



Schothorst Feed Research
Research for development

Soybean Meal Quality by Origin:

Economical Value of Hipro Soybean Meal in Least Cost Formulations

Report: USSEC No. 4/2016

May 6, 2016

J. Doppenberg, Ph.D.

This report is a contribution to the feed and animal feed industry
in the European Union, brought to you by:





Schothorst Feed Research

Report: USSEC No. 4

**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: May and August-October (2016)

By J. Doppenberg, Ph.D.

CONTENTS

0. Executive summary	4
1. Introduction.....	5
2. Feedstuff market developments Netherlands.....	5
3. Shadow prices soybean meal by origin, the Netherlands.....	6
3.1 <i>Shadow prices soybean meal by origin, Spain.....</i>	<i>12</i>
3.2 <i>Shadow prices soybean meal by origin, Poland.....</i>	<i>17</i>
3.3 <i>Shadow prices soybean meal by origin, Romania, Bulgaria, Serbia and Macedonia </i>	<i>21</i>
4. Analyses of value differences (€/100 kg) of soybean meal of differing qualities	25

Appendix

Table 1. Matrix values of SBM by origin

Table 2. Feedstuff prices in different regions

Disclaimer:

The content of this report is for informational purposes only. All information provided in this report is to the best of our knowledge accurate and based on solid research. Schothorst Feed Research BV can not be held responsible for any claims resulting from the use of the information provided or feedstuff prices mentioned in this report in formulating feeds or purchasing feedstuffs.

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	35.80	34.60	35.75	38.90@

*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%. @Hipro quality 46% crude protein.

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 € 35.80/100 kg for May in week 18, 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 €	-0.47	-0.39	+0.11	-0.64	-0.51	+0.14	-0.87	-0.68	+0.20
Energy €	-0.38	+0.10	+0.48	-0.40	+0.17	+0.58	-0.73	+0.57	+1.31
Dig. AA €	+0.15	+1.87	+1.69	+0.34	+0.70	+0.43	+0.49	+0.79	+0.48
Total €	-0.70	+1.58	+2.28	-0.77	+0.36	+1.15	-1.11	+0.68	+1.99

*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 all feeds, except the added value of US versus Brazil Hipro soybean meal in poultry feeds. The higher Hipro soybean meal price increases the added value but the lower synthetic DL Methionine and L Threonine prices decrease it. Virtually all other feedstuff prices have increased with the exception of wheat bran, palm oil and beet pulp. The value of (higher) quality Hipro

soybean meal due to differences in the crude protein and (digestible) energy content have increased in all feeds. The price effect due to differences in digestible amino acids has increased in swine feeds but is decreased in poultry feeds.

Hipro soybean meal from the United States has therefore f.i. a € 3.60-6.80/1000 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 € 11.50-19.90/MT. U.S. Hipro soybean meal has the highest added value for swine (€ 15.80-22.80) and broiler (€ 6.80-19.90) feeds, followed by layer feeds (€ 3.60-11.50/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 € 8.70-19.70 (U.S. vs Brazil) and € 10.10-21.70/MT (U.S. vs Arg) or respectively 2.4-5.5% and 2.8-6.1%.

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 18 are used for the current period (May) and the August-October period when the new grain harvest will be 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 Comerç Industria i Navegació 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 for May has increased sharply with € 5.00, compared to week 13. The price of soy oil increased € 0.50 and that of toasted soybeans with € 3.10. The price of soybean meal has increased due to poor harvest conditions (in Argentina) and a delay in planting in the U.S. due to rain. Soybean plantings in the USA for this season are expected to be as high as last year, however, according to the USDA. The prices of the other plant proteins have also increased considerable. Future prices of Hipro soybean meal and soybeans have increased but are lower than currently.

All grain prices have increased of which maize the most. The FAO predicts again a record global grain production for this year that will be the third year in a row. The maize production is expected to increase 1.1% in the USA and EU, totalling over 1 billion tons.

3. Shadow prices soybean meal by origin, the Netherlands

Price developments.

The Hipro (49/3.5) soybean meal price for May has increased with € 5.00 from week 13 to 18. This is a significant increase and breaks abruptly the trend of continuous decreasing prices we have seen for the last eight (8) months. The prices of virtually all feedstuffs have increased, just like in the previous period. Especially the maize price increased considerable. The prices of some synthetic amino acids (DL Methionine and L Threonine) have decreased sharply. The prices of toasted soybeans and soy oil price have increased slightly along with Hipro soybean meal, although the price of palm oil has decreased. The future prices (August-October) for the grain are higher than the current prices but those of other plant proteins are lower.

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

Table 3. Feedstuff prices of week 18 in the Netherlands for May and August-October.

Period		May	Aug-Oct	Current week 18-13	Future vs current
Grains	Maize	18.70	18.80	+1.50	+0.10
	Wheat	16.20	16.90	+0.70	+0.70
	Triticale	15.70	16.20	+0.20	+0.50
	Rye	14.90		+0.20	
	Barley	15.50	15.70	+0.40	+0.20
Grain by products	Wheat bran	12.50	12.60	-0.40	+0.10
	Maizegl. feed meal	17.20	16.90	+1.20	-0.30
Fats & oils	Animal fat	54.50			
	Palm oil	65.50	65.50	-0.60	
	Soy oil	69.50	71.00	+0.50	+1.50
	PFAD	62.50	62.50		
	Toasted Soybeans	43.80	44.50	+3.10	+0.70
Protein rich	Hipro SBM	35.80	34.90	+5.00	-0.90
	Lopro SBM	33.30	31.70	+4.50	-1.60
	RSM	23.70	21.50	+1.50	-2.20
	RSE	25.50	25.00	+1.30	-0.50
	Lopro Sunfl.sdml*				
	Maize DDGS	21.80		+2.00	
Misc.	Peas	23.00		+0.20	
	PKM	13.00	12.60	+1.30	-0.40
	Beet pulp	15.50	15.50	-0.40	

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 all grains have increased but especially the maize and wheat price increased sharply. The future (August-October) maize and wheat grain prices have also increased and are even higher than the current prices. This might indicate that the grain prices are not likely to decrease but might even increase in the near future. On the other hand the world stock of grains are high (especially maize) which might put pressure on the market. The prices of maize DDGS and maize gluten feed meal have increased but the wheat bran price has decreased.

The crude oil price (closely linked to the palm oil price) has increased progressively in April and is once again well over \$ 40/barrel. The palm oil price, however, has decreased and that of palm oil fatty acids is unchanged. The prices of both soy oil and toasted soy beans have increased. The animal fat price is unchanged and (still) considerable lower than that of plant oils and PFAD. The price of PFAD is still (€ 3.00) lower than that of palm oil but € 8.00 higher than that of animal fat. Soy oil is the most expensive plant oil. The price of toasted soy beans has increased slightly less than expected based on the increase in the prices of both soybean meal and soy oil.

All protein rich feedstuffs have increased in price but both Hipro and Lopro soybean the most on a per unit of protein basis. The prices of rapeseed and sunflower seed meal increased already considerable last month, probably lowering the current price hike. The relative low fat & oil prices (because the grain prices increased much more) make the low energy feedstuffs like rapeseed and sunflower more attractive compared to soybean meal and high energy and protein rich feedstuffs like rapeseed expellers and maize DDGS. The spread between the Lopro and Hipro soybean meal price has changed little since the Hipro soybean meal price increased (€ 0.50) more than the Lopro.

Resultantly pig feed costs increased with 4% and those of layer and broiler feeds with 8%. The future (August-October) feed costs are 3% higher for pig and 1% for poultry feeds than currently.

Feedstuff usage in feed formulations.

Pig feed formulations are based on rye, triticale and barley. Rye is the most attractive (€ 0.80/100 kg cheaper than triticale), followed by triticale and after that barley. The inclusion rates of both rye and triticale are limited. Barley has become less attractive, due to the lower crude protein content and high protein prices (10% inclusion rate, shadow price € 15.53). Maize is not attractive, the shadow price is € 17.56. Wheat (shadow price € 15.02) is also too expensive (benchmarked at the market price of triticale at € 15.70, the value of wheat is € 0.68 lower than of triticale). With these increased grain prices the value of maize, as an energy source, has increased (€ 2.54 over wheat). The usage of maize DDGS is reduced from 10 to 5 %, due to the low protein quality/value (and price increase). Wheat bran is therefore now attractive (shadow price € 12.69 at an 18% usage). Rapeseed products are also not attractive, moreover since the prices increased further. Rapeseed meal has a shadow price of € 21.41 at a market price of € 23.70.

Rapeseed expellers are likewise too expensive (shadow price only € 24.67). The margin between the market and shadow price of rapeseed expellers is less than that of rapeseed meal, making it sooner attractive. Peas are nearly attractive (shadow price € 22.97 at a market price of € 23.00). Lopro sunflower seed meal is not at all attractive (shadow price only € 12.02), since it is very low in energy. Palmkernel meal is not attractive, the price increased significantly (shadow price € 12.44 at a market price of € 13.00). Palm oil (shadow price € 61.60) is not but animal fat (lard) (shadow price € 62.60) will be attractive benchmarked at the palm oil fatty acids (PFAD) price € 62.50. The usage rate of fats & oils has increased with 1.6% due to the relative low fat & oil prices, compared to the energy costs from grains (starch). Beet Pulp is too expensive (shadow price € 13.42). Hipro soybean meal (shadow price € 35.87 at a market price of € 35.80) is more attractive than Lopro soybean meal (shadow price € 32.44 at a market price of € 33.30). The usage rate of Hipro soybean meal has decreased 1% due to the increased Hipro soybean meal price and (partly) replacement by wheat bran.

Layer feed formulations are now mainly based on wheat (36% usage, shadow price € 16.31). Maize is still used but the usage rate is decreased from 49 to 25% (minimum usage). Due to the high plant protein prices wheat has become attractive as a protein source. The shadow price of maize is only € 17.39, benchmarked at the market price of wheat at € 16.20 and Hipro soybean meal of € 35.80. This means the maize price has to decrease with € 1.31 before it will (start to) replace wheat. Peas are not attractive (shadow price € 20.32 at a market price of € 23.00). The usage of maize DDGS is maximised at 10% with a shadow price of € 22.99. Maize gluten have become attractive as a protein and xanthophyll (egg yolk colouring) source (although at the high maize DDGS usage they are probably not needed for the latter), the usage rate is <2%. Rapeseed expellers are considerable more attractive than rapeseed meal (shadow price rapeseed meal € 23.65 at a € 25.50 market price for rapeseed expellers) and also used to the maximum (2.5%). Wheat bran is too expensive (shadow price € 10.94). The fat addition is 2.5% due to the increased usage of wheat at the expense of maize. Lard is the most attractive fat source (shadow price € 63.75 at a PFAD price of € 62.50). Lopro sunflower seed meal (shadow price € 13.26) is not attractive. The Hipro soybean meal usage is reduced from 16 to 11%, due to the price hike. Hipro soybean meal (shadow price € 35.88) is more attractive than the Lopro quality. Toasted soybeans are not attractive (shadow price € 39.05).

Broiler feeds are based on wheat since the usage rate of maize is maximised (white meat requirement). Peas are not attractive (shadow price € 20.93 at a market price of € 23.00). Toasted soybeans are still used in addition to Hipro soybean meal but they have become less attractive (-3% usage) with the higher price ratio compared to Hipro soybean meal. Maize gluten meal (60% protein) have become attractive at the high soybean meal prices, the usage rate is however <1% with a shadow price of € 77.25. Animal fat and soy oil 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). PFAD are too expensive

(shadow price animal fat € 70.14 at a market price of € 62.50) for PFAD) even though the maximum C18:2 content for broiler feeds is not reached. Rapeseed meal and expellers are both not attractive. Rapeseed meal is even more unattractive than rapeseed expellers (the rapeseed meal shadow price is only € 16.00 (margin -€ 7.70) compared to that of € 25.11 (margin -€ 0.39) for rapeseed expellers). Maize DDGS has become even less interesting, the shadow price is now € 21.30 at a market price of € 21.80. The shadow price of Hipro sunflowerseed meal (32% crude protein) is only € 8.81. Hipro soybean meal usage is increased to 19%, due to a (partial) replacement of toasted soybeans.

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 € 35.87 in the grower/finisher pig feeds, € 35.88 in the layer feed and € 36.30 in the broiler feed at a market price of € 35.80. The spread in the Hipro soybean meal price is decreased from € 0.78 in swine feeds to € 0.07 and from € 0.39 in layer feeds to € 0.08 and but increased from € 0.12 in broiler feeds to € 0.50. In broiler feeds the margin increased due to the relative high price of toasted soybeans, in pig and layer feeds the margin decreased due to the high price of Hipro soybean meal.

The shadow price of the Lopro quality (42.8% crude protein) is € 32.44 in the grower/finisher pig feeds, € 31.34 in the layer feed and € 28.67 in the broiler feed at a market price of € 33.30. Consequently this makes Lopro soybean meal too expensive for all feeds, the price is € 0.86 too high for pig feeds, € 1.96 for layer and even € 4.63 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 € 6.06 (was € 2.68) in pig, € 7.16 (was € 3.64) in layer and € 9.83 (was € 4.23) in broiler feeds, while the market price differs € 5.00. With the higher soybean meal prices, the difference in value between Hipro and Lopro soybean meal has increased in pig feeds with € 3.38, € 3.52 in layer and € 5.60 in broiler feeds. Or in other words Hipro soybean meal has increased relatively less in price and become more attractive compared to Lopro soybean meal.

Toasted soybeans are not attractive compared to Hipro soybean meal (€ 35.80) and soy oil (€ 69.50) in May due to price sharp(er) increase of toasted soybeans than Hipro soybean meal and soy oil. The market price of toasted beans is at € 43.80 considerable higher than the formula: 75% Hipro + 7.5% maize + 17.5% SBO = $35.80 \times 0.75 + 18.70 \times 0.075 + 69.50 \times 0.175 = € 40.42$. When other fat sources are used instead of soy oil, toasted soybeans are even less attractive. The 'shadow price' of toasted soybeans drops to € 39.22 with PFAD and even to € 37.70 with animal fat. Consequently compared to animal fat toasted soybeans are € 6.10 too expensive and compared to palm oil fatty acids € 4.58. In layer feeds therefore no toasted soybeans are used but in broiler finisher feeds the usage rate is decreased to 12%.

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

The usage rate of soybean meal is:

- 8% Hipro in pig grower/finisher.
- 11% Hipro in the layer feeds.
- 19% Hipro in broiler grower/finisher feeds (additionally 12% 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 € 35.80 for May and € 34.90 for August-October in the Netherlands for week 18)

	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.
May	-0.70	+1.58	+2.28	-0.77	+0.38	+1.15	-1.31	+0.68	+1.99
Aug.-Oct.	-0.73	+1.50	+2.23	-0.73	+0.39	+1.12	-1.34	+0.72	+2.06

The value of Hipro soybean meal from Argentina is € 0.70-1.34/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.38-1.58 higher value than that from Brazil, despite a lower crude protein content, and € 1.12-2.28 more than that from Argentina. The highest added value of high(er) quality soybean meal is obtained in pig (€ 1.50-2.28) and broiler (€ 0.68-2.06) feeds, compared to layer feeds (€ 0.38-1.15). The added value of high(er) quality Hipro soybean meal has increased in all feeds with the higher Hipro soybean meal price, despite the lower synthetic amino acid prices. Specifically in poultry feeds the lower DL Methionine and L threonine prices reduces the added value of high(er) quality Hipro soybean meal and in pig feeds the lower L Tryptophan price.

In conclusion:

1. The price of Hipro soybean meal has increased sharply, reaching the high level of 8 months ago. The future price of Hipro soybean meal for the August-October period is nevertheless € 0.90 lower than the current price. This indicates that (currently) the

market might have overreacted and that the soybean meal prices might decrease 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 lower DL Methionine and L Threonine price reduces the added value of high(er) quality Hipro soybean meal in poultry feeds and the lower L Tryptophan price in pig feeds. It nevertheless shows the added value of a higher content of digestible amino acids in high(er) quality soybean meal and that this effect dependants on market conditions.
4. Hipro soybean meal has increased relatively less in price and has therefore become more attractive compared to Lopro soybean meal. The difference in value between Hipro and Lopro soybean meal is € 6.06 in pig, € 7.16 in layer and € 9.83 in broiler feeds, while the market price differs € 5.00.
5. U.S. soybean meal is worth € 2.23-2.28/100 kg more than Argentinean soybean meal in swine feeds, € 1.12-1.15 in layer feeds and € 1.99-2.06 in broiler feeds.
6. U.S. soybean meal is worth € 1.50-1.58/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.38-0.39 in layer feeds and € 0.68-0.72 in broiler grower/finisher feeds.
7. The additional value of U.S. soybean meal is highest over that from Brazil or Argentina in pig and broiler feeds in both periods.

3.1 Shadow prices soybean meal by origin, Spain

Price developments.

Feedstuff prices of week 18 were obtained from the Cambra Oficial de Comerç Industria i Navegació de Barcelona. The Hipro (49/3.5) soybean meal price for May has increased significantly (with € 4.90) as it has in other regions. The period of declining soybean meal prices has therefore ended abruptly. The indications are however that the price will not increase further since the future prices are lower than the current prices, price however might fluctuate considerable. The Hipro soybean meal price in Spain is already € 1.20 lower than in the Netherlands and € 1.15 less than in Poland. Rapeseed meal has increased in price along with Hipro soybean meal but the Hipro sunflower seed meal price is unchanged.

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

Table 5. Feedstuff prices of week 18 in Spain for May

Period		May	Change week 18-13
Grains	Maize	17.60	+1.15
	Wheat	17.20	+0.40
	Triticale		
	Rye		
	Barley	17.40	+0.40
Grain by products	Wheat bran	14.40	-0.10
	Maizegl. feed meal		
Fats & oils	Animal fat	57.50	-2.50
	Palm oil	72.00	+1.80
	Soy oil	72.70	-1.00
	Fatty acids	61.00	+5.50
	Toasted Soybeans		
Protein rich	Hipro SBM	34.60	+4.60
	Lopro SBM		
	RSM	24.50	+3.00
	RSE		
	Lopro Sunfl. sd ml.	16.00	
	Maize DDGS		
Misc.	Peas		
	PKM		
	Beet pulp	17.00	-0.60

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 have increased in Spain during last month, like in the Netherlands the maize price increased the most. The prices of wheat and barley are considerable higher in Spain than in the Netherlands, however maize is (€ 1.10) cheaper in Spain. Also wheat bran is more expensive.

Animal fat, palm and soy oil are considerable more expensive in Spain than in the Netherlands. Palm oil increased in price more in Spain while it decreased in the Netherlands. Soy oil, however decreased in price in Spain while it increased in the Netherlands. Animal fat and the palm oil fatty acid mixture are the cheapest fat sources.

No price for milo corn was available. The shadow price of milo corn is € 17.51 in pig feeds, € 16.41 in layer and € 20.10 in broiler feeds (benchmarked at the maize price of € 17.60 in swine and layer feeds and € 17.20 for wheat in broiler feeds).

Pig feeds costs have increased with 6% compared to week 13, those of layer feeds with 7% and broiler feeds with 5%.

Feedstuff usage in feed formulations.

Pig feed formulations are based on maize and wheat since no price for rye was available. Wheat is the cheapest grain (€ 0.40 cheaper than maize) but maize is still more attractive due to the higher energy content (despite the increased plant protein prices). The shadow price of rye is € 16.96 and that of triticale € 17.94 (benchmarked at the € 17.20 price of wheat). The value of triticale is € 0.98 higher than that of rye due to the lower energy and crude protein content. The shadow price of barley is € 16.47 at a market price of € 17.40.

Wheat bran has become attractive, the usage rate is 9% with a shadow price of € 15.10. Beet pulp remains unattractive (shadow price € 14.26). Palm kernel meal has a shadow price of € 14.25.

The Hipro soybean meal usage has increased, since rapeseed meal is no longer attractive. The shadow price of Hipro soybean meal is € 37.79, giving an extensive margin. Rapeseed meal has a shadow price is € 23.22 at a market price of € 24.50. The shadow price of rapeseed expellers is considerable higher (€ 25.36), giving an added value of € 2.14 over rapeseed meal. Both Lopro and Hipro sunflower seed meal are still not attractive, the shadow price of the Lopro quality is only € 15.04. Hipro sunflower seed meal is more likely to be attractive than Lopro sunflower seed meal, the value of the Hipro quality is € 3.13 higher than that of the Lopro. No price for maize DDGS was available, the shadow price is € 21.55 (there are maximum C18:2 restrictions because 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 € 49.73 (at a price of € 57.50).

Layer feed formulations are based on maize but wheat has become attractive as an additional source of protein (usage rate 17%, shadow price € 17.27). The usage rate of Hipro soybean meal usage has therefore been decreased from 23% to 22%. Wheat bran

is not attractive for layer feeds (shadow price € 13.43). Rapeseed meal is not attractive but although the price has increased considerable the shadow price is with € 24.38 close to the market price of € 24.50. Rapeseed expellers have a much higher value (shadow price € 30.72, which is € 6.34 more than that of rapeseed meal) but no market price was available. Both Hipro sunflower seed meal (shadow price € 20.98, no price available) and Lopro sunflower seed meal (shadow price € 15.93, at a price of € 16.00) will be too expensive. No price for maize DDGS was available, but it can be attractive (shadow price € 25.21), especially since rapeseed meal is now unattractive. Fish meal is too expensive (shadow price € 61.82), although the price is low in Spain (€ 137.00 in the Netherlands). Animal fat is now considerable less expensive than (palm oil) fatty acids, the shadow price of PFAD is € 55.38. The usage rate is 1.8% with the lower animal fat price (shadow price € 66.97). 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 now very unattractive (shadow price € 16.87) and so will Hipro sunflowerseed meal (shadow price only € 10.36) be. Maize DDGS will be attractive at a price below € 22.50. The shadow price for peas is € 21.46. Fish meal is also not attractive, although the shadow price at € 79.67 higher is than in layer and pig feeds. Animal fat is used as the cheapest fat source in conjunction with soy oil. Palm oil is too expensive (shadow price € 55.88 benchmarked at the animal fat price of € 57.50). Toasted soybeans are expensive compared to soy oil (shadow price € 78.74).

Value of Hipro soybean meal in feed formulations.

The shadow price of Hipro is € 37.79 in the grower/finisher pig feeds, € 34.78 in the layer feed and € 40.58 in the broiler feed at a market price of € 34.60. The spread in the Hipro soybean meal price (without affecting the usage rate) is highest in broiler feeds (€ 5.98), followed pig feeds (€ 3.19) and lastly layer feeds (€ 0.18). The spread has increased in all feeds due to the higher Hipro soybean meal price (it was € 1.29 in pig feeds, € 0.72 in layer and € 0.48 in broiler feeds). The usage rate of soybean meal is highest in poultry feeds.

The shadow price of the Lopro quality (42.8% crude protein) is € 31.66 in the grower/finisher pig feeds, € 30.79 in the layer feed and € 28.19 in the broiler feed. Consequently the difference in value between the shadow price of Lopro and the market price of Hipro soybean meal is € 2.94 in pig, € 3.81 in layer and € 6.41 in broiler feeds. These differences have increased in all feeds due to the higher Hipro soybean meal price, and have increased the most in poultry feeds with a higher usage of soybean meal. The differences were € 2.22 in pig, € 3.17 in layer and € 4.90 in broiler feeds in report no. 3/2016.

The shadow price of toasted soybeans is € 32.23 in pig and € 39.06 in layer feeds. In broiler feeds toasted beans are used because the amount of added fat & oil is maximised (shadow price € 46.70 at a soy oil price of € 72.70).

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

The usage rate of Hipro soybean meal is:

- 11% usage in pig grower/finisher pig feeds.
- 22% 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 € 34.60 for May in week 18)

	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.
May	-0.59	+1.36	+1.95	-0.66	+0.19	+0.85	-1.19	+0.66	+1.85

The value of Hipro soybean meal from Argentina is € 0.59-1.19/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.19-1.36 higher value than that from Brazil, despite a lower crude protein content, and € 0.85-1.95 more than that from Argentina. The highest added value of high(er) quality soybean meal is obtained in pig (€ 1.36-1.95) and broiler (€ 0.66-1.85) 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 in pig feeds from € 1.17-1.42 to € 1.36-1.95 mainly due to the higher Hipro soybean meal prices. However the prices of the synthetic amino acids DL Methionine, L Threonine and L Tryptophan have decrease, this also affects the added value of high(er) quality Hipro soybean meal from U.S. in poultry feeds. Therefore the added value changed in layer

feeds from € 0.42-0.98 to € 0.19-0.85 and in broiler feeds from € 0.92-1.89 to € 0.66-1.85 compared to report no 3/2015.

In conclusion:

1. The market price of Hipro soybean meal in Spain increased considerable with € 4.60 compared to report no 3/2016. The price of Hipro soybean meal in Spain is lowest of all regions: € 1.20 lower than in the Netherlands, € 1.15 than in Poland and € 4.30 than in Romania.
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. Due to the higher Hipro soybean meal price the added value of high(er) quality Hipro soybean meal has increased, however this is offset in poultry feeds by lower prices for synthetic amino acids specifically DL methionine and L Threonine.
4. U.S. soybean meal is worth € 1.95/100 kg more than Argentinean soybean meal in swine feeds, € 0.85 in layer feeds and € 1.85 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 € 1.36/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.19 in layer feeds and € 0.66 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 feedstuffs decreased in price, except Hipro soybean meal and rapeseed meal compared to report no. 03/2016 (based on feedstuff prices of week 18, 2016). The price decrease of the grains and grain by-products is remarkable since in other regions they increased. The grain, grain by-product and rapeseed meal prices in Poland are lowest of all regions. The increase in the prices of protein rich feedstuffs, including Hipro soybean meal, is in line with the increases in the Netherlands and Spain. The Hipro soybean meal price in Poland is € 1.15 higher than in Spain, € 0.05 lower than in the Netherlands and € 3.15 than in Romania.

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

Table 7. Feedstuff prices of week 18 in Poland for May

Period		May	Change week 18-13
Grains	Maize	14.70	-0.80
	Wheat	14.25	-0.55
	Triticale	12.90	-1.00
	Rye		
	Barley	13.60	-0.80
Grain by products	Wheat bran	11.75	-0.50
	Maizegl. feed meal		
Fats & oils	Animal fat	56.35	-3.20
	Palm oil		
	Soy oil	68.55	-3.95
	Fatty acids		
	Toasted Soybeans		
Protein rich	Hipro SBM	35.75	+5.40
	Lopro SBM		
	RSM	21.70	+2.15
	RSE		
	Hipro Sunfl. sd ml.		
	Maize DDGS	18.10	-1.45
Misc.	Peas		
	PKM		
	Beet pulp	18.10	-0.7

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 layer feed costs have decreased 2% compared to report no 3/2016 but those of layer feeds increased 1% and those of broiler feeds 2%. The increased Hipro soybean and rapeseed meal prices could be offset in pig feeds by the lower grain and grain by-product prices (and a lower Hipro soybean meal usage).

Feedstuff usage in feed formulations.

Pig feed formulations are based on triticale, wheat and maize. Triticale is considerable cheaper than wheat (-€ 1.35) but the usage rate is maximised at 25%. Also the triticale + wheat sum is maximised at 50%, so that 24% maize is used. The shadow price of wheat is only € 0.11 higher than the market price while that of triticale € 2.18 higher is (showing that triticale is considerable more attractive). Barely is not attractive. The shadow price of barley is € 13.77 and that of rye is € 14.17 at a maize price of € 14.70. Wheat bran is marginally attractive, the usage rate is 4% at a shadow price of € 11.75. Beet pulp (shadow price € 11.95) is not at all attractive.

Rapeseed meal is not attractive, since the price increased. No price was available for rapeseed expellers but they are more likely to be attractive than rapeseed meal. The shadow price of rapeseed meal is € 21.51 (at a market price of € 21.70) and that of rapeseed expellers € 23.51 (value difference € 2.00). Maize DDGS is attractive but the usage is restricted by the maximum C18:2 limitations. The usage rate is 7% at a shadow price of € 18.47. The inclusion rate of Hipro soybean meal is therefore decreased from 5% to 10% at the expense of rapeseed expellers.

Layer feed formulations are based on maize and wheat. Wheat is attractive as an additional source of protein due to the increased Hipro soybean meal price and despite the larger decrease in the maize price decrease. The usage rate of wheat is 10% with a shadow price of € 14.92. The price of wheat would have to decrease below € 13.05 before the usage rate would increase, indicating that maize at a market price of € 14.70 has a € 1.65 higher value than wheat. The Hipro soybean meal usage increased slightly to 17% since 1% less rapeseed products are used. Now only 1.5% rapeseed meal is used. No price was available for rapeseed expellers, they are more likely to be attractive than rapeseed meal. The value of rapeseed expellers is € 29.65 benchmarked at the rapeseed meal market price of € 21.70. Maize DDGS is still attractive (maximum usage rate of 10%, shadow price € 20.80). Wheat bran is of no interest, the shadow price is € 7.87. The shadow price of Hipro sunflowerseed meal is € 16.92 and that of the Lopro quality only € 10.44. Animal fat (2.8%) 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 meal is not (shadow price € 11.87 at a market price of € 21.70), rapeseed expellers are more likely to be attractive (shadow price € 27.03 or added value € 15.16). Maize DDGS is not therefore attractive (usage rate 4%, shadow price € 19.32).

The Hipro soybean meal usage is also increased from 14% to 16%. The shadow price for peas is € 19.27. Both animal fat and soy oil are used as fat sources. Animal fat is more attractive and the usage is higher because the C18:2 content of the broiler feed is maximised.

Value of Hipro soybean meal in feed formulations.

The shadow price of Hipro is € 36.20 in the grower/finisher pig feeds, € 40.93 in the layer feed and € 41.24 in the broiler feed at a market price of € 35.75. The spread in the Hipro soybean meal price is € 0.45 in the pig feed, € 5.18 in layer feeds and € 5.49 in broiler feeds, without its usage rate being affected. The spread was € 13.04 in pig feeds, € 9.00 in layer and € 0.56 in broiler feeds in report no 3/2016. The spread (value compared to the market price and that of other plant proteins) has decreased in pig and layer feeds due to the higher price of Hipro soybean meal, and is increased in broiler feeds due to the higher toasted soybeans price. The usage rate of Hipro soybean meal has actually increased in all feeds.

The shadow price of the Lopro quality (42.8% crude protein) in the same feeds is € 32.33 in the grower/finisher pig feeds, € 30.78 in the layer feed and € 27.27 in the broiler feed benchmarked at the market price of € 35.75 for Hipro soybean meal. Consequently the difference in value between the shadow price of Lopro and the market price of Hipro soybean meal is € 3.42 in pig, € 4.97 in layer and € 8.48 in broiler feeds. Last month, in report no 3/2016, the difference were € 2.18 in pig, € 3.34 in layer and € 5.65 in broiler feeds. The price difference has increased due to the increased prices of the protein rich feedstuffs and specifically that of Hipro soybean meal. The increases were largest in poultry (broiler) feeds.

The shadow price of toasted beans is € 31.20 in pig and € 37.29 in layer feeds. This was respectively € 29.90 and € 34.03 in report no 3/2016, showing the € 1.30-3.26 higher value of toasted soybeans with the € 5.40 higher Hipro soybean meal and grain prices but lower animal fat and soy oil prices. 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 € 52.83).

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.
- 16% 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 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 € 35.75 for May in week 18)

	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.
May	-0.64	+1.63	+2.27	-0.86	+0.34	+1.20	-1.57	+0.69	+2.26

The value of Hipro soybean meal from Argentina is € 0.64-1.57/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.34-1.63 higher value than that from Brazil, despite a lower crude protein content, and € 1.20-2.27 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 of high(er) quality Hipro soybean is increased in pig feeds from € 1.29-1.72 in report 3/2016 to € 1.63-2.27 because of the higher Hipro soybean meal price. In poultry feeds the value of U.S. versus Arg. soybean meal increased from € 1.16 in layer feeds to € 1.20 and from € 2.00 to € 2.26 in broiler feeds but the value of U.S. versus Brazil decreased from € 0.53 to € 0.34 in layer and € 0.83 to € 0.69 in broiler feeds. The latter is caused by the lower prices of the synthetic amino acids DL Methionine and L Threonine.

In conclusion:

1. The market price of Hipro soybean meal increased significantly in Poland as in the Netherlands and Spain.
2. U.S. soybean meal is worth € 2.27/100 kg more than Argentinean soybean meal in swine feeds, € 1.20 in layer feeds and € 2.26 in broiler feeds. The additional value of U.S. soybean meal is highest over that from Argentina in pig and broiler feeds.
3. U.S. soybean meal is worth € 1.63/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.34 in layer feeds and € 0.69 in broiler grower/finisher feeds. The additional value of U.S. soybean meal is highest over that from Brazil in pig feeds. Lower synthetic DL Methionine, L Threonine and L Tryptophan prices decrease the added value, specifically in poultry feeds.

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

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

Price developments.

Compared to last month all feedstuff prices have increased but not to the extent as in the Netherlands and Spain. In the latter countries the price of Hipro soybean meal has increased significantly. The Hipro soybean meal in Romania in fact decreased from € 39.85 to € 38.90 but there is also a quality difference (47 versus 46% crude protein). The prices of all other plant proteins (toasted soybeans, sunflower seed meal and maize DDGS increased slightly in price. The grain prices increased but less than in the Netherlands and Spain (while in Poland they decreased). The soybean meal price in Romania however is still highest of all the regions and often of lower quality. Considering the low maize DDGS and to a lesser extend 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 18 in Romania for May

Period		May	Change week 18-13
Grains	Maize	14.30	+0.20
	Wheat	14.55	+0.25
	Triticale		
	Sorghum		
	Barley		
Grain by products	Wheat bran	13.50	+0.10
	Maizegl. feed meal	13.80	+0.20
Fats & oils	Animal fat		
	Palm oil		
	Sunflower oil	65.80	+0.05
	Fatty acids		
	Toasted Soybeans	36.60	+0.80
Protein rich	Hipro SBM *	38.90	
	Lopro SBM		
	RSM		
	RSE		
	Hipro Sunfl. sd ml.	19.50	+0.05
	Maize DDGS	17.50	+0.10
Misc.	Peas		
	Beet pulp	16.00	

*Hipro 46% 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 did not increase compared to the last period (report no 3/2016) but those of layer feeds increased 1% and those of broiler feeds 2%.

Feedstuff usage in feed formulations.

Pig feed formulations are based on wheat and maize. Wheat is attractive as a protein source since the price of soybean meal is very high, the usage rate of wheat is at the maximum (40%) The shadow price of wheat is € 15.03, meaning that wheat has an added value of € 15.03 -14.30 = € 0.73 over maize in pig feeds.

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 € 14.75. 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 35% maize and 5% maize DDGS is used. Barley is not attractive (shadow price € 14.53). The shadow price of triticale is € 15.76, no price was available this time. The high prices of the protein rich feedstuffs increase the value of protein rich grains (f.i. the value triticale is € 1.46 higher than that of maize).

Peas can be very attractive starch and protein source but no price was available (shadow price € 22.89). Hipro sunflowerseed meal is not attractive, despite the high price of Hipro soybean meal. The high sunflower seed oil decreases the value of the Hipro sunflower seed meal since the energy content is low. The shadow price of Hipro sunflowerseed meal is € 19.23 at a market price of € 19.50. Wheat bran is attractive (shadow price only € 13.72) but the usage rate is low at 4%. No added fat or oil is used because it is still very expensive. Maize DDGS is consequently attractive but the usage is maximised by the C18:2 content of the pig feed. Prices for rapeseed meal (shadow price € 24.90) and rapeseed expellers (shadow price € 25.79) were also not available. The value of wheat DDGS (shadow price € 16.39) is considerably lower than that of maize DDGS. The usage of Hipro soybean meal is relatively high for pig feeds at 11%, due to the limited usage of by-products.

Layer feed formulations are based on maize and wheat. Wheat is quite attractive, the usage rate is 19% with a shadow price of € 15.35 at a maize price of € 14.30. The value of wheat is therefore € 1.05 over the maize price due to the higher protein content of wheat and the high plant protein prices. Peas can also be attractive for layer feeds, the shadow price is € 19.23 (which is much lower than the shadow price of € 22.89 in pig feeds). The shadow price of milo corn is € 12.83. Wheat bran is not attractive, it has no shadow price, due to the low energy content and the high plant oil price. Toasted soybeans are attractive. The usage rate is 15% and the shadow price has increased to € 39.79 due to the higher grain prices. Therefore still no sunflowerseed oil is added (shadow price € 45.84 at a toasted soybean price of € 36.00). Hipro sunflower seed meal is too expensive (shadow price € 8.12). Maize DDGS is no longer attractive, the usage

shadow price is only € 11.81. The shadow price of rapeseed expellers (shadow price € 36.96) is significantly higher than of rapeseed meal (shadow price € 18.03), both are higher for layer than pig feeds. The Hipro soybean meal usage is 11% due to the high usage of toasted soybeans.

Broiler feeds are maize based (no white meat requirement). Wheat is too expensive (shadow price € 14.80), mainly due to the low energy content compared to maize. Peas are not likely to be attractive as a protein and starch source, the shadow price is only € 11.55. Toasted soybeans are very attractive, the usage rate is reduced to 14% but the shadow price is increased to € 40.20 with the higher grain (maize) price. The usage rate of sunflower seed oil is therefore increased from 0.4% 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 with the price increase, the shadow price is even negative (due to C18:2 limits). The value of wheat DDGS is also low. Prices for rapeseed meal (shadow price negative) and rapeseed expellers (shadow price € 15.58) were not available, rapeseed expellers are obviously more likely to be attractive. Hipro soybean meal is therefore the most attractive protein source next to toasted soybeans, the usage rate is increased from 16% to 21% (at the expense of toasted soybeans).

Value of Hipro soybean meal in feed formulations.

The shadow price of the 46% Crude Protein) Hipro soybean meal is € 40.60 in the grower/finisher pig feeds, € 42.52 in the layer feed and € 38.96 in the broiler feed based on the market price of € 38.90. This gives a spread of € 1.70 in pig feeds, € 3.62 in layer feeds and € 0.06 in broiler feeds. The value of Hipro soybean meal is higher in pig and layer feeds but the usage rate is highest in broiler feeds.

The shadow price of the (47% Crude Protein) Hipro soybean meal is € 39.78 in the grower/finisher pig feeds, € 42.44 in the layer feed and € 44.61 in the broiler feed based on the 46% crude protein Hipro price of € 38.90. The difference in value due to 1.0 % crude protein (compared to the market price of € 38.90 of the 46% crude protein Hipro quality above) is € 0.88 in pig feeds, € 3.54 in layer and € 5.71 in broiler feeds. These differences were respectively € 0.88 in pig feeds, € 2.59 in layer and € 2.71 in broiler feeds in report no 3/2016 and increased in the poultry feeds due to the higher toasted o soybeans price. The difference increased the most in broiler feeds due to the high usage of both Hipro soybean meal and toasted soybeans.

The shadow price of a (43% Crude protein) Lopro quality is € 36.07 in the grower/finisher pig feeds, € 33.65 in the layer feed and € 26.96 in the broiler feed benchmarked at the Hipro soybean meal price of € 38.90. This gives a value difference of the Lopro versus the Hipro quality of € 2.83 in pig feeds (was € 2.00 in report no 3/2016), € 5.25 in layer feeds (was € 4.44) and € 11.94 in broiler feeds (was € -6.02). The value of Lopro soybean meal is especially poultry feeds low.

The shadow price of toasted beans is € 29.18 in pig, € 39.79 in layer and € 40.20 in broiler feeds. The usage rate is therefore high in poultry feeds at a market price of € 36.00. 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).

Hipro soybean meal is therefore used next to toasted soybeans in poultry feeds, the usage rate of soybean meal protein is lower in pig feeds.

The usage rate of soybean (meal) is:

- 11% Hipro in pig grower/finisher pig feeds.
- 11% Hipro and 15% toasted soybeans in the layer feeds.
- 21% Hipro 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 (Argentina, Brazil and the U.S.) in feeds for different species (based on the 46% CProt Hipro SBM price of € 38.90 for May in week 18)

	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.
May	-0.54	+1.85	+2.39	-1.41	+0.82	+2.24	-3.12	+1.52	+4.64

The value of Hipro soybean meal from Argentina is € 0.54-3.12/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.82-1.85 higher value than that from Brazil, despite a lower crude protein content, and € 2.24-4.64 more than that from Argentina. The highest added value of high(er) quality soybean meal is obtained in broiler 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 increased in pig and layer feeds but decreased in broiler feeds. The added value in pig feeds went from € 1.91-2.42 in report 3/2016 to € 1.85-2.39, in layer feeds from € 0.59-1.65 to € 0.82-2.24 and in broiler

feeds from € 0.52-2.03 to € 1.52-4.64. In pig feeds the added value of high(er) quality Hipro soybean meal decreased because the prices of synthetic amino acids (DL Methionine, L Threonine and L Tryptophan) decreased. In broiler feeds the added value is highest and increased because of the higher toasted soybeans price.

In conclusion:

1. The market price of Hipro soybean meal did not increase in Romania but is (already) very high compared to other regions, specifically when the low price maize DDGS is taken in consideration.
2. Hipro soybean meal is more attractive than the Lopro quality. The value of the Lopro quality is € 2.83 in less in pig feeds, € 5.25 in layer feeds and € 11.94 in broiler feeds.
3. The difference in value in soybean meal due to 1.0 % crude protein is € 0.88 in pig feeds, € 3.54 in layer and € 5.71 in broiler feeds.
4. The usage rate of soybean products is high in poultry feeds and low in pig feeds.
5. U.S. soybean meal is worth € 2.39/100 kg more than Argentinean soybean meal in swine feeds, € 2.24 in layer feeds and € 4.64 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 € 1.85/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.82 in layer feeds and € 1.52 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

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 € 35.80) for May 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 €	-0.47	-0.39	+0.11	-0.64	-0.51	+0.14	-0.87	-0.68	+0.20
Energy €	-0.38	+0.10	+0.48	-0.40	+0.17	+0.58	-0.73	+0.57	+1.31
Dig. AA €	+0.15	+1.87	+1.69	+0.34	+0.70	+0.43	+0.49	+0.79	+0.48
Total €	-0.70	+1.58	+2.28	-0.77	+0.36	+1.15	-1.11	+0.68	+1.99

A difference of 0.9% crude protein with the significantly higher Hipro soybean meal (and also higher grain and other plant protein but lower synthetic amino acids prices) adds or decreases € 0.47 /100 kg to the value of Hipro soybean meal in swine feeds (was € 0.38 in week 13), € 0.64 in layer feeds (was € 0.51) and € 0.87 in broiler feeds (was € 0.72). The value of protein in soybean meal increased in all feeds but especially poultry feeds. The Hipro soybean meal price increased € 5.00, that of rapeseed meal € 1.50, rapeseed expellers € 1.30 and of Maize DDGS € 2.00. The price of DL Methionine decreased € 0.30/kg and that of L-Threonine € 0.10.

The value of soybean meal due to energy content has increased as follows: 50 kcal NE

adds € 0.48/100 kg to the value of Hipro soybean meal in swine feeds (was € 0.40), 68 kcal ME € 0.58 in layer feeds (was € 0.52) and 69 kcal extra in broiler feeds increases the shadow price with € 1.31 (was € 1.18). The energy costs derived from both grains and fats & oils (with the exception of palm oil) have increased, the effect is largest in broiler feeds due to the higher fat additions.

Altogether the value differences due to protein content are larger in poultry than swine feeds and largest in broiler feeds. Differences in the amino acid pattern and digestibility (along with the digestible phosphorus content) create an added value of € 1.69-1.87/100 kg in swine feeds for U.S. soybean meal over that from Argentina or Brazil, € 0.43-0.77 in layer feeds and € 0.48-0.79 in broiler feeds. These value differences have increased in pig feeds compared to the last report (no 3/2016) but decreased in broiler feeds. Although at higher soybean meal prices the value differences due to the amino acid pattern and digestibility increases, lower synthetic amino acids decrease the value differences. 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 € 0.48 higher value over Argentinean soybean meal due to a 50 kcal ME difference in swine feeds, a € 0.58 difference in layer feeds for a 68 kcal ME difference and a € 1.31/100kg 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 € 1.87.

Variation in nutrient values

The effect of variation in the nutrient value (4-5%) of soybean meal on the value (market price € 35.80/100 kg in the Netherlands for May) is given in the following table.

Table 12. Price effect of variation in nutrient value

	Swine	Layer	Broiler
+/- 100 cal	0.95	0.85	1.89
+/- 4% dig AA	0.98	0.20	0.20
+/- 100 Cal and 4% dig AA	1.93	1.05	2.09
+/- 0.1 g/kg dig P	0.03	0.03	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 € 0.95/100 kg effect on the Hipro soybean meal value in swine (was € 0.80 in report no 3/2016) and € 0.85 in layer feeds (was € 0.70) but € 1.89 in broiler feeds (was € 1.71). A variation of 4% in digestible amino acids changes the value of Hipro soybean meal with € 0.20 in layer (was € 0.24), € 0.20 in broiler (was € 0.25) but € 0.98 in swine feeds (was € 0.79). 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 Hipro soybean meal increases this effect in swine feeds too, however the lower DL Methionine price decreases the effect in poultry feeds on the value of a 4% variation in the digestible amino content. The higher grain and fat & oil price has increased the effect of variation in the digestible energy content the most in swine and 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

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
Chemical analyses				
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
Energy value				
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
Digestible nutrients				
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 18, 2016. The Netherlands

Code	Article	Description	May	Aug-Oct
00010		Citruspulp Braz./USA	14.80	NA
00013		Peas <22%CP	23.00	NA
00015		Barley (EU)	15.50	15.70
00026		Soybean hulls	17.70	13.90
00033		MOLASSES cane <47% ^s	17.50	17.50
00034		Flaxseed	35.40	35.40
00038		Alfalfa 15% CP	20.50	19.50
00044		Rapeseed Expellers 8%	25.50	25.00
00061		Rye (EU)	14.90	100.00
00063		WHEAT EU (feed)	16.20	16.90
00064		PALMKERNELml<20%fiber	13.00	12.60
00075		Beet Pulp 20-25% ^s sugar	15.50	15.50
00076		MAIZE (EU)	18.70	18.80
00078		L-lysine HCl	130.00	130.00
00079		DL-Methionine	330.00	330.00
00080		Soybeans toast.pel.	43.80	44.50
00081		SBM 44/7 domestic	33.30	31.70
00084		SBM Hipro domestic	35.80	34.90
00090		Wheat middlings	12.50	12.60
00096		Soy oil liq.	69.50	71.00
00097		Palm oil	65.50	65.50
00099		Poultry Fat	56.50	NA
00100		Animal fat (lard)	54.00	NA
00105		Fish meal S. America	137.00	137.00
00107		MAIZEglut. fd ml 20-23%CP	17.20	16.90
00113		Sunflowerseedml<29%CP	NA	NA
00165		TRITICALE	15.70	16.20
00214		L-Threonine	160.00	160.00
00228		Monocal Phosph	50.00	50.00
00258		Palm oil Fatty Acids	62.50	62.50
00266		Rapeseed meal34%CP	23.70	21.50
00332		Vinasses beet	10.50	10.50
00488		MAIZE distillers sol	21.80	NA
00489		WHEAT DDGS	NA	NA

NA – no price available

Table 2B. Feedstuff prices of week 18, 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
Code	Description			
00013				23.00
00015	17.40	17.80	13.80	15.50
00061				14.90
00026	15.00	11.10		15.50
00033	14.00	11.00	13.60	17.70
00038	15.00			20.50
00044				25.50
00061				
00063	17.20	14.80	14.25	16.20
00075	17.00	16.00	18.10	15.50
00076	17.60	14.30	14.70	18.70
00078			118.80	130.00
00079			282.60	330.00
00080		36.60		43.80
00084	34.60	38.90@	35.75	35.80
00090	14.40	13.50	11.75	12.50
00096	72.70	65.80	68.55	69.50
00097	72.00			65.50
00100			56.35	54.00
00105	97.50			137.00
00107		13.80		17.20
00113	16.00	19.50		
00165			12.90	15.70
00214			161.55	160.00
00228			46.85	50.00
00266	24.50		21.70	23.70
00488		17.50	18.10	21.80
00258	61.00			62.50

@46% Crude protein, * Hipro Sunflower seed meal in Romania; Lopro in Spain and the Netherlands.