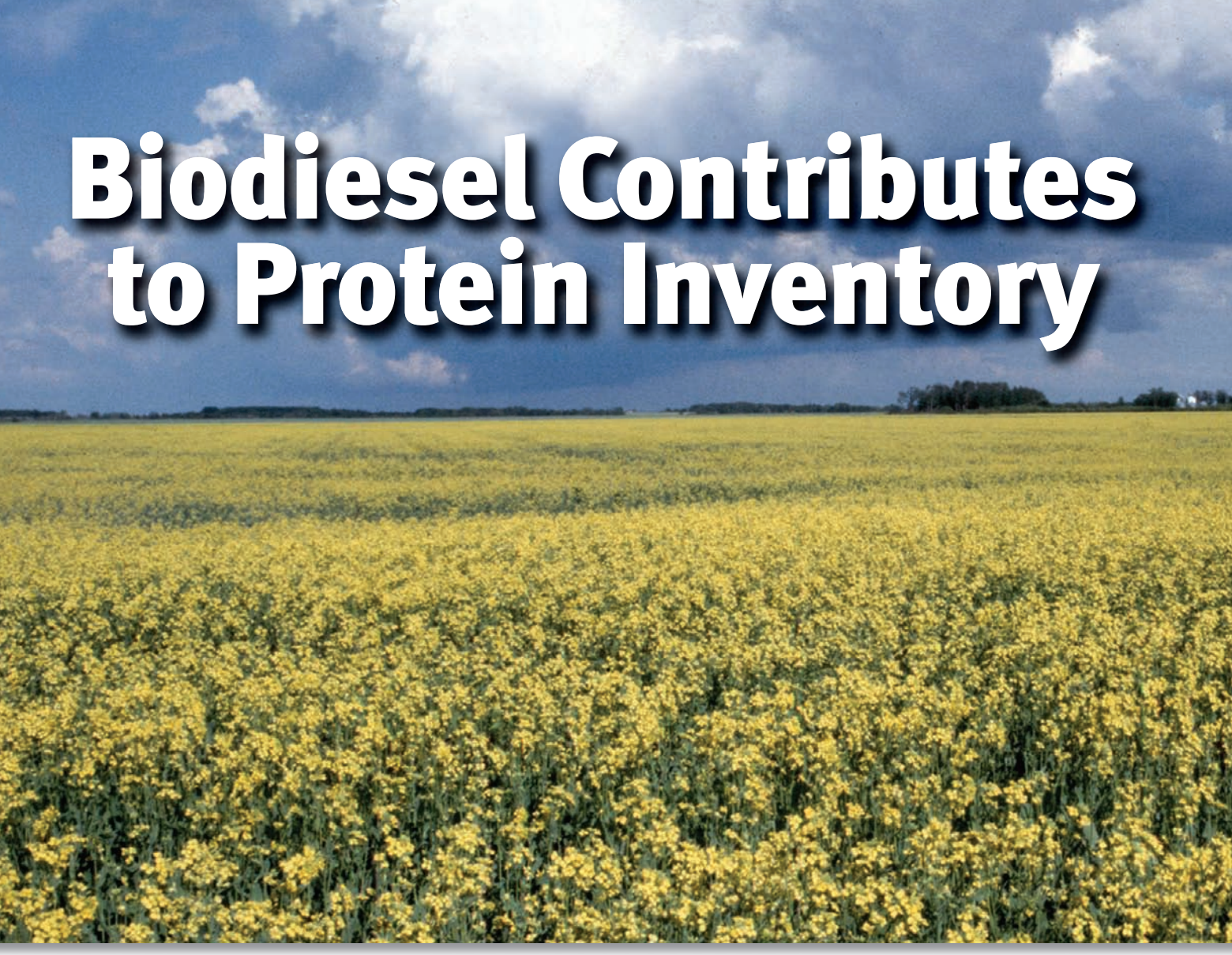


Biodiesel Contributes to Protein Inventory

Beef operations less likely to benefit from soy-based biodiesel, but increased production of oilseed biodiesel could change that scenario.

Story & photos by ***Ed Haag***

Considering this country's enthusiasm for energy independence, it is not surprising that biodiesel production jumped threefold in the U.S., from 25 million gallons (gal.) in 2004 to 75 million gal. in 2005. The National Biodiesel Board predicts that it will triple again this year, with a final tally of more than 250 million gal. produced in 2006.

With a score of new plants going on line during the next 24 months, analysts are speculating that 2007's production figure could reach 750 million gal.

Feeding & Feedstuffs

At present, 85%-90% of U.S. biodiesel is derived from soybeans. As a result, 68% of the total protein meal production in the U.S. is soy-based. Canola meal runs a distant second with a 12% share of this country's protein meal production, but that could change in the near future.

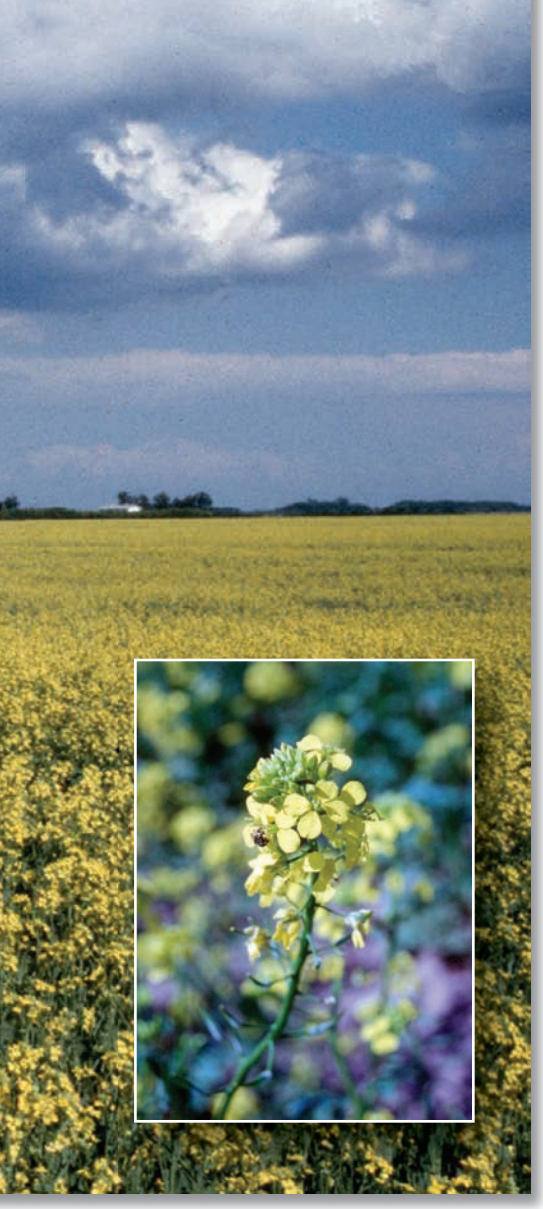
Corn, which competes directly with soybeans for farm acres in the Midwest, has seen record demand as ethanol plants continue to take an increasingly larger share of U.S. production. U.S. Department of Agriculture (USDA) analysts predict that this will lead to more corn production next year, with acreages increasing nationally by 11%. They add that most of that expansion will be at the expense of soybean production. Recent estimates indicate that U.S. farmers will be planting 4 million fewer soybean acres in 2007 than they did in the previous year.

North Dakota State University Extension beef specialist Greg Lardy points out that until recently, it was the protein meal, which is used extensively as swine and poultry feed, and not the oil that produced the highest total revenues for the soybean crushers.

"Because of the digestibility and the amino acid content, those industries prefer using soybean meal," he says. "It is what has built the soybean market in the U.S."

While USDA analysts do predict increases in poultry and hog production in 2007, those increases wouldn't be great enough to stimulate the kind of demand that would effectively compete with corn for acreage.

Considering the circumstances, if biodiesel producers wish to sustain their



►**Left:** Canola production will grow with the biodiesel industry

Table 1: Oil potential of various cultivars

Crop	Kg/ha	Liters /ha	Lb./acre	Gal./acre
Corn (maize)	145	172	129	18
Cashew nut	148	176	132	19
Oats	183	217	163	23
Lupine	195	232	175	25
Kenaf	230	273	205	29
Cotton	273	325	244	35
Hemp	305	363	272	39
Soybean	375	446	335	48
Coffee	386	459	345	49
Linseed (flax)	402	478	359	51
Hazelnuts	405	482	362	51
Pumpkin seed	449	534	401	57
Mustard seed	481	572	430	61
Sesame	585	696	522	74
Safflower	655	779	585	83
Sunflowers	800	952	714	102
Cocoa (cacao)	863	1,026	771	110
Peanuts	890	1,059	795	113
Rapeseed	1,000	1,190	893	127
Olives	1,019	1,212	910	129
Castor beans	1,188	1,413	1,061	151
Pecan nuts	1,505	1,791	1,344	191
Jojoba	1,528	1,818	1,365	194
Jatropha	1,590	1,892	1,420	202
Macadamia nuts	1,887	2,246	1,685	240
Brazil nuts	2,010	2,392	1,795	255
Avocado	2,217	2,638	1,980	282
Coconut	2,260	2,689	2,018	287
Oil palm	5,000	5,950	4,465	635

Source: U.S. Department of Agriculture.

ambitious expansion schedule, they will have to look increasingly to oilseed crops such as canola and rapeseed to make up for lost soybean acreage. Also contributing to this possibility is the fact that the soybean, when compared to most oilseeds, is not an efficient producer of oil.

"Canola seems to be the top choice for biodiesel production in the northern part of North Dakota and into Canada," Lardy says. "It is because the oil yield per acre is substantially more with canola than it is with soybeans."

Canola, which is 40% oil, produces 127 gal. to the acre, while soybeans, at 20% oil, produce 48 gal. to the acre (see Table 1).

Lardy adds that while soybean meal remains the first choice for the poultry and swine industry, canola meal is well-suited to bovine digestive systems.

"Canola meal is certainly an acceptable protein source for beef cattle," he says, adding that the ruminal escape value is similar to

CONTINUED ON PAGE 90

Lardy sees canola meal playing an increasingly important role in the resurgence of backgrounding in regions that don't have ready access to low-cost byproducts like distillers' grains.

Biodiesel Contributes to Protein Inventory CONTINUED FROM PAGE 89

soybean meal, and it is an effective protein supplement for nursing calves, growing and finishing cattle, and beef cows.

Because canola meal, like sunflower meal, is low in energy, beef producers should consider it a protein source and limit its intake to no more than 2-3 pounds (lb.) per day per animal, Lardy says. "Canola meal isn't like distillers' grains. You can't use it in higher volumes as a replacement for corn."

Instead, he sees canola meal playing an increasingly important role in the resurgence of backgrounding in regions that don't have ready access to low-cost byproducts like distillers' grains.

"If corn remains at $3-plus a bushel long term, one of the possible scenarios that could play out in the beef industry is the return to less time in the feedlot finishing cattle," Lardy says. "The corn feeding period might be only 100 to 150 days as opposed to 200 days."

Canola meal would be used as a protein supplement in a slow-growth, backgrounding diet that used low-quality forage as a primary feed source. "This could offer a cost-effective alternative to a longer finishing period," he says.

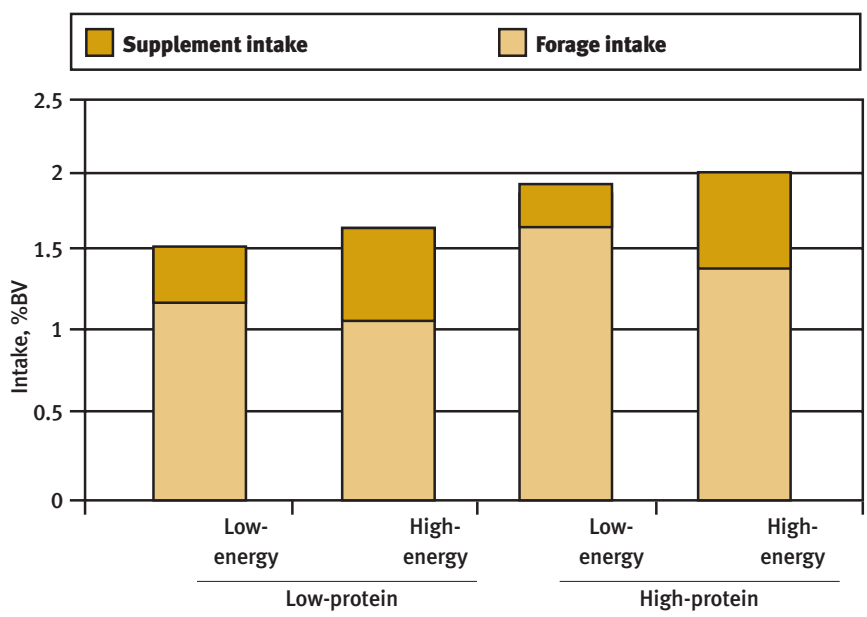
Decisions on the use of canola meal in beef cattle operations should be based on cost and availability of competing protein supplements, Lardy says, noting that the addition of two large crushing plants in North Dakota will increase the availability of canola meal to beef producers in his state. "The question is what will happen when these plants and the plants in Canada start churning out a lot more canola meal."

Table 2: Nutrient analysis of canola meal vs. soybean meal

Nutrient	Canola meal	Soybean meal
Int'l Feed Number	5-03-871	5-20-637
TDN, %	69.0	84.0
NE_m (Mcal/kg)	1.60	2.06
NE_g (Mcal/kg)	1.00	1.40
CP, %	40.9	49.9
Ruminal undegradability, % of CP	28	34
Ether extract, %	3.47	1.6
NDF, %	27.2	14.9
ADF, %	17.0	10.0
Calcium, %	0.70	0.40
Phosphorus, %	1.20	0.71
Magnesium, %	0.57	0.31
Potassium, %	1.37	2.22
Sulfur, %	1.17	0.46
Copper, mg/kg	7.95	22.4
Manganese, mg/kg	55.8	35
Zinc, mg/kg	71.5	57.0

Source: North Dakota State University. Table adapted from *Nutrient Requirements of Beef Cattle,* 7th Edition (1996).

Fig. 1: Influence of supplemental protein vs. energy on the intake of dormant tallgrass prairie forage



Source: DelCurto et al., 1990b.

Out of Canada

Anticipating two decades ago the growing demand for oilseed, Canadian canola breeders from the Agriculture and Agri-Food Canada (AAFC) Research Centre in Saskatoon, Sask., have succeeded in developing and are now in the process of commercializing new varieties that respond to what is rapidly becoming the new market reality.

This isn't surprising considering that the original canola was first developed in Canada in the late 1960s when plant breeders successfully altered the fatty acid composition in the rapeseed plant to improve the nutritional qualities of its oil and the palatability of its meal to livestock.

A promising cultivar recently released by AAFC is *Brassica juncea* canola. A derivative of common condiment mustard, this species was originally chosen for conversion to canola quality due to its heat and drought tolerance. This new canola has demonstrated good heat and drought tolerance during the drought years of 2002 and 2003. Grower surveys conducted for those years have identified its benefits as heat and drought tolerance, seedling vigor, blackleg resistance, resistance to pod shatter and frost tolerance.

One major concern voiced by ag economists in both Canada and the United States is that the precipitation demands of today's canolas will restrict oilseed acreages to higher-rainfall areas and consequently limit oilseed production to well below the market demand for biodiesel.

The new canola responds to this concern. AAFC agronomists say that *Brassica juncea*'s drought hardiness will extend the oilseed growing area into Canada's dry southern prairies, adding an estimated 2 to 4 million acres to the existing production base. Similar regions in the U.S. will also be able to take advantage of these new traits, assuring crushers on both sides of the border of

adequate oilseed stocks for the production of biodiesel and protein meal.

In addition, AAFC plant breeders have focused on improving the quality of the new canola's meal. It has a thinner seed coat than previously released varieties, resulting in reduced meal fiber content and increased protein content. The lower fiber content increases the energy content of the meal and the digestibility of energy and protein, thereby enhancing the overall feed value of the meal.

Another promising new canola currently under development is one derived from *Sinapis alba,* or yellow mustard. The average protein content of its meal is 48%, with some cultivars producing meal with protein content as high as 54%. The crude fiber level in the meal is only 8%, which is significantly less than the 12% crude fiber level in conventional canola meal. AAFC researchers predict that the meal from this new canola will compete directly with high-protein soybean meal in the animal feed market.

New feeding opportunity

With the promise of robust and long-term markets for ethanol and biodiesel — both generators of high-protein byproducts — most agricultural analysts predict a surplus of protein-based livestock feed. Economists from AgriFood Canada say that this surplus is expected to depress prices based on historic oilseed supply and livestock feed demand factors. They note that rising output of biodiesel is also expected to support the production of high-oil-content oilseeds, such as canola/rapeseed, rather than the production of soybeans.

For Tim DelCurto, researcher and beef nutrition specialist at Oregon State University, this is good news. "We are going to have some excellent supplemental protein sources for beef cattle production," he says. "This could help us out in the west."

He notes that beef cattle producers in the western U.S. have been at an economic disadvantage relative to other regions in North America due to the high cost of wintering animals. Feeding costs — usually for 1.5-2.5 tons of hay over the winter — represents 30%-50% of the gross revenues from the production of one cow per year.

Ag economists are predicting that as the demand for cropland increases — a direct result of the biofuel revolution — the price of all commodities, including hay, will increase.

With canola meal available as a low-cost protein supplement, beef producers in the west could replace expensive hay and or grain with low-cost grass-seed residue. Oregon's grass-seed industry produces more than 1 million tons of crop residues annually. Washington state, Idaho and California also have crop residue surpluses beef producers can draw upon.

DelCurto's research has shown that supplemented protein, such as canola meal, stimulates the intake of the high-fiber residue while improving overall rumen function.

"By feeding a 35%-protein canola meal, you can meet a gestating cow's protein needs on 3 pounds a day," he says. "Then that cow is going to maximize its intake of low-quality forage."

The addition of high-energy feed such as corn actually depresses both the intake and digestibility of low-quality forage. As DelCurto explains, energy supplements tend to replace or substitute for the intake of low-quality forages. As a result, energy supplementation of low-quality forage often exerts little or no influence on beef cattle performance.

He notes that responses to supplemental protein are usually observed when the crude protein (CP) content of the basal forage is less than 8%, adding that if forage availability is limited, responses to supplemental protein are often not observed because of the animal's inability to express increased intake.