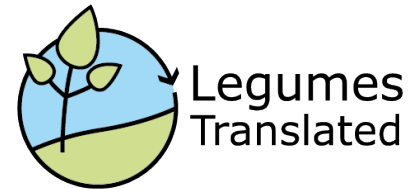


Valuing faba bean and pea for feed

Philipp Roth



A large proportion of Germany's protein feed requirement is met using imported soya, especially for pig and poultry feed. Most of the soya is imported from the USA, Argentina and Brazil and is genetically modified. Grain legumes such as faba bean and grain pea, along with rapeseed meal, have the potential to at least partially replace soybean meal for feeding livestock. Since 2015, agri-environmental measures such as 'Diverse cropping' have been funded in several German federal states. Among other things, these require that legumes are grown as the main crop on at least 10% of the farm's cropped area each year. Consequently, there is an increasing supply of locally-produced grain legumes in these regions which can either be sold directly to processing companies or used for local feed production. This raises the question of the economic value of the grain as determined by its nutritional constituents.

Applicability

Topic: Livestock feeding

For: Cattle and pig farmers

Where: Farms with cattle or pigs

Equipment: Grinding and mixing plant, storage capacity

Follow-up: Control of the production performance parameters

Impact: Use of native grain legumes in the feed ration without economic disadvantages

What is the intrinsic economic value of grain legumes for livestock feeding? How much can be paid for grain legumes considering the cost of standard protein sources?



Faba bean. Photograph: Thorsten Haase (LLH)

Table 1. Feed energy and protein parameters used for assessing value

Use	Energy content as...	Protein content as...
Pig fattening	MJ metabolisable energy (pig)	g/kg prececal digestible lysine
Cattle fattening	MJ metabolisable energy (pig)	g/kg crude protein (CP)
Dairy cattle	MJ net energy lactation	g/kg CP or usable crude protein (UCP)

Outcome

Numerous scientific studies show that livestock can be successfully fed with protein-rich cool-season grain legumes such as faba bean, pea and others. On the basis of the 'Löhr substitution method', it is possible to compare different feedstuffs with standard feeds based on soybean considering energy and protein content. This indicates the point at which an alternative feedstuff costs as much as the feedstuffs currently used, with approximately the same feed value.

This practice note helps in calculating the approximate equilibrium price of grain legumes in comparison with other protein and energy sources. With the help of this equilibrium price, a decision can be made as to which feedstuffs are economically preferable for the same feed value (energy and protein).

Required information

Some constituents of the feeds to be compared must be known to calculate the substitution value of faba bean and grain pea using the Löhr substitution method. The parameters shown in Table 1 are used.

Ideally, data for these parameters are available from analyses of the feed ingredients themselves. Published standard values for many

ingredients are available but these are often not sufficiently accurate in specific situations to give an accurate assessment of value. The additional costs of using European-grown grain legumes associated with transport and initial processing must be considered so that the faba bean or pea is compared properly with soybean meal.

Calculation aids

There are some freely available Excel-based applications that can be downloaded from the internet. These can be used to calculate the value of a new feed ingredient based on how it substitutes for an existing standard feed ingredient. The Excel application 'Comparative value of feed - substitution values of feed' from the Landesanstalt für Landwirtschaft, Ernährung und Ländlichen Raum Schwäbisch Gmünd (LEL) covers a range of animal species and types. It is available for download here:

<https://lel.landwirtschaft-bw.de/pb/,Lde/Startseite/Unsere+Themen/Tierhaltung>

A wide variety of feed ingredients can be selected and compared. For a selected feed component, e.g., faba bean, the programme indicates the substitution price in comparison to two comparable components, usually a protein and an energy supplier such as soybean meal and wheat. It also calculates how much of the previously used feed can be replaced by the alternative feed.

Table 2. Metabolisable energy (ME), crude protein (CP), and prececal digestible (PD) lysine contents of feed components and uses (per kg fresh weight). Source: own analyses, LEL Schwäbisch Gemünd

Feed	Energy content (MJ ME/kg)	Protein/PD lysine (g/kg)
Faba bean	11.9 (cattle)	270 g CP
Wheat	11.8 (cattle)	110 g CP
Soybean meal	12.1 (cattle)	450 g CP
Grain pea	13.4 (pig)	12.6 g PD lysine
Barley	12.7 (pig)	3.9 g PD lysine
Soybean meal	13.1 (pig)	26.6 g PD lysine

Calculation examples

Table 2 (on the previous page) provides data for the ingredients of the feeds compared later. Table 3 provides data on the value of faba bean for fattening cattle as determined by the cost of soybean meal (45% CP) and the cost of wheat. Table 4 (on the next page) provides the equivalent data for pig fattening.

The substitution value is the value of the alternative as determined by the value of the standard materials it replaces. If the calculated substitution value of the alternative grain as a feed ingredient is higher than its current market price, including transport and processing (e.g., to meal), its use reduces costs compared to the use of the established standard feed component.

An example based on the scenario from Table 3 illustrates this:

- Standard feed component prices: wheat (€150/t) and soybean meal (€400/t)
- The substitution value of faba bean is €268/t (Table 3).
- Alternative feed component cost: Faba bean €240/t (purchase price €220/t + €20/t transport and processing)

Introducing the faba bean into the feed reduces feed costs under this scenario. At €240/t, faba bean is a cost-effective alternative to wheat and soybean meal because the value as a substitute for wheat and soybean meal at €268/t is higher than the actual purchase price of 240 € (including transport and processing).



Pea flower. Photograph: Matthias Rauch

Limitations of the method

The presented method takes into account the two feeding parameters energy and protein content of feedstuffs. Many other parameters such as crude fibre content, digestibility, rumen resistance, etc., also play an important role in optimal ration design. In addition, many other feedstuffs which influence and complement each other are usually included. Therefore, it makes sense in specific cases to prepare a detailed ration calculation with the alternative feedstuff after calculating the substitution value in order to evaluate it fully and to be able to make a well-informed decision.

Table 3. Substitution value of faba bean (€/t) for cattle fattening as affected by the price of wheat and soybean meal (45% CP). Source: own calculations according to LEL Schwäbisch Gmünd

	Price (€/t) of soybean meal (45% CP)			
	300	350	400	450
Wheat price (€/t)	Substitution value of faba bean (€/t)			
125	207	231	254	278
150	220	244	268	291
175	234	257	281	304
200	247	270	294	317

1 kg faba bean replaces approximately 0.47 kg soybean meal and 0.53 kg wheat

Table 4. Substitution value of faba bean (€/t) for fattening pigs as affected by the price of barley and soybean meal (45% CP). Source: own calculations according to LEL Schwäbisch Gmünd

Barley price (€/t)	Price (€/t) of soybean meal (45% CP)			
	300	350	400	450
	Substitution value of faba bean (€/t)			
125	196	215	234	253
150	213	232	250	269
175	230	248	267	286
200	246	265	284	303

1 kg faba bean replaces approximately 0.34 kg soybean meal and 0.66 kg barley

Notes for the practice

- A substitution value must be calculated using comparison with the feedstuffs previously used to assess the economic effect of using faba bean and grain pea as alternative feedstuffs.
- The energy and protein contents of the feedstuffs, the purchase prices, and any transport and processing costs must be known.
- The actual calculation can be carried out using freely available software tools.
- If the purchase price of alternative feedstuffs including transport and preparation is lower than the calculated substitution value, their use becomes economically viable. This use should be further checked with a detailed ration calculation.

Sources

LEL Schwäbisch Gmünd, 2017. Comparative value of feed - substitution values of feed Version 1.2. Landesanstalt für Landwirtschaft, Ernährung und Ländlichen Raum Schwäbisch Gmünd, <https://lel.landwirtschaft-bw.de/pb/,Lde/Startseite/Unsere+Themen/Tierhaltung>

About this practice note and Legumes Translated

Authors: Philipp Roth

Publisher: Landesbetrieb Landwirtschaft Hessen (LLH)

Production: Donau Soja

Permalink: www.zenodo.org/record/6078504

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This practice note was prepared within the Legumes Translated project funded by the European Union through Horizon 2020, Project Grant Number 817634.

Citation: Roth, P., 2022. Valuing faba bean and pea for feed. Legumes Translated Practice Note 48. Landesbetrieb Landwirtschaft Hessen (LLH). www.legumestranslated.eu

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