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Soybean Meal Quality by Origin:

Economical Value of Hipro Soybean Meal in Least Cost Formulations

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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: August and November-January (2017)

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	42.50	41.60	39.55	37.00@

*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 € 42.50/100 kg for August in week 27, 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 €	-0.58	-0.47	+0.13	-0.82	-0.64	+0.19	-1.03	-0.82	+0.23
Energy €	-0.35	+0.08	+0.43	-0.39	+0.16	+0.55	-0.77	+0.58	+1.34
Dig. AA €	+0.13	+2.22	+2.07	+0.27	+0.66	+0.38	+0.18	+1.53	+1.34
Total €	-0.80	+1.83	+2.63	-0.94	+0.18	+1.12	-1.62	+1.29	+2.91

*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 broiler feeds only. In both swine and layer feeds the added value is practically unchanged, despite the higher Hipro soybean meal price. In broiler feeds the added value, due to energy, has increased due to the relative high price of toasted soybeans. All grain and protein rich feedstuff prices have decreased except toasted soybeans and peas. Although the Hipro soybean

meal price decreased (-€ 1.40) it does not compensate for the increase last month (+€ 8.10). Consequently value differences among different origins of Hipro soybean meal due to both crude protein, digestible energy and amino acid content are unchanged in swine and layers feeds only differences due to digestible energy have increased in broiler feeds of high(er) quality Hipro soybean meal from the U.S.
Hipro soybean meal from the United States has therefore f.i. a € 1.80-7.30/1000 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 € 11.20-29.10/MT. U.S. Hipro soybean meal has the highest added value for swine (€ 17.10-26.30) and broiler (€ 7.30-29.10) feeds, followed by layer feeds (€ 1.80-11.20/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 € 8.20-23.00 (U.S. vs Brazil) and € 9.30-26.80/MT (U.S. vs Arg) or respectively 1.9-5.4% and 2.2-6.3%.

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 27 are used for the current period (August) and the November-January (2017) period when the new harvest from the U.S. will come 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 for August has decreased slightly with € 1.40 after the sharp increase (+€ 8.10) the last period. Part of the damping effect of price decrease has been the decrease of the exchange rate of the Euro due to the Brexit. The price of soy oil decreased also (-€ 1.50) but that of toasted soybeans increased (+€ 1.00). The future prices of Hipro soybean meal is slightly higher than currently.
Excellent harvest predictions for grains (in Europe) and soybeans (in the U.S. and South America) put pressure on the market to decrease feedstuff prices further. Maize prices on the international market (in $) have reached the lowest level in the last 1.5 years.

3. Shadow prices soybean meal by origin, the Netherlands

Price developments.

The Hipro (49/3.5) soybean meal price for August has decreased with slightly (-€ 1.40) but is still historically high with € 425/ton after the sharp increase (with € 8.10) last month. As mentioned the Brexit effect on the Euro has dampened the price decrease of imported soy on the international market. However the decrease in the Hipro soybean meal price is considerable higher than that of other protein sources.

The prices of virtually all feedstuffs have decreased. The wheat and barley prices has decreased the most, although the lower value of the Euro should have made European grains more attractive on the international market. However the decrease in the maize price has therefore been less in the EU than on the international market.

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

Table 3. Feedstuff prices of week 27 in the Netherlands for August and November-January (2017).

Period		August	Nov-Jan	Current week 27-23	Future vs current
Grains	Maize	19.50	18.50	-0.30	-1.00
	Wheat	15.50	16.30	-1.60	+0.80
	Triticale	15.10	15.70	-0.90	+0.60
	Rye	14.80	14.90		+0.10
	Barley	14.60	15.70	-1.20	+1.10
Grain by products	Wheat bran	11.70	12.40	-1.50	+0.70
	Maizegl. feed meal	16.80	17.30	-1.20	+0.50
Fats & oils	Animal fat	56.00		-0.50	
	Palm oil	64.50	60.80	-2.00	-3.70
	Soy oil	70.00	70.50	-1.50	+0.50
	PFAD	61.00	61.00	-2.00	
	Toasted Soybeans	51.00	48.20	+1.00	-2.80
Protein rich	Hipro SBM	42.50	43.20	-1.40	+0.70
	Lopro SBM	39.20	39.70	-0.90	+0.50
	RSM	22.70	24.00	-1.60	+1.30
	RSE	26.80	27.00		+0.20
	Lopro Sunfl.sdml*	19.90	19.40	-0.60	-0.50
	Maize DDGS	23.40	23.80		+0.40
Misc.	Peas	23.70	24.00	+0.30	+0.30
	PKM	14.20	14.00	-0.50	-0.20
	Beet pulp	18.30	15.30	-0.30	-3.00

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 fat & oil prices have decreased along with the grain prices. The future prices (November-January) for most feedstuffs are higher than the current prices.

The prices of all grains are near € 150/ton, except maize which is relatively expensive with a price near € 200/ton. The future (November-January) grain prices are higher than currently but could decrease rapidly due to the positive harvest predictions.
The crude oil price (closely linked to the palm oil price) has been decreasing progressively last month from over $ 50/barrel to $ 50. The palm oil price and that of palm oil fatty acids have therefore decreased € 2.00. The price of soy oil has decreased less (-€ 1.50) because the price of toasted soy beans has increased (+€ 1.00). The animal fat price has decreased the least (-€ 0.50), but the price is still considerable lower than that of plant oils and PFAD. The price of PFAD is (€ 3.50) lower than that of palm oil but € 5.00 higher than that of animal fat. Soy oil is the most expensive plant oil.

All protein rich feedstuffs have decreased in price, remarkable is that rapeseed meal has decreased more in price than Hipro soybean meal and relatively more than Lopro soybean meal (on a per unit of protein basis). The price increase of toasted soybeans is difficult to explain in light of the decrease of the soybean meal and soy oil prices. The spread between the Lopro and Hipro soybean meal price has increased since the Hipro soybean meal price decreased (€ 0.50) more than the Lopro.
The low protein rich grain prices (wheat, triticale and rye versus maize) make protein sources relative expensive.

Resultantly layer feed costs decreased with 7%, those of pig feeds with 6% and of broiler feeds with 4%. The future (November-January) feed costs for pig feeds are 3% higher than currently those of layer feeds will be 1% higher and of broiler feeds the same.

Feedstuff usage in feed formulations.
Pig feed formulations are based on rye and triticale. Rye is more attractive (cheaper) than triticale. Since the inclusion rate of both rye and triticale is limited (to 25% maximum each), barley has become also attractive. The value (shadow price) of rye is € 0.77 lower than that of triticale, due to the lower crude protein and starch content especially at the high protein prices. Maize is not attractive, the shadow price is € 16.10. Wheat (shadow price € 14.93) is also too expensive. Benchmarked at the market price of rye at € 14.80, the value of wheat is € 0.13 higher than of rye but the value is € 0.17 lower than of triticale. With these high protein prices the value of maize compared to wheat is low (the value of wheat is now € 1.17 over that of maize). Peas are still attractive (shadow price € 24.26 at a market price of € 23.70) but the usage rate is decreased to 9%). Wheat bran is therefore more attractive, the shadow price is € 12.59 at a 20% usage.

Rapeseed meal has become attractive, the usage rate is maximised (the shadow price is € 23.41 at a market price of € 22.70 and a usage rate of 10%). Rapeseed expellers are too expensive, the value in pig feeds of rapeseed expellers is € 3.44 over that of

rapeseed meal (but the price difference is € 4.10). As mentioned peas are now very attractive as a protein source. Maize DDGS can be very attractive as both a protein and energy source but the shadow price is only € 21.24 due to the low protein quality. Also Lopro sunflower seed meal is too expensive, the shadow price is only € 13.16 at a market price of € 19.90. No soybean meal is used, due to the high prices of soy products. Hipro soybean meal (shadow price € 40.09 at a market price of € 42.50) is likely to be more attractive than Lopro soybean meal (shadow price € 36.14 at a market price of € 39.20). Soybean meal has mainly been replaced with rapeseed meal and peas.
Palmkernel meal is not attractive, the shadow price is decreased to € 11.90 (was € 12.67 last month) due to the lower grain and grain by-product prices. Also beet Pulp is too expensive (shadow price € 12.29). Neither palm oil (shadow price € 56.95) nor palm oil fatty acids (PFAD) with a shadow price of € 57.78 are attractive compared to animal fat (lard) at € 56.00. The usage rate of fats & oils is increased to 4% due to the higher usage of low energy by-products.

Layer feed formulations are still mainly wheat based (32% usage, shadow price € 16.70). Maize is still used but the usage rate is at the minimum restriction (25%). Due to the high maize and plant protein prices wheat is attractive as a protein source. The shadow price of maize is only € 15.36, benchmarked at the market price of wheat at € 15.50 and Hipro soybean meal of € 42.50. This means the maize price has to decrease with € 4.14 before it will (start to) replace wheat. Unlike in pig and broiler feeds, peas are not attractive in layer feeds (shadow price € 21.47 at a market price of € 23.70). Maize DDGS is very attractive and used to the maximum, the shadow price is very high at € 25.90 (market price € 23.40).
Maize gluten are attractive as a protein and xanthophyll (egg yolk colouring) source, however the usage rate is <2%. Rapeseed expellers are very attractive, the shadow price is € 29.18 with a (maximum) usage of 2.5%. Rapeseed meal is not attractive compared to rapeseed expellers, the shadow price of rapeseed meal is € 20.32 benchmarked at a market price of € 26.80 for rapeseed expellers). Wheat bran is used (shadow price € 11.80), but the usage rate is low (4%). The fat addition is increased to 3.1% due to the increased usage of by-products (maize DDGS). Lard is the most attractive fat source (shadow price € 57.77 at a market price of € 56.00).
Lopro sunflower seed meal (shadow price € 16.81) is not attractive. The Hipro soybean meal usage is decreased from 16 to 11%, because of the high maize DDGS usage. 10% maize DDGS replaced only 5.3% Hipro soybean meal however due to the lower and poor protein quality of maize DDGS. Hipro soybean meal (shadow price € 44.61) is more attractive than the Lopro quality. Toasted soybeans are not attractive (shadow price € 42.47).

Broiler feeds are based on wheat since the usage rate of maize is maximised (white meat requirement). Peas are no longer attractive (shadow price € 23.42 at a market price of € 23.70). Toasted soybeans are still used in addition to Hipro soybean meal but the usage rate remains low (8%) due to the high price. Maize gluten meal (60% protein) are also

attractive at the high soybean meal prices, the usage rate is 3% with a shadow price of € 80.34. Rapeseed expellers are very attractive, the usage rate is maximised at 2.5%. Rapeseed expellers are more attractive than rapeseed meal (the value of rape seed expellers is € 8.26 over that of rapeseed meal in high energy broiler feeds). Maize DDGS is too expensive, the shadow price is € 21.47. The shadow price of Hipro sunflowerseed meal (32% crude protein) is only € 8.84, the market price of Lopro sunflowerseed meal is € 19.90. Hipro soybean meal usage is increased from 11 to 15%, due to the low usage of peas.
Animal fat is the most attractive fat source, usage of added fat & oils is maximised (at 5.5%). If only plant oils are used a combination of PFAD, palm oil and soy oil needs to be used in order to ensure proper fat digestion (u/s ratio). The shadow price of animal fat is € 69.28 at a market price of € 56.00), the maximum C18:2 content for broiler feeds is not reached.

Value of Hipro soybean meal in feed formulations.
Hipro soybean meal is the most interesting soybean meal source for poultry feeds. Lopro soybean meal is not attractive for poultry feeds and all soy products are too expensive for pig feeds. The shadow price of Hipro is € 40.22 in the grower/finisher pig feeds, € 45.49 in the layer feed and € 45.33 in the broiler feed at a market price of € 43.90. The spread in the Hipro soybean meal price is decreased from € 0.07 in swine feeds to -€ 3.68, but in layer feeds it is increased from € 0.08 to € 1.59 and in broiler feeds from € 0.50 to € 1.43. The reason for the large margins in poultry feeds is that despite the high soybean meal prices no alternative proteins like maize DDGS were available for poultry feed formulation and that rapeseed meal is only marginally attractive. In pig feeds, peas and rapeseed meal can replace all the soybean meal.

The shadow price of the Lopro quality (42.8% crude protein) is € 36.14 in the grower/finisher pig feeds, € 37.39 in the layer feed and € 34.33 in the broiler feed at a market price of € 39.20. Consequently this makes Lopro soybean meal too expensive for all feeds, the price is € 3.06 too high for pig feeds, € 1.81 for layer and even € 4.87 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 € 6.36 (was € 3.91) in pig, € 5.11 (was € 5.20) in layer and € 8.17 (was € 6.83) in broiler feeds, while the market price differs € 3.30. Lopro soybean meal has become relative less interesting due to the decreases of all feedstuff prices (especially those of the by-products) in pig and broiler feeds.

Toasted soybeans are not attractive compared to Hipro soybean meal (€ 42.50) and soy oil (€ 70.00) for August due to price increase of toasted soybeans and decreases of the Hipro soybean meal and soy oil prices. The market price of toasted beans is at € 51.00 considerable higher than the formula: 75% Hipro + 7.5% maize + 17.5% SBO = 42.50*0.75 + 19.50*0.075 + 70.00*0.175 = € 45.59. When other fat sources are used instead of soy oil, toasted soybeans are even less attractive. The 'shadow price' of

toasted soybeans drops to € 44.63 with PFAD and even to € 43.14 with animal fat. Consequently compared to animal fat toasted soybeans are € 7.86 too expensive and compared to palm oil fatty acids € 6.37. In layer feeds therefore no toasted soybeans are used but in broiler finisher feeds the usage rate is 8%.

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

The usage rate of soybean meal is:

- 0% Hipro in pig grower/finisher.
- 11% Hipro in the layer feeds.
- 15% Hipro in broiler grower/finisher feeds (additionally 8% 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 (Argentine, Brazil and the U.S.) in feeds for different species (based on a Hipro SBM price of € 42.50 for August and € 43.20 for November-January in the Netherlands for week 27)

	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.
August	-0.80	+1.83	+2.63	-0.94	+0.18	+1.12	-1.62	+1.29	+2.91
Nov.-Jan.	-0.76	+1.71	+2.47	-0.94	+0.18	+1.12	-1.37	+0.73	+2.10

The value of Hipro soybean meal from Argentina is € 0.76-1.62/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.18-1.83 higher value than that from Brazil, despite a lower crude protein content, and € 1.12-2.91 more than that from Argentina. The highest added value of high(er) quality soybean meal is obtained in pig (€ 1.83-2.47) and broiler (€ 0.73-2.91) feeds, compared to layer feeds (€ 0.18 -1.12). The added value of high(er) quality Hipro soybean meal has changed little in pig (was € 1.77-2.80) and layer (was € 0.18-1.13) feeds but is increased in broiler feeds (was € 0.38-1.99). The increase in the added value of high(er) quality Hipro soybean meal in broiler feeds is due to the increased price of toasted soybeans.

In conclusion:

1. The price of Hipro soybean meal has decreased slightly after reaching the highest level in 2 years last month. The future price of Hipro soybean meal for the November-January period is € 0.80 higher than the current price. Due to good harvest predictions the market might have overreacted and the soybean meal prices might decrease further.
2. The spread between the Lopro and Hipro soybean meal price has increased since the Hipro soybean meal price decreased (€ 0.50) more than the Lopro.
3. All soy products are still too expensive for pig feeds.
4. Hipro soybean meal is priced attractive compared to Lopro soybean meal for all feeds.
5. The difference in value between the Lopro and Hipro soybean meal is € 6.36 in pig, € 5.11 in layer and € 8.17 in broiler feeds, while the market price differs € 3.30. Lopro soybean meal has become relative less interesting due to the decreases of all feedstuff prices.
6. The added value of high(er) quality Hipro soybean meal in broiler feeds is increased due to the increased price of toasted soybeans while the Hipro soybean meal has decreased.
7. U.S. soybean meal is worth € 2.47-2.63/100 kg more than Argentinean soybean meal in swine feeds, € 1.12 in layer feeds and € 2.10-2.91 in broiler feeds.
8. U.S. soybean meal is worth € 1.71-1.83/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.18 in layer feeds and € 0.73-1.29 in broiler grower/finisher feeds.
9. 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 23 were obtained from the Cambra Oficial de Comerc Industria i Navegacio de Barcelona. The Hipro (49/3.5) soybean meal price for July has decreased slightly (with € 0.90) last month after a significantly increase in the previous periods (f.i. with € 7.90 from week 18 to 23) as in other regions. The Hipro soybean meal price in Spain is still € 0.90 lower than in the Netherlands but € 2.05 more than in Poland. Rapeseed meal has decreased in price too, even more than Hipro soybean meal.

The grain and grain by-product have decreased to the same extent in the Netherlands. The maize price is lower than in the Netherlands but higher than in Poland. Wheat, rye and barley are more expensive in Spain than in the Netherlands and Poland (Table 2B).

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

Table 5. Feedstuff prices of week 27 in Spain for July

Period		July	Change week 27-23
Grains	Maize	17.70	-1.00
	Wheat	16.80	-1.30
	Triticale		
	Rye	15.00	
	Barley	15.60	-0.90
Grain by products	Wheat bran	13.00	-1.10
	Maizegl. feed meal		
Fats & oils	Animal fat	61.00	+2.00
	Palm oil	65.00	-2.50
	Soy oil	67.80	-1.50
	Fatty acids	65.00	+2.00
	Toasted Soybeans		
Protein rich	Hipro SBM	41.60	-0.90
	Lopro SBM		
	RSM	24.60	-1.90
	RSE		
	Lopro Sunfl. sd ml.	17.50	
	Maize DDGS		
Misc.	Peas		
	PKM		
	Beet pulp	18.50	

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)

No price for milo corn was available. The shadow price of milo corn is € 16.89 in pig feeds, € 15.42 in layer and € 19.93 in broiler feeds (benchmarked at the maize price of € 17.70 in swine and layer feeds and € 16.80 for wheat in broiler feeds).

Pig feeds costs have increased with 8% compared to week 23, those of layer feeds 3% and of broiler feeds 2%.

Feedstuff usage in feed formulations.
Pig feed formulations are based on rye and barley, since they are considerable cheaper than maize and wheat. Rye is the cheapest grain (€ 2.70 cheaper than maize and € 1.80 than wheat). Barley is € 0.60 more expensive than rye but still used because the usage of rye is limited. The shadow price of maize is € 17.33 and that of triticale € 17.39 (benchmarked at the € 15.60 price of barley). The value of triticale is high (compared to maize) due to the high protein prices. The shadow price of rye is € 16.21, which is € 0.61 higher than the market price of barley due to the higher energy and crude protein content. Wheat bran is very attractive, the usage rate is maximised at 20% with a shadow price of € 13.20. Beet pulp remains unattractive (shadow price € 13.09). Palm kernel meal has a shadow price of € 12.60. The reason is the high fat & oil prices.

The shadow price of Hipro soybean meal is € 42.32 at the market price of € 41.60, however the Hipro soybean meal usage has decreased with 2% because rapeseed meal has become attractive. The shadow price of rapeseed meal is € 26.94 which is very narrow compared to the market price of € 24.60, moreover the usage rate is only 3%. The shadow price of rapeseed expellers (€ 27.62) is considerable higher, giving an added value of € 3.02 over rapeseed meal. This was € 4.63 previous month, showing the impact of the lower plant protein and grain (energy) prices. Both Lopro and Hipro sunflower seed meal are still not attractive, the shadow price of the Lopro quality is only € 13.54. Hipro sunflower seed meal is more likely to be attractive than Lopro sunflower seed meal, the value of the Hipro quality is € 3.93 higher than that of the Lopro. No price for maize DDGS was available, the shadow price is € 22.79 (there are maximum C18:2 restrictions because the maize usage is high). Due to the high usage of low energy grains (rye and barley), rapeseed meal and grain by-products (wheat bran), now 4.5% animal fat is added. The shadow price of animal fat is only € 62.52 (at a price of € 61.00).

Layer feed formulations are based on wheat, a minimum amount of maize is used. Wheat is cheaper than maize but also attractive as an additional source of protein (usage rate 37%, shadow price € 16.90). Rapeseed meal is very attractive, the shadow price is € 27.98 with a (maximum) usage rate of 2.5%. Lopro sunflower seed meal is no longer attractive, the shadow price is € 17.03 at a market price of € 17.50. The usage rate of Hipro soybean meal usage is therefore unchanged at 19%. Wheat bran is not attractive for layer feeds (shadow price € 12.55). Rapeseed expellers have a much higher value than rapeseed meal (shadow price € 34.86, which is € 10.26 more than that of rapeseed meal) but no market price was available. Hipro sunflower seed meal has a shadow price

€ 23.58, which is € 6.08 over that of Lopro sunflowerseed meal. No price for maize DDGS was available, but it can be attractive (shadow price € 26.86), especially since both the animal fat and the Hipro soybean meal prices are high. The shadow price of fish meal is € 75.42 and therefore too expensive (market price € 97.50). Animal fat is considerable less expensive than (palm oil) fatty acids, the shadow price of PFAD is € 55.60. 0.8% soy oil is needed to meet the minimum C18:2 requirement. The usage rate of fat & oil is increased to 3.9% due to the high usage of rapeseed meal.

Broiler feeds are based on wheat since the usage rate of maize is maximised (white meat requirement). Toasted soybeans are used (usage 12%) 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 19%. Fish meal is also now attractive, the shadow price is € 101.11 but the usage rate is only 0.5%. Rapeseed meal remains unattractive (shadow price € 18.43 at a market price of € 24.60) and so will Hipro sunflowerseed meal be (shadow price only € 10.58). Maize DDGS will be attractive at a price below € 24.79. The shadow price for peas is € 22.73. Animal fat is used as the cheapest fat source in conjunction with soy oil. Palm oil is too expensive (shadow price € 55.89 benchmarked at the animal fat price of € 61.00). Toasted soybeans have a shadow price of € 51.76 due to the maximum usage rate of fat & oils.

Value of Hipro soybean meal in feed formulations.
The shadow price of Hipro is € 42.32 in the grower/finisher pig feeds, € 42.80 in the layer feed and € 46.54 in the broiler feed at a market price of € 41.60. The spread in the Hipro soybean meal price (without affecting the usage rate) is highest in broiler feeds (€ 4.94) followed by layer feeds (€ 1.20) and lastly pig feeds (€ 0.62). The spread has increased in pig and broiler feeds due to the lower Hipro soybean meal price (it was only € 0.05 in pig and € 3.71 in broiler feeds). It has decreased in layer feeds due to the high usage of rapeseed meal (it was € 8.54). The usage rate of soybean meal is highest in poultry feeds.

The shadow price of the Lopro quality (42.8% crude protein) is € 37.51 in the grower/finisher pig feeds, € 36.67 in the layer feed and € 33.41 in the broiler feed. Consequently the difference in value between the shadow price of Lopro and the market price of Hipro soybean meal is € 4.09 in pig, € 4.93 in layer and € 8.19 in broiler feeds. These differences have increased in pig and broiler feeds due to a different feed composition and have decreased the most in layer feeds with a higher usage of Hipro soybean meal. The differences were € 3.98 in pig, € 5.01 in layer and € 7.55 in broiler feeds in report no. 5/2016.

The shadow price of toasted soybeans is € 40.65 in pig and € 43.19 in layer feeds. In broiler feeds toasted beans are used because the amount of added fat & oil is maximised (shadow price € 51.76 at a soy oil price of € 67.80).
Hipro soybean meal is therefore the most attractive protein source especially in poultry

feeds, next to rapeseed meal and probably maize DDGS.

The usage rate of Hipro soybean meal is:

- 7% usage in pig grower/finisher pig feeds.
- 19% in the layer feeds.
- 19% 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 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 (Argentine, Brazil and the U.S.) in feeds for different species (based on a Hipro SBM price of € 41.60 for July in week 27

	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.
July	-0.87	+1.87	+2.74	-0.89	+0.10	+0.99	-1.56	+0.54	+2.10

The value of Hipro soybean meal from Argentina is € 0.87-1.56/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.10-1.87 higher value than that from Brazil, despite a lower crude protein content, and € 0.99-2.74 more than that from Argentina. The highest added value of high(er) quality soybean meal is obtained in pig (€ 1.87-2.74) and broiler (€ 0.54-2.10) 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 in pig feeds from € 1.81-2.67 to € 1.87-2.74 and in broiler feeds from € 0.50-1.93 to € 0.54-2.10 compared to report no 5/2015 mainly due to the different feed composition (pig feeds) and higher animal fat prices (broiler feeds). However the added value of high(er) quality Hipro soybean meal has decreased in layer feeds from € 0.14-1.03 to € 0.10-0.99 due to the lower plant protein and Hipro soybean meal prices.
The value of the U.S. versus the Argentina origin decreased the most but is still considerable higher than the difference between U.S. versus Brazil.

In conclusion:

1. The market price of Hipro soybean meal in Spain decreased € 0.90 compared to report no 5/2016 after a very sharp increase (with € 7.90) in the previous period. The price of Hipro soybean meal in Spain is € 0.90 lower than in the Netherlands but € 2.05 higher than in Poland.
2. The usage rate of soybean meal is high (19%) in poultry feeds, the added value of high(er) quality Hipro soybean meal is highest in pig and broiler feeds.
3. Although the Hipro soybean meal price decreased the added value of high(er) quality Hipro soybean meal has increased in pig and broiler feeds.
4. The difference in value between the shadow price of Lopro and the market price of Hipro soybean meal is € 4.09 in pig, € 4.93 in layer and € 8.19 in broiler feeds and has also increased in pig and broiler feeds.
5. U.S. soybean meal is worth € 2.74/100 kg more than Argentinean soybean meal in swine feeds, € 0.99 in layer feeds and € 2.10 in broiler feeds. The additional value of U.S. soybean meal is highest over that from Argentina in pig and broiler feeds.
6. U.S. soybean meal is worth € 1.87/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.10 in layer feeds and € 0.54 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.

The price of maize and wheat increased in Poland compared to report no. 05/2016 (based on feedstuff prices of week 27, 2016) but all other feedstuffs price decreased. Rapeseed meal decreased considerable more in price than Hipro soybean meal and maize DDGS. However the price of Hipro soybean meal price in Poland is still € 2.95 less than in the Netherlands and € 2.05 than in Spain. On the other hand rapeseed meal decreased most in price in Poland and is much lower than in the Netherlands and Spain. Also the grain and grain by-product prices in Poland are lowest of all regions. This makes Hipro soybean meal relatively expensive in Poland.

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

Table 7. Feedstuff prices of week 27 in Poland for July

Period		July	Change week 27-23
Grains	Maize	16.00	+0.55
	Wheat	14.55	+0.30
	Triticale	13.35	-0.30
	Rye		
	Barley	13.35	-0.30
Grain by products	Wheat bran	11.20	-0.40
	Maizegl. feed meal		
Fats & oils	Animal fat	60.55	-1.95
	Palm oil		
	Soy oil	72.65	-0.30
	Fatty acids		
	Toasted Soybeans		
Protein rich	Hipro SBM	39.55	-0.25
	Lopro SBM		
	RSM	20.45	-3.85
	RSE	22.65	
	Hipro Sunfl. sd ml.		
	Maize DDGS	18.90	-0.40
Misc.	Peas		
	PKM		
	Beet pulp	16.90	-1.30

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 3% compared to report no. 5/2016 and broiler feeds 1%. Layer feed costs are unchanged, due to the increased maize price.

Feedstuff usage in feed formulations.
Pig feed formulations are based on barley, triticale, and wheat. No price was available for rye which can be very attractive for pig feeds (shadow price € 14.49). Maize has become too expensive (shadow price € € 15.60). Triticale is priced the same as barley but triticale is considerable more attractive with a higher protein and energy content (the shadow price of triticale is € 15.62 compared to barley). The usage rate of triticale is maximised at 25%, consequently 40% barley is used. Since the inclusion rate of barley is maximised 5% wheat is used. The shadow price of wheat is € 14.16 before it will start to replace triticale (and barley) at the market price of € 13.65. The shadow price of triticale is € 15.62, showing that triticale is considerable more attractive than wheat.
Wheat bran is not attractive, the shadow price of € 10.75. Beet pulp (shadow price € 11.76) is not at all attractive.

Rapeseed expellers are very attractive, since the price of rapeseed products decreased. The shadow price of rapeseed meal is € 19.56 (at a market price of € 20.45) benchmarked at the rapeseed expellers price of € 22.65, this creates a € 3.09 value difference between rapeseed meal and expellers. This difference decreased slightly (from € 3.17 last month) due to the lower fat & oil prices. Maize DDGS is attractive but the usage is restricted by the maximum C18:2 limitations. The usage rate is 8% at a shadow price of € 19.72. The inclusion rate of Hipro soybean meal is therefore altogether decreased from 9% to 4%.

Layer feed formulations are based on maize and wheat. Wheat is attractive as an additional source of protein and energy due to the still high Hipro soybean meal price and increased maize price. The usage rate of wheat is now 13% with a shadow price of € 14.89. The price of wheat would have to decrease below € 13.37 before the usage rate would increase, indicating that maize at a market price of € 16.00 has now a € 2.63 higher value than wheat (was € 1.27 the previous period with higher Hipro soybean meal price). The Hipro soybean meal usage decreased slightly with the higher wheat usage.
Rapeseed expellers are very attractive (shadow price € 28.37 at a 2.5% (maximum) usage). The value of rapeseed meal is only € 14.73 benchmarked at the rapeseed expellers market price of € 28.37. This creates a € 13.64 difference due to the lower plant protein and higher grain (energy) prices (the difference was € 7.46 in report no 5/2016). Maize DDGS is still attractive (maximum usage rate of 10%, shadow price € 23.11). Wheat bran is of no interest, the shadow price is € 8.59.The shadow price of Hipro sunflowerseed meal is € 19.34 and that of the Lopro quality only € 12.31. Animal fat (2.7%) 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 (15%) 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 now also very attractive (shadow price € 24.36 at a market price of € 22.65), rapeseed meal is not attractive (shadow price € 10.85 or an added value of € 11.80 for rapeseed expellers over rapeseed meal). Maize DDGS is now less attractive (usage rate only 1%, but a shadow price of € 22.30). The Hipro soybean meal usage is decreased from 16 to 13% (due to a 5% usage of rapeseed expellers). The shadow price for peas is € 20.22. 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 € 51.70 in the grower/finisher pig feeds, € 49.35 in the layer feed and € 43.87 in the broiler feed at a market price of € 39.55. The spread in the Hipro soybean meal price is € 12.15 in the pig feed, € 9.80 in layer feeds and € 4.32 in broiler feeds, without its usage rate being affected. The spread was € 4.21 in pig feeds, € 7.00 in layer and € 4.38 in broiler feeds in report no 5/2016. The spread (value compared to the market price and that of other plant proteins) has increased in pig and layer feeds due to the higher usage of alternative protein sources of lower quality but decreased in broiler feeds due to the lower price of Hipro soybean meal. The usage rate of Hipro soybean meal is decreased in all feeds but the most in pig feeds.

The shadow price of the Lopro quality (42.8% crude protein) in the same feeds is € 35.43 in the grower/finisher pig feeds, € 34.19 in the layer feed and € 29.46 in the broiler feed benchmarked at the market price of € 39.55 for Hipro soybean meal. Consequently the difference in value between the shadow price of Lopro and the market price of Hipro soybean meal is € 4.12 in pig, € 5.36 in layer and € 10.09 in broiler feeds. Last month, in report no 5/2016, the difference were € 1.01 in pig, € 1.81 in layer and € 3.39 in broiler feeds. The price difference have increased due to the lower usage of Hipro soybean meal (increasing the value of more concentrated sources). The increases were largest in broiler feeds.

The shadow price of toasted beans is € 36.46 in pig and € 41.14 in layer feeds. This was respectively € 36.76 and € 41.66 in report no 5/2016, showing a lower value of toasted soybeans with the lower Hipro soybean meal and fat & 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 € 58.38).

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:

- 4% usage in pig grower/finisher pig feeds.
- 16% in the layer feeds.
- 13% 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 (Argentine, Brazil and the U.S.) in feeds for different species (based on a Hipro SBM price of € 39.55 for July in week 27)

	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.
July	-0.95	+1.85	+2.80	-0.95	+0.26	+1.21	-1.92	+0.74	+2.66

The value of Hipro soybean meal from Argentina is € 0.95-1.92/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.26-1.85 higher value than that from Brazil, despite a lower crude protein content, and € 1.21-2.80 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 decreased in pig feeds from € 1.98-2.85 in report no. 5/2016 to € 1.85-2.80 but increased in layer feeds from € 0.21-1.13 to € 0.26-1.21 and in broiler feeds from € 0.73-2.62 to € 0.74-2.66. The lower plant protein price slightly decrease the added value of high(er) quality Hipro soybean meal in pig feeds but it is slightly increased in poultry feeds due to poorer quality and higher usage of alternative protein sources.

In conclusion:

1. The market price of Hipro soybean meal decreased slightly in Poland last month after a significant increase last month as in the Netherlands and Spain.
2. The price of Hipro soybean meal in Poland is € 2.95 less than in the Netherlands and € 2.05 than in Spain.
3. The value difference between the Lopro and Hipro soybean meal increased to € 4.12 in pig, € 5.36 in layer and € 10.09 in broiler feeds.
4. The value of toasted soybeans decreased to € 36.46 in pig and € 41.14 in layer feeds due to the lower fat & soy oil prices.

5. U.S. soybean meal is worth € 2.80/100 kg more than Argentinean soybean meal in swine feeds, € 1.21 in layer feeds and € 2.66 in broiler feeds. The additional value of U.S. soybean meal is highest over that from Argentina in pig and broiler feeds.
6. U.S. soybean meal is worth € 1.85/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.26 in layer feeds and € 0.74 in broiler grower/finisher feeds. The additional value of U.S. soybean meal is highest over that from Brazil in pig and broiler feeds.
7. The lower plant protein price slightly decrease the added value of high(er) quality Hipro soybean meal in pig feeds but it is slightly increased in poultry feeds due to poorer quality and higher usage of alternative protein sources.

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

Price developments.

Compared to last month feedstuff prices have changed little, except the price of barley which decreased significantly. In Romania the price of soybean meal increased € 0.10 but in all other countries the price decreased slightly (after sharp increases last month), in the Netherlands the Hipro soybean meal decreased € 1.40, in Spain € 0.90 and in Poland € 0.25. The Hipro soybean meal in Romania is therefore the lowest of all regions, nevertheless there is also a quality difference (47 versus 46% crude protein). The prices Hipro sunflowerseed meal and maize DDGS increased in Romania but the prices of other plant proteins like rapeseed meal decreased in other countries, like Hipro soybean meal. The grain prices are low in Romania as in Poland, compared to North Western and Southern Europe.

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

Table 9. Feedstuff prices of week 27 in Romania for July

Period		July	Change week 27-23
Grains	Maize	16.35	
	Wheat	15.00	+0.05
	Triticale		
	Sorghum		
	Barley	12.50	-2.50
Grain by products	Wheat bran	13.40	-0.10
	Maizegl. feed meal	13.50	-0.30
Fats & oils	Animal fat		
	Palm oil		
	Sunflower oil	74.50	
	Fatty acids		
	Toasted Soybeans		
Protein rich	Hipro SBM *	37.00	+0.10
	Lopro SBM		
	RSM		
	RSE		
	Hipro Sunfl. sd ml.	19.80	+0.10
	Maize DDGS	18.00	+0.10
Misc.	Peas		
	Beet pulp	11.00	+1.00

*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)

Remarkable is the still very high price of sunflowerseed oil in Romania, while the prices of fat & oil prices have decreased in most countries. The maize price is unchanged in Romania, has increased € 0.55 in Poland but has decreased in the Netherlands (-€ 0.30) and in Spain (-€ 1.00).
No price was available for milo corn, which when priced attractive can reduce feed costs substantially. Resultantly pig feed costs decreased 2% compared to the last period (report no 5/2016) but those of layer and broiler feeds are unchanged.

Feedstuff usage in feed formulations.
Pig feed formulations are based on maize and barley. Barley is the most attractive priced grain (€ 3.85 cheaper than maize) but the energy content is low. The usage rate of barley is at the maximum (40%). Wheat can be attractive as a protein source since the price of soybean meal is still high but the shadow price in € 14.30 (€ 2.05 lower than the maize price). Because the energy (sunflower seed oil) costs are high, the shadow price of maize stays (relatively) high. Maize will (start to) replace barley when the price increases above € 16.71. This means that maize has an added value over barley of € 16.71 -12.50 = € 4.21 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 € 15.97. 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 41% maize and 3% maize DDGS are used. The shadow price of triticale is € 15.99, no price was available this time. The high prices of the protein and fat rich feedstuffs increase the value of starch and protein richer grains (f.i. the value triticale is € 3.49 higher than that of barley).

Peas can be very attractive starch and protein source but no price was available (shadow price € 23.21). 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 only € 6.98 at a market price of € 19.80. Wheat bran is therefore also not attractive (shadow price only € 4.50). No added fat or oil is used because it is still very expensive. Maize DDGS is attractive as an energy source but the usage is maximised by the C18:2 content of the pig feed. Prices for rapeseed meal (shadow price € 17.37) and rapeseed expellers (shadow price € 23.31) were also not available. The value of wheat DDGS (shadow price € 9.19) is considerable 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 still attractive, the usage rate is 17% with a shadow price of € 16.15 at a maize price of € 16.35 .The value of maize over wheat is therefore now € 0.20 due to the high sunflowerseed oil price, despite the still high plant protein prices. Maize DDGS is attractive, the usage rate is 2.3%

at a shadow price of € 22.47. Peas can also be attractive for layer feeds, the shadow price is € 19.41 (which is much lower than the shadow price of € 23.21 in pig feeds). The shadow price of milo corn is € 13.51. Wheat bran is not attractive, the shadow price is only € 2.06 due to the low energy content and the high plant oil price. The shadow price of toasted soybeans has increased from € 40.85 to € 40.90 due to the increased Hipro soybean meal price (with € 0.10). However the price for toasted soybean is unattractive so that 2.6% sunflowerseed oil is added. Hipro sunflower seed meal is too expensive (shadow price € 12.29). The shadow price of rapeseed expellers (shadow price € 34.75) is significantly higher than of rapeseed meal (shadow price € 20.02). The value of rapeseed expellers is higher for layer than pig feeds since sunflowerseed oil is added to layer feeds. The Hipro soybean meal usage is 21% since no toasted soybeans are used.

Broiler feeds are maize based (no white meat requirement). Wheat is too expensive (shadow price € 8.80), mainly due to the low energy content compared to maize. Peas are not likely to be attractive as a protein and starch source for broiler feeds, the shadow price is only € 15.35. Toasted soybeans are not attractive but the sunflowerseed oil addition is maximised so that 3% toasted soybeans are used. The shadow price of toasted soybeans is € 55.36 with the high sunflowerseed oil price (of € 74.50). The usage rate of sunflower seed oil is therefore still 3.5%. Hipro sunflowerseed meal is not attractive due to the low energy content. Maize DDGS is only marginally attractive as an energy + protein source (due to C18:2 limits), the usage rate is 2% with a shadow price of € 19.70.The value of wheat DDGS is also low. Prices for rapeseed meal (shadow price € 10.37) and rapeseed expellers (shadow price € 23.03) were not available, rapeseed expellers are obviously more likely to be attractive (added value rapeseed expellers over rapeseed meal is € 12.66). Hipro soybean meal is therefore the most attractive protein source next to toasted soybeans, the usage rate is 28% (next to 3% toasted soybeans).

Value of Hipro soybean meal in feed formulations.
The shadow price of the (46% Crude Protein) Hipro soybean meal is € 41.76 in the grower/finisher pig feeds, € 42.52 in the layer feed and € 45.07 in the broiler feed based on the market price of € 37.00. This gives a spread of € 4.76 in pig feeds, € 5.52 in layer feeds and € 8.07 in broiler feeds. In the previous period, report no. 5/2016, these differences were € 4.53 in pig feeds, € 5.13 in layer feeds and € 8.10 in broiler feeds. The price margins (value) of Hipro soybean meal decreased slightly in all feeds due to the higher soybean meal price.

The shadow price of the (47% Crude Protein) Hipro soybean meal is € 38.01 in the grower/finisher pig feeds, € 39.74 in the layer feed and € 40.56 in the broiler feed based on the 46% crude protein Hipro price of € 37.00. The difference in value due to 1.0 % crude protein (compared to the market price of € 37.00 of the 46% crude protein Hipro quality above) is € 1.01 in pig feeds, € 2.74 in layer and € 3.56 in broiler feeds. These differences were respectively € 0.79 in pig feeds, € 2.75 in layer and € 3.51 in broiler

feeds in report no 5/2016 and increased in pig feeds the most due to the high barley usage.

The shadow price of a (43% Crude protein) Lopro quality is € 33.25 in the grower/finisher pig feeds, € 32.62 in the layer feed and € 29.99 in the broiler feed benchmarked at the Hipro soybean meal price of € 37.00. This gives a value difference of the Lopro versus the Hipro quality of € 3.75 in pig feeds (was € 3.05 in report no. 5/2016), € 4.38 in layer feeds (was € 4.41) and € 7.01 in broiler feeds (was € 6.92). The value of Lopro soybean meal is especially in poultry feeds low but increased in pig feeds.

The shadow price of toasted beans is € 36.45 in pig, € 40.94 in layer and € 55.36 in broiler feeds. Toasted soybeans are therefore only used in broiler feeds at a market price of € 51.00. The value is high in poultry, and especially broiler, 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 broiler feeds and maize DDGS in pig and layer 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.
- 21% Hipro in the layer feeds.
- 28% Hipro in broiler grower/finisher feeds along with 3% 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 46% CProt Hipro SBM price of € 37.00 for July in week 27)

	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.
July	-1.19	+2.30	+3.49	-1.21	+0.52	+1.73	-2.02	+0.60	+2.62

The value of Hipro soybean meal from Argentina is € 1.19-2.02/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.52-2.30 higher value than that from Brazil, despite a lower crude protein content, and € 1.73-3.49 more than that from Argentina. The highest added value of high(er) quality soybean meal is obtained in pig and 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 feeds but decreased in layer and broiler feeds. The added value in pig feeds went from € 1.93-2.64 in report no. 5/2016 to € 2.30-3.49, in layer feeds from € 0.57-1.77 to € 0.52-1.73 and in broiler feeds from € 0.65-2.62 to € 0.60-2.62. In pig feeds the added value of high(er) quality Hipro soybean meal increased because the higher barley usage, in poultry feeds it decreased because of a higher soybean meal price.

In conclusion:

1. The market price of Hipro soybean meal increased slightly in Romania but decreased in other regions (where it had increased sharply last month). The price of soybean meal is still lowest in Romania of all regions but also the quality (protein content) is lower.
2. Hipro soybean meal is more attractive than the Lopro quality. The value of the Lopro quality is € 3.75 in less in pig feeds, € 4.38 in layer feeds and € 7.01 in broiler feeds.
3. The difference in value in soybean meal due to 1.0 % crude protein is € 1.01 in pig feeds, € 2.74 in layer and € 3.56 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 € 3.49/100 kg more than Argentinean soybean meal in swine feeds, € 1.72 in layer feeds and € 2.62 in broiler feeds. The additional value of U.S. soybean meal is highest over that from Argentina in pig and broiler feeds.
6. U.S. soybean meal is worth € 2.30/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.52 in layer feeds and € 0.60 in broiler grower/finisher feeds. The additional value of U.S. soybean meal is highest over that from Brazil in swine feeds.

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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 € 42.50) for August 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.
Absolute differences in nutrient value									
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
Value (€/100 kg) differences (compare to table 1)									
Protein €	-0.58	-0.47	+0.13	-0.82	-0.64	+0.19	-1.03	-0.82	+0.23
Energy €	-0.35	+0.08	+0.43	-0.39	+0.16	+0.55	-0.77	+0.58	+1.34
Dig. AA €	+0.13	+2.22	+2.07	+0.27	+0.66	+0.38	+0.18	+1.53	+1.34
Total €	-0.80	+1.83	+2.63	-0.94	+0.18	+1.12	-1.62	+1.29	+2.91

A difference of 0.9% crude protein with the lower Hipro soybean meal (and also lower grain and other plant protein prices) adds or decreases € 0.58 /100 kg to the value of Hipro soybean meal in swine feeds (was € 0.56 in week 23), € 0.82 in layer feeds (was € 0.82) and € 1.03 in broiler feeds (was € 0.94). The value of protein in soybean meal increased in pig and broiler feeds but is unchanged in layer feeds. The Hipro soybean meal price decreased € 1.40, but that of rapeseed meal with € 1.60.

The value of soybean meal due to energy content has increased as follows: 50 kcal NE adds € 0.43/100 kg to the value of Hipro soybean meal in swine feeds (was € 0.48), 68

kcal ME € 0.55 in layer feeds (was € 0.57) and 69 kcal extra in broiler feeds increases the shadow price with € 1.34 (was € 1.01). The energy costs derived from both grains and fats & oils have decreased in pig and layer feeds but in broiler feeds is the value of Hipro soybean meal due to the energy content increased because of the increased price of toasted soybeans.

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 € 2.07-2.22/100 kg in swine feeds for U.S. soybean meal over that from Argentina or Brazil (was € 2.03-2.15), € 0.38-0.66 in layer feeds (was € 0.38-0.66) and € 1.34-1.53 in broiler feeds (was € 0.96-0.77). These value differences have increased in pig feeds (different grain usage) and considerable more in broiler feeds (increased price of toasted soybeans) compared to the last report (no 5/2016). 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 € 0.43 higher value over Argentinean soybean meal due to a 50 kcal ME difference in swine feeds, a € 0.55 difference in layer feeds for a 68 kcal ME difference and a € 1.34/100kg 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 € 2.22.

Variation in nutrient values

The effect of variation in the nutrient value (4-5%) of soybean meal on the value (market price € 42.50/100 kg in the Netherlands for August) is given in the following table.

Table 12. Price effect of variation in nutrient value

	Swine	Layer	Broiler
+/- 100 cal	0.86	0.79	1.96
+/- 4% dig AA	1.19	0.17	0.59
+/- 100 Cal and 4% dig AA	2.05	0.97	2.55
+/- 0.1 g/kg dig P	0.02	0.02	0.04

Variation in the energy content has the largest effect on the value of soybean meal. In pig feeds the lower grain prices reduce the value effects of variation in the energy content but in broiler feeds a higher price for toasted soybeans increase it. A variation of +/- 100 kcal has a € 0.86/100 kg effect on the Hipro soybean meal value in swine (was € 0.96 in report no 4/2016) and € 0.79 in layer feeds (was € 0.84) but € 1.96 in broiler feeds (was € 1.46).
In pig and broiler feeds a higher usage of alternate proteins increases the value effect due to the digestible amino acid content, despite a lower Hipro soybean meal price. A variation of 4% in digestible amino acids changes the value of Hipro soybean meal with € 0.17 in layer (was € 0.17), € 0.59 in broiler (was € 0.34) but € 1.19 in swine feeds (was € 1.17). 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. Variation in the digestible energy content has the largest effect in broiler feeds because these are very concentrated feed. 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.

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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 Metabolisible 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 27, 2016. The Netherlands

Code	Article	Description	August	Nov-Jan
00010		Citruspulp Braz./USA	17.00	NA
00013		Peas <22%CP	23.70	24.00
00015		Barley (EU)	14.60	15.70
00023		Hipro SBM bypass pel	44.70	45.20
00026		Soybean hulls	15.20	15.30
00033		MOLASSES cane <47%s	17.50	17.50
00034		Flaxseed	38.20	38.20
00038		Alfalfa 15% CP	19.50	19.50
00044		Rapeseed Expellers 8%	26.80	27.00
00061		Rye (EU)	14.80	14.90
00063		WHEAT EU (feed)	15.50	16.30
00064		PALMKERNELml<20%fiber	14.20	14.00
00075		Beet Pulp 20-25%sugar	18.30	15.30
00076		MAIZE (EU)	19.50	18.50
00078		L-lysine HCl	135.00	135.00
00079		DL-Methionine	315.00	315.00
00080		Soybeans toast.pel.	51.00	48.20
00081		SBM 44/7 domestic	39.20	39.70
00084		SBM Hipro domestic	42.50	43.20
00090		Wheat middlings	11.70	12.40
00096		Soy oil liq.	70.00	70.50
00097		Palm oil	64.50	60.80
00099		Poultry Fat	58.00	58.00
00100		Animal fat (lard)	56.00	56.00
00105		Fish meal S. America	150.00	150.00
00107		MAIZEglut. fd ml 20-23%CP	16.80	17.30
00113		Sunflowerseedml<29%CP	19.90	19.40
00165		TRITICALE	15.10	15.70
00214		L-Threonine	160.00	160.00
00228		Monocal Phosph	45.50	45.50
00258		Palm oil Fatty Acids	61.00	61.00
00265		RSM bypass Rumirap	25.10	26.00
00266		Rapeseed meal34%CP	22.70	24.00
00284		RSM bypass Mervob meal	25.10	26.00
00302		CovaSoy HP	44.70	45.20
00332		Vinasses beet	10.50	10.50
00488		MAIZE distillers sol	23.40	23.80
00489		WHEAT DDGS	NA	NA

NA – no price available

Table 2B. Feedstuff prices of week 27, 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	Peas <22%CP				23.70
00015	Barley (E.E.G.)	15.60	12.50	13.35	14.60
00061	Rye	15.00			14.80
00026	Soybean hulls	15.00	11.00		15.20
00033	Molasses cane <47%s	13.50	11.00	13.10	17.50
00038	Alfalfa	15.00			19.50
00044	RSM.expell 8% fat			22.65	
00061	Milo corn				
00063	Wheat EEG (feed)	16.80	15.00	14.55	15.50
00075	Beet Pulp	18.50	11.00	16.90	18.30
00076	Maize (E.E.G.)	17.70	16.35	16.00	19.50
00078	L-lysine HCl			123.55	135.00
00079	DL-Methionine			296.65	315.00
00080	Soybeans toast.pel.				51.00
00084	**SBM Hipro**	**41.60**	**37.00@**	**39.55**	**42.50**
00090	Wheat bran	13.00	13.40	11.20	11.70
00096	Soy/Sunflo oil liq.	67.80	74.50	72.65	70.00
00097	Palm oil	65.00			64.50
00100	Animal fat (lard)	61.00		60.55	56.00
00105	Fish meal 65%	97.50			150.00
00107	Maizeglutenfeedmeal		13.50		16.80
00113	Sunflower seed meal*	17.50	19.80		
00165	Triticale			13.35	15.10
00214	L-Threonine			147.80	160.00
00228	Monocal			46.10	45.50
00266	Rapeseed meal34%CP	24.60		20.45	22.70
00488	Maize distillers sol		18.00	18.90	
00258	Palm oil fatty acids	65.00			61.00

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