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# **Soybean Meal Quality by Origin:**

## **Economical Value of Hipro Soybean Meal in Least Cost Formulations**

Report: USSEC No. 1/2016

February 12, 2016

J. Doppenberg, Ph.D.

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Schothorst Feed Research

**Report: USSEC No. 1**

**Least Cost Formulations of Animal Feeds in Different Regions for the  
U.S. Soybean Export Council, American Soybean Association-  
International Marketing, and United Soybean Board**

**Periods: January and May-July (2016)**

**By J. Doppenberg, Ph.D.**

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## 0. Executive summary

The added value of higher quality soybean meal in feeds for different species is studied in this report with feedstuffs and prices for four regions: the Netherlands (indicative for North Western Europe), Spain (indicative for South Western Europe), Poland (indicative for North Eastern Europe) and Romania (indicative for South Eastern Europe).

The current market price of Hipro soybean meal in €/100 kg in the different regions is as follows:

Table 1. Market prices of Hipro soybean meal in different regions

Hipro SBM*	Netherlands	Spain	Poland	Romania
€/100 kg	32.60	29.60	31.00	33.40**

\*Hipro soybean meal is sold on a per unit of protein basis, the average protein content of the generic product used in the formulations is 46.8%. \*\*44% Crude protein quality

The shadow price and the added value of high quality soybean meal depends on the costs of all protein rich feedstuffs offered on the market, the costs of energy rich feedstuffs (grains and fats & oils), the species for which a feed is formulated and the animal category. The inclusion rate of Hipro soybean meal is highest in poultry feeds (10-30%). A higher quality soybean meal is defined as a product with a higher amino acid content per unit of protein (specifically lysine) and a higher organic matter and protein (amino acid) digestibility, resulting in higher digestible amino acid and energy matrix value. Hipro soybean meal is defined as containing on average 46-47% crude protein. The calculated value differences for Hipro soybean meal by origin are:

Table 2. Value differences (+/-) of Hipro SBM in €/100 kg among origins, due to different nutrient values (see Appendix for matrix values), for feeds for different species (based on a Hipro SBM price of € 32.60/100 kg for January in week 5, 2016)

	Swine			Layer			Broiler		
	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.
Protein €	-0.41	-0.34	+0.10	-0.53	-0.42	+0.13	-0.74	-0.58	+0.16
Energy €	-0.30	+0.08	+0.38	-0.31	+0.13	+0.45	-0.64	+0.49	+1.14
Dig. AA €	+0.12	+1.57	+1.42	+0.26	+0.83	+0.54	+0.28	+0.96	+0.67
Total €	-0.59	+1.31	+1.90	-0.58	+0.54	+1.12	-1.10	+0.87	+1.97

\*Rest caused by differences in amino acid digestibility and mineral content (P), see table 10.

### *In conclusion*

The added value of high quality Hipro soybean meal has increased in pig and layer feeds due to the higher synthetic amino acids (L-Lysine, L-Threonine and L-Tryptophan) and fat & oil prices, despite lower prices for plant proteins and grains. The value of (higher) quality Hipro soybean meal due to differences in the protein as well as the energy content have increased slightly in all feeds but the largest increase has been in the added value

due to the digestible amino acids and phosphorus. Hipro soybean meal from the United States has therefore f.i. a € 5.40-8.70/1000 kg higher value (absolute) than Brazilian Hipro SBM in poultry feeds. However compared to the Argentinean origin the added value of U.S. SBM is € 11.20-19.70/MT. U.S. Hipro soybean meal has the highest added value for swine (€ 13.10-19.90) and broiler (€ 8.70-19.70) feeds, followed by layer feeds (€ 5.40-11.20/MT). Differences in the energy plus digestible amino acid + P content together contribute significantly more to the added value of Hipro soybean meal than differences in the protein content.

On an equal protein content basis the value differences (in energy, mineral and digestible amino acid content) are € 9.60-16.50 (U.S. vs Brazil) and € 9.90-18.10/MT (U.S. vs Arg) or respectively 2.9-5.1% and 3.0-5.6%.

## 1. Introduction

Swine and poultry feeds are formulated via a Least Cost Formulation (LCF)-program to evaluate the value of soybean meal of different quality (origin) and different regions (with differing feedstuff prices/ availability). Market and future prices of feedstuffs for the Dutch feed industry of week 5 are used for the current period (January) and the May-July period when the new harvest of South America is on the market. Current feedstuff prices obtained from the feed industry in Poland and Romania were used. For Spain feedstuff prices from the Cambra Oficial de Comerc Industria i Navegacio de Barcelona were used. For a listing of all feedstuff prices for the different regions and periods see table 2 in the Appendix. Note that the same feedstuff restrictions and nutrient requirements are used for all LCF's. Premix, production and marketing costs are not included. Matrix values for the different origins of analyzed soybean meal samples are used. See the Appendix (table 1) for approximate analyses and nutrient values used.

## 2. Feedstuff market developments the Netherlands

*The price of Hipro soybean meal has decreased € 0.40 for February, compared to week 2. The price of soy oil increased, so that the price of toasted soybeans has increased. Due to high yields of soybeans the price have decreased further. The future price for the May-July period, when the new harvest of South America will be on the market in the EU, is (-€ 1.10) lower than the current price. The prices of the other plant proteins have decreased in line with soybean meal, future prices are however higher than currently. All grain and grain by-product prices have decreased. There is are large supply of grains and also the demand for bioethanol production has decreased significantly. The (imported) fiber rich feedstuff prices have decreased along with them. The crude oil price continues to decline (after a short increase), nevertheless the fat & oil prices have increased. The synthetic amino acid prices (L-Lysine, L-Threonine and L-Tryptophan) have all increased, increasing the value of high quality proteins. Altogether ingredient costs of all formulated feed costs have decreased for all feeds.*

### 3. Shadow prices soybean meal by origin, the Netherlands

#### *Price developments.*

The Hipro (49/3.5) soybean meal price for January has decreased with € 1.00 from week 48, 2015 to 2, 2016. The decline is more than in the last month, altogether the price has decreased with € 1.90 in the last three months. The current prices of all protein rich feedstuffs and DL Methionine have decreased as well but the prices of L Lysine and L Threonine have increased. Most notable is the decrease in the price of wheat and that of triticale, barley and rye along with it. The maize price is unchanged. Some plant oil prices have decreased while others have increased. The future price for soybean meal (May-July, when the South American harvest comes on the market in the EU), is still lower than the current price but those of other plant proteins are higher.

In brief the price developments are (€/100 kg):

Table 3. Feedstuff prices of week 5 in the Netherlands for February and May-July.

Period		February	May-July	Current week 05-02	Future vs current
Grains	Maize	17.40	17.60	-0.70	+0.20
	Wheat	16.20	16.40	-0.90	+0.20
	Triticale	16.20	16.40	-0.80	+0.20
	Rye	15.10	15.30	-0.90	+0.20
	Barley	15.40	15.60	-1.40	+0.20
Grain by products	Wheat bran	14.30	13.40	-0.70	-0.90
	Maizegl. feed meal	17.30	17.40	-0.70	+0.10
Fats & oils	Animal fat	52.00	52.00		
	Palm oil	57.00	58.00	+1.40	+1.00
	Soy oil	69.50	68.00	+2.70	-1.50
	PFAD	56.00	56.00	+4.00	
	Toasted Soybeans	41.20	41.20	+0.40	-0.40
Protein rich	Hipro SBM	32.60	31.50	-0.40	-1.10
	Lopro SBM	30.30	28.80	-0.50	-1.50
	RSM	20.10	20.50	-1.00	+0.40
	RSE	24.00	24.20	-1.00	+0.20
	Lopro Sunfl.sdml*	15.90*	16.10*	-1.60	+0.20
	Maize DDGS	19.80		-1.70	
Misc.	Peas	23.10	23.30	-0.10	+0.20
	PKM	12.50	12.40	-0.90	-0.10
	Beet pulp	17.10	17.10	-1.40	

\*Hipro sunflower seed meal is about € 5.00/100 kg more. PFAD (Palm oil Fatty Acid Distillate), Hipro and Lopro SBM (High and low protein soybean meal), RSM (rapeseed meal), RSE (rapeseed expellers), Lopro Sunfl. sd ml (Lopro sunflowerseed meal) and PKM (Palmkernel meal)

The prices of maize, wheat, triticale, barley and rye all decreased but the future (May-July) grain prices are slightly higher than the current prices for all grains. This might indicate that the grain prices will not decrease (much) more. On the other hand grain producers are holding off selling at these low prices. The prices of both wheat bran and maize gluten feed meal decreased in line with the grain prices.

The plant oil price have all increased along while the price of toasted soy beans. The animal fat price is unchanged. The crude oil price has decreased below \$ 30/barrel after a short upsurge. Palm oil increased less in price than soy oil and PFAD. The price of PFAD is still lower than that of palm oil but significantly higher than the animal fat price. Although soy oil increased in price the price increase is less than the price decrease last month. The price of toasted soy beans has increased, despite the decrease in the soybean meal, due to the higher soy oil price.

All protein rich feedstuffs have decreased in price, absolutely and relatively, more than Hipro soybean meal. Specifically the price decreases of sunflowerseed meal and maize DDGS have been very sharply. Nevertheless sunflower seed meal remains unattractive due to the low energy content and the high fat & oil prices. This makes the energy and protein rich rapeseed expellers, however, very attractive. Lopro soybean meal has decreased less in price than Hipro soybean meal, in absolute terms but more so based on a per unit of protein basis. Hipro soybean meal is therefore more attractive.

Resultantly pig feed costs decreased with 4%, those of layer feeds 3% and of broiler feeds 2%. The future (May-July) feed costs are 1% higher for pig and layer feeds, those of broiler feeds are the same as currently.

#### *Feedstuff usage in feed formulations.*

Pig feed formulations are based on rye, triticale and barley. Rye is the most attractive (€ 1.10/100 kg cheaper than triticale), followed by triticale. The inclusion rates of both rye and triticale are limited. Barley is therefore used (14% inclusion rate, shadow price € 15.75). Maize is not attractive, the shadow price is € 17.05. Wheat (shadow price € 15.54) is also too expensive. With these low plant protein and high fat & oil prices the value of maize is relatively high. Wheat bran is therefore not attractive (shadow price € 13.13). The usage of maize DDGS, however, is increased from 7 to 10%. Rapeseed meal remains very attractive at this competitive price (shadow price € 20.78). Rapeseed expellers are too expensive (shadow price € 23.36 benchmarked at a market price of € 20.10 for rapeseed meal). At high(er) fats & oil prices rapeseed expellers will sooner be attractive than rapeseed meal but currently animal fat (lard) is used, which is relatively cheap (€ 52.00). Peas are not attractive (shadow price € 20.82 at a market price of € 23.10). Lopro sunflower seed meal is not at all attractive (shadow price only € 13.74), since it is very low in energy. Palmkernel meal is attractive due to the low price (shadow price € 12.92) but the usage rate is below the maximum of 5%. Palm oil (shadow price € 52.83) and palm oil fatty acids (PFAD, shadow price € 53.55) are not attractive. Or the

other way around the shadow price of animal fat (lard) is € 54.35 benchmarked at the PFAD price of € 56.00. The usage rate of fats & oils is increased 1% due to the high usage of barley. Beet Pulp is too expensive (shadow price € 13.01). Hipro soybean meal (shadow price € 33.25 at a market price of € 32.60) is more attractive than Lopro soybean meal (shadow price € 29.73 at a market price of € 30.30). The usage rate of Hipro soybean meal has decreased (from 5 to 4%) because of the decreased usage of maize and the increased usage of maize DDGS.

Layer feed formulations are still mainly based on maize (shadow price € 17.69). 10% wheat is still used because of the sharper price decrease of the wheat price. The maize usage is still almost 50%. The shadow price of wheat is € 17.40, benchmarked at the market price of maize at € 17.40 and maize DDGS of € 19.80. This gives a margin of € 1.20 in the wheat price before the usage rate will be decreased. Peas are not attractive (shadow price € 19.66 at a market price of € 23.10). The usage of maize DDGS is maximised at 10% with a shadow price of € 21.87. Rapeseed expellers are considerably more attractive than rapeseed meal (shadow price rapeseed meal € 18.48 at a € 24.00 rapeseed expellers price) and also used to the maximum. Maize gluten and alfalfa are not needed as xanthophyll (egg yolk colouring) sources at this high maize and maize DDGS usage. Maize gluten feed meal (shadow price € 16.84) is too expensive and so is wheat bran (shadow price € 12.27). The fat addition is 2.5% total, due to the high maize usage. Lard is the most attractive fat source (shadow price PFAD € 52.07 at a lard price of € 52.00). Lopro sunflower seed meal (shadow price € 14.67) is not attractive. The Hipro soybean meal usage remains 16%. Hipro soybean meal (shadow price € 33.89) is more attractive than the Lopro quality. Toasted soybeans are not attractive (shadow price € 34.63).

Broiler feeds are based on wheat since the usage rate of maize is maximised (white meat requirement). Peas are not attractive (shadow price € 20.11 at a market price of € 23.10). Toasted soybeans are used in addition to Hipro soybean meal. Animal fat and PFAD are the most attractive fat source, usage of added fat & oils is maximised (at 5.5%). They are used together to ensure proper fat digestion (u/s ratio). Soy oil is too expensive (shadow price € 64.27 at a market price of € 69.50) because the C18:2 content of broiler feeds is maximised. Rapeseed expellers are attractive, however the usage rate is only 2% (maximum 5%). Rapeseed meal is too expensive compared to rapeseed expellers (the rapeseed meal shadow price is only € 15.97 compared to the market price of € 24.00 for rapeseed expellers). Maize DDGS usage is maximised at 5%, the shadow price is € 20.85. Maize gluten meal (60% protein) is too expensive (shadow price € 66.34). The shadow price of Hipro sunflowerseed meal (32% crude protein) is only € 9.41. Hipro soybean meal usage remains at 13% with a shadow price of even € 37.52.

#### *Value of Hipro soybean meal in feed formulations.*

Hipro soybean meal is the most interesting soybean meal source for all feeds, Lopro soybean meal is not attractive. The shadow price of Hipro is € 33.25 in the



grower/finisher pig feeds, € 33.89 in the layer feed and € 37.52 in the broiler feed at a market price of € 32.60. The spread in the Hipro soybean meal price is decreased from € 1.41 in swine feeds to € 0.65 and from € 1.57 in layer feeds to € 1.29 but increased from € 3.16 in broiler feeds to € 4.19. The higher toasted soybeans price increased the margin in broiler feeds but the lower plant protein prices decreased it in pig and layer feeds.

The shadow price of the Lopro quality (42.8% crude protein) is € 29.73 in the grower/finisher pig feeds, € 28.91 in the layer feed and € 26.34 in the broiler feed at a market price of € 30.30. Consequently this makes Lopro soybean meal too expensive for all feeds, the price is € 0.57 too high for pig feeds, € 1.39 for layer and even € 3.96 for broiler feeds (compared to the Hipro quality and price). Or more practical the difference in value between the Lopro and Hipro soybean meal is € 2.87 in pig, € 3.69 in layer and € 6.26 in broiler feeds, while the market price differs € 2.30. With the sharper decrease in the Hipro soybean meal price than that of Lopro these value differences have increased in pig feeds with € 0.17, in layer feeds with € 0.10 and in broiler feeds with € 1.44 compared to report no. 1/2016. The latter is due to the high toasted soybeans price.

Toasted soybeans are not attractive compared to Hipro soybean meal (€ 32.60) and soy oil (€ 69.50) in February due to price increase of soy beans and despite the increase of the soy oil price. The market price of toasted beans is at € 41.20 higher than the formula:  $75\% \text{ Hipro} + 7.5\% \text{ maize} + 17.5\% \text{ SBO} = 32.60 \cdot 0.75 + 17.40 \cdot 0.075 + 69.50 \cdot 0.175 = € 37.92$ . When other fat sources are used instead of soy oil, toasted soybeans are even less attractive. The 'shadow price' of toasted soybeans drops to € 35.73 with palm oil and even to € 34.86 with animal fat. Consequently compared to animal fat toasted soybeans are € 6.34 too expensive and compared to palm oil € 5.47. In layer feeds therefore no toasted soybeans are used but in broiler finisher feeds the usage rate is 15%.

Hipro soybean meal is therefore an attractive protein sources next to toasted soybeans, rapeseed meal, - expellers and maize DDGS in all feeds.

The usage rate of soybean meal is:

- 4% Hipro in pig grower/finisher.
- 16% Hipro in the layer feeds.
- 13% Hipro in broiler grower/finisher feeds (additionally 15% toasted soybeans are used as a protein and fat source).

*Value differences (€/100 kg) of soybean meal of differing qualities in the Netherlands*

The matrix values of the generic CVB Hipro soybean meal and the different origins are listed in table 1 of the Appendix. The (digestible) energy content varies among the

different origins along with the protein and amino acid content and digestibility. Hipro soybean meal from the U.S. has equal or higher nutrient values for digestible amino acids compared to the generic CVB Hipro soybean meal and the highest energy content of all Hipro soybean meal products. This is reflected in the shadow prices of the three origins compared to the generic product offered on the Dutch market for the different periods in table 4 (see also table 12 ‘price effect of variation in nutrient value’).

Table 4. Value differences (+/-) of Hipro SBM in €/100 kg among origins (Argentina, Brazil and the U.S.) in feeds for different species (based on a Hipro SBM price of € 32.60 for February and € 31.50 for May-July in the Netherlands for week 5)

	Swine			Layer			Broiler		
	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.
February	-0.59	+1.31	+1.90	-0.58	+0.54	+1.12	-1.10	+0.87	+1.97
May-July	-0.44	+1.28	+1.72	-0.54	+0.32	+0.86	-1.10	+0.90	+2.00

The value of Hipro soybean meal from Argentina is € 0.44-1.10/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.32-1.31 higher value than that from Brazil, despite a lower crude protein content, and € 0.86-2.00 more than that from Argentina. The highest added value of high(er) quality soybean meal is obtained in pig (€ 1.28-1.90) and broiler (€ 0.87-2.00) feeds, compared to layer feeds (€ 0.32-1.12). The added value of high(er) quality Hipro soybean meal has increased in all feeds with the higher prices for synthetic amino acid and toasted soybeans, despite the lower plant protein prices. The increase is the largest in pig and broiler feeds.

In conclusion:

1. The market price of soybean meal in the Netherlands continues to decrease, the price of toasted soybeans, however has increased. The future price of Hipro soybean meal for the May-July period is (still) lower than the current price. This indicates that (currently) the soybean meal prices are still expected to decrease further with the new harvest from South America coming on the market, but this might change.
2. Hipro soybean meal is priced attractive compared to Lopro soybean meal for all feeds.
3. The usage rate of soybean meal has decreased in pig but remains unchanged and high in poultry feeds. Toasted soybeans are only attractive in broiler feeds.
4. The added value of high(er) quality Hipro soybean meal has increased in broiler feeds due to the higher toasted soy beans price.
5. U.S. soybean meal is worth € 1.72-1.90/100 kg more than Argentinean soybean meal in swine feeds, € 0.86-1.12 in layer feeds and € 1.97-2.00 in broiler feeds. The additional value of U.S. soybean meal is highest over that from Argentina in pig and broiler feeds in both periods
6. U.S. soybean meal is worth € 1.28-1.31/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.32-0.54 in layer feeds and € 0.87-0.90 in broiler grower/finisher feeds. The additional value of U.S. soybean meal is highest over that from Brazil also in pig and broiler feeds in both periods.

### 3.1 Shadow prices soybean meal by origin, Spain

#### Price developments.

Feedstuff prices of week 5 were obtained from the Cambra Oficial de Comerç Industria i Navegació de Barcelona. The Hipro (49/3.5) soybean meal price for February has been decreased with € 0.70. The previous months the price decreased with € 3.90. The indications are therefore that the price will continue to decrease, although the price might still fluctuate. The Hipro soybean meal price in Spain has decreased more than in the Netherlands (-€ 0.40) but less than in Poland (-€ 1.35). Nevertheless the Hipro soybean meal price is € 3.00 lower in Spain than in the Netherlands and € 1.40 lower than in Poland. Rapeseed meal and Hipro sunflower seed meal have decreased relatively more in price than soybean meal.

In brief the price developments are (€/100 kg):

Table 5. Feedstuff prices of week 5 in Spain for February

Period		February	Change week 5-2
Grains	Maize	16.60	-0.70
	Wheat	17.20	-1.50
	Triticale		
	Rye	15.90	-0.80
	Barley	17.00	-0.90
Grain by products	Wheat bran	15.50	-1.50
	Maizegl. feed meal		
Fats & oils	Animal fat	56.00	-1.00
	Palm oil	63.50	+5.50
	Soy oil	67.50	-1.90
	Fatty acids	53.50	-2.50
	Toasted Soybeans		
Protein rich	Hipro SBM	29.60	-0.70
	Lopro SBM		
	RSM	20.20	-1.30
	RSE		
	Lopro Sunfl. sd ml.	17.70	-1.30
	Maize DDGS		
Misc.	Peas		
	PKM	13.50	
	Beet pulp	18.00	+1.50

PFAD (Palm oil Fatty Acid Distillate), SBM (soybean meal), RSM (rapeseed meal), RSE (rapeseed expellers), Hipro Sunfl. sd ml (Hipro sunflowerseed meal) and PKM (Palmkernel meal)

The prices of all grains and grain by-products decreased in Spain. In the Netherlands also all grain prices decreased. Although the price of wheat decreased the most of all grains in Spain it is still considerable higher than in the Netherlands. Also rye and barley are more expensive but maize is (€ 0.80) cheaper in Spain.

Palm oil increased in price, like in the Netherlands. The other fats & oils decreased in price in Spain, but all plant oils increased in price in the Netherlands. The price of animal fat is higher than in the Netherlands but soy oil and (palm oil) fatty acids are cheaper in Spain. No price for milo corn was available. The shadow price of milo corn is € 16.59 in pig feeds, € 15.64 in layer and € 20.01 in broiler feeds (benchmarked at the maize price of € 16.60 in swine and layer feeds and € 17.20 for wheat in broiler feeds).

Pig and broiler feeds costs decreased 4% compared to week 2, layer feed costs decreased 3%.

#### *Feedstuff usage in feed formulations.*

Pig feed formulations are based on maize and rye. Maize is the cheapest grain (€ 0.70 cheaper than rye), nevertheless rye is attractive as a starch + protein source. The shadow price of rye is € 16.11 compared to maize at € 16.60 which gives a € 0.49 value difference mainly due to its lower energy content. No price was available for triticale, the shadow price is € 16.66 (€ 0.55 higher than the shadow price of rye). The shadow price of wheat is € 16.21 at a market price of € 17.20. Barely (shadow price € 15.73) is also too expensive. Wheat bran is no longer attractive, the shadow price is € 14.63. Beet pulp remains unattractive (shadow price € 13.75). Palmkernel meal is quite attractive (shadow price € 14.26 at a usage rate of 5%).

The Hipro soybean meal usage is increased with 0.5% by replacing triticale with rye. Rapeseed meal is very attractive, the usage rate is maximised with a shadow price of € 21.05. The shadow price of rapeseed expellers is considerable higher (€ 22.72 benchmarked at the rapeseed meal price of € 21.05), because of the (still) high fat & oil prices. Both Lopro and Hipro sunflower seed meal are still not attractive. Hipro sunflower seed meal is more likely to be attractive than Lopro sunflower seed meal, the value of the Hipro quality is € 2.53 higher than that of the Lopro. The shadow price of the Lopro quality is € 1.91 lower than the current price. No price for maize DDGS was available, the shadow price is € 20.93 (currently there are no maximum C18:2 restrictions although the maize usage is high). No added fats & oils are used since the maize usage is high and the fat & oil prices are relatively high, the shadow price of animal fat f.i. is only € 40.42 (at a price of € 56.00).

Layer feed formulations are based on maize. Wheat is not attractive, even not as an additional source of protein (shadow price € 16.33). Wheat bran is also not attractive for layer feeds (shadow price € 12.15). Rapeseed meal, however, is attractive (shadow price € 21.34). The usage rate is maximised at 2.5%. The Hipro soybean meal usage is still 21%. Rapeseed expellers have a much higher value (shadow price € 27.65 benchmarked at the rapeseed meal price of € 20.20) than rapeseed meal but no price was available.

Both Hipro sunflower seed meal (shadow price € 18.08, no price available) and Lopro sunflower seed meal (shadow price € 13.63, at a price of € 17.70) will be too expensive. No price for maize DDGS was available, but it can be attractive (shadow price € 22.19). Fish meal is too expensive (shadow price € 55.92), although the price is low in Spain (€ 145.00 in the Netherlands). Animal fat is more expensive than (palm oil) fatty acids but nevertheless more attractive (usage rate 2.1%, shadow price € 56.79). No soy oil is needed to meet the minimum C18:2 requirement.

Broiler feeds are based on wheat since the usage rate of maize is maximised (white meat requirement). Toasted soybeans are used (usage 14%) in addition to Hipro soybean meal since the addition of fat & oil is maximised. Hipro soybean meal is the major protein source, the usage rate is 18%. Rapeseed meal is still unattractive (shadow price € 15.01) and so will Hipro sunflowerseed meal (shadow price only € 8.82) be. Maize DDGS will be attractive at a price below € 20.20. The shadow price for peas is € 20.14. Fish meal is also not attractive, although the shadow price at € 71.11 higher is than in layer and pig feeds. Animal fat and soy oil are used as added fat sources, the maximum fat & oil sum is 5.5%. Palm oil is too expensive (shadow price € 52.17 benchmarked at the price of animal fat at € 56.00).

#### *Value of Hipro soybean meal in feed formulations.*

The shadow price of Hipro is € 40.63 in the grower/finisher pig feeds, € 36.16 in the layer feed and € 29.82 in the broiler feed at a market price of € 29.60. The spread in the Hipro soybean meal price (without affecting the usage rate) is highest in pig feeds (€ 11.03), followed by layer feeds (€ 6.56) and lastly broiler feeds (€ 0.22). The spread has increased considerable in pig and layer feeds due to the lower Hipro soybean meal price (it was € 6.01 in pig feeds, € 4.17 in layer and € 2.04 in broiler feeds). The usage rate of soybean meal is highest in poultry feeds, where the spread is lower.

The shadow price of the Lopro quality (42.8% crude protein) is € 28.13 in the grower/finisher pig feeds, € 26.22 in the layer feed and € 24.00 in the broiler feed. Consequently the difference in value between the shadow price of Lopro and the market price of Hipro soybean meal is € 1.47 in pig, € 3.38 in layer and € 5.60 in broiler feeds. These differences have decreased in pig and layer feeds, due to the grain and grain by-product prices, but have increased in broiler feeds due to the relative high fat & oil and toasted soybeans prices. The differences were € 2.17 in pig, € 3.39 in layer and € 5.21 in broiler feeds in report no. 1/2016.

The shadow price of toasted soybeans is € 29.11 in pig and € 34.24 in layer feeds. In broiler feeds toasted beans are used because the amount of added fat & oil is maximised (shadow price € 48.27 at a soy oil price of € 67.63).

Hipro soybean meal is therefore the most attractive protein source next to rapeseed meal and probably maize DDGS especially in poultry feeds.

The usage rate of Hipro soybean meal is:

- 7% usage in pig grower/finisher pig feeds.
- 21% in the layer feeds.
- 18% in broiler grower/finisher feeds, additionally (14%) toasted soybeans are used as a protein and fat source.

*Value differences (€/100 kg) of soybean meal of differing qualities in Spain*

The matrix values of the generic CVB Hipro soybean meal and the different origins are listed in table 1 of the Appendix. The (digestible) energy content varies among the different origins along with the protein and amino acid content and digestibility. Hipro soybean meal from the U.S. has equal or higher nutrient values for digestible amino acids compared to the generic CVB Hipro soybean meal and the highest energy content of all Hipro soybean meal products. This is reflected in the shadow prices of the three origins compared to the generic product offered on the Spanish market for the different periods in table 6 (see also table 12 ‘price effect of variation in nutrient value’).

Table 6. Value differences (+/-) of Hipro SBM in €/100 kg among origins (Argentina, Brazil and the U.S.) in feeds for different species (based on a Hipro SBM price of € 29.60 for February in week 5)

	Swine			Layer			Broiler		
	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.
February	-0.29	+1.08	+1.37	-0.51	+0.40	+0.91	-0.97	+0.94	+1.91

The value of Hipro soybean meal from Argentina is € 0.29-0.97/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.40-1.08 higher value than that from Brazil, despite a lower crude protein content, and € 0.91-1.91 more than that from Argentina. The highest added value of high(er) quality soybean meal is obtained in pig (€ 1.08-1.37) and broiler (€ 0.94-1.91) feeds.

The added value is influenced by the Hipro soybean meal market price, the quality differences between origins, the feeding value per specie and the feed composition. The value of high(er) quality Hipro soybean meal from U.S. has increased slightly in pig (from € 1.07-1.34 to € 1.08-1.37) and layer feeds (from € 0.39-0.91 to € 0.40-0.91) and more in broiler feeds (from € 0.92-1.81 to € 0.94-1.91) compared to report no 12/2015. Despite the lower Hipro soybean meal price the value increases due to the relative high fat & oil price (and the high(er) digestible energy content of high(er) quality Hipro soybean meal).

In conclusion:

1. The market price of Hipro soybean meal in Spain has decreased € 0.70 compared to report no 1/2016, this is significantly less than in the last period (-€ 3.90). The price of Hipro soybean meal in Spain is lower than in the Netherlands (-€ 3.00) and Poland (-€ 1.40).
2. The usage rate of soybean meal is high in poultry feeds, the added value of high(er) quality Hipro soybean meal is highest in pig and broiler feeds.
3. Despite the lower Hipro soybean meal price the added value of high(er) quality Hipro soybean meal has increased slightly, especially in broiler feeds. Also the value difference between the Lopro and Hipro soybean meal quality has increased in broiler feeds.
4. U.S. soybean meal is worth € 1.37/100 kg more than Argentinean soybean meal in swine feeds, € 0.91 in layer feeds and € 1.91 in broiler feeds. The additional value of U.S. soybean meal is highest over that from Argentina in pig and broiler feeds.
5. U.S. soybean meal is worth € 1.08/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.40 in layer feeds and € 0.94 in broiler grower/finisher feeds. The additional value of U.S. soybean meal is highest over that from Brazil in pig and broiler feeds.

### 3.2 Shadow prices soybean meal by origin, Poland

#### Price developments.

All protein rich feedstuffs decreased in price, except rapeseed products, compared to report no. 12/2015 (based on feedstuff prices of week 2, 2016). Remarkable is that in the same period in the Netherlands and Spain the prices of rapeseed products decreased, on the other hand the prices are still considerable lower in Poland. The grain and grain by-product prices in Poland are lowest of all regions; only in Romania is the maize price (€ 0.95) lower. The Hipro soybean meal price decreased € 1.35, which is slightly less than last month (-€ 1.15), however the price decrease is more than in the Netherlands (-€ 0.40) and Spain (-€ 0.70). The Hipro soybean meal price is higher in Poland than in Spain but lower than in the Netherlands.

In brief the price developments are (€/100 kg):

Table 7. Feedstuff prices of week 5 in Poland for February

Period		February	Change week 5-2
Grains	Maize	14.35	-1.45
	Wheat	15.50	-0.45
	Triticale	13.70	-0.25
	Rye		
	Barley	14.15	+0.25
Grain by products	Wheat bran	11.25	+0.40
	Maizegl. feed meal		
Fats & oils	Animal fat	58.90	-3.20
	Palm oil		
	Soy oil	70.80	+0.10
	Fatty acids		
	Toasted Soybeans		
Protein rich	Hipro SBM	31.00	-1.35
	Lopro SBM		
	RSM	19.55	+0.35
	RSE	21.90	+0.60
	Hipro Sunfl. sd ml.		
	Maize DDGS	19.10	-1.15
Misc.	Peas		
	PKM		
	Beet pulp	18.20	-0.65

PFAD (Palm oil Fatty Acid Distillate), SBM (soybean meal), RSM (rapeseed meal), RSE (rapeseed expellers), Hipro Sunfl. sd ml (Hipro sunflowerseed meal) and PKM (Palmkernel meal)



Pig feed costs have decreased 3%, those of layer feeds 6% and those of broiler feeds 3% compared to report no 12/2015. Layer feed costs decreased the most because of the high usage of both maize and Hipro soybean meal.

*Feedstuff usage in feed formulations.*

Pig feed formulations are based on maize and triticale. Triticale are cheaper than maize (-€ 0.65) but the usage rate triticale is maximised at 25%. Maize and maize DDGS are used till the maximum C18:2 limitations, giving a usage rate of 48% for maize and 1% for maize DDGS. The shadow price of triticale is € 14.38 at a maize price of € 14.35. The shadow price of wheat is € 13.69, comparable to the market price of triticale. Maize is much more attractive at a market price of € 14.35 than barley at 14.15 due to the low energy content of barley (the value of maize is € 1.29 over that of barley). The shadow price of rye is € 13.43 (at a triticale price of € 13.70).

Wheat bran is attractive (shadow price € 11.46, usage rate 9%). Beet pulp (shadow price € 10.91) is not at all attractive.

Rapeseed products have become less attractive, since the price increased and that of Hipro soybean meal decreased. The rapeseed meal usage is only 2% (shadow price € 19.64). The shadow price of rapeseed expellers meal is € 21.82 benchmarked at the rapeseed meal price of € 19.55. The shadow price of maize DDGS is only € 19.24 because the usage rate is limited (and value decreased) by the maximum C18:2 restrictions. The inclusion rate of Hipro soybean meal is therefore increased from 6 to 10%.

Layer feed formulations are based on maize. Wheat is not attractive as an additional source of protein (with the recent decreases in the Hipro soybean meal price). The shadow price of wheat is € 14.29 at a market price of € 14.35 for maize, giving a € 0.06 lower value for wheat over maize. The Hipro soybean meal usage remains therefore at 16%. Wheat bran is of no interest, the shadow price is € 9.33. Maize DDGS is still attractive (maximum usage rate of 10%, shadow price € 20.02). Rapeseed expellers are very attractive (maximum usage rate of 2.5%, shadow price € 26.65). The value of rapeseed meal benchmarked at the market price of € 21.90 for rapeseed expellers is only € 14.80. The shadow price of Hipro sunflowerseed meal is € 16.26 and that of the Lopro quality only € 11.12. Animal fat (2%) is used as the added fat source.

Broiler feeds are mainly based on wheat since the usage rate of maize is maximised (white meat requirement). Toasted soybeans (16%) are used in addition to Hipro soybean meal since the fat & oil addition is maximised. Hipro soybean meal is the major protein source. Rapeseed expellers are very attractive (maximum usage rate of 5%, shadow price € 22.35), the shadow price of rapeseed meal is in comparison only € 13.11. Maize DDGS usage is low (1%, shadow price € 19.81). The Hipro soybean meal usage remains high at 13%. The shadow price for peas is € 19.03. Animal fat is the most attractive fat source however the C18:2 content of the broiler feed is maximised.

#### *Value of Hipro soybean meal in feed formulations.*

The shadow price of Hipro is € 31.51 in the grower/finisher pig feeds, € 39.79 in the layer feed and € 39.46 in the broiler feed at a market price of € 31.00. The spread in the Hipro soybean meal price is € 0.51 in the pig feed, € 8.79 in layer feeds and € 8.46 in broiler feeds, without its usage rate being affected. The spread (value compared to the market price and that of other plant proteins) has decreased in pig feeds due to the higher usage of Hipro soybean meal but increased in poultry feeds due to the higher rapeseed expellers price; it was € 9.87 in pig feeds, € 3.46 in layer and € 6.80 in broiler feeds. The usage rate of Hipro soybean meal is only increased in pig feeds because the usage of Hipro soybean meal was already high in poultry feeds.

The shadow price of the Lopro quality (42.8% crude protein) in the same feeds is € 28.12 in the grower/finisher pig feeds, € 26.96 in the layer feed and € 24.31 in the broiler feed benchmarked at the market price of € 31.00 for Hipro soybean meal. Consequently the difference in value between the shadow price of Lopro and the market price of Hipro soybean meal is € 2.88 in pig, € 4.04 in layer and € 6.69 in broiler feeds. Last month, in report no 1/2016, the difference were € 0.72 in pig, € 1.69 in layer and € 2.27 in broiler feeds and have obviously increased with the lower grain (maize, wheat and triticale) prices. In the most concentrated feeds the value of Hipro soybean meal is highest (over that of Lopro).

The shadow price of toasted beans is € 30.45 in pig and € 34.24 in layer feeds. This was respectively € 29.84 and € 35.92 in report no 12/2015, showing the lower value of toasted soybeans at the lower plant protein and animal fat prices in layer feeds, while in pig feeds the value increased slightly (no added fat & oil). In broiler feeds toasted beans are used because the amount of added fat & oil is maximised, although Hipro soybean meal is more attractive as a protein source (shadow price € 42.81).

Hipro soybean meal is therefore the most attractive protein source especially in poultry feeds, next to rapeseed expellers and maize DDGS.

The usage rate of Hipro soybean meal is:

- 10% usage in pig grower/finisher pig feeds.
- 16% in the layer feeds.
- 13% in broiler grower/finisher feeds, additionally (16%) toasted soybeans are used as a protein and fat source.

#### *Value differences (€/100 kg) of soybean meal of differing qualities in Poland*

The matrix values of the generic CVB Hipro soybean meal and the different origins are listed in table 1 of the Appendix. The (digestible) energy content varies among the different origins along with the protein and amino acid content and digestibility. Hipro

soybean meal from the U.S. has equal or higher nutrient values for digestible amino acids compared to the generic CVB Hipro soybean meal and the highest energy content of all Hipro soybean meal products. This is reflected in the shadow prices of the three origins compared to the generic product offered on the Polish market for the different periods in table 8 (see also table 12 'price effect of variation in nutrient value').

Table 8. Value differences (+/-) of Hipro SBM in €/100 kg among origins (Argentina, Brazil and the U.S.) in feeds for different species (based on a Hipro SBM price of € 31.00 for February in week 5)

	Swine			Layer			Broiler		
	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.
February	-0.50	+1.38	+1.88	-0.65	+0.54	+1.19	-1.20	+0.87	+2.07

The value of Hipro soybean meal from Argentina is € 0.50-1.20/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.54-1.38 higher value than that from Brazil, despite a lower crude protein content, and € 1.19-2.07 more than that from Argentina. The highest added value of high(er) quality soybean meal is obtained in pig and broiler feeds.

The added value is of high(er) quality Hipro soybean decreased from € 1.48-1.99 in report 1/2016 to € 1.38-1.88 in pig feeds because of the lower market price for Hipro soybean. The added value is slightly increased from € 0.53-1.19 in layer feeds to € 0.54-1.19 and in broiler feeds from € 0.80-1.95 to € 0.87-2.07 due to the higher prices of the rapeseed products.

In conclusion:

1. The market price of Hipro soybean meal in the Poland has decreased with another € 1.35, compared to report no 12/2015 (where it already decreased € 1.15 in the month before). The price of Hipro soybean meal in Poland is lower than in the Netherlands and Spain. However alternative plant proteins like rapeseed products and maize DDGS are also relatively cheap in Poland.
2. The usage rate of soybean meal is unchanged and high in poultry feeds.
3. The added value of high(er) quality Hipro soybean meal decreased with the lower Hipro soybean meal prices in pig feeds and increased in layer and broiler feeds.
4. U.S. soybean meal is worth € 1.88/100 kg more than Argentinean soybean meal in swine feeds, € 1.19 in layer feeds and € 2.07 in broiler feeds. The additional value of U.S. soybean meal is highest over that from Argentina in pig and broiler feeds.
5. U.S. soybean meal is worth € 1.38/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.54 in layer feeds and € 0.87 in broiler grower/finisher feeds. The additional value of U.S. soybean meal is highest over that from Brazil in pig feeds.

For further information please contact Mr. Jerzy Wiesław Kosieradzki, USSEC EU Regional Consultant. Mobile: +48 608 089 443 Email: [jerzy.kosieradzki@gmail.com](mailto:jerzy.kosieradzki@gmail.com)

### 3.3 Shadow prices soybean meal by origin, Romania, Bulgaria, Serbia and Macedonia

#### Price developments.

The grain prices have changed little compared to last month. The largest price decreases were among the protein rich feedstuff and plant oil. The market price of soybean meal has decreased once again significantly after a considerable price increase in previous periods (+€ 2.55 for Lopro from week 44 to 48 but a decrease of -€ 7.00 for Lopro from week 48 to 2). The soybean meal price in Romania however is still highest of all the regions and often of lower quality. Remarkable is that in Romania the plant oil price increased sharply, while it decreased sharply in the previous period. The plant oil and soybean meal prices in Romania are highest of all regions but the maize price is lowest. Considering the low maize and sunflower seed meal prices, Hipro soybean meal is quite expensive as a protein source in Romania.

In brief the price developments are (€/100 kg):

Table 9. Feedstuff prices of week 5 in Romania for February

Period		February	Change week 5-2
Grains	Maize	13.40	
	Wheat	18.20	+0.05
	Triticale	18.10	-0.10
	Sorghum		
	Barley	18.00	+0.05
Grain by products	Wheat bran	14.20	+0.05
	Maizegl. feed meal		
Fats & oils	Animal fat		
	Palm oil		
	Sunflower oil	74.50	+8.10
	Fatty acids		
	Toasted Soybeans		
Protein rich	Hipro SBM		
	Lopro SBM*	33.40	-4.25
	RSM		
	RSE		
	Hipro Sunfl. sd ml.	18.90	+3.40
	Maize DDGS	21.00	-1.15
Misc.	Peas	18.90	
	Beet pulp		

\*Lopro 44% crude protein. PFAD (Palm oil Fatty Acid Distillate), SBM (soybean meal), RSM (rapeseed meal), RSE (rapeseed expellers), Hipro Sunfl. sd ml (Hipro sunflowerseed meal) and PKM (Palmkernel meal)

No price was available for milo corn, which when priced attractive can reduce feed costs substantially. Resultantly pig feed costs decreased 3% compared to the last period (report no 12/2015), those of layer feeds 5% and of broiler feeds even 6%.

#### *Feedstuff usage in feed formulations.*

Pig feed formulations are based on maize with some triticale. Milo corn can be very attractive compared to maize in Romania, due to the higher protein and lower C18:2 content, the shadow price is € 15.68. The usage rate of milo corn is restricted to 25%, but can be higher based on the tannin content. The usage rate of maize and milo corn (and also maize DDGS) is restricted because C18:2 limitations are used, consequently 7% triticale is used (and 58% maize). Barley is not attractive (shadow price € 16.42 and neither is wheat (shadow price € 17.58). Although the market prices of wheat and triticale are about equal, the shadow price (value) of wheat is (€ 0.52) lower.

Peas are very attractive starch and protein source (usage rate 15%, shadow price € 21.44). Hipro sunflowerseed meal is still attractive (usage rate 10%), despite price increase (while the soybean meal price decreased). The shadow price of Hipro sunflowerseed meal is € 20.06 at a market price of € 18.90. Wheat bran is therefore not attractive (shadow price only € 12.78). No added fat or oil is used because it is very expensive. Even maize DDGS is not attractive since the C18:2 content and maize usage is maximised, the shadow price is only € 6.15. Prices for rapeseed meal (shadow price € 25.06) and rapeseed expellers (shadow price € 22.21) were also not available. The value of wheat DDGS (shadow price € 13.82) is like that of maize DDGS low. The usage of Lopro soybean meal is relatively low for pig feeds at 4%, due to the high pea usage.

Layer feed formulations are based on maize, wheat is not attractive. Although the protein content of wheat is higher than that of maize, it is too expensive (shadow price € 13.88 compared to maize price of only € 13.40). Peas can also be attractive for layer feeds however the shadow price is much lower than in pig feeds (shadow price € 17.73 in layer but € 21.44 in pig feeds at a usage rate of 10%). The shadow price of milo corn is € 12.58. Wheat bran is not attractive, the shadow price is only € 8.39 due to the low energy content and the high plant oil price. Toasted soybeans are now quite attractive, the usage rate is 12% and the shadow price is € 38.86. Therefore no sunflowerseed oil is added anymore (shadow price € 56.03 at a toasted soybean price of € 35.60). Hipro sunflower seed meal is too expensive (shadow price € 18.19). Maize DDGS is only marginally attractive, the usage rate is only 0.1% at a shadow price of € 21.55. The shadow price of rapeseed expellers (shadow price € 30.46) is significantly higher than of rapeseed meal (shadow price € 22.80) and higher than for pig feeds. The Lopro soybean meal usage is decreased to 14% due to the high usage of toasted soybeans.

Broiler feeds are maize based (no white meat requirement). Wheat is too expensive (shadow price € 5.37). Peas are not attractive as a protein and starch source, the shadow price is € 11.70 at a market price of € 18.90. Toasted soybeans are attractive, the usage

rate is 14% at a shadow price of € 37.35. The usage rate of sunflower seed oil is therefore reduced from 3.5% to 1.6%. Hipro sunflowerseed meal is not attractive due to the low energy content. Maize DDGS is also not attractive as an energy + protein source, the shadow price is only € 4.45. The value of wheat DDGS is even lower. Prices for rapeseed meal (shadow price € 2.55) and rapeseed expellers (shadow price € 17.21) were not available, rapeseed expellers are more likely to be attractive. Hipro soybean meal is therefore the most attractive protein source next to toasted soybeans, the usage rate is therefore reduced to 21%.

#### *Value of Hipro soybean meal in feed formulations.*

The shadow price of the Lopro quality is € 38.73 in the grower/finisher pig feeds, € 35.10 in the layer feed and € 38.09 in the broiler feed compared to the market price of € 33.40. This gives a spread of € 5.33 in pig feeds, € 1.70 in layer feeds and € 4.69 in broiler feeds.

The shadow price of the (47% Crude Protein) Hipro soybean meal is € 33.71 in the grower/finisher pig feeds, € 35.30 in the layer feed and € 37.55 in the broiler feed based on the Lopro price of € 33.50 (no price for the Hipro quality was available). The difference in value (due to 1.0 % crude protein) is € 0.21 in pig feeds, € 1.80 in layer and € 4.05 in broiler feeds. These differences were respectively € 0.49 in pig feeds, € 2.65 in layer and € 2.23 in broiler feeds in report no 12/2015 and only decreased in pig and layer feeds due to the lower Lopro soybean meal price. The difference increased in broiler feeds due to the high sunflowerseed oil price. The value differences remain largest in poultry feeds.

The shadow price of toasted beans is zero in pig, € 38.86 in layer and € 37.35 in broiler feeds. The usage rate is therefore high in poultry feeds at a market price of € 33.40. The value is high in poultry feeds due to the high energy concentration and high plant oil prices and low in pig feeds due to the C18:2 restrictions (and low energy content).

Lopro soybean meal is therefore used next to toasted soybeans in poultry feeds, the usage rate of Lopro soybean meal is low in pig feeds.

The usage rate of soybean (meal) is:

- 4% Lopro in pig grower/finisher pig feeds.
- 14% Lopro and 12% toasted soybeans in the layer feeds.
- 21% Lopro in broiler grower/finisher feeds along with 14% toasted soybeans.

#### *Value differences (€/100 kg) of soybean meal of differing qualities in Romania*

The matrix values of the generic CVB Hipro soybean meal and the different origins are listed in table 1 of the Appendix. The (digestible) energy content varies among the different origins along with the protein and amino acid content and digestibility. Hipro

soybean meal from the U.S. has equal or higher nutrient values for digestible amino acids compared to the generic CVB Hipro soybean meal and the highest energy content of all Hipro soybean meal products. This is reflected in the shadow prices of the three origins compared to the generic product offered on the Romania market for the different periods in table 10 (see also table 12 'price effect of variation in nutrient value').

Table 10. Value differences (+/-) of Hipro SBM in €/100 kg among origins (Argentine, Brazil and the U.S.) in feeds for different species (based on the Lopro SBM price of € 33.40 for February in week 5)

	Swine			Layer			Broiler		
	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.
February	-0.09	+1.75	+1.86	-0.77	+0.40	+1.17	-2.23	+1.14	+3.37

The value of Hipro soybean meal from Argentina is € 0.09-2.23/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.40-1.75 higher value than that from Brazil, despite a lower crude protein content, and € 1.17-3.37 more than that from Argentina. The highest added value of high(er) quality soybean meal is obtained in swine feeds, in all feeds the added value of U.S. versus Argentina is substantially higher than U.S. versus Brazil.

The added value of high(er) quality soybean meal has decreased in pig and layer feeds but increased in broiler feeds. The added value in pig feeds went from € 2.42-2.72 in report 12/2015 to € 1.75-1.86, in layer feeds from € 0.53-1.62 to € 0.40-1.17 and in broiler feeds from € 0.38-1.63 to € 1.14-3.37. The added value is highest in broiler and pig feeds but the usage rate is low in pig feeds.

In conclusion:

1. The market price of soybean meal is high in Romania compared to other regions, specifically when the lower quality is taken in consideration.
2. Hipro soybean meal is in general more attractive than the Lopro quality, but no price was available for the Hipro quality.
3. The usage rate of soybean products is high in poultry feeds and low in pig feeds.
4. The added value of high(er) quality Hipro soybean meal has increased in broiler feeds even with the lower soybean meal price.
5. U.S. soybean meal is worth € 1.86/100 kg more than Argentinean soybean meal in swine feeds, € 1.17 in layer feeds and € 3.37 in broiler feeds. The additional value of U.S. soybean meal is highest over that from Argentina in in swine feeds.
6. U.S. soybean meal is worth € 1.75/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.40 in layer feeds and € 1.14 in broiler grower/finisher feeds. The additional value of U.S. soybean meal is highest over that from Brazil in swine feeds.

For further information please contact Mr. Iani Adrian Chihaiia, Romania / USSEC South Eastern European Consultant. Email: [cia@feedinfo.ro](mailto:cia@feedinfo.ro)

*In conclusion in all regions, soybean meal from the U.S. has a higher value than soybean meal from Argentina or Brazil. Hipro soybean meal from the U.S. has the highest added value, specifically in broiler feeds. These value differences are a result of differences in the protein content as well as differences in the digestibility of amino acids and organic matter (energy content). Usage rate of soybean meal is higher in poultry feeds than swine feeds.*



#### 4. Analyses of value differences (€/100 kg) of soybean meal of differing qualities

As can be seen from the matrices (see table 1 Appendix) the different quality soybean meals differ in nutritional value resulting in shadow prices differences in feeds for different species and categories or phases, the main differences are:

1. Protein content. This varies from 46.0% (Arg.) to 46.9% (Brazil).
2. Energy content. U.S. soybean meal has a 2.6% higher NE (swine), 3.0% higher AME-layer and 3.6% higher AME-broiler than soybean meal from Argentina. Brazilian soybean meal is 2.1% higher in NE, 2.1% AME-layer and 2.1% AME-broiler than soybean meal from Argentina.
3. Amino acid profile, amino acid digestibility and digestible phosphorus. U.S. soybean meal has f.i. a 7.9% higher AID lysine (swine) content than soybean meal from Argentina and the TD lysine (poultry) content is 9.2% higher. Brazilian soybean meal has a 2.5% higher AID lysine (swine) content than soybean meal from Argentina and the TD lysine (poultry) content is 2.9% higher.

The value difference caused by each factor is given in table below where a comparison is made to Brazilian soybean meal for each species. This analysis is based on the shadow prices in the Netherlands (Hipro soybean meal € 32.60) for February of the different qualities soybean meal (see table 4 chapter 3). The results are in general applicable to all regions.

Table 11. Differences in value (€/100 kg) of the different soybean meals caused by the chemical and nutritional differences compared to the Brazilian and Argentinean product

	Swine			Layer			Broiler		
	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.	Argent. vs Brazil	U.S. vs Brazil	U.S. vs Arg.
<i>Absolute differences in nutrient value</i>									
Protein%	-0.9	-0.7	+0.2	-0.9	-0.7	+0.2	-0.9	-0.7	+0.2
Energy cal	-40	+10	+50	-48	+20	+68	-39	+30	+69
<i>Value (€/100 kg) differences (compare to table 1)</i>									
Protein €	-0.41	-0.34	+0.10	-0.53	-0.42	+0.13	-0.74	-0.58	+0.16
Energy €	-0.30	+0.08	+0.38	-0.31	+0.13	+0.45	-0.64	+0.49	+1.14
Dig. AA €	+0.12	+1.57	+1.42	+0.26	+0.83	+0.54	+0.28	+0.96	+0.67
Total €	-0.59	+1.31	+1.90	-0.58	+0.54	+1.12	-1.10	+0.87	+1.97

*A difference of 0.9% crude protein with the lower soybean meal (and also grain and other plant protein) prices but higher prices for synthetic amino acids adds or decreases € 0.41/100 kg to the value of Hipro soybean meal in swine feeds (was € 0.40 in week 2), € 0.53 in layer feeds (was € 0.51) and € 0.74 in broiler feeds (was € 0.70). The value of protein in soybean meal protein increased in all feeds because of the higher L-Lysine, L-Threonine and L-Tryptophan prices despite the lower prices of Hipro soybean meal (-0.40), rapeseed meal and -expellers (-€ 1.00) and maize DDGS (-€ 1.70).*

*The value of soybean meal due to energy content has increased as follows: 50 kcal NE adds € 0.38/100 kg to the value of Hipro soybean meal in swine feeds (was € 0.35) and*

68 kcal ME € 0.45 in layer feeds (was € 0.43). Although the energy costs derived from grains (starch) have decreased the fat & oil prices have (absolutely and relatively) increased. 69 kcal extra in broiler feeds increases the shadow price with € 1.14 (was € 1.04) due to the higher toasted soybean (along with a higher soy oil) price.

Altogether the value differences due to protein content are larger in poultry than swine feeds, they are largest in broiler feeds. Differences in the amino acid pattern and digestibility (along with the digestible phosphorus content) create an added value of € 1.42-1.57/100 kg in swine feeds for U.S. soybean meal over that from Argentina or Brazil, € 0.54-0.83 in layer feeds and € 0.67-0.96 in broiler feeds. These value differences have increased the most in pig and broiler feeds compared to the last report (no 1/2016) due to the higher usage of the synthetic amino acids L-Lysine, L-Threonine and L-Tryptophan. In poultry feeds the still high DL methionine price (€ 4.45/kg) increases the added value differences due to digestible amino acids between the different origins. In conclusion next to the protein content, the digestible energy, amino acid and phosphorus contribute significantly to the value of soybean meal.

From table 11 above can further be concluded:

1. Differences in the protein content contribute significantly to the differences in the value (shadow price) of soybean meal. However this explains only partly the differences in the value.
2. The value (shadow price) differences due to energy are largest in broiler feeds. The U.S. origin demands a € 0.38 higher value over Argentinean soybean meal due to a 50 kcal ME difference in swine feeds, a € 0.45 difference in layer feeds for a 68 kcal ME difference and a € 1.14/100kg for a 69 kcal ME difference in broiler feeds.
3. The increased digestibility of amino acids (and phosphorus) has a large impact on the added value of U.S. soybean meal for swine feeds, compared to the Brazilian origin it adds € 1.57.

#### Variation in nutrient values

The effect of variation in the nutrient value (4-5%) of soybean meal on the value (market price € 32.60/100 kg in the Netherlands for February) is given in the following table.

Table 12. Price effect of variation in nutrient value

	Swine	Layer	Broiler
+/- 100 cal	0.84	0.66	1.66
+/- 4% dig AA	0.88	0.29	0.31
+/- 100 Cal and 4% dig AA	1.72	0.94	1.97
+/- 0.1 g/kg dig P	0.03	0.04	0.04

Variation in the energy content has the largest effect on the value of soybean meal in

broiler feeds (and is therefore changed the most). A variation of +/- 100 kcal has a € 0.84/100 kg effect on the Hipro soybean meal value in swine and € 0.66 in layer feeds but € 1.66 in broiler feeds. A variation of 4% in digestible amino acids changes the value of Hipro soybean meal with € 0.29 in layer, € 0.31 in broiler but € 0.88 in swine feeds. The effects of digestible energy and amino acids on the value of soybean meal are additive.

Variation in the AID (or SID) amino acid content has the largest impact in swine feeds, the higher synthetic amino acid prices have also increased the effect of variation in the digestible amino content the most in swine feeds. The higher fat & oil and toasted soybean prices have increased the effect of variation in the digestible energy content the most in broiler feeds. Digestible phosphorus has the highest value in poultry feeds.

*In summary the higher economical and nutritional value of soybean meal from U.S. origin over soybean meal from Argentina or Brazil, at the same protein content, is caused by the (combined) higher amino acids and organic matter (= energy) digestibility. Differences in the (digestible) energy content contribute more to the added value than differences in digestible amino acid and phosphorus content.*

Sincerely yours,

Jannes Doppenberg, Ph.D.

For any comments, questions or suggestions please write to [jdoppenberg@schothorst.nl](mailto:jdoppenberg@schothorst.nl)

## Appendix

### Least cost formulations set up

The purpose of least cost formulations is to determine the shadow price of feedstuffs like Hipro soybean meal of different qualities (origins) in comparison to other (protein rich) feedstuffs. The *shadow price is the maximum price* that can be paid for a feedstuff to be used in a feed formulation, this is dependant on:

- Market effects. Mainly the availability and prices of ‘competing’ feedstuffs, i.e. protein rich feedstuffs like other quality soybean meals, sunflower seed meal and/or rapeseed meal. Therefore current market and future prices of feedstuffs for the Dutch, Spanish, Polish and Romanian feed industry when available are used. Updates are made on a monthly base, so that the effects of feedstuff price changes on feedstuff composition and compound feed costs can be analyzed.
- The species for which the feed is formulated, since the feeding or nutritional value of the feedstuff and/or the nutrient restriction vary per specie. Therefore three sets of feed formulations are made for swine, layers and broilers each.
- The chemical composition and matrix values of soybean meal (of different origin). The price effect of differences in a) protein, b) energy and c) digestible amino acid (and phosphorus) were analyzed separately by equalizing protein and energy contents for swine and poultry feeds. Both the chemical composition of SBM as well as the effect of processing (crushing) varies and influences the nutritional quality. The nutrient values listed in table 1 are averages based on the research of Prof Mateos, individual batches of SBM can vary considerable.

Note that the exact nutritional and economical value of a feedstuff can only be obtained (and compared) if the feeding value (Net Energy or Apparent Metabolizable Energy content and digestible ileal or total tract amino acid content) was determined with the target species (layer, growing pigs or broiler) of all feedstuffs used in the formulation via the same research protocol (for the digestibility experiments). In this formulation the CVB matrix is used for all the feedstuffs and the three different (origins of) soybean meals are compared among each other with matrix values obtained from the research of Prof. G. Mateos (Universidad Politecnica de Madrid, Spain). Therefore the differences in economical value among the three soybean meals with different origins can be determined from the differences in nutritional value from the different matrices.

### Matrix values

The most important nutrient values per species of the different soybean meals are listed in table 1. Note that the nutrients which have a minimum or a maximum restriction or requirement in the formulations influence both the feed cost and shadow prices of feedstuffs. The energy (NE, EV and AME) and the (ileal) digestible amino acids) content are most crucial.

Table 1. Nutrient values per specie of the soybean meals by origin

Chemical composition (g/kg product)				
Feedstuffs	CVB	Mateos Matrix		
	SFR	Argentina 46.0% CP	Brazil 46.9% CP	U.S. 46.2% CP
<b>Chemical analyses</b>				
Moisture	122.0	120.0	112.0	120.0
C.Protein	468.0	460.0	469.0	462.0
C.Fiber	40.0	36.0	54.0	38.0
Ash	64.0	67.0	62.0	67.0
C.Fat	22.0	16.0	19.0	15.0
Starch (Ewers)	40.0	25.0	25.0	25.0
Sugars	65.0	67.0	53.0	79.0
Calcium	2.80	3.30	3.00	4.60
Phosphorus	6.30	6.90	6.20	6.80
Potassium	22.3	22.5	21.3	21.1
Lysine	29.0	28.3	28.6	28.8
Meth+cyst	13.6	13.5	13.4	13.5
Tryptophan	6.1	6.3	6.3	6.4
Threonine	18.3	18.2	18.2	18.1
Isoleucine	21.5	20.8	21.2	20.8
<b>Energy value</b>				
NE pigs kcal	1945	1940	1980	1990
EV pigs (Dutch)	92.62	92.38	94.29	94.76
AME layer kcal	2227	2242	2290	2310
AME broiler kcal	1888	1901	1940	1970
<b>Digestible nutrients</b>				
Digestible P swine	2.50	2.70	2.40	2.70
Dig. P poultry	2.60	2.80	2.30	2.80
il.dig.Lys swine	25.8	24.0	24.6	25.9
Il.dig.Lys/100 g.Pr	5.51	5.22	5.25	5.61
il.dig.Meth swine	5.9	5.5	5.4	5.8
il.dig.M+C swine	11.6	10.9	11.1	11.6
il.dig.Tryp swine	5.2	5.2	5.2	5.5
il.dig.Thre swine	15.4	14.5	14.7	15.4
il.dig. Isol swine	18.7	17.5	18.1	18.5
dig.Lys poultry	25.5	24.0	24.7	26.2
dig.Lys/100 g.Prot	5.45	5.22	5.27	5.67
dig.Meth poultry	5.8	5.5	5.5	5.8
dig.M+C poultry	11.5	11.1	11.2	11.9
dig.Tryp poultry	5.4	5.4	5.4	5.5
dig.Thre poultry	15.6	14.9	15.2	15.9
dig.Isol poultry	18.9	18.1	18.7	18.8

**Table 2A Feedstuff prices in €/100 kg week 5, 2016. The Netherlands**

<b>Code</b>	<b>Article</b>	<b>Description</b>	<b>February</b>	<b>May-July</b>
00010		Citruspulp Braz./USA	16.10	17.00
00013		Peas <22%CP	23.10	23.30
00015		Barley (EU)	15.40	15.60
00026		Soybean hulls	15.10	14.00
00033		MOLASSES cane <47% <sup>s</sup>	17.00	17.00
00034		Flaxseed	38.50	38.50
00038		Alfalfa 15% CP	19.50	19.50
00044		Rapeseed Expellers 8%	24.00	24.20
00061		Rye (EU)	15.10	15.30
00063		WHEAT EU (feed)	16.20	16.40
00064		PALMKERNELml<20%fiber	12.50	12.40
00075		Beet Pulp 20-25% <sup>s</sup> sugar	17.10	17.10
00076		MAIZE (EU)	17.40	17.60
00077		SBM 42%CP Arg.pel.	N.A.	N.A.
00078		L-lysine HCl	132.00	132.00
00079		DL-Methionine	445.00	445.00
00080		Soybeans toast.pel.	41.20	41.20
00081		SBM 44/7 domestic	30.30	28.80
00084		SBM Hipro domestic	32.60	31.50
00090		Wheat middlings	14.30	13.40
00096		Soy oil liq.	69.50	68.00
00097		Palm oil	57.00	58.00
00100		Animal fat (lard)	52.00	52.00
00105		Fish meal S. America	145.00	145.00
00107		MAIZEglut. fd ml 20-23%CP	17.30	17.40
00113		Sunflowerseedml<29%CP	15.90	16.10
00165		TRITICALE	16.20	16.40
00214		L-Threonine	190.00	190.00
00228		Monocal Phosph	54.90	54.90
00256		Fatty Acids 20% Lin.	59.00	59.00
00258		Palm oil Fatty Acids	56.00	56.00
00266		Rapeseed meal34%CP	20.10	20.50
00332		Vinasses beet	10.50	10.50
00488		MAIZE distillers sol	19.80	N.A.
00489		WHEAT DDGS	N.A.	N.A.

**NA – no price available**

**Table 2B. Feedstuff prices of week 5, 2016 for Spain\*, Romania# and Poland compared to the Netherlands**

\* Feedstuff prices for the Northern Barcelona area.

#Feedstuff prices are similar for Romania, Bulgaria, Serbia and Macedonia, see text for exceptions

	Spain	Romania#	Poland	Netherlands
	€/100 kg	€/100 kg	€/100 kg	€/100 kg
<b>Code</b>	<b>Description</b>			
00013		18.90		23.10
00015	17.00	18.00	14.15	15.40
00061	15.90			15.10
00026	13.40			15.10
00033	14.00	11.10	13.50	17.00
00038	15.00			19.50
00044			21.90	24.00
00061				
00063	17.20	18.20	15.50	16.20
00075	18.00		18.20	18.50
00076	16.60	13.40	14.35	17.10
00078		129.30	122.50	132.00
00079		470.10	430.35	445.00
00080		35.60		41.20
<b>00084</b>	<b>29.60</b>	<b>33.40*</b>	<b>31.00</b>	<b>32.60</b>
00090	15.50	14.20	11.25	14.30
00096	67.50	74.50	70.80	69.50
00097	63.50			57.00
00100	57.00		58.90	52.00
00105	97.00			145.00
00107				17.30
00113	17.70	18.90		15.90
00165	17.40	18.10	13.70	16.20
00214			171.70	190.00
00228		54.70	52.80	54.90
00266	20.20		19.55	20.10
00488		21.00	19.10	19.80
00258	53.50			56.00

&Lopro quality \* Hipro Sunflower seed meal in Romania; Lopro in Spain and the Netherlands.