Expensive soy – these are the alternatives for feeding pigs

Manfred Weber
State Centre for Agriculture and Horticulture, Iden, Sachsen-Anhalt

Soybean meal is still the No. 1 protein-rich ingredient for animal feed, but prices have been rising for months, and experts expect further increases. top agrar presents some alternatives.

Despite increased cultivation of protein crops, Europe continues to rely on imports of large quantities of plant protein animal for feed. EU-wide, only about 56% of the demand for protein-rich oilseeds can be covered by domestic production. In summary, this report sets out that:

- The soybean harvest in the main growing countries is smaller than in previous years. Farmers are struggling with persistent droughts.
- Prices for soybean meal have been rising for months. Experts expect the trend to continue.
- As an alternative to soybean meal, rapeseed meal for example, is a good choice. Sunflower extraction meal is also interesting. There are now products on the market with 46% crude protein.
- Grain legumes are also suitable. However, their availability is limited. In addition, their crude protein and amino acid contents are rather low.

Legumes Translated Special Report 1

Based on a translation of an article written by Manfred Weber and published in the German agricultural journal *top agrar*. Details are provided in the imprint.

Drought in the soybean states

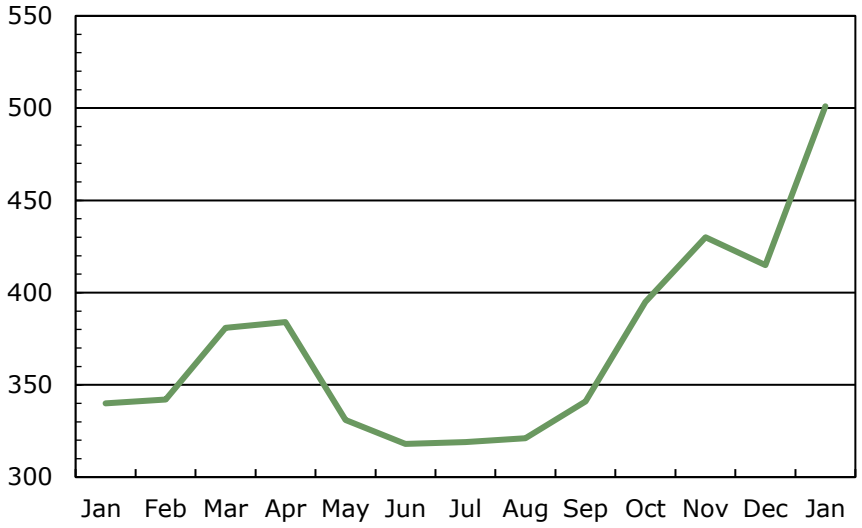

Figure 1. Changes in price (EUR/t) of soybean meal price at the Bologna Exchange from January 2020 to January 2021. Source: Donau Soja based on data from the Bologna Exchange.

This dependence on imports has now become an economic problem for European livestock farmers. This is because the prices for protein animal feed have been rising for months. As Figure 1 shows, the prices for soybean meal with 42% crude protein have increased dramatically since the summer of 2020. The price of soybean meal has risen from just over 300 EUR/tonne in August to more than 500 EUR in early 2021. As a result, the cost of fattening a pig using an average soy content of 10% in the ration has increased by 4 to 5 EUR.

Among other things, the smaller soybean harvest in the USA last autumn is driving up prices. According to the US Department of Agriculture (USDA), US farmers harvested around 1 million tonnes less than forecast in 2020. This was due to lower yields and the correction of the stated harvested area. The drought in the major South American growing regions last November and December is also responsible for increasing prices. The harvest slump in Argentina is likely to be particularly pronounced. The extreme, persistent drought has led to a long delay in sowing in autumn. Market experts, therefore, expect a significantly smaller harvest. The Brazilian crop is also affected by poor growing conditions. Nevertheless, the US Department of Agriculture (USDA) currently expects a good Brazilian harvest as weather conditions have gradually improved. All in all, the USDA's latest crop forecast assumes that more than one million tonnes fewer soybeans will be harvested worldwide in the current calendar year as a result of the weather. In addition to the supply shortage, the diversion of commodity flows is also leading to rising prices. The USA alone is now supplying significantly more soy to Asia again. One reason for this is the partial settlement of the trade dispute with China. Compared to the same period in the previous year, EU imports from the USA have fallen by 12%.

Rapeseed extraction meal: High fibre content is good for intestinal activity

Rapeseed extraction meal (REM) is produced when the oil is extracted from the rapeseed grains. About 5.2 million tonnes of rapeseed extraction meal are available annually in Germany. Of this, about 2.5 million tonnes end up in compound feed. Native, GMO-free REM contains around 340 g of crude protein (CP) per kg and thus about 10% less protein than classic soy extraction meal. However, the CP content is very stable and the declared values are almost always met. This stability is especially relevant in the case of nutrient-reduced feeding where it is particularly important that the actual and target protein concentrations match. The high fibre content at 12.5% in rapeseed extraction meal has positive effects on intestinal health. The fibre stimulates intestinal peristalsis. The high methionine content is also beneficial (Table 1). Methionine supports liver and cell metabolism. However, the concentrations of the other amino acids are lower compared to soy extraction meal. Farms that feed their pigs a nitrogen and phosphorus reduced diet must take the relatively high phosphorus content into account when planning the ration. The glucosinolate content, which restricts feed intake and utilisation, is now significantly lower than in the past due to the success of plant breeding. As a rule, it no longer plays a role at feed rates up to 15%.

Table 1. Ingredients of important protein feeds per kg at 88% DM

Feed	REM[1)]	SEM[2)]	SEM (HP)[3)]	Faba bean	Fodder pea	Blue lupin
Energy, MJ ME	10.1	9.8	n.a.	13.0	13.8	13.5
Crude protein	340	340	460	260	200	289
Lysine, g	19.6	11.6	14.4	16.3	15.0	14.0
PCV Lysine[4)] g	14.3	8.9	11.1	13.4	12.6	11.8
Methionine/cystine	14.9	7.1	10.3	1.8	1.9	1.8
PCV Methionine/cystine	12.6	5.4	7.8	1.1	1.4	1.5
Calcium, g	7.6	3.9	4.2	1.2	1.0	2.5
Phosphorus, g	10.5	9.8	15.4	5.5	4.1	4.1

[1)] Rapeseed extraction meal. [2)] Sunflower extraction meal, from partially dehulled seed. [3)] Own analyses; [4)] PCV = precaecal digestible lysine. The crude protein content of grain legumes is lower than that of extraction meal.

Sunflower meal: Lysine snapshot

Sunflower extraction meal (SEM) is increasingly being fed due to positive experiences in Germany. At the moment, around 430,000 tonnes per year is used. SEM can easily compete with rapeseed extraction meal in terms of crude protein content, as Table 1 shows. In contrast, the lysine and methionine contents are significantly lower. However, the amino acid deficit can be compensated using free (synthetic) amino acids. The sunflower extraction meal also has a high digestive fibre content. The relatively high phosphorus content of almost 10g per kg can be critical in nutrient-reduced feeding.

A high protein sunflower extraction meal (SEM-HP) has recently come on the market which with 460 g of crude protein, is similar to classic soy extraction meal. If the amino acids are supplemented accordingly, they can usually be exchanged 1:1 for soy extraction meal without any problems. Recent studies have shown this. Sunflower extraction meal is suitable for sows and piglets as well as for fattening pigs. The maximum quantities to be used are given in Table 2.

Table 2. Maximum input quantities[1)]

Type of animal		REM	SEM	Faba bean	Fodder pea	Blue lupin
Piglet	Up to 20 kg	5				
	From 20 kg	10	5	5	5	5
Fattening pigs	Growing	10	5 to 10	15	20	15
	Finishing	20	5 to 10	25	25[2)]	20
Sows	Dry	Up to 100	8	8	8	8
	Lactating	10	10	15	20	10

[1)] In % per kg feed; [2)] for dry feeding maximum 40%. Protein alternatives are equally suitable for use in sow, piglet and fattening feed.

Faba bean: Weather influences nutrient levels

Faba bean is well suited for use in pig feed. However, there is still a lack of sufficient availability, and the crop in Germany is relatively small at 235,000 tonnes. Faba bean is not the priority or preferred crop on many German arable farms. In most cases, the cultivation of wheat or maize gives higher returns.

Faba bean can be fed to all farmed animals. The maximum quantities to be used are shown in Table 3. Attention must be paid to large variations in levels of constituents. They are influenced by various factors, such as the year of cultivation, the soil, the weather, etc. Therefore, a feed analysis must be carried out before feeding.

The energy content of faba bean is around 13 MJ ME, the lysine of the protein is similar to that of soy extraction meal. Faba bean is deficient in methionine. The calcium and phosphorus contents are also rather low compared to other protein feeds. Antinutritional constituents no longer play a role for the commonly used rates of inclusion. The data on potential market value are provided in Table 3.

Photo 1: Faba bean, photograph: Frederick Stoddard (University of Helsinki). Photo 2: Pea, photograph: Matthias Rauch. Photo 3: Blue lupin, photograph: Losar de la Vera

Pea: Improved feed conversion

Efficient utilisation of the nutrients by the animal is becoming increasingly important given the tightening regulations in the new German Fertiliser Ordinance. This is where pea can help. Trials indicate that feed conversion increases when peas are used. Pea is not as nutrient-rich as other protein-rich alternatives (Table 1). For example, at 20% crude protein, native, pea has barely half the protein concentration of soy extraction meal. On the other hand, the lysine content at 15 g per kg is similarly to that of soy extraction meal when viewed in relation to the protein content. However, the content of the amino acid methionine is significantly lower. The methionine deficit can be compensated, for example, by using rapeseed extraction meal. The combination of pea, rape and soy is also possible. Like faba bean, the content values vary considerably in some cases. Therefore, feed analysis must always be carried out before feeding. In principle, pea can be used in all rations. If dry feed is used in the final fattening stage, up to 40% is possible (see Table 3). To ensure that pea use does not unnecessarily increase feed costs, economic value must be considered. As Table 3 shows, peas may cost a maximum of 308 €/tonne if 240 € are paid for wheat and 40o € is paid for soybean meal.

Lupin: Maximum 10% in lactation feed

Like beans and peas, lupins are also a very interesting option for arable farms. Nitrogen fixation provides the nitrogen and lupin is drought tolerant. Lupin is not widely grown so not often used in pig feeding. However, lupin can be very interesting for individual farms. Native, GMO-free lupins have the highest value of the three grain legumes (beans, peas, lupins) with just under 290 g of crude protein. However, the lysine content of 14 g/kg is very low in relation to the protein content. The methionine content is also low, which must be considered when calculating the ration. However, the values can fluctuate considerably depending on the weather, soil, etc., as Germany-wide monitoring has shown. In addition to the sweet blue lupin, white lupin varieties are currently being brought onto the market again. The good forage qualities speak in their favour. The maximum possible application quantities are on par with the other grain legumes, as Table 2 shows. In terms of value for money, sweet lupin is in the range of the fodder pea. Table 3 shows the wheat and soybean meal prices at which the use of SEM pays off. For example, if wheat costs 20.00 € and soybean meal 40.00 € per dt, SEM may cost a maximum of 22.30 € per dt. At a soy price of 50.00 €, it is 26.10 €.

Table 3. Price worthiness of protein feeds[1)]

	REM			SEM			Faba bean			Fodder pea			Blue sweet lupine		
Wheat EUR/t	16	20	24	16	20	24	16	20	24	16	20	24	16	20	24
Soy 300 EUR/t	20.3	20.9	21.5	17.1	18.5	20.0	22.3	23.9	25.4	23.3	25.2	27.2	23.7	25.8	28.0
Soy price 40 €	26.3	26.9	27.5	20.9	22.3	23.8	27.6	29.1	30.8	28.5	30.4	32.4	28.8	30.9	33.0
Soy price 50 €	32.3	32.9	33.5	24.7	26.1	27.6	32.9	34.5	36.0	33.7	35.6	37.6	33.9	36.0	38.1

[1)] Calculated with the exchange method according to Löhr (corresponding to the contents of energy and pcv lysine). The price of wheat and soy meal determines when the use of the various protein alternatives becomes profitable.

About this Special Report

Author: Manfred Weber, LLG Iden, Sachsen-Anhalt, manfred.weber@llg.mule.sachsen-anhalt.de, www.llg.sachsen-anhalt.de/themen/tierhaltung-und-tierzucht/schweine/

Publisher: top agrar, Hülsebrockstraße 2-8, D-48165 Münster, marcus.arden@topagrar.com, www.topagrar.com

Translation: Jasmin Karer, Lauren Dietemann and Donal Murphy-Bokern, office@donausoja.org, www.legumestranslated.eu

Production: Donau Soja

Permalink: www.zenodo.org/record/4719096

Cover photo: Faba bean. Photograph: Thorsten Haase (LLH)

Citation: Weber, M., 2021. Expensive soy – these are the alternatives. top agrar, 3/2021. English adaptation in Legumes Translated Special Report 1.

This Special Report was translated and edited within the Legumes Translated project funded by the European Union through Horizon 2020, Project Grant Number 817634. The original report in German can be found here: Teures Soja – das sind die Alternativen | top agrar online