# Profitability of Livestock Diversification

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Many eastern North Dakota grain farms have become highly specialized. With this specialization has come increased uncertainty. Changes in the market price of one or two crops can make all the difference between profit or loss. Costs have increased dramatically in recent years. Purchased inputs such as fertilizer, fuel and farm chemicals are a much larger part of farm expenses. This makes farm profitability subject to forces beyond the farmer's control.

Farmers are looking for ways to increase the income of their operations. Many are also considering diversifying to reduce dependence on one or two main commodities. A cow-calf herd can be an efficient means of converting an unused resource — crop residues — into a saleable product — beef. This could help achieve both goals: increasing income and reducing income uncertainty.

Research recently completed by the agricultural economics department studied the profitability of this option by comparing two situations: a traditional eastern North Dakota grain farm, and the same grain farm with a drylot cow-calf herd added. The grain enterprise was modeled after an average-sized farm located in Foster County. The economic feasibility is studied through a 30-year comparison of returns of a grain farm with and without a drylot cow herd. The effect of herd size on income was also investigated.

## GRAIN FARM

The model farm was designed to represent a typical farm in east-central North Dakota. Grain crops considered were the top six crops grown in Foster County according to the 1982 Census of Agriculture: hard red spring wheat (HRSW), durum, barley, oats, corn, and oil sunflowers. The farm is 1,132 acres, the 1982 average of grain farms in the county. Maximum crop acreage allowed within the model are: 430 acres wheat base, 410 acres oil sunflower, 166 acres corn base, and 130 acres feed grain base.

The effect of the drylot cow-calf enterprise on profitability of the grain farm over time was analyzed using 30 years of yield and price information (1958-1987). Foster County average yields for each of the crops were adjusted to technology. Seasonal average crop prices for the central crop reporting district were adjusted to 1987 dollars.

Owner labor available during critical times of the year was 11 hours per day, seven days a week for one person. Only 60 percent of this was available for field work, to allow for downtime (20 percent) and unfavorable weather (20 percent). Hired labor was limited to 50 percent of the amount of owner labor.

Equipment and labor requirements for tillage operations are based on the 1987 Farm Management Planning Guide, published by NDSU Extension Service (Table 1).

Farm program deficiency payments were based on 1987 Agricultural Stabilization and Conservation Service (ASCS) county average yields multiplied by the difference between the crop price for that year (in 1987 dollars) and the 1987 target price. If the crop price for a specific year is less than the 1987 loan price, the difference between the loan price and target price is used to calculate the deficiency payment for that year. Target price, loan price, and county average yields for farm program crops are shown in Table 2.

## DRYLOT COW-CALF HERD

The size of the added drylot cow herd was 65 head, which was the average beef cow herd size for commercial producers in North Dakota. The midpoint of calving season

**Table 1. Equipment and labor requirements for field operations, Foster County, North Dakota.**

| Operation | Machine | Required labor, hours per acre[a] |
|---|---|---|
| Cultivating | 28' field cultivator | .075 |
| Fertilizing | 40' fertilizer spreader | .035 |
| Seeding | 28' grain drill | .100 |
| Spraying | 50' sprayer | .053 |
| Planting | 8 row, 30" rows | .152 |
| Cultivating | 8 row, 30" rows | .134 |
| Swathing | 20' self propelled | .103 |
| Combining | large combine | .176[b] |
| Harrowing | 48' harrow | .036 |
| Chiseling | 20' chisel plow | .117 |
| Combining | large combine, 8 rows | .235 |
| Disking | 24' offset disk | .075 |
| Plowing | 9 bottom, 18" bottoms | .173 |

[a] includes time for filling equipment (i.e., drills, sprayer)

[b] includes time for hauling grain

**Source:** Minnesota Farm Machinery Cost Estimates for 1980.

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**Table 2. Government farm program set-aside coefficients, Foster County, N.D. average yields, target prices, and loan rates (1987).**

| Item | Crop | | | |
|---|---|---|---|---|
| | Wheat | Barley | Oats | Corn |
| Target price ($/bu.) | 4.38 | 2.60 | 1.60 | 3.03 |
| Loan price ($/bu.) | 2.22 | 1.29 | .79 | 1.66 |
| Expected deficiency payment ($/bu.) | 2.16 | 1.31 | .81 | 1.37 |
| Foster County average yield (bu/acre) | 28 | 42 | 48 | 60 |
| Required setaside (%) | 27.5 | 20 | 20 | 20 |

**Source:** Foster County ASCS office.

was March 13. Calving at this time means most of the herd has calved by April 10, before the start of spring field work. Calves are creep-fed and sold about Sept. 1. Livestock rations are shown in Table 3. The breeding season starts May 15 and runs through June 30. The brood cow herd grazes crop residues after harvest (from Sept. 1 through Nov. 14), which reduces labor and feed requirements. Cows are moved into drylot and winter feeding starts on November 14.

Production coefficients for the drylot cow-calf herd were estimated by analyzing 1985, 1986, and 1987 performance records from the Carrington Experiment Station and are listed in Table 4.

The cow-calf enterprise is more labor intensive than the cash grain farm, making it necessary to consider labor needs. Dale Burr and Vern Anderson of the Carrington Experiment Station estimated per head labor needs for the cow-calf system (Table 5). The experiment station has its midpoint of the calving season approximately April 10; therefore, labor requirements are advanced by one month to allow labor needs to be coordinated within the format set up for the cash grain farm. The labor coefficients include labor required for fence and equipment maintenance but not for harvesting and hauling forage, which is custom hired.

Owner labor is considered available for the livestock only when it is not needed for field labor. This means labor available for livestock chores may be limited to only 20 percent of an 11-hour, seven-day work week. This time is available because weather does not allow field work. Hired labor for livestock is available at 50 percent of available owner labor. The livestock operation may use excess field labor but not vice versa.

Two price series were used to determine revenue distributions for the livestock enterprise. A North Dakota September average price series from 1958 through 1987 is used for weaned steer and heifer calves. The other price series is the annual average price of culled cows and yearling heifers. An annual average is used because cull cows and heifers may be sold throughout the year. Both price series are adjusted to 1987 dollars.

## RESULTS

Labor requirements increase by 56 percent with the addition of the drylot cow-calf herd. The grain farm with the cow-calf system requires 499 more hours labor than the

**Table 3. Brood cow herd rations, lbs/head/day (1987).**

| Livestock Type | Feed | | | | | Days Used |
|---|---|---|---|---|---|---|
| | Corn | Barley | Corn Silage | Alfalfa Hay | Straw | |
| Heifer calves | | | 11 | 11 | 2 | 365 |
| Mature brood cows | | | | | | |
| Mid gestation | | | 12 | 7 | 10 | 30 |
| Late gestation | | | 14 | 9 | 8 | 90 |
| Lactation | | | 40 | 12 | | 170 |
| Bred Heifers | | | | | | |
| Mid gestation | | | 26 | 8 | 5 | 91 |
| Late gestation | | | 30 | 10 | 3 | 90 |
| Lactation | | 5 | 30 | 12 | | 170 |
| Bulls | | | | | | |
| Young (1-2 yrs. old) | | | 15 | 20 | | 153 |
| Old | | | | 30 | | 275 |
| Calves (creep fed) | 2 | 2 | | 2 | | 170 |

**Source: Carrington Experiment Station drylot herd records, Carrington, N.D.**

**Table 4. Production coefficients of drylot cow-calf herd.**

| Item | Coefficient |
|---|---|
| Steer weaning weight | 504 pounds |
| Heifer weaning weight | 472 pounds |
| Cow weight | 1,200 pounds |
| Bull weight | 2,000 pounds |
| Death loss | 1 percent |
| Cow replacement | 16 percent |
| Heifers retained | 18 percent |
| Calves live weaned | 90 percent |
| Calves live weaned per cow exposed | 76 percent |

**Source:** Carrington Experiment Staton drylot herd records, Carrington, N.D.

**Table 5. Drylot cow-calf labor requirements per head per month.**

| Month | Hours Per Head |
|---|---|
| December | .4 |
| January | .4 |
| February | 1.6 |
| March | 2.0 |
| April | 1.2 |
| May | 1.4 |
| June | .2 |
| July | .2 |
| August | .4 |
| September | .1 |
| October | .1 |
| November | .4 |
| Total | 8.4 |

**Source:** A coordinated estimate by Vern Anderson and Dale Burr based on experience at Carrington Experiment Station.

grain farm. Of the increase, 170 hours or 34.1 percent occur during months when labor is required for field work. About 40 percent of total available labor is used by the grain farm before and after addition of the drylot cow-calf operation. Since forage harvesting is custom hired, it is treated as a variable cost and not as labor.

Income increased by $12,166 after addition of the drylot cow-calf system (Table 6). The major change in crop acreage was to reduce oil sunflowers by 70 acres, equal to the increase in alfalfa hay acreage needed to support the cow herd. Total corn acreage was unchanged, but 24 acres was harvested as silage after adding the drylot cow-calf herd. All government base acres are in production. In this model, the grain farm with cow-calf herd requires about $4,000 more in operating capital than the grain farm alone.

## MAXIMUM DRYLOT COW HERD SIZE

Cow herd size was allowed to adjust until factors on the farm limited the number of cows. The limiting factor was labor. The expected level of profit increased $1,110 as the cow herd size increased to 70 head. Table 7 presents the enterprise allocation with drylot cow herd size not fixed. Cow herd size cannot get any larger than 70 head because all owner and hired labor is being used from May 2 to May 23, the start of the breeding season as well as planting season for row crops.

To support the additional five head of cattle, corn silage acreage was increased by 1 acre and hay was increased by 4 acres, which reduced oil sunflower by 4 acres and corn grain by 1 acre. Durum and oats do not enter the solution set.

## CONCLUSIONS

Addition of a drylot system is feasible from the standpoint of labor available. It increases income by $12,166. However, hired labor is needed for the spring planting season. The increase in income when adding the drylot cow herd should be high enough to cover the increased costs incurred and to allow an acceptable return to labor and management. If, for example, it cost $60,000 to add the cow herd and facilities, $6,000 would be needed to service that investment at 10 percent interest, which leaves $6,166 return to labor and management.

Using existing facilities could significantly reduce the needed investment. A farmer may have a pole barn and corral system he is not using. Therefore, he could incorporate the drylot cow herd with minimal added investment, leaving increased returns to labor and management. Contrast this to a situation where the farmer may need to construct a new pole barn and corrals and to purchase more equipment. In this case, returns to labor and management may be unsatisfactory. For these reasons, each producer's situation must be evaluated on an individual basis.

Some things not included in this project need further attention. In this model, field labor was 60 percent of total labor available. This figure should be investigated more fully, because a 10 percent change in field labor availability could affect strategies. Not considered within the drylot enterprise was the benefits of manure use on the grain fields.

Two publications which may help a farmer in budgeting and overhead expense for a drylot cow-calf enterprise are "How Much Debt Will A Beef Cow Support?" and "Preparing and Understanding a Beef Cow-Calf Enterprise Budget." These publications are available from the North Dakota State University Extension Service, Fargo, N.D.

## REFERENCES


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**Table 6. Optimal land allocation and average returns (1958-1987) for grain farm and grain farm with cow-calf herd.**

| | Contribution to Overhead | HRSW | Corn | Corn Silage | Hay | Barley | Sun-flower | Fallow |
|---|---|---|---|---|---|---|---|---|
| | | acres | | | | | | |
| Grain farm | $63,776 | 312 | 133 | — | — | 104 | 406 | 177 |
| Grain farm with CC herd | $75,942 | 312 | 109 | 24 | 70 | 104 | 336 | 177 |

**Table 7. Optimal land allocation and average returns (1958-1987) for grain farm with variable cow herd size, Foster County, N.D.**

| Contribution to Overhead | HRSW | Corn | Corn Silage | Hay | Barley | Sun-flower | Fallow | Cow |
|---|---|---|---|---|---|---|---|---|
| | acres | | | | | | | head |
| $77,017 | 312 | 108 | 25 | 74 | 104 | 332 | 177 | 70 |