The Delicate Balance of Barley as a Feed Crop

Vernon J. Racz

Prairie Feed Resource Centre, Department of Animal and Poultry Science
University of Saskatchewan, 6D34 – 51 Campus Drive, Saskatoon, SK S7N 5A8

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Abstract

The global feed industry consumes 36% of total crop production and is dominated by corn and soybeans. To be competitive producing meat, milk, or eggs, a competitive feed source is required. Increased transport costs and the drive for increased efficiency of livestock production have rearranged the competitiveness and placement of barley as a feed crop. Barley lacking the bulk density of corn and being slightly less dense in energy has at first glance a lower chance of competing as a feed source. Targeted breeding for special characteristics that give added value, yield increases as a crop, providing dual use and exploiting the relationship between malting and feed are avenues to increase barleys competitiveness.

The industry changes to facilitate identity preservation and potential for designer food products are opportunities for barley to regain and retain market share. The challenge is not if we will do it, but when and what to do.

Introduction

In any system of feed development there must be included basic research and applied technology with commercial development. To be efficient the two must be combined in a systems approach. The opportunities this system affords is enhanced efficiency and increased dollar impact. The following details an approach to identify position and possible solutions to improving barley as a feed.

To capture these opportunities in the feed sector there are certain aspects that must be recognized that makes Saskatchewan unique. We basically have a larger crop producing sector that exceeds our livestock's capability to consume it. This situation is further complicated by increasing transport costs lower nutrient density in our feeds and a limited domestic market. Thus we have to contend with a global market, increasing nutritional knowledge, and a drive for both the livestock and crops industries worldwide to minimize risk in production.

Situation

In terms of global production, corn is the largest feed crop with some 590 million tonnes produced and 78 million tonnes traded (table 1). Barley has a global production of 135 million tonnes and only 13.5 million tonnes traded globally, mainly for malt, from the significant exporters. Canada, in 2000, exported only 260 thousand tonnes for feed (table 2).

Saskatchewan produces the lion's share of crops in Canada (tables 3, 4). With barley, 80% is grown for malting, 20% of which is accepted for malt. Because we have no real export feed market for barley we have to use 80 to 85% of the barley domestically for feed. With field peas 75% are sold in the feed market and it is competitive in the export market for reasons of nutrient density, bulk density and a special fit in the marketplace.

Barley, our main feed crop, is in a particular bad bind in that production exceeds local consumption and the excess must be exported to Alberta or further on average production years. Considering Saskatchewan produces 1.80 million pigs and it takes 1.0 tonne of feed for three pigs to market, we only need 600,000 tonnes of feed total. Our beef industry must consume the rest or export the barley. Table 5 shows the current status of barley in the feed system (Sask.). While it is recognized, because of weather that we have an artificially high price for barley, there is no known lower end for corn as they price corn into the market to compete and capture maximum dollar. The fact is corn in Lethbridge will be a better buy than our barley. As well the barley fed here must compete with corn competitively as a feed for our livestock producer because the export market for meat is the same. In short, we need competitive feeds to have competitive meat products.

In growing feed crops crop producers must have a price to allow economic sustainable production. Tables 6 and 7 are results from the Crops Livestock Interface project and shows the relative costs of production per unit of feed grain in the dark brown and black soil zones. In addition, nutrient yield per acre is given. It clearly shows for non-ruminants like pigs, while hulled barley is OK more mileage could be gained from a high yielding CPS wheat or hulless barley. For ruminants, which can digest more fibre, lower quality barley or other special barley would have greater impact. It should be noted that in 2001 (April) barley prices at Wadena were $2.05/bushel and October 2002 prices were $2.81/bushel, taking a severe drought in Alberta to increase price above the cost of production. . Not responding to increase barley's competitiveness would place our livestock and barley crop industries at a disadvantage to others restricting growth in both sectors.

Potential Opportunity

To capture market demands we need to create competitive feed sources that can be used to create unique safe food products. There is potential to use barley to create special designer meats and for production of specialty malts that can be linked to feeding activities in ways to increase the sustainability of growing barley.

Barley, through modeling in the Crops Livestock Interface, has shown little in any value increase from an increase in protein content table 8. Because of this, lower protein barleys are OK and open the door to accept high yielding malting varieties as feed. Rather greater gain can be had from activities on barley that would increase energy for both cattle and swine and giving it special characteristics such as having a low phytate content for increased phosphorus availability. Forage use as silage is also included as a possible enhanced feed use form.

Work begun on barley by the Crop Development Centre (B. Rossnagel) and Animal and Poultry Science has identified a slower digestion rate of the carbohydrate fraction in the rumen for a specific barley variety that increases efficiency of energy capture. This means a higher level of production (increased gain) or an estimated 5 to 10% increase in feed efficiency with feedlot steers on high grain diets. Reducing phytate content to increase available phosphorus of barley for pigs and poultry would save $2.50 to $3.00 per tonne of pig feed and be environmentally sustainable. Pioneer Grain has a low phytate corn on the market and Cargill is developing a field test for phytate to allow its commercialization as an IP grain. The CDC has a low phytate barley that is being bred up.

Further work is underway to identify superior feed barleys and superior malting varieties as to feed and yield characteristics under the CLI project. Commercial activities are underway to look at systems to combine specialty malt production, feedlots and special malt barley production. The results would be value added activity from malt production, feeding activity from an assured feed supply and malt barley crop production. Barley silage and identifying superior silage varieties not only increases efficiency of production but increases gross returns per acre, some 2 or 3 fold from a basic wheat crop. Table 9 shows gains with silage alone sold as crop standing in the field, while table 10 includes feeding activity or gain in gross returns.

Summary

Changes in the global feed marketplace and increased transport costs are necessitating improvements in barley to increase it's competitiveness. The changes possible are increasing nutrient density particularly energy increasing energy capture and giving it special characteristics such as low phytate. Other changes could include use as a forage crop, use to create designer meat products, and combining in a system of IP grains to give it value as a specialty malt or demonstrating food safety.

Table 1. Corn Production (2001)

- CORN: largest feed crop (590 M. t)
  - World trade: 78 M. t
  - Production: U.S. (253 M. t), China (106 M.T)
  - Exports: U.S. (50 M. t), China (7.0 M. t), Argentina (12.0 M. t),South Africa (5 M. t)
  - Major purchasers: Japan (16 M. t)
    Taiwan (5 M. t)
    Korea (9.0 M. t)
    Former Soviet Union (1.0 M. t)
    Mexico (4.8 M. t)
    S.E. Asia (Thailand, Philippines, Malaysia, Indonesia, others)

Source: USDA Website

Table 2: Barley Production (2001)

- Global production 135 M.t(2000) (155 in 1995)
- Exporters: Canada (3.17 M. t),
  Australia (2.67 M. t), EU (6.06 M. t)
  U.S. (1.45 M. t), as feed or for malt
- Importers, Saudi Arabia feed), Japan (feed, malt), China (malt)
- Canada exported 0.26 M. t for feed (2000)

Source: USDA Website

Table 3. Production of Cereal and Oilseeds

	Western Canada 2000 ('000 tonnes)			
	MB	AB	SK	CA
Wheat	4266.0	7287.8	13532.6	26804.0
Oats	657.0	657.0	1377.2	3389.4
Barley	1622.0	5388.7	5477.9	13468.1
Rye	55.9	42.5	97.8	260.3
Canola	1487.8	2154.6	3379.3	7118.7
Flaxseed	205.7	17.8	469.9	693.4

Source: Statistical Handbook 2001. Canadian Grain Commission

Table 4. Specialty Crop Production 2000

	('000 tonnes)			
	MB	AB	SK	CA
Mustard	13.8	3.3	185.1	202.2
Sunflower	101.8	5.1	12.4	119.3
Lentils	16.1	9.9	888.1	914.1
Field Peas	160.5	620.5	2072.4	2864.3
Canary Seed	5.0	17.2	148.6	170.8
Triticale	-	-	-	31.0
Tame Forage (hay)	2721.6	5556.5	3674.1	23145.1
Processed Forage (pellets & cubes)	40.0	349.0	372.0	810.0

Source: Statistical Handbook 2001. Canadian Grain Commission

Table 5. Current Position of Barley - Saskatoon Feb 14, 2003

Corn $171.00/tonne
Barley $162.00/tonne

Feeding value nutritionally (ruminant) = barley 93 to 95% of corn:
Real value price of barley
FOB Saskatoon = 159 to 162.45/tonne or 3.46 to 3.54/ bu.
Wadena barley in Lethbridge = 171.00 x 0.94 = 160.74 -30.00 = 130.74/tonne or2.85/bu.
Cost of barley prod black soil zone from SAF: $2.16/bu. (includes 17.33 land cost no labor & management, and 59.9 bu./acre on stubble)

Table 6. Position: Main Commodities

	Yields and Costs of Production: Stubble Crop		
	Soil Zone – Dark Brown		
	Barley	HRS	CPS
Total Variable			
Costs/acre	80.45	83.02	83.38
Total cost/acre	122.77	132.29	132.65
Yield bu/acre	45.1	28.0	34.3
Break even/bu	2.72	4.72	3.87
Break even/tonne	125.05	173.63	142.12
Yield of DE/Mcal/acre	3099.0	2657.0	3255.0
(swine)			
Yield of CP - kg/acre	108.24	103.09	116.93

Source: Crops-Livestock Interface Project

Table 7. Position: Main Commodities

	Yields and Costs of Production: Stubble Crop		
	Soil Zone – Black		
	Barley	HRS	CPS
Total Variable			
Costs/acre	85.25	89.87	90.23
Total cost/acre	146.95	151.57	151.93
Yield bu/acre	59.6	35.6	44.0
Break even/bu	2.47	4.26	3.45
Break even/tonne	113.26	156.46	126.89
Yield of DE/Mcal/acre	4096.0	3378	4176.0
(swine)	143.04	131.07	150.00
Yield of CP - kg/acre			

Source: Crops-Livestock Interface Project

Table 8. Value of Protein in Barley

Hog	12% CP	10% CP	Difference
Grow 30	147.36	143.95	3.41
60	148.15	145.66	2.49
100	147.79	146.21	1.58
Beef			
Grow 1	122.91	112.18	10.73
Med	124.18	124.18	0.00
Finish	113.60	113.60	0.00

Table 9. Examples of Forage Opportunities

1. Grain vs. silage
    - Barley silage 2.1 tonne D.M./acre
      = 1323 kg TDN
      = 2310 kg protein
    - Barley grain 60 bushels/acre = 1.30 tonnes
      = 1066 kg TDN
      = 156 kg protein
    - Question: Which is cheaper to produce? What if you paid for silage $30/tonne wet? (180.00/acre)

Table 10. What is the Value of Barley Silage?

2. Feeding Margin (700 lb. or 318 kg steer)
    - Yield adjusted for silo loss of 15%
      1.35 to 2.2 tonnes of dry matter fed
    - Amount of dry matter eaten/day; 8.1 kg (18 lb. DM)
    - Daily gain; 0.9 kg (2.0 lb.) from silage based on US-NRC Model (with implant and rumensin)
    - Gain per acre:
      from 1.35 tonnes; 150 kg or 330 lb.
      from 2.2 tonnes; 244 kg or 538 lb.
    - Gross income per acre at $1.00/lb.; $330 to $538

Source: D. A. Christensen, Dept of Animal and Poultry Science, University of Sask.