

A Guide to Feeding Field Peas to Livestock

Nutrient Content and Feeding Recommendations for Beef, Dairy, Sheep, Swine and Poultry

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Field pea (*Pisum sativum L.*) is an annual cool-season legume crop that is grown around the world on over 25 million acres.

In 2001, 3.6 million acres of field pea was grown in Canada, while 100,000 acres were planted in North Dakota. Significant expansion has occurred in North Dakota and surrounding states in recent years and this region is now the primary source of feed pea in the United States. In 2001, North Dakota produced nearly 40% of all field pea grown in the U.S., but total U.S. production equaled only 13% of the Canadian crop. Currently, about 30% of the domestic dry pea production is consumed in the food and feed markets within the United States and the remainder exported. Competitive export markets suggest optimum value of field pea may be captured by local or regional use of this relatively new and nutrient dense feedstuff.

Field pea or “dry pea” is marketed as a dry, shelled product for either human food as “split peas” or as a livestock feed. Field pea contributes significant amounts of protein, carbohydrates, and amino acids to all species but is increasingly considered an excellent ingredient in beef, dairy, swine and poultry rations due to their nutrient density.

Field pea (test weight = 60 pounds per bushel) can be produced with conventional equipment and is easy to grow, handle, process, and feed. Several varieties are available and each has some unique characteristics. Seed color (green [preferred] or yellow) and seed size [large preferred] are two traits that impact acceptance in the human edible market. However, all field pea varieties may be considered feed grade peas. The crude protein content of field pea may vary due to the influence of variety and environment.



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Because of this variation, field pea should be tested for protein for inclusion in balanced livestock rations.

Field pea yields compare favorably with spring wheat with generally higher yields expected for field pea within some regions. Yield data from North Dakota State University research centers shows that field pea perform well across the state. Projections are for continued expansion of field pea acres in North Dakota and surrounding states as growers recognize that the crop is well adapted the region and contributes many positive benefits to crop rotation.

Field pea may also be grown as a forage crop, where it is typically planted as a mixture with cereal grains to enhance the protein concentration of the forage. Field pea in such mixtures will increase digestibility, protein, and energy content of the forage. The amount of improvement depends on proportion of peas in the forage, maturity at harvest, and variety. Most growers want equal plant populations from cereal and peas requiring approximately 70% peas and 30% cereal grains by weight as a seed mix. Growing peas with cereal grains will commonly increase protein content of the forage from 2 to 4 percentage points. The mixed forage can be harvested as hay or silage, with potential for double cropping if adequate moisture is available.

Field pea intended for the feed market is handled like most other commodities. Storage on-farm or at local grain elevators positions the crop to be readily moved to processors or livestock operations through traditional truck and rail connections. Specific elevators may be prepared to make unit train shipments of field peas to major domestic livestock operations or to ports for international feed markets.

Markets are developing with increasing knowledge and realization of the nutritional value of peas. Some growers utilize peas in their own livestock enterprises, but commercial demand is increasing from feed manufacturers and commercial livestock enterprises.

This guide to feeding field peas has a companion publication, *EB 76 Feeding Field Pea to Livestock*, that is a thorough literature review of recent field pea research for those interested in more details.

Nutrients in Field Pea

Field pea compares favorably with other grains and co-products for several nutrients. Peas are considered a crude protein source (Table 1) in most diets. Energy levels are similar to corn for most livestock species with starch ($\approx 54\%$) and digestible fiber (hemicellulose fraction $\approx 7\%$) accounting for most of this fraction. Fat is a modest contributor at 1.55%. Amino acids are important to swine and poultry but not a major concern to ruminants as microbes in the rumen provide the required amino acids for beef and dairy cattle and sheep. However, rate and extent

of ruminal degradation for both starch and protein are important to ruminants. Field pea complements most other grains and can serve as a pellet binder for manufactured feeds.

Economic Comparison of Field Pea

Any economic comparison of field pea with other feeds must consider both crude protein and energy content as well as some intrinsic palatability factors. When considering peas, crude protein will usually be the first limiting nutrient so initial calculations are made on a protein basis only. In Table 2, cost per unit of protein is extrapolated to cost per ton or bushel when the unit cost of protein is equal, in this case \$.189 per pound of crude protein on a dry matter basis. Another method of calculating relative value for only protein would be to establish a range of prices for a respective commodity, such as soybean meal at \$150, \$200, and \$250 per ton with equivalent prices for protein resulting in field peas valued on a per bushel basis of \$2.31, \$3.08, and \$3.84, respectively.

It must be noted that field peas add significantly to the energy in any diet when included as a protein source. Formulating least cost rations with

Table 1. Analytical comparison of field peas to other grains.

	Field Peas	Corn	Barley	Oats	Wheat Midds	Soy Hulls
	----- Percent -----					
Dry Matter	89	89	89	89	90	91
	----- Dry matter basis -----					
Crude Protein	24.5	9.5	13.2	13.1	17.8	12.2
Acid Detergent Fiber	8.0	3.3	5.8	14.0	12.2	11.0
Neutral Detergent Fiber	15.1	10.8	18.1	29.3	40.7	66.1
Estimated TDN	90	90	85	83	81	80
Fat	1.55	4.30	2.25	5.05	5.05	2.10
Calcium	.05	.03	.05	.10	.11	.53
Phosphorous	.48	.31	.37	1.73	.95	.18
Potassium	1.01	.33	.56	1.89	1.10	1.29

Adapted from NRC, 1984, 1996

Table 2. Equivalent cost of field peas to other crude protein sources.

	Field Peas*	Soybean Meal	Canola Meal	Sunflower Meal	Safflower Meal
Crude protein, % (DM basis)	24.5	47.8	40.2	35.6	27.9
Equivalent value per ton, \$	83.33**	162	137	121	95

* Does not include a value for higher energy content of field peas.

** Equal to \$2.50 per 60 lb bushel

field peas for any species or class of livestock should be done with knowledge of nutrient requirements of the animal and nutrients available in feeds being considered. A basic understanding of nutrition is needed to develop practical, productive, and economical diets. Ration balancing software is available and nutritionists may be consulted for assistance. The brief reviews to follow provide rules of thumb in using field pea for beef, dairy, sheep, swine, and poultry.

Feeding Recommendations for Beef Cattle

Field pea is a very palatable feedstuff for all classes of beef cattle. This feed may best be used in diets where nutrient density and palatability are important, such as creep feeds and receiving diets. Creep feeds with 33% to 67% field peas produced optimum animal performance and return. This formulation may provide excess crude protein as creep feed recommendations call for no more than 16%. Weaned calves can be fed pea at essentially any proportion of the concentrate when grains and supplements make up 60% or less of the total diet. Dietary crude protein requirements for growing steers and heifers are based on gain goals, with higher protein required for faster growth. Maximum recommendations are 13.5 to 14% crude protein in the diet. Peas fed at more than 25% of the total diet will probably result in excess crude protein, but like the creep feed trials, slightly improved performance was observed over the

control diet when peas were included at 50% or more of the concentrate. The economics of using field peas at levels higher than 25% of the total diet should be carefully considered. Energy values (NEg) for field peas in growing diets can be as high as .71 Mcal/lb. Finishing cattle have demonstrated some improved performance traits with up to 20% field peas in the diet.

Field pea works well in beef cow supplements at most any level. The nutrient density will provide additional benefits as fewer pounds of feed will be required for the same nutrition, resulting in lower transportation and storage costs. Field pea may be fed in place of range cake as a protein and energy source for wintering cows or incorporated into range cake at any level required. Field pea makes an excellent binder for pelleting or cubing.

No anti-nutritional traits were observed in field pea fed to feedlot and breeding beef cattle at up to 76% of total dry matter intake. While field pea processing has not been proven to be beneficial, additional research is planned to define any threshold of response from grinding or rolling. Both starch and protein from field peas degrade slowly but relatively thoroughly in the rumen, with only modest levels of escape protein (<25% of crude protein). Slow starch fermentation makes peas a potentially desirable complement for stabilizing ruminal pH when more rapidly fermented feeds like wheat and barley are fed.

Feeding Recommendations for Dairy Cattle

The versatility of field pea is evident as peas have been used successfully in pre-ruminant baby calf diets as well as lactating cow diets. In starter diets, ground field peas can be included at up to 40 to 50% of the concentrate replacing portions of corn, barley, and/or soybean meal. Equal animal performance was observed in trials in Alberta and Minnesota. Field pea can be used as the sole protein source for growing heifers.

Because dry peas degrade slowly but thoroughly in the rumen, highly productive cows in early lactation require additional escape protein from sources other than peas. Young cows are also more susceptible than second lactation and older cows to lack of escape protein in the diet. In Alberta trials, field pea replaced soybean meal as a protein source without affecting feed intake, milk yield, or 4% fat corrected milk, provided escape protein requirements are met by distillers grains or other sources. Field pea can be used at up to 25% of the concentrate. Field pea effectively improved ruminal pH when substituted for barley in lactating cow diets. Processing field pea has not been investigated in lactating cow diets, but the preference for all other grains is to grind relatively fine. Small particle size allows maximum digestion during the relatively rapid passage rate of digesta through the gastrointestinal tract.

Feeding Recommendations for Sheep

“Experienced shepherds esteem field peas for fattening sheep . . .” (from Morrison’s Feeds and Feeding, 20th Edition, 1946). This historical comment is supported by recent research using field pea in growing and finishing lamb diets. Peas appear to have a net energy value at least equal to corn and in one trial 14% greater than corn. Peas were successfully included at up to 45% of the feedlot diet, replacing a portion of the corn and all of the soybean meal. Peas appear to be an excellent source of energy, protein, vitamins and minerals for growing and finishing lambs. Least cost rations should be balanced based on relative feed costs and expected performance. No specific research with peas and breeding flocks is known, but the limited research data in feedlot and knowledge of reproduction in other ruminant species suggests no problems would be anticipated in ewe diets.

Feeding Recommendations for Swine

The nutrient density and low fiber levels in field pea makes it an attractive feed for swine diets. Balancing these diets requires appropriate complementary feeds or supplements. Starter diets can contain up to 15% ground field peas, but extruding the peas will increase the maximum recommended level to 20%. Early weaned pigs should weigh at least 20 pounds and be 20 days old before introducing field peas.

For growing finishing pigs, substantial evidence exists that field pea can replace all of the soybean meal and a portion of the basal grain in wheat, barley, and/or hullless-oat grain based diets. Pea/corn diets will require an additional 4 to 8% protein supplement due to the low protein content in corn. Growing diets for swine may contain up to 40% field pea.

Recommendations from finishing research indicate pigs perform well on diets that contain from 10 to 43% field pea. Amino acids are important in growing and finishing swine diet formulation, especially methionine. Options include adding synthetic methionine or mixing peas with canola meal, as it is high in methionine. Strong evidence supports blending canola meal with field pea to make an excellent replacement for soybean meal. Addition of the enzymes phytase (phosphorous metabolism) and xylanase (fiber digestion) further increased performance of growing pigs fed pea.

In lactating sow diets, peas can replace up to 30% of soybean meal without affecting performance. Anti-nutritional factors observed in other annual legumes (i.e. anti-trypsin factor in soybeans) are 5 to 20 times lower in spring-planted field pea and not considered a problem in feeding field pea to swine. Field pea should be ground or pelleted with other feeds when included in swine diets. Field pea must compete economically with other feeds as an energy and protein source and can be used without affecting animal performance.

Feeding Recommendations for Poultry

Several different classes of poultry can utilize field pea in their diets with proper consideration for meeting nutrient requirements. Peas can be a viable energy source, as well as a protein source since the amino acid profile closely matches requirements for many of the poultry species. Low levels of trypsin inhibitors in spring-seeded peas allow feeding without roasting. Grinding is the preferred processing method for peas in all poultry diets, but fines should be avoided.

For laying hens, peas can be fed at up to 40% of the diet without severely affecting performance, but 10% is a more practical level with equal performance. Broilers and turkeys can consume 20 to 30% field pea without affecting performance. Commercial xylanases and betaglucanases added to poultry diets increased protein digestibility in diets with high percentages of field pea. Due to the shorter digestive tract and rapid passage rate, energy derived from field pea by poultry is similar to barley. Methionine is the first limiting amino acid, so supplementation with other feeds or purified sources may be recommended. As with other species, comparative cost of nutrients will determine the economic level of field peas in poultry diets.

For more information on this and other topics, see: www.ag.ndsu.nodak.edu

