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## Abstract

Ninety farm households located in East-Central Saskatchewan were surveyed to determine the characteristics that affected their decision to enter into, expand, or not expand cow-calf production between 1995 and 2001. Of the 90 farm households, 36 had increased, 40 had maintained, and 14 had decreased the size of their beef cowherd between 1995 and 2001. The study found first that given the effect of age on the probability of beef cowherd expansion, new entrants to farming will be needed if beef cattle numbers are to significantly expand. Second, in order to cover the high switching costs involved with shifting from grain to cow-calf production, the farm household typically needs to borrow money. Third, farm households that owned beef cows in 1995 are the group of farm households that have been predominantly responsible for the expansion of the beef cowherd in the research area between 1995 and 2001. Fourth, farm households with farm operators earning income from off-farm employment were hindered from expanding their beef cowherd between 1995 and 2001. Farm advisors should realize farm households consider many other factors in their decision making than just on-farm economics.

## Cow-calf Expansion with the Removal of Transportation Subsidies in East Central Saskatchewan, Canada

By Tim M. Highmoor, Andrew Schmitz, William J. Brown, and Ken Rosaasen

### Introduction

The objective of this paper was to determine characteristics of farm households, located in East-Central Saskatchewan, that affected each's decision to enter into, expand, or not expand cow-calf production between 1995 and 2001. The area surveyed is among a group of communities in Western Canada located the farthest from a major saltwater port. The removal of the Western Grain Transportation Act (WGTA) subsidy on transporting grain to export position and the new method of port price pooling have caused grain freight rates to increase sharply since August 1, 1995.



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In the 1994-95 crop year, the nominal freight rate for shipping wheat out of Norquay, the largest town in the area and the only town with an export grain handling facility open for business in 2001, was Cdn \$12.25/tonne. In the 1995-96 crop year the freight rate was roughly tripled to Cdn \$36.99/tonne. In the 2001-02 crop year, the freight rate was Cdn\$39.14/tonne.

However, producers were not fully compensated for the loss of the WGTA transportation subsidy (Schmitz, Highmoor, and Schmitz, 2002). Therefore there has been a significant economic incentive to switch from export crop production to other farm enterprises, especially beef production since the area is well suited to raising cattle. This paper is important to farm advisors because it demonstrates that the economics of on-farm production is not the only thing upon which farm households base their decisions.

### The Survey

Ninety farm households were interviewed in person in order to gain a perspective on beef herd expansion and to obtain data for empirical analysis (see survey instrument in Highmoor, 2002).

Of the 90 farm households, 36 had increased, 40 had maintained, and 14 had decreased the size of their beef cowherd between 1995 and 2001. The survey was divided into two sections. The first was open-ended and designed for respondents to state their own reasons for choosing the production decisions they had made between 1995 and 2001.

Farm households that did or did not expand their beef cowherd between 1995 and 2001 were asked to state their reasons for having made the production choice they did. Respondents were allowed to cite as many reasons as they desired.

The main reasons given for why the respondents did not enter into or expand their beef cowherds between 1995 and 2001 were: 1) age; 2) high switching costs for switching from grain to cattle production; 3) shortage of available labour for beef production; and 4) increased beef production interference with off farm employment (Table 1).

The main reasons given in Table 2 for why respondents entered into or expanded their beef cowherds between 1995 and 2001 were: 1) profit earned in cow-calf versus grain production; 2) crop input costs too expensive compared to the returns being earned; and 3) operations achieved greater enjoyment from

raising cattle compared to growing grain. Removal of the WGTA was only mentioned three times, recognizing the removal of the WGTA affected the relative profitability of different enterprises; hence, the impact of the removal of the WGTA may have been understated.

The socioeconomic information analyzed was: age of the youngest farm operator in the farm household (AGE); the number of farm operators belonging to the farm household (NUMOPER); the number of farm operators belonging to the farm household earning income from off-farm employment per number of farm operators belonging to the farm household (OFE%); whether or not the farm household had debt prior to expanding or considering expansion of its cowherd (DEBT); whether or not the farm household would have or did have to borrow money before expanding its beef cowherd (BORROW); the level of cow-calf production skills of the farm household (SKILLS) (measured by very poor = 1 and excellent = 5); the number of acres of land owned and used for grain production in 1995 (GRAIN95); the number of beef cows owned in 1995 (BEEFCOWS95); and the average quality of land owned and used by the farm household for grain production in 1995 (LQ) (measured by extremely poor = 1 and extremely good = 5). A binary choice probit model<sup>1</sup> was used to determine farm household production decisions between 1995 and 2001. Under the probit model framework, the decision of a farm household represents one of only two choices: to increase or not to increase the size of their herd.

### Results

Table 3 summarizes the findings of the Probit analysis. All the variables were significant except the number of farm operators in the household (NUMOPER) and land quality (LQ), which will no longer be discussed.

(AGE): The average age of the youngest farm operator in each of the 90 farm households was 47.3 years of age as of August 1, 2001. The average age of all farm operators included in the study was 51.7. The median age of all the farm operators was 50.5. Figure 1 shows the probability of the farm household expanding its beef cowherd between 1995 and 2001 increased at a decreasing rate as the age of the youngest farm operator increased from 17 to 36.5 years of age and decreased at an increasing rate thereafter. The

group of farm households that had the highest probability of having expanded their beef cowherd between 1995 and 2001 were those whose youngest farm operator was between 25 and 43 years of age as of August 1, 2001.

(OFE%): Seventy-three of the 90 farm households had at least one farm operator who had earned off-farm income between 1995 and 2001. However, only 47 of these had earned income from off-farm employment, whereas the remaining 26 farm households were earning off-farm income from Old Age and Canada Pension Plans (investment returns in stock markets and mutual funds were not considered). The average proportion of farm operators in the farm household who had earned income from off-farm employment between 1995 and 2001 was 0.398. Figure 2 shows the highest probability of expanding the beef cowherd between 1995 and 2001 occurred when 0.41 of the farm households' operators had earned income from off-farm employment between 1995 and 2001. This result likely came about because of two reasons. First, the income earned from off-farm employment may have helped to cover some of the switching or expansion costs incurred when the beef cowherd was increased. Second, there were still some operators available to the household to handle the workload associated with having more cows. Farm households with all of their operators earning income from off-farm employment had the lowest probability of having increased their beef cowherd.

(DEBT): The results of the probit regression show the marginal effect of the DEBT variable to be statistically significant, but positive rather than negative. This means the probability the farm household expanded its beef cowherd between 1995 and 2001 was higher if it had debt prior to the expansion than if it did not have any debt. It was found that 28 of the 55 farm households that had debt prior to expansion of their beef cowherd had in fact expanded their beef cowherd between 1995 and 2001, whereas only eight of the 35 farm households that did not have any debt between 1995 and 2001 had expanded their beef cowherd between 1995 and 2001.

The DEBT variable was found to have a positive rather than a negative marginal effect for at least three reasons. First, older aged farm households had a much lower

probability of expanding their beef cowherd between 1995 and 2001. Second, younger aged farm households (Figure 1) have the highest probability of increasing their beef cowherd between 1995 and 2001. They likely had debt because they had only been in the farming business for a relatively short period of time and still had debts to pay off. Third, those with debt may have been less risk averse and more willing to embrace change.

(BORROW): The results of the probit regression found the marginal effect of the BORROW variable to be negative and statistically significant. Having to borrow money to cover the high costs of switching or expanding a farm operation to include additional beef cows was a major constraint preventing these farm households from expanding their cowherds.

(SKILLS): The marginal effect of the SKILLS variable was positive and statistically significant. Of the 46 farm households that rated their cow-calf production skills to be a 4 or 5 out of 5, 23 had expanded their beef cowherd between 1995 and 2001. Meanwhile, only 13 of the 44 farm households that rated their cow-calf production skills to be a 1, 2, or 3 out of 5 had expanded their beef cowherd between 1995 and 2001.

(GRAIN95): In 1995, the average acreage of grain land owned and used by these 90 farm households for grain production (including summerfallow) was approximately 560 acres. Interestingly enough, this number declined to 458 acres as of 2001, a reduction of approximately 9,200 acres, which is a reduction of 18.6 percent. There were only 84 farm households that were using their own land for grain production in 1995 (not 90). As of August 1, 2001, only 71 of the 90 farm households included in the study were using their own land for grain production.

The highest probability of expanding the beef cowherd between 1995 and 2001 occurred when the farm household used approximately 1,065 acres of its own land for grain production in 1995 and was at its highest range when the farm household used between 502 and 1,626 acres (Figure 3). This acreage range excludes three different groups not likely to expand the cowherd of this area. First, many of the retired farm households that rent their land out and

typically had 480 acres of land or less. Second, the large grain producing farm households that feel they have too much time and capital invested in grain farming to consider getting into cow-calf production. Third, farmers with small land holdings spend the greatest percentage of their time earning off-farm income.

(BEEFCOWS95): Thirty-six farm households increased, 40 maintained, and 14 decreased the size of their beef cowherd between 1995 and 2001. However, of the 40 farm households that maintained the size of their beef cowherd between 1995 and 2001, 31 never had any beef cows in either 1995 or 2001. Thus, only nine of the 40 farm households actually maintained a constant herd size. Of the 36 farm households that had expanded their beef cowherd between 1995 and 2001, 30 already had beef cows in 1995.

To accurately report the typical herd size that existed among these farm households, it should be realized that only 52 of the 90 farm households included in the study owned beef cows in 1995, of which the average herd size was 42 beef cows. As of August 1, 2001 there were still only 52 farm households that owned beef cows; only this time the average herd size had increased to 62 cows. This represents an expansion of approximately 1,000 cows, of which 80 percent were added to herds that existed in 1995.

The probability of the farm household expanding its beef cowherd increased at a decreasing rate from 0-65 beef cows owned by the farm household in 1995, after which it decreased at an increasing rate (Figure 4). The group of farm households that had the highest probability of having expanded their beef cowherd between 1995 and 2001 was the group who owned approximately 15 to 115 beef cows in 1995. The probability that farmers with herd sizes larger than 115 beef cows increased their beef cowherd by 2001 was quite low (however, there were only four farm households included in the study that owned 100 or more beef cows in 1995).

Those who were small to medium sized cow-calf producers in 1995 were the group most likely to have expanded their beef cowherd between 1995 and 2001. This is reasonable

due to the probit regression results and the fact that only six of the 38 farm households that did not have beef cows in 1995 now own beef cows. Furthermore, the farm household with a large beef cowherd (i.e., over 100 beef cows owned in 1995) may have been earning enough money for a comfortable living, given the high cattle prices between 1995 and 2001, and therefore did not feel the need to expand herd size.

### Implications and Conclusions

If the size of the cowherd of this region is to expand further, the barriers found in this study preventing these producers from expanding cow-calf production must first be overcome. First, given the effect of age on the probability of beef cowherd expansion, either new entrants and/or young people returning to farming will be needed if beef cattle numbers are to significantly expand. Second, in order to cover the high switching costs involved with shifting from grain to cow-calf production, the farm household typically needs to borrow money. This was a major factor constraining many farm households in the area from expanding their beef cowherd. Third, farm households that owned beef cows in 1995 are the group of farm households that have been predominantly responsible for the expansion of the beef cowherd in the area between 1995 and 2001. Very few of the farm households that did not have cattle in 1995 appear to have gotten into cow-calf production as of 2001. It would appear these farms are not interested in cow-calf production for a number of reasons (age, off-farm employment, borrowing, cow-calf skills, leisure time considerations); hence government should not spend money and time on trying to entice them into cow-calf production. Fourth, farm households with farm operators earning income from off-farm employment were hindered from expanding their beef cowherd between 1995 and 2001. In many cases it appeared farm households were unable to acquire enough land and cattle to not have to rely on income from off farm employment. These farm households are already earning income from off-farm employment and are uneasy about the risks associated with expansion using borrowed money. Therefore these farm households must be presented with, or find, a way of being able to expand their beef cowherds so that they can earn enough money on the farm and not have to rely on income earned from off-farm employment for survival.



Those farm households that have recently entered into/expanded their cowherds with substantial amounts of borrowed money will be facing financial difficulties now or in the near future. Those farm households currently contemplating entry into/expansion of their cowherds have most likely put their plans on hold. The BSE crisis is another indication of how outside forces can drastically change the fortunes of the cowcalf industry.

The information presented in this paper is important for farm advisors. Even though the on-farm economics of beef production improved substantially with the elimination of the WGTA, most farms did not expand or enter into beef production. Farm advisors should realize farm households consider many other factors in their decision making than just on-farm economics.

### Endnotes

<sup>1</sup> Binary choice models involve estimation where the dependent variable is discrete rather than continuous (Griffiths, Hill, and Judge, 1993). The dependent variable takes on the value of 0 (no expansion of the beef cowherd) or 1 (an expansion of the beef cowherd). The objective is to determine the probability that a firm with given characteristics will choose one alternative over another. A probit regression model is one of several forms in which a binary choice model can be presented. This random variable is assumed to be normally distributed. The occurrence of this event varies from firm to firm for two reasons: (1) random variation from firm to firm and (2) differences in the independent variables (age, number of farm operators, the occurrence of off-farm income etc.). This model does not observe the net benefit of expanding the beef cowherd, only whether the farm household has done so or not. For example, one factor of interest was the marginal effect of age on the probability that the farm household expanded its beef cowherd between 1995 and 2001. The parameters of the model, like those of any non-linear regression model are not necessarily the marginal effects usually analyzed. They represent the marginal effect or probability of expanding the beef cowherd, as the value of one of the independent variables changes (ex. AGE) and the remaining independent variables are held constant at their sample means (Greene, 1990).

Possibly many of the variables analyzed may in fact produce marginal effects, which are not linear. For instance, possibly the marginal effect of (AGE), on the probability that the farm household expanded its beef cowherd between 1995 and 2001, may be different for farm operators at younger ages (e.g., less than 30) than at older ages (e.g., greater than 60). Therefore, in order to add some flexibility, but not complicate the calculation of the model, each of the quantitative variables included in the model was set to the first and second power. The dummy and intercept variables were not raised to the second power.

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*Table 1. Reasons for Not Expanding the Beef Cowherd Between 1995 and 2001*

|  | <b>Number of Responses</b> |
|--|----------------------------|
| Age  | 20                         |
| Switching Costs are to high/would have to borrow money to expand herd size                           | 15                         |
| Shortage of Labor for a cow-calf operation   | 12                         |
| Expanding herd size would interfere with off-farm employment   | 8                          |
| Enjoy grain farming lifestyle/grain production allows holidays during the year                       | 6                          |
| Lack of experience with cow-calf production  | 5                          |
| Believe in specialization in grain farming/working on economies of size in grain farming             | 4                          |
| Too risky to switch into cow-calf  | 4                          |
| Foresee cattle industry experiencing low prices like the late 1970's/no luck with cattle in the past | 3                          |
| Do not like cattle   | 3                          |
| Expected grain prices to have increased by now   | 2                          |
| Satisfied with existing operation  | 2                          |
| More profit in grain versus cattle   | 2                          |

*Table 2. Reasons for Expanding Beef Cowherd Between 1995 and 2001*

|  | <b>Number of Responses</b> |
|--|----------------------------|
| More profit in cow-calf versus grain (low grain prices/grain farming unprofitable) | 20                         |
| Rising crop input costs  | 12                         |
| Enjoy working with cattle & forages more than growing grain                        | 6                          |
| Land more suited to forages/livestock than grain production                        | 3                          |
| Crow (WGTA) removal & rail transportation issues                                   | 3                          |
| Closure of elevators   | 3                          |
| Building up retirement in livestock and land                                       | 2                          |
| Less control from multi-national grain companies & government                      | 2                          |

*Table 3. Summary of Findings*

| <b>Variable</b>         | <b>Actual Marginal Effect</b> | <b>Combined Marginal Effect</b> | <b>Statistically Significant</b> |
|-------------------------|-------------------------------|---------------------------------|----------------------------------|
| AGE                     | +                             | Positive to 36.5 years          | *                                |
| AGE <sup>2</sup>        | -                             | Negative after 36.5 years       | *                                |
| OFE%                    | +                             | Positive to 41%                 | **                               |
| OFE% <sup>2</sup>       | -                             | Negative over 41%               | **                               |
| NUMOPER                 | -                             |                                 |                                  |
| NUMOPER <sup>2</sup>    | +                             |                                 |                                  |
| DEBT                    | +                             | Positive                        | *                                |
| BORROW                  | -                             | Negative                        | *                                |
| SKILLS                  | +                             | Positive                        | *                                |
| GRAIN95                 | +                             | Positive to 1065 acres,         | *                                |
| GRAIN95 <sup>2</sup>    | -                             | Negative over 1065 acres        | *                                |
| BEEFCOWS95              | +                             | Positive to 65 beef cows        | *                                |
| BEEFCOWS95 <sup>2</sup> | -                             | Negative over 65 beef cows      | *                                |
| LQ                      | +                             |                                 |                                  |

\* at 95% level; \*\* at 90% level

Figure 1. AGE and Probability of Expanding the Beef Cowherd Between 1995 and 2001

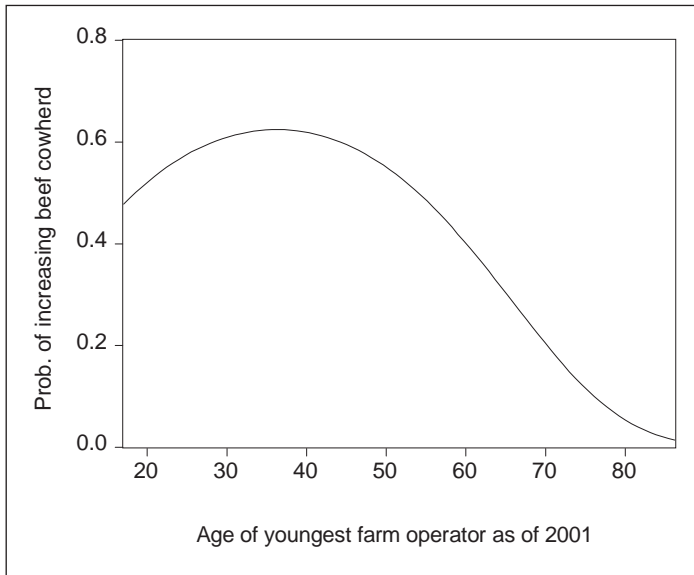


Figure 2. Off-farm Employment and Beef Herd Expansion Between 1995 and 2001

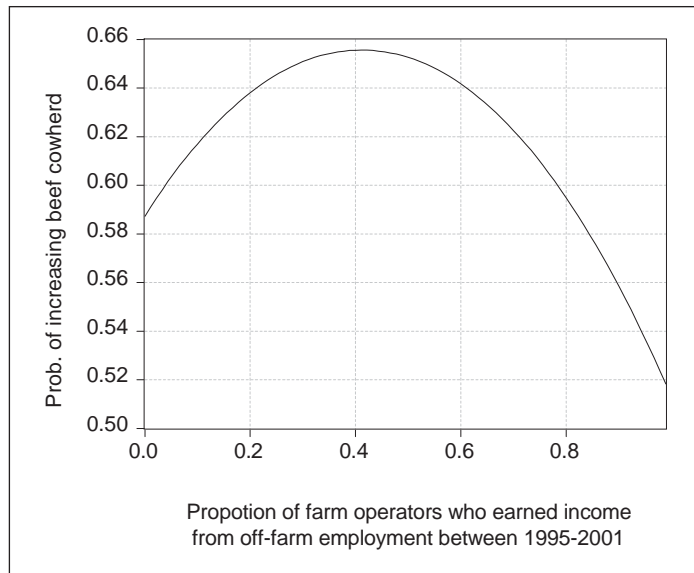


Figure 3. Acreage Owned and Beef Cowherd Expansion Between 1995 and 2001

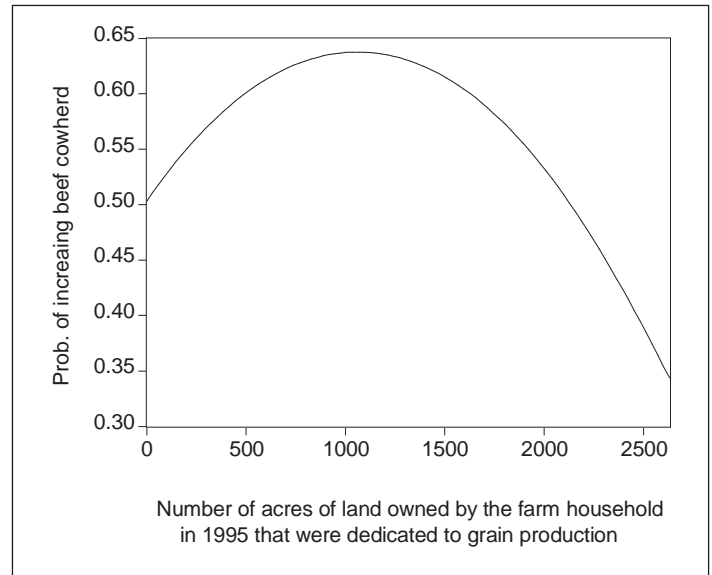


Figure 4. Beef Cows Owned and Probability of Beef Cowherd Expansion

