Whole Farm, Profit Objective Pricing

Department of Agricultural Economics — *www.agmanager.info*

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Payday is the day agricultural producers sell their commodities and livestock. Most of us, whether farmers, small businessmen, or employees, wish to earn the most for our efforts. The intent of this guide is to help producers calculate a profit objective price for their commodities in any given year based on that year's farm mix of crops and livestock and on historical expense, income, and production data. With the knowledge of this profit objective price, actual marketing plans can be devised and carried out.

At a minimum, profit for a full-time farmer must be able to pay family living expenses, principal payments, income taxes, self-employment taxes, and necessary capital purchases. These five items are paid with taxable dollars. Any farm that cannot generate sufficient profit to meet these needs will either lose equity or must find alternative sources of income.

How objective pricing differs

Whole farm, profit objective pricing differs from break-even analysis of enterprises. Break-even analysis is just that, covering expenses, but not including a profit objective to cover family living, principal payments, taxes, and capital purchases. Whole farm profit objective pricing includes these items in the required net cash flow outcome. Meeting the profit objective price for farm commodities will enable farm operators to meet their obligations.

Calculation of prices to obtain a profit objective is a five-step process:

1. Identify total cash flow needs.
2. Identify farm enterprises for the year.
3. Calculate long-term (5- to 10-year) average production levels for each commodity raised on the farm.
4. Calculate the expense-to-income ratio.
5. Assign investment, labor, and management expenses to each enterprise.

Following these five steps and doing some estimation will derive profit objective prices for a farm operation and indicate what prices are needed to obtain a profit to cover the expenses noted.

Profit objective prices can be compared to historical or projected gross income per unit (includes cash sales, inventory adjustments, and government payments). Five years of gross income per unit for selected Kansas enterprises are provided in Table 1. The gross income per unit figures for the cow/calf and farrow-to-finish enterprises represent weighted averages for market livestock and breeding livestock.

Analysis Steps

The net cash flow or profit needed is determined by examining historical data as well as current data from loan payment schedules and an estimation of taxes. Family living expenses can be based on past family living expense records or use of a budget. Loan payment amortization schedules will indicate the amount of principal required to be paid in the current year. An estimate of taxes can be obtained using IRS publications or consulting a tax advisor. Depreciation can be used as a proxy for necessary capital purchases. If a business does not at least buy as many depreciable assets as the depreciation value, business equity will decline. The sum of family living expenses, principal payments, taxes, and capital purchases represents the total net dollar amount needed from farm operations. Any off-farm income, such as wages, interest, dividends, rents, or royalties must be subtracted from the amount of dollars needed from farm operations.

Step two is the identification of the farm mix as planned, or in actuality[1]. The allocation of crop acres on a per crop basis is needed to calculate how much production is expected to be available for sale in a year. Similarly, an estimate of the animal units that are available needs to be made. Use of historic data (5 to 10 years) of past yields multiplied by the acres, head, or litters will give a gross number of units available for sale. These calculations provide the operator information from which to plan and use in further calculations.

Step three is the derivation of long-term production levels for each commodity. A review of past crop and livestock production records should provide this information.

Step four derives an estimate of the expense-to-income ratio. This ratio is a measure of farm efficiency. The ratio is total expenses divided by total income. As a rule of thumb, the ratio should range between 0.70 and 0.80. In other words

[1] *For the purpose of this discussion, the farm mix has been determined by prior farm operator experience and history. This Farm Management Guide does not attempt to determine the optimal farm mix arrangement through linear programming or other analytical tools.*

$70 to $80 is spent to earn $100 of gross income. Farm operators who are members of a Kansas Farm Management Association have this number calculated for them in their annual business analysis printouts.

For non-Farm Management Association members, this ratio can be calculated by reviewing past tax returns. To derive this ratio from tax returns, farm operators need to divide total expenses by gross income as shown on Schedule F. This ratio is the linchpin of the total process. Once the expense-to-income ratio is calculated, divide the sum of one minus the ratio into the net cash flow needed to obtain the gross farm income needed. The lower the ratio, the lower the minimum prices that are needed to attain the farm profit objectives. Conversely, the higher the ratio the higher the prices needed to attain the farm profit objectives.

Step five is probably the most difficult. One must assign the percentage of investment, labor, and management to an enterprise and determine a weighted average for the enterprise. When step five is completed, a simple mathematical equation is solved to determine the profit objective price. A review of the depreciation schedule for assets can be used to allocate the investment in machinery, motorized equipment and buildings to the various enterprises. Similarly a review of owned and rented land to determine investment and land cost per crop enterprise is required.

A notebook or daily activity diary may be kept for a period of time to help in the assignment of labor and management per enterprise. Once the percentage of investment, labor, and management has been allocated to the enterprises, then a weighted average can be calculated. This weighted average on a per enterprise basis is then used to calculate the price objective for that enterprise needed to meet whole farm cash flows.

Example

The example below has the following assumptions.

1. Family living withdrawals, $50,945
2. Principal payments, $15,920
3. Income and self-employment taxes, $8,980
4. Depreciation (Capital Asset Purchases), $33,595
5. Off-farm income, $0

The total net cash flow needed from farm operations is the sum of items 1, 2, 3, and 4, less item 5 or $101,735.

The farm mix is assumed to be the following:

1. 100 beef cows with

   —average pounds produced per cow of 550 pounds

2. 100 acres of hay and alfalfa

   —fed to beef cows

3. 800 acres of corn

   —110 bu./acre 10-year average yield
   —88,000 bushels sold

4. 800 acres of soybeans

   —33 bu./acre 10-year average yield
   —26,400 bushels sold

Historical production records allow use of 5- to 10-year average yields for crop and livestock enterprises to estimate gross number values for sale. The expense-to-income ratio for this farm operation was 0.80. Gross farm objective income is calculated by using the following formula:

$$\text{GFOI} = \frac{\text{Objective Income}}{1 - \frac{\text{Expense}}{\text{Income}}}$$

In this example, 0.20 is divided into $109,440. The resulting quotient is $547,200, which is equal to gross farm objective income.

The investment, labor, and management percentage allocations for each enterprise were computed to be as follows:

16 percent for beef cows (includes the hay and alfalfa enterprises)
47 percent for corn
37 percent for soybeans

Thus the calculation of profit objective prices for this example farm are as follows.

Beef Cows: $547,200 × 0.16 ÷ (100 × 550) × 100 = $/cwt. = $159.19

Corn: $547,200 × 0.47 ÷ (800 × 110) = $/bushel = $2.92/bu.

Soybeans: $547,200 × 0.37 ÷ (800 × 33) = $/bushel = $7.67/bu.

Changes in the percentages of the allocations to the enterprises affect the prices needed to meet the net farm income objective. Also, a change in the expense-to-income ratio will greatly change the needed prices of the salable commodities. Likewise, increases in objective income increases all prices. Table 2 shows a sensitivity analysis for this example with changes in the expense-to-income ratio. Table 3 shows the same example with changes in the percentages allocated to the enterprises. From these sensitivity studies one can see that a slight change in one or all factors can result in a large change in the price needed to attain the profit objective necessary to reach the net farm income required to meet obligations.

Managers and operators of farms can see how controlling expenses would aid in reducing the expense-to-income ratio. Expenses are often blamed for increasing at a rate faster than income. However, expenses for operating a particular farm remain fairly constant over time when taking inflation into account. Income has a greater effect on the expense-to-income ratio. Use of whole farm profit objective pricing can help farm operators to increase income by realizing what price is needed to meet obligations.

By studying percentage allocation values, farm operators may be able to see where investment, labor, and management are most efficiently implemented. Changes in allocation of resources from a whole farm price objective view point may lead to greater returns to those resources. A more rigorous analysis of a particular farm may yield the optimal farm mix of crops and livestock.

With a little study and effort, farm operators can use whole farm objective pricing to determine their individual cash flow needs and become more comfortable and confident in marketing their agricultural products.

Table 1. *Average Gross Income for Selected Agricultural Enterprises in Kansas, 2006-2010. Prices in $/ton for Alfalfa, $/bu for Crops, and $/cwt for Livestock*

Commodity	2006	2007	2008	2009	2010	Average
Non-Irrigated Alfalfa	$ 111.07	$ 94.87	$ 113.60	$ 96.79	$ 100.54	$ 103.37
Non-Irrigated Brome	63.94	71.04	67.30	53.91	53.70	61.98
Non-Irrigated Corn	3.40	4.27	4.39	3.78	5.08	4.18
Non-Irrigated Grain Sorghum	3.92	4.46	3.77	3.49	4.94	4.12
Non-Irrigated Soybeans	7.07	10.26	10.07	10.02	12.13	9.91
Non-Irrigated Wheat	5.61	8.21	7.86	5.86	5.69	6.65
Cow/Calf	91.98	98.07	84.23	84.79	110.84	93.98
Dairy (Milk)	15.13	19.95	20.98	16.36	18.95	18.27

Source: Kansas Farm Management Associations.

Table 2. *Sensitivity Analysis of Expense-to-Income Ratio on Prices of Commodities Needed to Attain Net Cash Flow.*

Expense/Income ratio	Gross income required	Profit objective price		
		Beef/cwt.	Corn/bu.	Soybeans/bu.
0.75	437,760	127.35	2.34	6.14
0.80	547,200	159.19	2.92	7.67
0.85	729,600	212.25	3.90	10.23
0.90	1,094,400	318.37	5.85	15.34

Table 3. *Sensitivity Analysis of Different Percentage Allocation to Enterprises.*

Enterprise	Percentage allocation	Profit Objective Price
Beef	16	$159.19 per cwt.
Corn	47	2.92 per bu.
Soybeans	37	7.67 per bu.
Beef	12	$119.39 per cwt.
Corn	49	3.05 per bu.
Soybeans	39	8.08 per bu.
Beef	20	$198.98 per cwt.
Corn	45	2.80 per bu.
Soybeans	35	7.25 per bu.

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