# PROCEEDINGS

48th Annual Meeting

WESTERN AGRICULTURAL ECONOMICS ASSOCIATION

Reno, Nevada

July 20, 21, 22, 1975

William D. Gorman, Editor

# CROP PRODUCTION ACCOUNTING IN THE FARMING SECTOR USING NATIONAL ECONOMIC ACCOUNTING CONCEPTS*

Richard Simunek

Economic Research Service

Value of production equals value of sales plus inventory change assuming no production is unsold. Value of production is the measure of nonfarm output used to estimate gross national product (GNP) by the U.S. Department of Commerce. Yet, value of sales rather than production is the primary basis of farm output in the Commerce measure of farm output, and also in the total net farm income series estimated by the U.S. Department of Agriculture. Farm output (gross farm income) equals value of sales plus imputations made for farm inventory change, food and fuel wood consumed directly in farm households, and gross rental value of farm dwellings. But much unsold farm production (own-account) remains which is not explicitly accounted for in gross farm income at its actual moment of appearance or disappearance, for example, feed crops used on farms where produced (table 1). Nonmeasurement of own-account activity can cause a distortion of productivity analysis, input/output analysis, classification by size of farm and type-of-farm, and measurement of total capital formation.

To overcome these problems, value of production is recommended as the measure of farm output. Estimates of value of farm sales and total net farm income are based on a data system established before the U.S. national economic accounts were developed in the 1930's, and no move to shift farm data toward the value of production concept has been made. Value of sales, while inadequate by itself for monitoring total production flows, is appropriate for cash income analysis as initially intended.

Two objectives are planned in this paper. First, present an accounting framework within which measurement and distribution of value of crop production commensurate with national economic accounting concepts may be developed. Second, examine the two output measures, value of crop production and value of crop sales, as to their ability to accurately monitor economic performance. Attaining these objectives should provide a reference point for outlining data needs for accurate measurement of value of crop production and its use as capital formation, intermediate consumption, and final consumption. Farm output and intermediate consumption for total net farm income are estimated using disposition reports issued by the Statistical Reporting Service (SRS) including *Field Crops* for the major crops.

*The views expressed in this paper are those of the author and do not reflect official U. S. Department of Agriculture policy. My gratitude is expressed to Lillie Jones and Essie Peterson who assisted with data and manuscript preparation.

## COMMODITY FLOWS ACCOUNT

Commodity flows accounts such as the one illustrated in figure 1 are the first step in the construction of a set of national farm economic accounts. For example, exports and imports in the commodity flows account are also registered in the rest-of-the-world account, value of production in the income and product account, capital formed in the capital flows account, and beginning and ending stocks in the balance sheet. Two observations may be made at this point. First, many of the economic entities in the commodity flows account are estimated by USDA but are reported on a piecemeal basis and not in a rigorous accounting format in which debits must equal credits. Second, data gaps for production accounting

Fig. 1. Commodity flows account[1]

| | |
|---|---|
| 1. Beginning stocks | 5. Own-account uses |
| 2. Value of production | a. Capital formation |
| 3. Imports | b. Intermediate consumption |
| 4. Inventory valuation adjustment | c. Final consumption |
| | 6. Value of sales |
| | a. To other farms[1] |
| | b. To nonfarm sectors |
| | C. To export |
| | 7. Ending inventory |

[1] Would be as detailed as own-account uses.

based on national economic accounting concepts are immediately identified. For example, under national economic accounting concepts, cattle can be separated between fixed capital assets and work-in-progress and crops fed to produce breeding and dairy cattle are charged to gross capital formation. Presently all cattle on farms are included in farm inventory change and all feeding expenses in current expenses.

## VALUE OF CROP PRODUCTION

Measurement of value of crop production by SRS in the disposition account in table 1 is consistent with national economic accounting procedures. Value of crop sales includes marketings to dealers and other farmers, eventual exports, and current deliveries to the Commodity Credit Corporation (CCC). Value of crop sales reported by SRS refers to the percent of that particular crop marketed and therefore does not include redemptions, deliveries, or resales from other crop years.

An important difference between value of sales and value of production concerns the time of recording economic activity. Value of sales is recorded at the time of sales whereas value of production is recorded at the moment of appearance (harvest time for crops). Crop marketing seasons generally do not coincide with calendar years, and a given year's crop is usually sold in two calendar years. Therefore, to estimate total net farm income on a mandated calendar year basis, value of sales for the crop year are distributed on a calendar year basis with monthly marketing percentages furnished by SRS. Before distribution, current sales reported by SRS are adjusted for inventory stock change and old crop year CCC loans made and paid.

Value of crop sales is subject to three sensitive timing effects, the percent of production for own-account purposes, the percent of sales occurring after January 1, and sales out of CCC inventory stocks, or inventory profits. The percentage of feed production sold has steadily increased, as shown in table 2. This simply reflects the market trade in feed grains that accompanies increasing specialization

Table 1. Feed crop production, 1973

| Feed crop | Value of production[1] | Value of sales[2] | Inventory change[3] | Own-account production | Own-account as a percent of value of production |
|---|---|---|---|---|---|
| | | ---Thousand dollars--- | | | Percent |
| Hay | 5,022,159 | 1,021,906 | 198,368 | 3,801,885 | 76 |
| Corn | 13,426,563 | 7,535,156 | 517,459 | 5,373,948 | 40 |
| Oats | 769,126 | 306,899 | 69,567 | 392,660 | 51 |
| Barley | 893,390 | 619,902 | 61,716 | 211,772 | 24 |
| Sorghum Grain | 1,991,944 | 1,520,306 | 68,158 | 403,480 | 20 |
| Total | 22,103,182 | 11,004,169 | 915,268 | 10,183,745 | 46 |

[1]Source: Statistical Reporting Service, U.S. Dept. of Agriculture, "Field Crops", CrPr 1(74), May 1974.
[2]Economic Research Service, U. S. Dept. of Agriculture, "Farm Income Situation," FIS-224, July 1974. Current sales reported by SRS are adjusted for sales out of CCC and non-CCC stocks.
[3]Unpublished data. Component of net change in farm inventories used to estimate total net farm income. Does not include CCC stocks whereas value of sales includes sales out of CCC stocks.

Table 2. Percent of feed production sold, 1949-1973[1]

| Year | Corn | Barley | Oats | Sorghum Grain | Hay |
|---|---|---|---|---|---|
| | | ---Percent--- | | | |
| 1949 | 31.4 | 60.6 | 22.6 | 70.9 | 13.2 |
| 1954 | 38.8 | 66.3 | 27.4 | 79.4 | 13.1 |
| 1959 | 43.9 | 68.6 | 26.6 | 74.3 | 15.0 |
| 1964 | 48.9 | 76.3 | 33.1 | 78.3 | 18.5 |
| 1969 | 54.6 | 72.7 | 39.4 | 78.5 | 18.5 |
| 1973 | 60.9 | 73.5 | 39.0 | 80.3 | 20.1 |

[1]Source: Economic Research Service, U. S. Dept. of Agriculture, "Agricultural Statistics", 1972 and 1974

of grain and livestock farming. Thus, what is observed as increased output and productivity via measurement of value of sales may actually be more of an increase in marketing activity than in production activity.

A second statistical timing factor, the percent of sales occurring after January 1, is observed in table 3. As stated previously, value of sales for the crop year is distributed on a calendar year basis to estimate total net farm income using the percent of open market sales by months. However, farm proprietors may elect cash accounting procedures under IRS tax regulations to market their commodities in such a way as to minimize income taxes or maximize receipts. Therefore, the percent of wheat sales marketed after January 1 ranges from 21.2 percent to 37.0 percent. Abrupt changes may occur. During 1971 thru 1973 the percent of sales marketed after January 1 increased from 27.8 percent to 37.0 percent and then dropped to 27.9 percent. Timing of sales is not a distortion factor of actual production flows when own-account production and inventory change are appropriately measured.

A final timing distortion is inventory profits or sales out of CCC inventory stocks. Net change in crop inventories for estimating total net farm income reflect physical changes during the year for crops stored on farms valued at their average price for the year. Grain stocks held by CCC are not included in net inventory change because nonrecourse loans are treated as cash receipts in the month the loan is made. If the crop is later redeemed and the loan repaid, the outlay required for such redemption is treated as an offset to cash receipts during the month it takes place. The redeemed crop is later redistributed depending upon time of sale. Prior to 1973, relationships had been relatively stable, preventing "inventory profits" from causing large revisions because CCC loan values were generally equal to or greater than open market price. Farm inventory profits are strictly monetary and should not affect appropriate measurement of value of production. Summing value of sales, own-account production, and inventory change will not derive value of production for a calendar year unless inventory change is estimated for CCC stocks. For instance, assume no production occurs during a calendar year but farmers redeem $15 of their CCC stocks and resell the redeemed stocks for $25. An inventory profit of $10 is realized. Sales ($25) less CCC redemptions ($15) equal net sales of $10. Inventory change equals $0 because CCC stocks are excluded from inventory change under present accounting procedures. In this example, adding value of sales ($10) to inventory change ($0) equals value of production of $10, which is incorrect. Value of production actually equals $0.

Table 3. Percent of open market wheat sales, by months, 1962-1963 to 1973-1974[1]

| Month | Crop Marketing Season | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1962-1963 | 1963-1964 | 1964-1965 | 1965-1966 | 1966-1967 | 1967-1968 | 1968-1969 | 1969-1970 | 1970-1971 | 1971-1972 | 1972-1973 | 1973-1974 |
| | ----------Percent---------- | | | | | | | | | | | |
| May | 1.5 | 1.1 | 1.1 | .8 | .5 | .9 | .5 | .6 | .6 | .3 | 1.1 | .5 |
| June | 13.8 | 15.7 | 17.8 | 13.5 | 14.6 | 10.4 | 11.5 | 11.1 | 11.2 | 11.3 | 10.8 | 9.7 |
| July | 25.3 | 25.4 | 22.6 | 19.9 | 22.0 | 21.7 | 19.8 | 19.1 | 18.7 | 16.4 | 17.9 | 20.2 |
| August | 13.2 | 12.5 | 9.2 | 10.5 | 10.2 | 11.7 | 9.5 | 10.2 | 11.5 | 9.9 | 17.0 | 16.4 |
| September | 7.9 | 8.4 | 7.5 | 7.7 | 7.5 | 8.2 | 8.0 | 8.2 | 10.4 | 7.0 | 10.1 | 10.8 |
| October | 4.8 | 6.4 | 6.5 | 7.6 | 4.2 | 6.3 | 7.3 | 6.7 | 7.2 | 6.3 | 5.1 | 6.1 |
| November | 3.7 | 4.2 | 5.0 | 5.6 | 5.0 | 5.2 | 6.1 | 5.5 | 5.4 | 5.0 | 4.7 | 5.0 |
| December | 4.4 | 5.1 | 5.7 | 7.0 | 7.3 | 7.5 | 7.2 | 7.4 | 7.2 | 6.8 | 5.4 | 6.8 |
| January | 8.3 | 10.1 | 7.3 | 9.5 | 7.1 | 8.8 | 7.6 | 10.0 | 9.0 | 8.9 | 8.8 | 8.8 |
| February | 6.1 | 3.9 | 4.2 | 4.8 | 4.7 | 5.5 | 5.3 | 5.3 | 5.0 | 6.1 | 3.7 | 4.4 |
| March | 4.4 | 2.9 | 5.4 | 5.1 | 7.7 | 5.8 | 5.6 | 5.2 | 4.6 | 6.9 | 3.9 | 3.3 |
| April | 3.3 | 2.2 | 4.0 | 3.3 | 4.1 | 3.2 | 4.4 | 4.9 | 4.0 | 6.8 | 3.8 | 3.4 |
| May | 2.0 | 1.6 | 2.3 | 2.7 | 2.9 | 2.6 | 3.9 | 3.1 | 2.9 | 4.5 | 4.4 | 2.6 |
| June | 1.3 | .5 | 1.4 | 2.0 | 2.2 | 2.2 | 3.3 | 2.7 | 2.3 | 3.3 | 3.3 | 2.0 |
| Year | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Jan-June | 25.4 | 21.2 | 24.6 | 27.4 | 23.7 | 28.1 | 30.1 | 31.2 | 27.8 | 37.0 | 27.9 | 24.5 |

[1] Source: Statistical Reporting Service, U. S. Department of Agriculture, "Field Crops", CrPr 1 (73); May 1973; CrPr 1 (74), May 1974; and CrPr 1 (75), May 1975

## IMPLICATIONS

All three problems associated with timing of sales converged on the estimate of 1973 realized net farm income causing a revision in the preliminary estimate of $26.1 billion published in the February 1974 issue of the *Farm Income Situation* to $32.2 billion published the following July. Redemption of CCC loans and resale at higher prices plus unusually large sales of currently produced crops as farmers took advantage of prevailing high prices were two of the major reasons of this large revision. For the most current crop year, sales are estimated as a function of production based on past relationships. The uniqueness of demand and rising prices in 1973 caused these relationships to break down. However, the point of this example is not to suggest areas of possible improvement for estimating value of sales but to illustrate the idea that value of sales alone is inferior to value of production for providing an accurate and consistent picture of the timing and magnitude of production flows.

## SUMMARY

Value of sales alone cannot accurately monitor crop production and related economic performance due to three statistical timing factors. Of most importance, own-account crop production is not measured at the time of its actual appearance and disappearance. Value of sales, by itself, is further distorted as a measure of actual production flows from the percent of sales occurring after January 1 and sales out of CCC inventory stocks. Measuring value of production would build upon existing concepts by adding own-account production to value of sales.

## REFERENCES

AAEA Committee on Economic Statistics, "Our Obsolete Data Systems: New Directions and Opportunities." *Am. J. of Agr. Econ.* 54(1972) :867-875.

Carlin, Thomas, A. and Charles R. Handy. "Concept of the Agricultural Economy and Economic Accounting." *Am. J. of Agr. Econ.* 56(1974) :064-975.

Simunek, Richard W., "Capital Accounting in the Farming Sector Using National Economic Accounting Concepts." *Am. J. of Agr. Econ.* 56(1974) :1205.

U.S. Department of Agriculture, *Farm Income Situation.* ERS FIS-224, July 1974.

U.S. Department of Agriculture, *Field Crops.* SRS CrPrl (74), May 1974.

Weeks, Eldon E., "The Concept and Measurement of Farm Income and General Welfare in Agriculture." *West. Agr. Econ. Assoc. Proc.* July 1972.