y$ = [Barley under loan]$_y$ * (([Barley receiving certificate exchange gains]$_{y-1}$ / [Barley under loan]$_{y-1}$) + ([Barley receiving certificate exchange gains]$_{y-2}$ / [Barley under loan]$_{y-2}$) + ([Barley receiving certificate exchange gains]$_{y-3}$ / [Barley under loan]$_{y-3}$)) / 3

If [Barley certificate exchange rate]$_y \leq 0$ then [Barley net value of certificates]$_y = 0$

If [Barley certificate exchange rate]$_t > 0$ and [Barley certificate exchange rate]$_{y-1} = 0$ then [Barley net value of certificates]$_y$ * Barley receiving certificate exchange gains]$_y$ * [Barley certificate exchange rate]$_y$

If [Barley certificate exchange rate]$_y > 0$ and [Barley certificate exchange rate]$_{y-1} > 0$ then [Barley net value of certificates]$_y$ = [Barley net value of certificates]$_{y-1}$ * (([Barley receiving certificate exchange gains]$_y$ - [Barley receiving certificate exchange gains]$_{y-1}$) / [Barley receiving certificate exchange gains]$_{y-1}$) * ([Barley certificate exchange rate]$_y$ - [Barley certificate exchange rate]$_{y-1}$) / [Barley certificate exchange rate]$_{y-1}$)

[[Barley net value of certificates]$_t$ = 0.05 * [[Barley net value of certificates]$_{y-1}$ + 0.95 * [[Barley net value of certificates]$_y$

Oats Net Value of Certificates

[Oats certificate exchange rate]$_y$ = [Oats loan rate]$_y$ - MIN([Oats average market price]$_{Q1,y}$, [Oats average market price]$_{Q2,y}$, [Oats average market price]$_{Q3,y}$, [Oats average market price]$_{Q4,y}$)

[Oats under loan]$_y$ = [Oats production]$_y$ * (([Oats under loan]$_{y-1}$ / [Oats production]$_{y-1}$) + ([Oats under loan]$_{y-2}$ / [Oats production]$_{y-2}$) + ([Oats under loan]$_{y-3}$ / [Oats production]$_{y-3}$)) / 3

[Oats receiving certificate exchange gains]$_y$ = [Oats under loan]$_y$ * (([Oats receiving certificate exchange gains]$_{y-1}$ / [Oats under loan]$_{y-1}$) + ([Oats receiving certificate exchange gains]$_{y-2}$ / [Oats under loan]$_{y-2}$) + ([Oats receiving certificate exchange gains]$_{y-3}$ / [Oats under loan]$_{y-3}$)) / 3

If [Oats certificate exchange rate]$_y \leq 0$ then [Oats net value of certificates]$_y = 0$

If [Oats certificate exchange rate]$_y$ > 0 and [Oats certificate exchange rate]$_{y-1}$ = 0 then [Oats net value of certificates]$_y$ = [Oats receiving certificate exchange gains]$_y$ * [Oats certificate exchange rate]$_y$

If [Oats certificate exchange rate]$_y$ > 0 and [Oats certificate exchange rate]$_{y-1}$ > 0 then [Oats net value of certificates]$_y$ = [Oats net value of certificates]$_{y-1}$ * (([Oats receiving certificate exchange gains]$_y$ - [Oats receiving certificate exchange gains]$_{y-1}$) / [Oats receiving certificate exchange gains]$_{y-1}$) * (([Oats certificate exchange rate]$_y$ - [Oats certificate exchange rate]$_{y-1}$) / [Oats certificate exchange rate]$_{y-1}$)

[Oats net value of certificates]$_t$ = 0.05 * [Oats net value of certificates]$_{y-1}$ + 0.95 * [Oats net value of certificates]$_y$

Upland Cotton Net Value of Certificates

[Upland cotton certificate exchange rate]$_y$ = [Upland cotton loan rate]$_y$ – MIN([Upland cotton loan rate]$_y$, [Adjusted world price of upland cotton]$_y$)

[Upland cotton under loan]$_y$ = [Upland cotton production]$_y$ * (([Upland cotton under loan]$_{y-1}$ / [Upland cotton production]$_{y-1}$) + ([Upland cotton under loan]$_{y-2}$ / [Upland cotton production]$_{y-2}$) + ([Upland cotton under loan]$_{y-3}$ / [Upland cotton production]$_{y-3}$)) / 3

[Upland cotton receiving certificate exchange gains]$_y$ = [Upland cotton under loan]$_y$ * (([Upland cotton under loan]$_y$ * Upland cotton receiving certificate exchange gains]$_{y-1}$ / [Upland cotton under loan]$_{y-1}$) + Upland cotton receiving certificate exchange gains]$_{y-2}$ / [Upland cotton under loan]$_{y-2}$) + ([Upland cotton receiving certificate exchange gains]$_{y-3}$ / [Upland cotton under loan]$_{y-3}$)) / 3

If [Upland cotton certificate exchange rate]$_y$ ≤ 0 then [Upland cotton net value of certificates]$_y$ = 0

If [Upland cotton certificate exchange rate]$_y$ > 0 and [Upland cotton certificate exchange rate]$_{y-1}$ = 0 then [Upland cotton net value of certificates]$_y$ = [Upland cotton receiving certificate exchange gains]$_y$ * [Upland cotton certificate exchange rate]$_y$

If [Upland cotton certificate exchange rate]$_y$ > 0 and [Upland cotton certificate exchange rate]$_{y-1}$ > 0 then [Upland cotton net value of certificates]$_y$ = [Upland cotton net value of certificates]$_{y-1}$ * (([Upland cotton receiving certificate exchange gains]$_y$ - [Upland cotton receiving certificate exchange gains]$_{y-1}$) / [Upland cotton receiving certificate exchange gains]$_{y-1}$) * (([Upland cotton certificate exchange rate]$_y$ - [Upland cotton certificate exchange rate]$_{y-1}$) / [Upland cotton certificate exchange rate]$_{y-1}$)

[Upland cotton net value of certificates]$_t$ = 0.40 * [Upland cotton net value of certificates]$_{y-1}$ + 0.60 * [Upland cotton net value of certificates]$_y$

Soybeans Net Value of Certificates

[Soybeans certificate exchange rate]$_y$ = [Soybeans loan rate]$_y$ - MIN([Soybeans average market price]$_{Q1,y}$, [([Soybeans average market price]$_{Q2,y}$, [([Soybeans average market price]$_{Q3,y}$, [([Soybeans average market price]$_{Q4,y}$)

[Soybeans under loan]$_y$ = [Soybeans production]$_y$ * (([Soybeans under loan]$_{y-1}$ Soybeans production]$_{y-1}$) + ([Soybeans under loan]$_{y-2}$ / [Soybeans production]$_{y-2}$) + ([Soybeans under loan]$_{y-3}$ / [Soybeans production]$_{y-3}$)) / 3

[Soybeans receiving certificate exchange gains]$_y$ = [Soybeans under loan]$_y$ * (([Soybeans receiving certificate exchange gains]$_{y-1}$ / [Soybeans under loan]$_{y-1}$) + ([Soybeans receiving certificate exchange gains]$_{y-2}$ /

[Soybeans under loan]$_{y-2}$) + ([Soybeans receiving certificate exchange gains]$_{y-3}$ / [Soybeans under loan]$_{y-3}$)) / 3

If [Soybeans certificate exchange rate]$_y$ ≤ 0 then [Soybeans net value of certificates]$_y$ = 0

If [Soybeans certificate exchange rate]$_y$ > 0 and [Soybeans certificate exchange rate]$_{y-1}$ = 0 then [Soybeans net value of certificates]$_y$ * [Soybeans receiving certificate exchange gains]$_y$ * [Soybeans certificate exchange rate]$_y$

If [Soybeans certificate exchange rate]$_y$ > 0 and [Soybeans certificate exchange rate]$_{y-1}$ > 0 then [Soybeans net value of certificates]$_y$ = [Soybeans net value of certificates]$_{y-1}$ * (([Soybeans receiving certificate exchange gains]$_y$ - [Soybeans receiving certificate exchange gains]$_{y-1}$) / [Soybeans receiving certificate exchange gains]$_{y-1}$) * (([Soybeans certificate exchange rate]$_y$ - [Soybeans certificate exchange rate]$_{y-1}$) / [Soybeans certificate exchange rate]$_{y-1}$)

[Soybeans net value of certificates]$_t$ = 0.15 * [Soybeans net value of certificates]$_{y-1}$ + 0.85 * [Soybeans net value of certificates]$_y$

Flaxseed Net Value of Certificates

[Flaxseed certificate exchange rate]$_y$ = [Flaxseed loan rate]$_y$ - MIN([Flaxseed average market price]$_{Q1,y}$, [Flaxseed average market price]$_{Q2,y}$, [Flaxseed average market price]$_{Q3,y}$, [Flaxseed average market price]$_{Q4,y}$)

[Flaxseed under loan]$_y$ = [Flaxseed production]$_y$ * (([Flaxseed under loan]$_{y-1}$ / [Flaxseed production]$_{y-1}$) + ([Flaxseed under loan]$_{y-2}$ / [Flaxseed production]$_{y-2}$) + ([Flaxseed under loan]$_{y-3}$ / [Flaxseed production]$_{y-3}$)) / 3

[Flaxseed receiving certificate exchange gains]$_y$ = [Flaxseed under loan]$_y$ * (([Flaxseed receiving certificate exchange gains]$_{y-1}$ / [Flaxseed under loan]$_{y-1}$) + ([Flaxseed receiving certificate exchange gains]$_{y-2}$ / [Flaxseed under loan]$_{y-2}$) + ([Flaxseed receiving certificate exchange gains]$_{y-3}$ / [Flaxseed under loan]$_{y-3}$)) / 3

If [Flaxseed certificate exchange rate]$_y$ ≤ 0 then [Flaxseed net value of certificates]$_y$ = 0

If [Flaxseed certificate exchange rate]$_y$ > 0 and [Flaxseed certificate exchange rate]$_{y-1}$ = 0 then [Flaxseed net value of certificates]$_y$ = [Flaxseed receiving certificate exchange gains]$_y$ * [Flaxseed certificate exchange rate]$_y$

If [Flaxseed certificate exchange rate]$_t$ > 0 and [Flaxseed marketing loan gains]$_{y-1}$ > 0 then [Flaxseed net value of certificates]$_y$ = [Flaxseed net value of certificates]$_{y-1}$ * (([Flaxseed receiving certificate exchange gains]$_y$ - [Flaxseed receiving certificate exchange gains]$_{y-1}$) / [Flaxseed receiving certificate exchange gains]$_{y-1}$) * (([Flaxseed certificate exchange rate]$_y$ - [Flaxseed certificate exchange rate]$_{y-1}$) / [Flaxseed certificate exchange rate]$_{y-1}$)

[Flaxseed net value of certificates]$_t$ = 0.15 * [Flaxseed net value of certificates]$_{y-1}$ + 0.85 * [Flaxseed net value of certificates]$_y$

Sunflower Seed (Oil) Net Value of Certificates

[Sunflower (oil) certificate exchange rate]$_y$ = [Sunflower seed (oil) loan rate]$_y$ - MIN([Sunflower seed (oil) average market price]$_{Q1,y}$, [Sunflower seed (oil) average market price]$_{Q2,y}$, [Sunflower seed (oil) average market price]$_{Q3,y}$, [Sunflower seed (oil) average market price]$_{Q4,y}$)

[Sunflower seed (oil) under loan]$_y$ = [Sunflower seed (oil) production]$_y$ * (([Sunflower seed (oil) under loan]$_{y-1}$ / [Sunflower seed (oil) production]$_{y-1}$) + ([Sunflower seed (oil) under loan]$_{y-2}$ / [Sunflower seed (oil) production]$_{y-2}$) + ([Sunflower seed (oil) under loan]$_{y-3}$ / [Sunflower seed (oil) production]$_{y-3}$)) / 3

[Sunflower seed (oil) receiving certificate exchange gains]$_y$ = [Sunflower seed (oil) under loan]$_y$ * (([Sunflower seed (oil) receiving certificate exchange gains]$_{y-1}$ / [Sun Sunflower flower seed (oil) under loan]$_{y-1}$) + ([Sunflower seed (oil) receiving certificate exchange gains]$_{y-2}$ / [Sunflower seed (oil) under loan]$_{y-2}$) + ([Sunflower seed (oil) receiving certificate exchange gains]$_{y-3}$ / [Sunflower seed (oil) under loan]$_{y-3}$)) / 3

If [Sunflower seed (oil) certificate exchange rate]$_y$ ≤ 0 then [Sunflower seed (oil) net value of certificates]$_y$ = 0

If [Sunflower seed (oil) certificate exchange rate]$_y$ > 0 and [Sunflower seed (oil) certificate exchange rate]$_{y-1}$ = 0 then [Sunflower seed (oil) net value of certificates]$_y$ = [Sunflower seed (oil) receiving certificate exchange gains]$_y$ * [Sunflower seed (oil) certificate exchange rate]$_y$

If [Expected sunflower seed (oil) certificate exchange rate]$_y$ > 0 and [Sunflower seed (oil) certificate exchange rate]$_{y-1}$ > 0 then [Sunflower seed (oil) net value of certificates]$_y$ = [Sunflower seed (oil) net value of certificates]$_{y-1}$ * (([Sunflower seed (oil) receiving certificate exchange gains]$_y$ - [Sunflower seed (oil) receiving certificate exchange gains]$_{y-1}$) / [Sunflower seed (oil) receiving certificate exchange gains]$_{y-1}$) * (([Sunflower seed (oil) certificate exchange rate]$_y$ - [Sunflower seed (oil) certificate exchange rate]$_{y-1}$) / [Sunflower seed (oil) certificate exchange rate]$_{y-1}$)

[Sunflower seed (oil) net value of certificates]$_t$ = 0.15 * [Sunflower seed (oil) net value of certificates]$_{y-1}$ + 0.85 * [Sunflower seed (oil) net value of certificates]$_y$

Sunflower Seed (Non-oil) Net Value of Certificates

[Sunflower seed (non-oil) certificate exchange rate]$_y$ = [Sunflower seed (non-oil) loan rate]$_y$ - MIN([Sunflower seed (non-oil) average market price]$_{Q1,y}$, [Sunflower seed (non-oil) average market price]$_{Q2,y}$, [Sunflower seed (non-oil) average market price]$_{Q3,y}$, [Sunflower seed (non-oil) average market price]$_{Q4,y}$)

[Sunflower seed (non-oil) under loan]$_y$ = [Sunflower seed (non-oil) production]$_y$ * (([Sunflower seed (non-oil) under loan]$_{y-1}$ / [Sunflower seed (non-oil) production]$_{y-1}$) + ([Sunflower seed (non-oil) under loan]$_{y-2}$ / [Sunflower seed (non-oil) production]$_{y-2}$) + ([Sunflower seed (non-oil) under loan]$_{y-3}$ / [Sunflower seed (non-oil) production]$_{y-3}$)) / 3

[Sunflower seed (non-oil) receiving certificate exchange gains]$_y$ = [Sunflower seed (non-oil) under loan]$_y$ * (([Sunflower seed (non-oil) receiving certificate exchange gains]$_{y-1}$ / [Sunflower seed (non-oil) under loan]$_{y-1}$) + ([Sunflower seed (non-oil) receiving certificate exchange gains]$_{y-2}$ / [Sunflower seed (non-oil) under loan]$_{y-2}$) + ([Sunflower seed (non-oil) receiving certificate exchange gains]$_{y-3}$ / [Sunflower seed (non-oil) under loan]$_{y-3}$)) / 3

If [Sunflower seed (non-oil) certificate exchange rate]$_y$ ≤ 0 then [Sunflower seed (non-oil) net value of certificates]$_y$ = 0

If [Sunflower seed (non-oil) certificate exchange rate]$_y$ > 0 and [Sunflower seed (non-oil) certificate exchange rate]$_{y-1}$ = 0 then [Sunflower seed (non-oil) net value of certificates]$_y$ = [Sunflower seed (non-oil) receiving certificate exchange gains]$_y$ * [Sunflower seed (non-oil) certificate exchange rate]$_y$

If [Sunflower seed (non-oil) certificate exchange rate]$_y$ > 0 and [Sunflower seed (non-oil) certificate exchange rate]$_{y-1}$ > 0 then [Sunflower seed (non-oil) net value of certificates]$_y$ = [Sunflower seed (non-oil) net value of certificates]$_{y-1}$ * (([Sunflower seed (non-oil) receiving certificate exchange gains]$_y$ - [Sunflower seed (non-oil) receiving certificate exchange gains]$_{y-1}$) / [Sunflower seed (non-oil) receiving certificate exchange gains]$_{y-1}$) * (([Sunflower seed (non-oil) certificate exchange rate]$_y$ - [Sunflower seed (non-oil) certificate exchange rate]$_{y-1}$) / [Sunflower seed (non-oil) certificate exchange rate]$_{y-1}$)

[Sunflower seed (non-oil) net value of certificates]$_t$ = 0.15 * [Sunflower seed (non-oil) net value of certificates]$_{y-1}$ + 0.85 * [Sunflower seed (non-oil) seed net value of certificates]$_y$

Canola Net Value of Certificates

[Canola certificate exchange rate]$_y$ = [Canola loan rate]$_y$ - MIN([Canola average market price]$_{Q1,y}$, [Canola average market price]$_{Q2,y}$, [Canola average market price]$_{Q3,y}$, [Canola average market price]$_{Q4,y}$)

[Canola under loan]$_y$ = [Canola production]$_y$ * (([Canola under loan]$_{y-1}$ / [Canola production]$_{y-1}$) + ([Canola under loan]$_{y-2}$ / [Canola production]$_{y-2}$) + ([Canola under loan]$_{y-3}$ / [Canola production]$_{y-3}$)) / 3

[Canola receiving certificate exchange gains]$_y$ = [Canola under loan]$_y$ * (([Canola receiving certificate exchange gains]$_{y-1}$ / [Canola under loan]$_{y-1}$) + ([Canola receiving certificate exchange gains]$_{y-2}$ / [Canola under loan]$_{y-2}$) + ([Canola receiving certificate exchange gains]$_{y-3}$ / [Canola under loan]$_{y-3}$)) / 3

If [Canola certificate exchange rate]$_y$ ≤ 0 then [Canola net value of certificates]$_y$ = 0

If [Canola certificate exchange rate]$_t$ > 0 and [Canola certificate exchange rate]$_{y-1}$ = 0 then [Canola net value of certificates]$_y$ = [Canola receiving marketing loan gains]$_t$ * [Canola marketing loan gain payment rate]$_y$

If [Canola certificate exchange rate]$_y$ > 0 and [Canola certificate exchange rate]$_{y-1}$ > 0 then [Canola net value of certificates]$_y$ = [Canola net value of certificates]$_{y-1}$ * (([Canola receiving certificate exchange gains]$_y$ - [Canola receiving certificate exchange gains]$_{y-1}$) / [Canola receiving certificate exchange gains]$_{y-1}$) * (([Canola certificate exchange rate]$_y$ - [Canola certificate exchange rate]$_{y-1}$) / [Canola certificate exchange rate]$_{y-1}$)

[Canola net value of certificates]$_t$ = 0.15 * [Canola net value of certificates]$_{y-1}$ + 0.85 * [Canola net value of certificates]$_y$

Rapeseed Net Value of Certificates

[Rapeseed certificate exchange rate]$_y$ = [Rapeseed loan rate]$_y$ - MIN([Rapeseed average market price]$_{Q1,y}$, [Rapeseed average market price]$_{Q2,y}$, [Rapeseed average market price]$_{Q3,y}$, [Rapeseed average market price]$_{Q4,y}$)

[Rapeseed under loan]$_y$ = [Rapeseed production]$_y$ * ([Rapeseed under loan]$_{y-1}$ / [Rapeseed production]$_{y-1}$ + [Rapeseed under loan]$_{y-2}$ / [Rapeseed production]$_{y-2}$ + [Rapeseed under loan]$_{y-3}$ / [Rapeseed production]$_{y-3}$) / 3

[Rapeseed receiving certificate exchange gains]$_y$ = [Rapeseed under loan]$_y$ * (([Rapeseed receiving certificate exchange gains]$_{y-1}$ / [Rapeseed under loan]$_{y-1}$) + ([Rapeseed receiving certificate exchange gains]$_{y-2}$ / [Rapeseed under loan]$_{y-2}$) + ([Rapeseed receiving certificate exchange gains]$_{y-3}$ / [Rapeseed under loan]$_{y-3}$)) / 3

If [Rapeseed certificate exchange rate]$_y$ ≤ 0 then [Rapeseed net value of certificates]$_y$ = 0

If [Rapeseed certificate exchange rate]$_y$ > 0 and [Rapeseed certificate exchange rate]$_{y-1}$ = 0 then [Rapeseed net value of certificates]$_y$ = [Rapeseed receiving certificate exchange gains]$_t$ * [Rapeseed certificate exchange rate]$_y$

If [Rapeseed certificate exchange rate]$_y$ > 0 and [Rapeseed certificate exchange rate]$_{y-1}$ > 0 then [Rapeseed net value of certificates]$_y$ = [Rapeseed net value of certificates]$_{y-1}$ * (([Rapeseed receiving certificate exchange gains]$_y$ - [Rapeseed receiving certificate exchange gains]$_{y-1}$) / [Rapeseed receiving certificate exchange gains]$_{y-1}$)

$* ((\text{[Rapeseed certificate exchange rate]}_y - \text{[Rapeseed certificate exchange rate]}_{y-1}) / \text{[Rapeseed certificate exchange rate]}_{y-1})$

$\text{[Rapeseed net value of certificates]}_t = 0.15 * \text{[Rapeseed net value of certificates,]}_{y-1} + 0.85 * \text{[Rapeseed net value of certificates]}_y$

Mustard seed Net Value of Certificates

$\text{[Mustard seed certificate exchange rate]}_y = \text{[Mustard seed loan rate]}_y - \text{MIN}(\text{[Mustard seed average market price]}_{Q1,y}, \text{[Mustard seed average market price]}_{Q2,y}, \text{[Mustard seed average market price]}_{Q3,y}, \text{[Mustard seed average market price]}_{Q4,y})$

$\text{[Mustard seed under loan]}_y = \text{[Mustard seed production]}_y * ((\text{[Mustard seed under loan]}_{y-1} / \text{[Mustard seed production]}_{y-1}) + (\text{[Mustard seed under loan]}_{y-2} / \text{[Mustard seed production]}_{y-2}) + (\text{[Mustard seed under loan]}_{y-3} / \text{[Mustard seed production]}_{y-3})) / 3$

$\text{[Mustard seed receiving certificate exchange gains]}_y = \text{[Mustard seed under loan]}_y * ((\text{[Mustard seed receiving certificate exchange gains]}_{y-1} / \text{[Mustard seed under loan]}_{y-1}) + (\text{[Mustard seed receiving certificate exchange gains]}_{y-2} / \text{[Mustard seed under loan]}_{y-2}) + (\text{[Mustard seed receiving certificate exchange gains]}_{y-3} / \text{[Mustard seed under loan]}_{y-3})) / 3$

If $\text{[Mustard seed certificate exchange rate]}_y \leq 0$ then $\text{[Mustard seed net value of certificates]}_y = 0$

If $\text{[Mustard seed certificate exchange rate]}_y > 0$ and $\text{[Mustard seed certificate exchange rate]}_{y-1} = 0$ then $\text{[Mustard seed net value of certificates]}_y = \text{[Mustard seed receiving certificate exchange gains]}_y * \text{[Mustard seed certificate exchange rate]}_y$

If $\text{[Mustard seed certificate exchange rate]}_y > 0$ and $\text{[Mustard seed certificate exchange rate]}_{y-1} > 0$ then $\text{[Mustard seed net value of certificates]}_y = \text{[Mustard seed net value of certificates]}_{y-1} * ((\text{[Mustard seed receiving certificate exchange gains]}_y - \text{[Mustard seed receiving certificate exchange gains]}_{y-1}) / \text{[Mustard seed receiving certificate exchange gains]}_{y-1}) * ((\text{[Mustard seed certificate exchange rate]}_y - \text{[Mustard seed certificate exchange rate]}_{y-1}) / \text{[Mustard seed certificate exchange rate]}_{y-1})$

$\text{[Mustard seed net value of certificates]}_t = 0.15 * \text{[Mustard seed net value of certificates]}_{y-1} + 0.85 * \text{[Mustard seed net value of certificates]}_y$

Crambe Net Value of Certificates

$\text{[Crambe certificate exchange rate]}_y = \text{[Crambe loan rate]}_y - \text{MIN}(\text{[Crambe average market price]}_{Q1,y}, \text{[Crambe average market price]}_{Q2,y}, \text{[Crambe average market price]}_{Q3,y}, \text{[Crambe average market price]}_{Q4,y})$

$\text{[Crambe under loan]}_y = \text{[Crambe production]}_y * ((\text{[Crambe under loan]}_{y-1} / \text{[Crambe production]}_{y-1}) + (\text{[Crambe under loan]}_{y-2} / \text{[Crambe production]}_{y-2}) + (\text{[Crambe under loan]}_{y-3} / \text{[Crambe production]}_{y-3})) / 3$

$\text{[Crambe receiving certificate exchange gains]}_y = \text{[Crambe under loan]}_y * ((\text{[Crambe receiving certificate exchange gains]}_{y-1} / \text{[Crambe under loan]}_{y-1}) + (\text{[Crambe receiving certificate exchange gains]}_{y-2} / \text{[Crambe under loan]}_{y-2}) + (\text{[Crambe receiving certificate exchange gains]}_{y-3} / \text{Crambe under loan]}_{y-3})) / 3$

If $\text{[Crambe certificate exchange rate]}_y \leq 0$ then $\text{[Crambe net value of certificates]}_y = 0$

If $\text{[Crambe certificate exchange rate]}_y > 0$ and $\text{[Crambe certificate exchange rate]}_{y-1} = 0$ then $\text{[Crambe net value of certificates]}_y = \text{[Crambe receiving certificate exchange gains]}_y * \text{[Crambe certificate exchange rate]}_y$

If [Crambe certificate exchange rate]$_y$ > 0 and [Crambe marketing loan payment rate]$_{y-1}$ > 0 then [Crambe net value of certificates]$_y$ = [Crambe net value of certificates]$_{y-1}$ * (([Crambe receiving marketing loan gains]$_y$ - [Crambe receiving marketing loan gains]$_{y-1}$) / [Crambe receiving marketing loan gains]$_{y-1}$) * (([Crambe certificate exchange rate]$_y$ - [Crambe certificate exchange rate]$_{y-1}$) / [Crambe certificate exchange rate]$_{y-1}$)

[Crambe net value of certificates]$_t$ = 0.15 * [Crambe net value of certificates]$_{y-1}$ + 0.85 * [Crambe net value of certificates]$_y$ Safflower Net Value of Certificates

[Safflower certificate exchange rate]$_y$ = [Safflower loan rate]$_y$ - MIN([Safflower average market price]$_{Q1,y}$, [Safflower average market price]$_{Q2,y}$, [Safflower average market price]$_{Q3,y}$, [Safflower average market price]$_{Q4,y}$)

[Safflower under loan]$_y$ = [Safflower production]$_y$ * (([Safflower under loan]$_{y-1}$ / [Safflower production]$_{y-1}$) + ([Safflower under loan]$_{y-2}$ / [Safflower production]$_{y-2}$) + ([Safflower under loan]$_{y-3}$ / [Safflower production]$_{y-3}$)) / 3

[Safflower receiving certificate exchange gains]$_y$ = [Safflower under loan]$_y$ * (([Safflower receiving certificate exchange gains]$_{y-1}$ / [Safflower under loan]$_{y-1}$) + ([Safflower receiving certificate exchange gains]$_{y-2}$ / [Safflower under loan]$_{y-2}$) + ([Safflower receiving certificate exchange gains]$_{y-3}$ / [Safflower under loan]$_{y-3}$)) / 3

If [Safflower certificate exchange rate]$_y$ ≤ 0 then [Safflower net value of certificates]$_y$ = 0

If [Safflower certificate exchange rate]$_y$ > 0 and [Safflower certificate exchange rate]$_{y-1}$ = 0 then [Safflower net value of certificates]$_t$ = [Safflower receiving certificate exchange gains]$_y$ * [Safflower certificate exchange rate]$_y$

If [Safflower certificate exchange rate]$_y$ > 0 and [Safflower certificate exchange rate]$_{y-1}$ > 0 then [Safflower net value of certificates]$_y$ = [Safflower net value of certificates]$_{y-1}$ * (([Safflower receiving certificate exchange gains]$_y$ - [Safflower receiving certificate exchange gains]$_{y-1}$) / [Safflower receiving certificate exchange gains]$_{y-1}$) * (([Safflower certificate exchange rate]$_y$ - [Safflower certificate exchange rate]$_{y-1}$) / [Safflower certificate exchange rate]$_{y-1}$)

[Safflower net value of certificates]$_t$ = 0.15 * [Safflower net value of certificates]$_{y-1}$ + 0.85 * [Safflower net value of certificates]$_y$

Peanuts Net Value of Certificates

[Peanuts certificate exchange rate]$_y$ = [Peanuts loan rate]$_y$ - MIN([Peanuts average market price]$_{Q1,y}$, [Peanuts average market price]$_{Q2,t}$, [Peanuts average market price]$_{Q3,y}$, [Peanuts average market price]$_{Q4,y}$y

[Peanuts under loan]$_y$ = [Peanuts production]$_y$ * ([Peanuts under loan]$_{t-1}$ / [Peanuts production]$_{y-1}$ + [Peanuts under loan]$_{y-2}$ / [Peanuts production]$_{y-2}$ + [Peanuts under loan]$_{y-3}$ / [Peanuts production]$_{y-3}$) / 3

[Peanuts receiving certificate exchange gains]$_y$ = [Peanuts under loan]$_y$ * (([Peanuts receiving certificate exchange gains]$_{y-1}$ / [Peanuts under loan]$_{y-1}$) + ([Peanuts receiving certificate exchange gains]$_{t-2}$ / [Peanuts under loan]$_{y-2}$) + ([Peanuts receiving certificate exchange gains]$_{y-3}$ / [Peanuts under loan]$_{y-3}$)) / 3

If [Peanuts certificate exchange rate]$_y$ ≤ 0 then [Peanuts net value of certificates]$_y$ = 0

If [Peanuts certificate exchange rate]$_y$ > 0 and [Peanuts certificate exchange rate]$_{y-1}$ = 0 then [Peanuts net value of certificates]$_y$ = [Peanuts receiving certificate exchange gains]$_y$ * [Peanuts certificate exchange rate]$_y$

If [Peanuts certificate exchange rate]$_y$ > 0 and [Peanuts certificate exchange rate]$_{y-1}$ > 0 then [Peanuts net value of certificates]$_y$ = [Peanuts net value of certificates]$_{y-1}$ * (([Peanuts receiving certificate exchange gains]$_y$ - [Peanuts receiving certificate exchange gains]$_{y-1}$) / [Peanuts receiving certificate exchange gains]$_{y-1}$) * (([Peanuts certificate exchange rate]$_y$ - [Peanuts certificate exchange rate]$_{y-1}$) / [Peanuts certificate exchange rate]$_{y-1}$)

[Peanuts net value of certificates]$_t$ = 0.15 * [Peanuts net value of certificates]$_{y-1}$ + 0.85 * [Peanuts net value of certificates]$_y$

Wool (graded) Marketing Loan Gains

[Wool (graded) certificate exchange rate]$_t$ = [Wool (graded) loan rate]$_t$ - MIN([Wool (graded) average market price]$_{Q1,t}$, [Wool (graded) average market price]$_{Q2,t}$, [Wool (graded) average market price]$_{Q3,t}$, [Wool (graded) average market price]$_{Q4,t}$)

[Wool (graded) under loan]$_t$ = [Wool (graded) production]$_t$ * (([Wool (graded) under loan]$_{t-1}$ / [Wool (graded) production]$_{t-1}$) + ([Wool (graded) under loan]$_{t-2}$ / [Wool (graded) production]$_{t-2}$) + ([Wool (graded) under loan]$_{t-3}$ / [Wool (graded) production]$_{t-3}$)) / 3

[Wool (graded) receiving marketing loan gains]$_t$ = [Wool (graded) under loan]$_t$ * (([Wool (graded) receiving marketing loan gains]$_{t-1}$ / [Wool (graded) under loan]$_{t-1}$) + ([Wool (graded) receiving marketing loan gains]$_{t-2}$ / [Wool (graded) under loan]$_{t-2}$) + ([Wool (graded) receiving marketing loan gains]$_{t-3}$ / [Wool (graded) under loan]$_{t-3}$)) / 3

If [Wool (graded) certificate exchange rate]$_t$ ≤ 0 then [Wool (graded) net value of certificates]$_t$ = 0

If [Wool (graded) certificate exchange rate]$_t$ > 0 and [Wool (graded) certificate exchange rate]$_{t-1}$ = 0 then [Wool (graded) net value of certificates]$_t$ = [Wool (graded) receiving marketing loan gains]$_t$ * [Wool (graded) certificate exchange rate]$_t$

If [Wool (graded) certificate exchange rate]$_t$ > 0 and [Wool (graded) certificate exchange rate]$_{t-1}$ > 0 then [Wool (graded) net value of certificates]$_t$ = [Wool (graded) net value of certificates]$_{t-1}$ * (([Wool (graded) receiving certificate exchange gains]$_y$ - [Wool receiving certificate exchange gains]$_{y-1}$) / [Wool (graded) receiving certificate exchange gains]$_{y-1}$) * (([Wool (graded) certificate exchange rate]$_y$ - [Wool (graded) certificate exchange rate]$_{y-1}$) / [Wool (graded) certificate exchange rate]$_{y-1}$)

Wool (not graded) Net Value of Certificates

[Wool (not graded) certificate exchange rate]$_t$ = [Wool (not graded) loan rate]$_t$ - MIN([Wool (not graded) average market price]$_{Q1,t}$, [Wool (not graded) average market price]$_{Q2,t}$, [Wool (not graded) average market price]$_{Q3,t}$, [Wool (not graded) average market price]$_{Q4,t}$)

[Wool (not graded) under loan]$_t$ = [Wool (not graded) production]$_t$ * (([Wool (not graded) under loan]$_{t-1}$ / [Wool (not graded) production]$_{t-1}$) + ([Wool (not graded) under loan]$_{t-2}$ / [Wool production]$_{t-2}$) + ([Wool (not graded) under loan]$_{t-3}$ / [Wool (not graded) production]$_{t-3}$)) / 3

[Wool (not graded) receiving certificate exchange gains]$_t$ = [Wool (not graded) under loan]$_t$ * (([Wool (not graded) receiving certificate exchange gains]$_{t-1}$ / [Wool (not graded) under loan]$_{t-1}$) + ([Wool (not graded) receiving certificate exchange gains]$_{t-2}$ / [Wool (not graded) under loan]$_{t-2}$) + ([Wool (not graded) receiving certificate exchange gains]$_{t-3}$ / [Wool (not graded) under loan]$_{t-3}$)) / 3

If [Wool (not graded) certificate exchange rate]$_t$ ≤ 0 then [Wool (not graded) net value of certificates]$_t$ = 0

If [Wool (not graded) certificate exchange rate]$_t$ > 0 and [Wool (not graded) certificate exchange rate]$_{t-1}$ = 0 then
[Wool (not graded) net value of certificates]$_t$ = [Wool (not graded) receiving marketing loan gains]$_t$ * [Wool (not graded) certificate exchange rate]$_t$

If [Wool (not graded) certificate exchange rate]$_t$ > 0 and [Wool (not graded) certificate exchange rate]$_{t-1}$ > 0 then
[Wool (not graded) net value of certificates]$_t$ = [Wool (not graded) net value of certificates]$_{t-1}$ * (([Wool (not graded) receiving certificate exchange gains]$_y$ - [Wool (not graded) receiving certificate exchange gains]$_{y-1}$) / [Wool (not graded) receiving certificate exchange gains]$_{y-1}$ * (([Wool (not graded) certificate exchange rate]$_y$ - [Wool (not graded) certificate exchange rate]$_{y-1}$) / [Wool (not graded) certificate exchange rate]$_{y-1}$)

Mohair Marketing Loan Gains

[Mohair certificate exchange rate]$_t$ = [Mohair loan rate]$_t$ - MIN([Mohair average market price]$_{Q1,t}$, [Mohair average market price]$_{Q2,t}$, [Mohair average market price]$_{Q3,t}$, [Mohair average market price]$_{Q4,t}$)

[Mohair under loan]$_t$ = [Mohair production]$_t$ * (([Mohair under loan]$_{t-1}$ / [Mohair production]$_{t-1}$) + ([Mohair under loan]$_{t-2}$ / [Mohair production]$_{t-2}$) + ([Mohair under loan]$_{t-3}$ / [Mohair production]$_{t-3}$)) / 3

[Mohair receiving certificate exchange gains]$_t$ = [Mohair under loan]$_t$ * (([Mohair receiving certificate exchange gains]$_{t-1}$ / [Mohair under loan]$_{t-1}$) + ([Mohair receiving certificate exchange gains]$_{t-2}$ / [Mohair under loan]$_{t-2}$) + ([Mohair receiving certificate exchange gains]$_{t-3}$ / [Mohair under loan]$_{t-3}$)) / 3

If [Mohair certificate exchange rate]$_t$ ≤ 0 then [Mohair net value of certificates]$_t$ = 0

If [Mohair certificate exchange rate]$_t$ > 0 and [Mohair certificate exchange rate]$_{t-1}$ = 0 then [Mohair net value of certificates]$_t$ = [Mohair receiving certificate exchange gains]$_t$ * [Mohair certificate exchange rate]$_t$

If [Mohair certificate exchange rate]$_t$ > 0 and [Mohair certificate exchange rate]$_{t-1}$ > 0 then [Mohair net value of certificates]$_t$ = [Mohair net value of certificates]$_{t-1}$ * (([Mohair receiving certificate exchange gains]$_t$ - [Mohair receiving certificate exchange gains]$_{t-1}$) / [Mohair receiving certificate exchange gains]$_{t-1}$) * (([Mohair certificate exchange rate]$_t$ - [Mohair certificate exchange rate]$_{t-1}$) / [Mohair certificate exchange rate]$_{t-1}$)

Honey Net Value of Certificates

[Honey marketing certificate exchange rate]$_t$ = [Honey loan rate]$_t$ - MIN([Honey average market price]$_{Q1,t}$, [Honey average market price]$_{Q2,t}$, [Honey average market price]$_{Q3,t}$, [Honey average market price]$_{Q4,t}$)

[Honey under loan]$_t$ = [Honey production]$_t$ * (([Honey under loan]$_{t-1}$ / [Honey production]$_{t-1}$) + ([Honey under loan]$_{t-2}$ / [Honey production]$_{t-2}$) + ([Honey under loan]$_{t-3}$ / [Honey production]$_{t-3}$)) / 3

[Honey receiving marketing loan gains]$_t$ = [Honey under loan]$_t$ * (([Honey receiving marketing loan gains]$_{t-1}$ / [Honey under loan]$_{t-1}$) + ([Honey receiving marketing loan gains]$_{t-2}$ / [Honey under loan]$_{t-2}$) + ([Honey receiving marketing loan gains]$_{t-3}$ / [Honey under loan]$_{t-3}$)) / 3

If [Honey certificate exchange rate]$_t$ ≤ 0 then [Honey marketing loan gains]$_t$ = 0

If [Honey certificate exchange rate]$_t$ > 0 and [Honey certificate exchange rate]$_{t-1}$ = 0 then [Honey marketing loan gains]$_t$ = [Honey receiving marketing loan gains]$_t$ * [Honey certificate exchange rate]$_t$

If $[\text{Honey certificate exchange rate}]_t > 0$ and $[\text{Honey certificate exchange rate}]_{t-1} > 0$ then $[\text{Honey net value of certificates}]_t = [\text{Honey net value of certificates}]_{t-1} * (([\text{Honey receiving certificate exchange gains}]_t - [\text{Honey receiving certificate exchange gains}]_{t-1}) / [\text{Honey receiving certificate exchange gains}]_{t-1}) * (([\text{Honey certificate exchange rate}]_t - [\text{Honey certificate exchange rate}]_{t-1}) / [\text{Honey marketing loan gain payment rate}]_{t-1})$

Compensation Payments to Peanut Quota Holders

$[\text{Compensation payment}]_y = [\text{Payment rate}] * [\text{National peanut quota}]$

$[\text{Total compensation payment}] = [\text{Compensation payment}]_{2002} + [\text{Compensation payment}]_{2003} + [\text{Compensation payment}]_{2004} + [\text{Compensation payment}]_{2005} + [\text{Compensation payment}]_{2006}$

For calendar year 2006:

$[\text{Compensation payment to peanut quota holders}]_{2006} = [\text{Total compensation payment}] - [\text{Compensation payment}]_{2005} - [\text{Compensation payment}]_{2004} - [\text{Compensation payment}]_{2003} - [\text{Compensation payment}]_{2002}$

Tobacco Transition Payment Program

$[\text{Total tobacco transition payment}]_{2006} = [\text{Average value of contracts}] - [\text{Average value of contracts sold}]_{2005} - [\text{Average value of contracts sold}]_{2006} + \text{NPV}[\text{Total value contracts sold}]_{2006}$

$[\text{Total tobacco transition payment}]_{2007} = [\text{Average value of contracts}] - [\text{Average value of contracts sold}]_{2005} - [\text{Average value of contracts sold}]_{2006} - [\text{Average value of contracts sold}]_{2007} + \text{NPV}[\text{Total value contracts sold}]_{2007}$

$[\text{Total tobacco transition payment}]_{2008} = [\text{Average value of contracts}] - [\text{Average value of contracts sold}]_{2005} - [\text{Average value of contracts sold}]_{2006} - [\text{Average value of contracts sold}]_{2007} - [\text{Average value of contracts sold}]_{2008} + \text{NPV}[\text{Total value contracts sold}]_{2008}$

$[\text{Total tobacco transition payment}]_{2009} = [\text{Average value of contracts}] - [\text{Average value of contracts sold}]_{2005} - [\text{Average value of contracts sold}]_{2006} - [\text{Average value of contracts sold}]_{2007} - [\text{Average value of contracts sold}]_{2008} - [\text{Average value of contracts sold}]_{2009} + \text{NPV}[\text{Total value contracts sold}]_{2009}$

$[\text{Total tobacco transition payment}]_{2010} = [\text{Average value of contracts}] - [\text{Average value of contracts sold}]_{2005} - [\text{Average value of contracts sold}]_{2006} - [\text{Average value of contracts sold}]_{2007} - [\text{Average value of contracts sold}]_{2008} - [\text{Average value of contracts sold}]_{2009} - [\text{Average value of contracts sold}]_{2010} + \text{NPV}[\text{Total value contracts sold}]_{2010}$

$[\text{Total tobacco transition payment}]_{2011} = [\text{Average value of contracts}] - [\text{Average value of contracts sold}]_{2005} - [\text{Average value of contracts sold}]_{2006} - [\text{Average value of contracts sold}]_{2007} - [\text{Average value of contracts sold}]_{2008} - [\text{Average value of contracts sold}]_{2009} - [\text{Average value of contracts sold}]_{2010} - [\text{Average value of contracts sold}]_{2011} + \text{NPV}[\text{Total value contracts sold}]_{2011}$

$[\text{Total tobacco transition payment}]_{2012} = [\text{Average value of contracts}] - [\text{Average value of contracts sold}]_{2005} - [\text{Average value of contracts sold}]_{2006} - [\text{Average value of contracts sold}]_{2007} - [\text{Average value of contracts sold}]_{2008} - [\text{Average value of contracts sold}]_{2009} - [\text{Average value of contracts sold}]_{2010} - [\text{Average value of contracts sold}]_{2011} - [\text{Average value of contracts sold}]_{2012} + \text{NPV}[\text{Total value contracts sold}]_{2012}$

$[\text{Total tobacco transition payment}]_{2013} = [\text{Average value of contracts}] - [\text{Average value of contracts sold}]_{2005} - [\text{Average value of contracts sold}]_{2006} - [\text{Average value of contracts sold}]_{2007} - [\text{Average value of contracts sold}]_{2008} - [\text{Average value of contracts sold}]_{2009} - [\text{Average value of contracts sold}]_{2010} - [\text{Average value}

of contracts sold] $_{2011}$ - [Average value of contracts sold] $_{2012}$ - [Average value of contracts sold] $_{2013}$ + NPV[Total value contracts sold]$_{2013}$

[Total tobacco transition payment]$_{2014}$ = [Average value of contracts] - [Average value of contracts sold] $_{2005}$ - [Average value of contracts sold] $_{2006}$ - [Average value of contracts sold] $_{2007}$ - [Average value of contracts sold] $_{2008}$ - [Average value of contracts sold] $_{2009}$ - [Average value of contracts sold] $_{2010}$ - [Average value of contracts sold] $_{2011}$ - [Average value of contracts sold] $_{2012}$ - [Average value of contracts sold] $_{2013}$

National Dairy Milk Income Market Loss Payments[28]

[Class I milk price, Boston]$_t$ = [Manufactured milk value]$_t$ + \$3.25

[Payment rate]$_t$ = 0.45 * (\$16.94 - [Class I milk price, Boston]$_t$)

[Total milk production eligible for payment, marketing year]$_t$ = [Total milk production, marketing year]$_t$ * (1 – 0.466)

[Total national dairy market loss payment, marketing year]$_t$ = [Total milk production eligible for payment, marketing year]$_t$ * [Payment rate]$_t$

[Total national dairy market loss payment, calendar year]$_{2004}$ = (11 * [Total national dairy market loss payment, marketing year]$_{2004}$ + [1 * Total national dairy market loss payment, marketing year]$_{2005}$) / 12

[Total national dairy market loss payment, calendar year]$_{2005}$ = 11 * [Total national dairy market loss payment, marketing year]$_{2005}$ / 12

Conservation Program Payments

Conservation Reserve Program

[Wheat Conservation Reserve Program payment]$_t$ = [Wheat Conservation Reserve Program payment]$_{t-1}$ * [Expected percent change in wheat acres enrolled in Conservation Reserve Program]$_t$

[Rice Conservation Reserve Program payment]$_t$ = [Rice Conservation Reserve Program payment]$_{t-1}$ * [Expected percent change in rice acres enrolled in Conservation Reserve Program]$_t$

[Corn Conservation Reserve Program payment]$_t$ = [Corn Conservation Reserve Program payment]$_{t-1}$ * [Expected percent change in corn acres enrolled in Conservation Reserve Program]$_t$

[Sorghum Conservation Reserve Program payment]$_t$ = [Sorghum Conservation Reserve Program payment]$_{t-1}$ * [Expected percent change in sorghum acres enrolled in Conservation Reserve Program]$_t$

[Barley Conservation Reserve Program payment]$_t$ = [Barley Conservation Reserve Program payment]$_{t-1}$ * [Expected percent change in barley acres enrolled in Conservation Reserve Program]$_t$

[Oats Conservation Reserve Program payment]$_t$ = [Oats Conservation Reserve Program payment]$_{t-1}$ * [Expected percent change in oats acres enrolled in Conservation Reserve Program]$_t$

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[28]This program was originally intended to start in 2002 and end in 2005. The program has recently been resurrected. Program legislation limited the payment quantity of milk to no more than 2,400,000 pounds per farm. Using ARMS data, 46.6% of total milk production was produced on farms in excess of 2,400,000 pounds. Thus, 53.4 % of total milk production was eligible for market loss payments·.

[Upland cotton Conservation Reserve Program payment]$_t$ = [Upland cotton Conservation Reserve Program payment]$_{t-1}$ * [Expected percent change in upland cotton acres enrolled in Conservation Reserve Program]$_t$

[Conservation Reserve Program payments]$_t$ = [Wheat Conservation Reserve Program payment]$_t$ + [Rice Conservation Reserve Program payment]$_t$ + [Corn Conservation Reserve Program payment]$_t$ + [Sorghum Conservation Reserve Program payment]$_t$ + [Barley Conservation Reserve Program payment]$_t$ + [Oats Conservation Reserve Program payment]$_t$ + [Upland cotton Conservation Reserve Program payment]$_t$

Agricultural Conservation Program

[Agricultural Conservation Program payment]$_t$ = [Agricultural Conservation Program payment adjusted by any change specified in legislation]$_{t-1}$

Emergency Conservation Reserve Program

[Emergency Conservation Program payment]$_t$ = [Emergency Conservation Program payment adjusted by any change specified in legislation]$_{t-1}$

Great Plains Conservation Program

[Great Plains Conservation Program payment]$_t$ = [Great Plains Conservation Program payment adjusted by any change specified in legislation]$_{t-1}$

<u>Total Conservation Program Payments</u>

[Total Conservation Program payments]$_t$ = [Conservation Reserve Program payments]$_t$ + [Agricultural Conservation Program payments]$_t$ + [Emergency Conservation Program payments]$_t$ + [Great Plains Conservation Program payments]$_t$

Note: All other conservation programs are considered as miscellaneous programs.

Miscellaneous Program Payments

Farmer-owned Reserve Storage payment, not included in final estimate as payments not available by State

[Wheat Farmer-owned Reserve Storage payment]$_t$ = [Wheat Farmer-owned Reserve Storage payment]$_{t-1}$ * [Expected percent change in quantity of wheat in Farmer-owned Reserve Storage]$_t$

[Rice Farmer-owned Reserve Storage payment]$_t$ = [Rice Farmer-owned Reserve Storage payment]$_{t-1}$ * [Expected percent change in quantity of rice in Farmer-owned Reserve Storage]$_t$

[Corn Farmer-owned Reserve Storage payment]$_t$ = [Corn Farmer-owned Reserve Storage payment]$_{t-1}$ * [Expected percent change in quantity of corn in Farmer-owned Reserve Storage]$_t$

[Sorghum Farmer-owned Reserve Storage payment]$_t$ = [Sorghum Farmer-owned Reserve Storage payment]$_{t-1}$ * [Expected percent change in quantity of sorghum in Farmer-owned Reserve Storage]$_t$

[Barley Farmer-owned Reserve Storage payment]$_t$ = [Barley Farmer-owned Reserve Storage payment]$_{t-1}$ * [Expected percent change in quantity of barley in Farmer-owned Reserve Storage]$_t$

[Oats Farmer-owned Reserve Storage payment]$_t$ = [Oats Farmer-owned Reserve Storage payment]$_{t-1}$ * [Expected percent change in quantity of oats in Farmer-owned Reserve Storage]$_t$

[Upland cotton Farmer-owned Reserve Storage payment]$_t$ = [Upland cotton Farmer-owned Reserve Storage payment]$_{t-1}$ * [Expected percent change in quantity of upland cotton in Farmer-owned Reserve Storage]$_t$

[Soybeans Farmer-owned Reserve Storage payment]$_t$ = [Soybeans Farmer-owned Reserve Storage payment]$_{t-1}$ * [Expected percent change in quantity of soybeans in Farmer-owned Reserve Storage]$_t$

[Total Farmer-owned Reserve Storage payment]$_t$ = [Wheat Farmer-owned Reserve Storage payment]$_t$ + [Rice Farmer-owned Reserve Storage payment]$_t$ + [Corn Farmer-owned Reserve Storage payment]$_t$ + [Sorghum Farmer-owned Reserve Storage payment]$_t$ + [Barley Farmer-owned Reserve Storage payment]$_t$ + [Oats Farmer-owned Reserve Storage payment]$_t$ + [Upland cotton Farmer-owned Reserve Storage payment]$_t$ + [Soybeans Farmer-owned Reserve Storage payment]$_t$

American Indian Livestock Feed Program

[American Indian Livestock Feed Program payments]$_t$ = [American Indian Livestock Feed Program payments adjusted by any change specified in legislation]$_{t-1}$

Colorado River Basin Salinity Control Program

[Colorado River Basin Salinity Control Program payments]$_t$ = [Colorado River Basin Salinity Control Program payments adjusted by any change specified in legislation]$_{t-1}$

Dairy Indemnity Program

[Dairy Indemnity Program payments]$_t$ = [Dairy Indemnity Program payments adjusted by any change specified in legislation]$_{t-1}$

Disaster Program payments

[Disaster Program payments]$_t$ = [As specified in legislation adjusted by expected payment schedule]$_t$

Disaster Reserve Program

[Disaster Reserve Program payments]$_t$ = [As specified in legislation adjusted by expected payment schedule]$_t$

Environmental Quality Incentives Program

[Environmental Quality Incentives Program payments]$_t$ = [Environmental Quality Incentives Program payments adjusted by any change specified in legislation]$_{t-1}$

Flood Compensation Program

[Flood Compensation Program payments]$_t$ = [As specified in legislation adjusted by expected payment schedule]$_t$

Interest Program

[Interest Program payments]$_t$ = [Interest Program payments adjusted by any change specified in legislation]$_{t-1}$

Noninsured Assistance Program

[Noninsured Assistance Program payments]$_t$ = [Noninsured Assistance Program payments adjusted by any change specified in legislation]$_{t-1}$

Pasture Recovery Program

[Pasture Recovery Program payments]$_t$ = [Pasture Recovery Program payments adjusted by any change specified in legislation]$_{t-1}$

Rural Clean Water Program

[Rural Clean Water Program payments]$_t$ = [Rural Clean Water Program payments adjusted by any change specified in legislation]$_{t-1}$

Small Hog Operation Program

[Small Hog Operation Program payments]$_t$ = [Small Hog Operation Program payments adjusted by any change specified in legislation]$_{t-1}$

Wetlands Reserve Program

[Wetlands Reserve Program payments]$_t$ = [Wetland Reserve Program payments adjusted by any change specified in legislation]$_{t-1}$

Any Other Miscellaneous Program

[Any Other Miscellaneous Program payments]$_t$ = [Other Miscellaneous Program payments adjusted by any change specified in legislation]$_{t-1}$

Total Miscellaneous Programs

[Total Other Miscellaneous Program Payments]$_t$ = [American Indian Livestock Feed Program payments]$_t$ + [Colorado River Basin Salinity Control Program payments]$_t$ + [Dairy Indemnity Program payments]$_t$ + [Disaster Program payments]$_t$ + [Disaster Reserve Program payments]$_t$ + [Environmental Quality Incentives Program payments]$_t$ + [Flood Compensation Program payments]$_t$ + [Interest Program payments]$_t$ + [Noninsured Assistance Program payments]$_t$ + [Pasture Recovery Program payments]$_t$ + [Rural Clean Water Program payments]$_t$ + [Small Hog Operation Program payments]$_t$ + [Wetlands Reserve Program payments]$_t$ + [Any Other Miscellaneous Program payments]$_t$

Supplemental Funding Program Payments

Crop Disaster Program

[Crop Disaster Program payments]$_t$ = [As specified in legislation adjusted by payments realized in previous years]$_t$

Crop Loss Disaster Assistance Program

[Crop Loss Disaster Assistance Program payments]$_t$ = [As specified in legislation adjusted by payments realized in previous years and expected payment schedule]$_t$

Dairy Disaster Assistance Program

[Dairy Disaster Assistance Program payments]$_t$ = [As specified in legislation adjusted by payments realized in previous years and expected payment schedule]$_t$

Dairy Market Loss Assistance Program

[Dairy Market Loss Assistance Program payments]$_t$ = [As specified in legislation adjusted by payments realized in previous years and expected payment schedule]$_t$

Lamb Meat Adjustment Assistance Program

[Lamb Meat Adjustment Assistance Program payments]$_t$ = [As specified in legislation adjusted by payments realized in previous years and expected payment schedule]$_t$

Loan Deficiency Program payments for Non-contract Production Flexibility Crop Growers

[Loan Deficiency Program payments for Non-contract Production Flexibility Crop Growers]$_t$ = [As specified in legislation adjusted by payments realized in previous years and expected payment schedule]$_t$

Livestock Emergency Assistance Program

[Livestock Emergency Assistance Program payments]$_t$ = [As specified in legislation adjusted by payments realized in previous years and expected payment schedule]$_t$

Marketing Loss Assistance Program

[Marketing Loss Assistance Program payments]$_t$ = [As specified in legislation adjusted by payments realized in previous years and expected payment schedule]$_t$

Oilseed Program

[Oilseed Program payments]$_t$ = [As specified in legislation adjusted by payments realized in previous years and expected payment schedule]$_t$

Peanut Marketing Assistance Program

[Peanut Marketing Assistance Program payments]$_t$ = [As specified in legislation adjusted by payments realized in previous years and expected payment schedule]$_t$

Tobacco Disaster Assistance Program

[Tobacco Disaster Assistance Program payments]$_t$ = [As specified in legislation adjusted by payments realized in previous years and expected payment schedule]$_t$

Wool and Mohair Marketing Loss Assistance Program

[Wool and Mohair Marketing Loss Assistance Program payments]$_t$ = [As specified in legislation adjusted by payments realized in previous years and expected payment schedule]$_t$

Any Other Supplemental Program payments

[Any Other Supplemental Program payments]$_t$ = [As specified in legislation adjusted by payments realized in previous years and expected payment schedule]$_t$

Total Supplemental Program Payments

[Total Supplemental Program Payments]$_t$ = [Crop Disaster Program payments]$_t$ + [Crop Loss Disaster Assistance Program payments]$_t$ + [Dairy Disaster Assistance Program payments]$_t$ + [Dairy Market Loss Assistance Program payments]$_t$ + [Lamb Meat Adjustment Assistance Program payments]$_t$ + [Loan Deficiency Program payments for Non-contract Production Flexibility Crop Growers]$_t$ + [Livestock Emergency Assistance

Program payments]$_t$ + [Marketing Loss Assistance Program payments]$_t$ + [Oilseed Program payments]$_t$ + [Peanut Marketing Assistance Program payment]$_t$ + [Tobacco Disaster Assistance Program payments]$_t$ + [Wool and Mohair Marketing Loss Assistance Program payments]$_t$ + [Any Other Supplemental Program payments]$_t$

Total Direct Government Program Payments

[Total Direct Government Program Payments]$_t$ = [Total Production Flexibility Payments]$_t$ + [Total Loan Deficiency Payments]$_t$ + [Total Direct Payments]$_t$ + [Total Counter-cyclical Payments]$_t$ + [Total Marketing Loan Gain Payments]$_t$ + [Compensation payments to peanut quota holders]$_t$ + [National Dairy Market Loss Payments]$_t$ + [Total Conservation Program Payments]$_t$ + [Total Miscellaneous Program Payments]$_t$ + [Total Supplemental Program Payments]