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Soybean Meal Quality by Origin:

Economical Value of Hipro Soybean Meal in Least Cost Formulations

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Schothorst Feed Research

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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	37.70	37.70	35.85	30.60@

*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 € 37.70/100 kg for August in week 31, 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 €	-0.51	-0.42	+0.12	-0.67	-0.52	+0.15	-0.87	-0.68	+0.20
Energy €	-0.34	+0.08	+0.43	-0.38	+0.16	+0.47	-0.69	+0.54	+1.23
Dig. AA €	+0.14	+2.00	+1.82	+0.25	+0.68	+0.50	+0.23	+0.73	+0.49
Total €	-0.71	+1.66	+2.37	-0.80	+0.32	+1.12	-1.33	+0.59	+1.92

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

In conclusion

Although the Hipro soybean meal price decreased with € 4.80 this month and € 1.40 in the previous month it has not compensated for the sharp increase (+€ 8.10) from week 18 to 23. The added value of high quality Hipro soybean meal has increased for U.S. versus Brazil only in layer and broiler feeds and also increased the difference in value between Hipro soybean meal from Brazil and Argentina. The lower plant protein prices

have decreased the value of Hipro soybean due to differences in protein content the most in poultry feeds. In both swine and broiler feeds the added value due to differences in digestible amino acid and phosphorus content is the largest but has decreased with the lower Hipro soybean meal price and consequently a higher usage of in these feed formulations.

Hipro soybean meal from the United States has therefore f.i. a € 3.20-5.90/1000 kg higher value (absolute) than Brazilian Hipro SBM in poultry feeds. However compared to the Argentinean origin the added value of U.S. SBM is € 11.20-19.20/MT. U.S. Hipro soybean meal has the highest added value for swine (€ 16.60-23.70) and broiler (€ 5.90-19.20) feeds, followed by layer feeds (€ 3.20-11.20/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 € 8.40-20.80 (U.S. vs Brazil) and € 9.70-17.20/MT (U.S. vs Arg) or respectively 2.2-5.5% and 2.6-4.6%.

1. Introduction

Swine and poultry feeds are formulated via a Least Cost Formulation (LCF)-program to evaluate the value of soybean meal of different quality (origin) and different regions (with differing feedstuff prices/ availability). Market and future prices of feedstuffs for the Dutch feed industry of week 31 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 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 August has decreased with € 4.80 after a slight decrease the last period, which does not offset the price hike (+€ 8.10) in May/June. Excellent harvest predictions for soybeans in the U.S. and to a lesser extent in South America) decrease the prices of protein rich feedstuffs. The price of soy oil increased while the other plant oils decreased in price. The wheat, barley and triticale prices increased but those of maize decreased slightly since the maize price was already relatively high. Maize prices are high due to a lower yield and quality in South America.

3. Shadow prices soybean meal by origin, the Netherlands

Price developments.

The Hipro (49/3.5) soybean meal price for August has decreased with € 4.80/100 kg and is with € 377/ton well below the € 439/ton (in week 23). The prices of all protein rich feedstuffs have decreased but the price of Hipro soybean meal the most in absolute and relative terms. The price of toasted soybeans decreased in line with the price of Hipro soybean meal. The wheat prices has increased significantly, the triticale and barley prices have followed. However the maize and rye price decreased slightly. The plant oils decreased in price, except soy oil. Animal fat increased in price in line with soy oil.

The grain by products increased in price but f.i. palm kernel meal decreased significantly in price.

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

Table 3. Feedstuff prices of week 31 in the Netherlands for August and November-January (2017).

Period		August	Nov-Jan	Current week 31-27	Future vs current
Grains	Maize	19.30	18.50	-0.20	-0.80
	Wheat	16.80	16.60	+1.30	-0.20
	Triticale	15.50	16.00	+0.40	+0.50
	Rye	14.70	14.90	-0.10	+0.20
	Barley	15.20	15.40	+0.60	+0.20
Grain by products	Wheat bran	12.50	12.70	+0.80	+0.20
	Maizegl. feed meal	17.20	17.10	+0.40	-0.10
Fats & oils	Animal fat	56.50		+0.50	
	Palm oil	62.90	59.90	-1.60	-3.00
	Soy oil	70.50	68.50	+0.50	-2.00
	PFAD	61.00	61.00		
	Toasted Soybeans	46.50	44.40	-4.50	-2.10
Protein rich	Hipro SBM	37.70	38.20	-4.80	+0.50
	Lopro SBM	34.40	35.20	-4.80	+0.80
	RSM	21.10	21.70	-1.60	+0.60
	RSE	24.90	26.50	-1.90	+1.60
	Lopro Sunfl.sdml*	17.80	17.70	-2.10	-0.10
	Maize DDGS				
Misc.	Peas	23.20	23.80	-0.50	+0.60
	PKM	12.60	12.40	-1.60	-0.20
	Beet pulp	18.80	15.60	+0.50	-3.20

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 future (November-January) prices of the protein rich feedstuffs are higher than the current prices with the exception of sunflower seed meal. Especially the rapeseed expellers price is high while the future prices of the plant oils are lower than currently. The future grain prices are all higher than currently with the exception of maize and wheat. Especially the maize price is lower this could be an effect of the lower than expected yield in South America while the harvest predictions for the U.S, are still high.

Resultantly pig and layer feed costs are unchanged but those of broiler feeds are decreased with 2% compared to report no 6/2016 based on feedstuff prices of week 27. The future (November-January) feed costs for pig feeds are 2% higher than currently but those of both layer and broiler feeds will be 1% lower.

Feedstuff usage in feed formulations.

Pig feed formulations are based on rye and triticale. Rye is more attractive (€ 0.80 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 now only € 0.02 lower than that of triticale (was € 0.77 previously), showing the lower value of protein, at the lower prices of protein rich feedstuffs prices. Maize is not attractive, the shadow price is € 16.81. Wheat (shadow price € 14.86) is also too expensive. Benchmarked at the market price of triticale of € 15.50, the value of wheat is € 0.64 lower than of triticale. The value of rye on the other hand is € 0.22 higher than that of triticale. With the lower protein prices the value of maize compared to wheat has increased (the value of maize is now € 1.95 over that of wheat, while it was previously € 1.17). Peas are no longer attractive (shadow price € 23.16 at a market price of € 23.20). Wheat bran is still very attractive, the shadow price is € 12.98 at a 20% usage.

The usage rate of rapeseed meal is still maximised (the shadow price is € 22.11 at a market price of € 21.10). Rapeseed expellers are too expensive, the value in pig feeds of rapeseed expellers is now € 2.79 over that of rapeseed meal (was € 3.44 at the higher protein prices), however the market price difference is € 3.80). As mentioned peas are no longer attractive as a protein source. Maize DDGS can be very attractive as both a protein and energy source, no price was available. The shadow price is increased to € 21.48 due to the higher animal fat price. Lopro sunflower seed meal remains to be too expensive, the shadow price is only € 13.24 at a market price of € 17.80.

Soybean meal has therefore once again become attractive due to the relative sharp price decrease of the soy products. Hipro soybean meal (shadow price € 37.82 at a market price of € 37.70) is more attractive than Lopro soybean meal (shadow price € 34.14 at a market price of € 34.40). Soybean meal has replaced peas.

Palmkernel meal is not attractive, the shadow price is increased to € 12.48 (was € 11.90 last month) due to the higher grain and grain by-product prices. Also beet Pulp is too expensive (shadow price € 13.00). Neither palm oil (shadow price € 57.44) nor palm oil fatty acids (PFAD) with a shadow price of € 58.27 are attractive compared to animal fat

(lard) at € 56.50. The usage rate of fats & oils is increased to 4.5% due to the higher barley usage.

Layer feed formulations are still mainly wheat based (33% usage, shadow price € 17.48). Maize is still used but the usage rate is at the minimum restriction (25%). Due to the still high maize and plant protein prices wheat is attractive as a protein source. The shadow price of maize is increased to € 17.87 (from € 15.36), benchmarked at the market price of wheat at € 16.80 and Hipro soybean meal of € 37.70. The shadow price of maize has increased due to the higher energy (wheat + animal fat) costs and the lower prices of protein rich feedstuffs.

Maize DDGS is mostly very attractive, no market price was available, the shadow price is very high at € 24.77. Maize gluten are attractive as a protein and xanthophyll (egg yolk colouring) source, however the usage rate is <1%. Rapeseed expellers are very attractive, the shadow price is € 27.73 with a (maximum) usage of 2.5%. Rapeseed meal is not attractive compared to rapeseed expellers, the shadow price of rapeseed meal is € 18.27 benchmarked at a market price of € 24.90 for rapeseed expellers). Wheat bran is no longer attractive (shadow price € 10.96 at a market price of € 12.50). Wheat bran has been replaced with maize gluten feed meal (shadow price €17.20 with a market price of € 17.20). The fat addition has therefore been increased to 3.3%. Lard is the most attractive fat source (shadow price € 60.75 at a market price of € 56.50).

Peas are not attractive in layer feeds (shadow price € 21.37 at a market price of € 23.20). Lopro sunflower seed meal (shadow price € 15.28) remains attractive. The Hipro soybean meal usage is increased therefore from 11 to 15%, because no maize DDGS price was available. 10% maize DDGS can replace only 5.3% Hipro soybean meal however due to the lower and poor protein quality of maize DDGS. Hipro soybean meal (shadow price € 39.01) is more attractive than the Lopro quality. Toasted soybeans are not attractive (shadow price € 40.87).

Broiler feeds are based on wheat since the usage rate of maize is maximised (white meat requirement). Peas are not attractive (shadow price € 21.96 at a market price of € 23.20). Toasted soybeans have become more attractive due to the decreased toasted soybeans price and the increased animal fat price, the usage rate increased from 8 to 12%. Maize gluten meal (60% protein) has become less attractive at the lower soybean meal prices, the usage rate is reduced from 3 to 1% with a shadow price of € 74.63. 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 reduced from € 8.26 to € 4.70 over that of rapeseed meal due to the lower protein prices). Maize DDGS is likely too expensive, the shadow price is € 23.59. The shadow price of Hipro sunflowerseed meal (32% crude protein) is only € 11.26, the market price of Lopro sunflowerseed meal is only € 3.01. Hipro soybean meal usage is slightly reduced from 15 to 14%, due to the increased usage of toasted soy beans.

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 € 57.00 (at a market price of € 56.50), due to the C18:2 maximum restrictions.

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 € 37.82 in the grower/finisher pig feeds, € 39.01 in the layer feed and € 39.96 in the broiler feed at a market price of € 37.70. The spread in the Hipro soybean meal price is increased from -€ 3.68 in swine feeds to € 2.12 and in broiler feeds from € 1.43 to € 2.26. In pig feeds soy products are once again attractive and used due to the sharper decrease of the soybean meal prices than other plant proteins. In broiler feeds the spread for Hipro soybean meal has increased due to the higher toasted soybeans usage. In layer feeds the spread decreased from € 1.59 to € 1.31 because no maize DDGS (poor protein quality) is used.

The shadow price of the Lopro quality (42.8% crude protein) is € 34.14 in the grower/finisher pig feeds, € 33.26 in the layer feed and € 30.73 in the broiler feed at a market price of € 34.40. Consequently this makes Lopro soybean meal too expensive for all feeds, the price is € 0.36 too high for pig feeds, € 1.14 for layer and even € 3.67 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 € 3.56 (was € 6.36) in pig, € 4.44 (was € 5.11) in layer and € 6.97 (was € 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 the prices of all protein rich feedstuffs (especially soybean meal).

Toasted soybeans are still not attractive compared to Hipro soybean meal (€ 37.70) and soy oil (€ 70.50) for August despite the price decrease of toasted soybeans and the price increase of soy oil. The market price of toasted beans is at € 46.50 higher than the formula: 75% Hipro + 7.5% maize + 17.5% SBO = $37.70 \times 0.75 + 19.30 \times 0.075 + 70.50 \times 0.175 = € 42.06$. When other fat sources are used instead of soy oil, toasted soybeans are even less attractive. The 'shadow price' of toasted soybeans drops to € 40.40 with PFAD and even to € 39.61 with animal fat. Consequently compared to animal fat toasted soybeans are € 6.89 too expensive and compared to palm oil fatty acids € 6.10. In layer feeds therefore no toasted soybeans are used but in broiler finisher feeds the usage rate is increased to 12%.

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:

- 3% Hipro in pig grower/finisher.
- 15% Hipro in the layer feeds.
- 14% 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 € 37.70 for August and € 38.20 for November-January in the Netherlands for week 31)

	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	-0.71	+1.66	+2.37	-0.80	+0.32	+1.12	-1.33	+0.59	+1.92
Nov.-Jan.	-0.72	+1.68	+2.40	-0.81	+0.30	+1.11	-1.20	+0.53	+1.73

The value of Hipro soybean meal from Argentina is € 0.71-1.33/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.30-1.68 higher value than that from Brazil, despite a lower crude protein content, and € 1.11-2.40 more than that from Argentina. The highest added value of high(er) quality soybean meal is obtained in pig (€ 1.66-2.40) and broiler (€ 0.53-1.92) feeds, compared to layer feeds (€ 0.30 -1.12). The added value of high(er) quality Hipro soybean meal has decreased in pig (was € 1.83-2.47) and broiler feeds (was € 0.73-2.91) due to the lower soybean meal prices. However it increased in layer feeds (was € 0.18-1.12). The increase in the added value of high(er) quality Hipro soybean meal in layer feeds is due to the usage of maize gluten feed meal (poor protein quality).

In conclusion:

1. The price of Hipro soybean meal has considerably decreased for the second month in a row (after reaching the highest level in 2 years in May/June). The future price of Hipro soybean meal for the November-January period is € 0.50 higher than the current price. Due to good harvest predictions the soybean meal prices might decrease further.
2. Hipro soybean meal is once again attractive for pig feeds.
3. Hipro soybean meal is more attractive than Lopro soybean meal for all feeds.
4. The difference in value between the Lopro and Hipro soybean meal is € 3.56 in pig, € 4.44 in layer and € 6.97 in broiler feeds. Lopro soybean meal has become relatively less interesting due to the decreases of the protein rich feedstuff prices.
5. The added value of high(er) quality Hipro soybean meal in pig and broiler feeds is decreased due to the lower soybean meal prices but is increased in layer feeds.
6. U.S. soybean meal is worth € 2.37-2.40/100 kg more than Argentinean soybean meal in swine feeds, € 1.11-1.12 in layer feeds and € 1.73-1.92 in broiler feeds.
7. U.S. soybean meal is worth € 1.66-1.68/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.30-0.32 in layer feeds and € 0.53-0.59 in broiler grower/finisher feeds.
8. 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 31 were obtained from the Cambra Oficial de Comerç Industria i Navegació de Barcelona. The Hipro (49/3.5) soybean meal price for August has decreased significantly last month (with € 3.90) after a slight decrease the previous month periods (with € 0.90). This is in line with the other regions. The Hipro soybean meal price in Spain is the same as in the Netherlands but € 1.85 higher than in Poland. Rapeseed and sunflower seed meal have decreased in price too, but not to the extent of Hipro soybean meal. The grain prices have all increased, while f.i in Poland the prices have decreased. Wheat, rye and barley as well as rapeseed meal 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 31 in Spain for August

Period		August	Change week 31-27
Grains	Maize	17.80	+0.10
	Wheat	17.20	+0.40
	Triticale		
	Rye	15.20	+0.20
	Barley	15.80	+0.20
Grain by products	Wheat bran	12.50	-0.50
	Maizegl. feed meal		
Fats & oils	Animal fat	63.00	+2.00
	Palm oil	65.70	+0.70
	Soy oil	67.80	
	Fatty acids	68.50	+3.50
	Toasted Soybeans		
Protein rich	Hipro SBM	37.70	-3.90
	Lopro SBM		
	RSM	23.00	-1.60
	RSE		
	Lopro Sunfl. sd ml.	17.00	-0.50
	Maize DDGS		
Misc.	Peas		
	PKM		
	Beet pulp		

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 € 17.44 in pig feeds, € 16.11 in layer and € 21.11 in broiler feeds (benchmarked at the rye price of € 15.20 in swine, €17.80 for maize in layer and € 17.20 for wheat in broiler feeds).

Pig and of broiler feeds costs have decreased with 1% compared to week 27, those of layer feeds with 3% feeds.

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 (€ 2.60 cheaper than maize and € 2.00 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 € 17.76 and that of triticale € 17.65 (benchmarked at the € 15.80 price of barley). The value of triticale is decreased compared to maize due to the lower protein prices (was + € 0.06 previous month). The shadow price of rye is € 16.44, which is € 0.64 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 € 12.96. Beet pulp remains unattractive (shadow price € 13.23). Palm kernel meal has a shadow price of only € 12.57. The reason is the high fat & oil prices.

The shadow price of Hipro soybean meal is € 39.00 at the market price of € 37.70. The Hipro soybean meal usage is unchanged, despite the lower price and consequently an increased margin. The shadow price of rapeseed meal is € 23.06 which is very narrow compared to the market price of € 23.00, moreover the usage rate is only 3%. The shadow price of rapeseed expellers (€ 26.26) is considerable higher, giving now an added value of € 3.26 over rapeseed meal. This was € 3.02 previous month, showing the impact of the higher fat & oils prices despite the lower plant protein prices. Both Lopro and Hipro sunflower seed meal are still not attractive, the shadow price of the Lopro quality is only € 12.81. Hipro sunflower seed meal is more likely to be attractive than Lopro sunflower seed meal, the value of the Hipro quality is € 3.85 higher than that of the Lopro. No price for maize DDGS was available, the shadow price is € 22.80 (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), 4.5% animal fat is added. The shadow price of animal fat is only € 63.59 (at a price of € 63.00).

Layer feed formulations are once again based on maize, only a small amount of wheat is used. Wheat is cheaper than maize but lower in energy and now less attractive as an additional source of protein (usage rate 16%, shadow price € 17.23 at a market price of € 17.20). Rapeseed meal is very attractive, the shadow price is € 25.55 with a (maximum) usage rate of 2.5%. Lopro sunflower seed meal is not attractive, the shadow price is € 15.54 at a market price of € 17.00. The usage rate of Hipro soybean meal usage is therefore increased to 20%. Wheat bran is not attractive for layer feeds (shadow

price € 12.46). Rapeseed expellers have a much higher value than rapeseed meal (shadow price € 32.67, which is € 9.67 more than that of rapeseed meal) but no market price was available. Hipro sunflower seed meal has a shadow price of € 21.45, which is € 4.45 over that of Lopro sunflowerseed meal. No price for maize DDGS was available, but it can be attractive (shadow price € 25.14), especially since both the animal fat and the Hipro soybean meal prices are high. The shadow price of fish meal is € 69.21 and therefore too expensive (market price € 97.50). Soy oil is the most attractive fat source, although animal fat is considerable less expensive. The shadow price of animal fat is € 62.27. 2.3% soy oil is used which is more than needed to meet the minimum C18:2 requirement. The usage rate of fat & oil is decreased due to the higher usage of maize.

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 still attractive, the shadow price is € 103.70 but the usage rate is only 0.5%. Rapeseed meal remains unattractive (shadow price € 13.61 at a market price of € 23.00) and so will Hipro sunflowerseed meal be (shadow price only € 5.00). Maize DDGS will be attractive at a price below € 22.44. The shadow price for peas is € 21.86. Animal fat is used as the cheapest fat source in conjunction with soy oil. Palm oil is too expensive (shadow price € 57.13 benchmarked at the animal fat price of € 63.00). Toasted soybeans have a shadow price of € 51.85 due to the maximum usage rate of fat & oils.

Value of Hipro soybean meal in feed formulations.

The shadow price of Hipro is € 39.00 in the grower/finisher pig feeds, € 38.16 in the layer feed and € 45.22 in the broiler feed at a market price of € 37.70. The spread in the Hipro soybean meal price (without affecting the usage rate) is highest in broiler feeds (€ 7.52) followed by pig feeds (€ 1.30) and lastly layer feeds (€ 0.46). The spread has decreased in pig and layer feeds due to the lower Hipro soybean meal price (it was only € 0.62 in pig € 1.20 in layer feeds. It has increased in broiler feeds due to the increased fat & oil prices (it was € 4.94 in broiler feeds in report no. 6/2016). The usage rate of Hipro soybean meal is highest in poultry feeds.

The shadow price of the Lopro quality (42.8% crude protein) is € 34.11 in the grower/finisher pig feeds, € 33.25 in the layer feed and € 29.16 in the broiler feed. Consequently the difference in value between the shadow price of Lopro and the market price of Hipro soybean meal is € 3.59 in pig, € 4.45 in layer and € 8.54 in broiler feeds. These differences have also decreased in pig and layer feeds due to the lower protein prices but have increased in broiler feeds due to the higher fat & oil prices. The differences were € 4.09 in pig, € 4.93 in layer and € 8.19 in broiler feeds in report no. 6/2016.

The shadow price of toasted soybeans is € 38.24 in pig and € 40.24 in layer feeds. In

broiler feeds toasted beans are used because the amount of added fat & oil is maximised (shadow price € 51.85 at a soy oil price of € 77.19).

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.
- 20% 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 (Argentina, Brazil and the U.S.) in feeds for different species (based on a Hipro SBM price of € 37.70 for August in week 31)

	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	-0.79	+1.64	+2.43	-0.78	+0.18	+0.96	-1.63	+0.73	+2.36

The value of Hipro soybean meal from Argentina is € 0.78-1.63/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.18-1.64 higher value than that from Brazil, despite a lower crude protein content, and € 0.96-2.43 more than that from Argentina. The highest added value of high(er) quality soybean meal is obtained in pig (€ 1.64-2.43) and broiler (€ 0.73-2.36) 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 the U.S. has decreased in pig feeds from € 1.87-2.74 to € 1.64-2.43 compared to report no 5/2015 due to the lower plant protein prices. In broiler feeds the added value increased from € 0.54-2.10 to € 0.73-2.36 mainly due to the higher fat & oil prices. In layer feeds the value of high(er) quality Hipro soybean meal from the U.S. changed from € 0.10-0.99 to € 0.18-0.96 for mixed reasons. The value of the U.S. versus the Argentina origin decreased the most in pig

feeds and increased the most in broiler feeds 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 significantly with € 3.90, compared to the € 0.90 decrease last month (report no 6/2016) and the very sharp increase (with € 7.90) in May/June. The price of Hipro soybean meal in Spain is the same as in the Netherlands but € 1.85 lower than in Poland.
2. The usage rate of soybean meal is high (19-20%) 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 broiler feeds.
4. The difference in value between the shadow price of Lopro and the market price of Hipro soybean meal is € 3.59 in pig, € 4.45 in layer and € 8.54 in broiler feeds and has also increased in broiler feeds.
5. U.S. soybean meal is worth € 2.43/100 kg more than Argentinean soybean meal in swine feeds, € 0.96 in layer feeds and € 2.36 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 € 1.64/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.18 in layer feeds and € 0.73 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 all feedstuffs have decreased in Poland compared to report no. 06/2016 (based on feedstuff prices of week 31, 2016) except the prices of the fats & oils, maize DDGS and beet pulp. Hipro soybean meal decreased considerable more in price than Rapeseed meal (and maize DDGS). Also in other regions the price of soybean products has decreased considerable. The price of Hipro soybean meal price in Poland is € 1.85 less than in both the Netherlands and Spain. On the other hand rapeseed meal is priced considerable lower in Poland than in the Netherlands (-€ 2.25) and Spain (-€ 4.15). Also the grain and grain by-product prices in Poland are lowest of all regions. This makes Hipro soybean meal still relatively expensive in Poland.

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

Table 7. Feedstuff prices of week 31 in Poland for August

Period		August	Change week 31-27
Grains	Maize	14.95	-1.05
	Wheat	12.65	-1.90
	Triticale	11.95	-1.40
	Rye		
	Barley	12.20	-1.15
Grain by products	Wheat bran	10.45	-0.65
	Maizegl. feed meal		
Fats & oils	Animal fat	65.05	+4.50
	Palm oil		
	Soy oil	74.50	+1.85
	Fatty acids		
	Toasted Soybeans		
Protein rich	Hipro SBM	35.85	-3.70
	Lopro SBM		
	RSM	18.85	-1.60
	RSE	21.25	-1.40
	Hipro Sunfl. sd ml.		
	Maize DDGS	19.55	+0.65
Misc.	Peas		
	PKM		
	Beet pulp	17.70	+0.80

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

Pig feed costs have decreased 7% compared to report no. 6/2016, those of layer feeds 5% and of broiler feeds 7%. A high usage of maize DDGS in layer feeds diminished the savings.

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 € 12.57). Maize is too expensive (shadow price € € 14.53). Triticale is the cheapest grain at € 11.95 (shadow price € 13.75), however the usage rate of triticale (and also wheat) is maximised at 25%. The shadow price of barley compared to triticale is € 12.61 and that of wheat € 13.04. Consequently 27% barley is used next to 25% each of triticale and wheat.

Wheat bran is not attractive, the shadow price of € 8.84. Beet pulp (shadow price € 10.04) is not at all attractive.

Rapeseed expellers are still very attractive, although the price of rapeseed products decreased less than that of soybean meal. The shadow price of rapeseed meal is € 17.58 (at a market price of € 18.85) benchmarked at the rapeseed expellers price of € 21.25, this creates a € 3.67 value difference between rapeseed meal and expellers. This difference increased slightly (from € 3.09 last month) due to the higher fat & oil prices. Maize DDGS is not attractive, the price increased while all grains and protein rich feedstuffs decreased in price. The shadow price is € 19.22 at a market price of € 19.55. The inclusion rate of Hipro soybean meal has increased from 4% to 5%.

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 relative high maize price. The usage rate of wheat is 13% with a shadow price of € 13.14. The price of wheat would have to decrease below € 12.62 before the usage rate would increase, indicating that maize at a market price of € 14.50 has now a € 1.88 higher value than wheat (was € 2.63 the previous period with a higher Hipro soybean meal price). The Hipro soybean meal usage is unchanged, despite the lower price.

Rapeseed expellers are still attractive (shadow price € 28.11 at a 2.5% (maximum) usage). The value of rapeseed meal is only € 11.99 benchmarked at the rapeseed expellers market price of € 21.25. This creates a € 9.26 difference. The difference was € 13.64 in report no 6/2016) and is reduced due to the lower plant protein prices, although the fat & oil prices have increased. Maize DDGS is still attractive (maximum usage rate of 10%) but the margin is small at a shadow price of € 19.64. Wheat bran is of no interest, the shadow price is € 4.97. The shadow price of Hipro sunflowerseed meal is € 14.70 and that of the Lopro quality only € 7.41. 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 very attractive (shadow price € 22.91 at a market price of € 21.25), rapeseed meal is not attractive (shadow price € 11.74 or an added value of € 9.51 for rapeseed expellers over rapeseed meal). Maize DDGS is not attractive (shadow price € 19.16 at a market price of € 19.55). The Hipro soybean meal usage is increased from 13 to 14%. The shadow price for peas is € 18.04. 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 € 38.82 in the grower/finisher pig feeds, € 45.45 in the layer feed and € 36.38 in the broiler feed at a market price of € 35.85. The spread in the Hipro soybean meal price is € 2.97 in the pig feed, € 9.60 in layer feeds and € 0.53 in broiler feeds, without its usage rate being affected. The spread was € 12.15 in pig feeds, € 9.80 in layer and € 4.32 in broiler feeds in report no 6/2016. The spread (value compared to the market price) has decreased in all feeds due to the lower prices of grains and protein rich feedstuffs and especially that of Hipro soybean meal. The usage rate of Hipro soybean meal, however, is increased in pig and broiler feeds.

The shadow price of the Lopro quality (42.8% crude protein) in the same feeds is € 31.97 in the grower/finisher pig feeds, € 30.29 in the layer feed and € 27.31 in the broiler feed benchmarked at the market price of € 35.85 for Hipro soybean meal. Consequently the difference in value between the shadow price of Lopro and the market price of Hipro soybean meal is € 3.88 in pig, € 5.56 in layer and € 8.54 in broiler feeds. Last month, in report no 6/2016, the difference were € 4.12 in pig, € 5.36 in layer and € 10.09 in broiler feeds. The price difference have decreased in pig and broiler feeds due to the lower Hipro soybean meal price. In layer feeds the value of Hipro over Lopro soybean meal has slightly increased.

The shadow price of toasted beans is € 36.95 in pig and € 39.05 in layer feeds. This was respectively € 36.46 and € 41.14 in report no 6/2016, showing a higher value of toasted soybeans in layer feeds, where the addition of fat & oil prices is higher, at the higher fat & oil prices but the lower Hipro soybean meal price. 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 € 46.83).

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:

- 5% usage in pig grower/finisher pig feeds.
- 16% in the layer feeds.
- 14% 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 € 35.85 for August in week 31)

	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	-0.85	+1.81	+2.66	-0.97	+0.39	+1.36	-1.63	+0.62	+2.25

The value of Hipro soybean meal from Argentina is € 0.85-1.63/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.39-1.81 higher value than that from Brazil, despite a lower crude protein content, and € 1.36-2.66 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 € 1.85-2.80 in report no. 6/2016 to € 1.81-2.66 and in broiler feeds from € 0.74-2.66 to € 0.62-2.25 but increased in layer feeds from € 0.26-1.21 to € 0.39-1.36. The lower Hipro and rapeseed expellers prices slightly decrease the added value of high(er) quality Hipro soybean meal in pig and broiler feeds but it is slightly increased in layer feeds due to higher maize DDGS price.

In conclusion:

1. The market price of Hipro soybean meal decreased considerable in Poland last month after the slight decrease last month and the sharp increase in May/June. The same trend is observed in other regions.
2. The price of Hipro soybean meal in Poland is € 1.85 less than in the Netherlands and Spain.
3. The value difference between the Lopro and Hipro soybean meal is € 3.88 in pig, € 5.56 in layer and € 8.54 in broiler feeds.
4. The value of toasted soybeans is € 36.95 in pig and € 39.05 in layer feeds.

5. U.S. soybean meal is worth € 2.66/100 kg more than Argentinean soybean meal in swine feeds, € 1.36 in layer feeds and € 2.25 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 € 1.81/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.39 in layer feeds and € 0.62 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 Hipro and rapeseed expeller prices slightly decrease the added value of high(er) quality Hipro soybean meal in pig and broiler feeds but it is slightly increased in layer feeds due to higher price of maize DDGS.

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

Price developments.

Compared to last month some feedstuff prices have changed considerable. The price of maize is unchanged but the price of wheat increased significantly. The price of sunflowerseed oil decreased sharply. The price of soybean meal still increased (+€ 0.10) in the previous period but decreased sharply to just slightly above € 300/ton. Also in other regions the prices of the plant proteins have decreased.), The Hipro soybean meal in Romania is lowest of all regions, the Hipro price is in both the Netherlands and Spain € 7.10 higher and in Poland € 5.25. However there is also a quality difference (47 versus 46% crude protein). Remarkable is that the price of Hipro sunflowerseed meal increased in Romania and the price of maize DDGS decreased only marginally. 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 31 in Romania for August

Period		August	Change week 31-27
Grains	Maize	16.35	
	Wheat	17.25	+2.25
	Triticale		
	Sorghum		
	Barley	13.50	+1.00
Grain by products	Wheat bran	13.40	
	Maizegl. feed meal	13.50	
Fats & oils	Animal fat		
	Palm oil		
	Sunflower oil	66.25	-8.25
	Fatty acids		
	Toasted Soybeans		
Protein rich	Hipro SBM *	30.60	-6.40
	Lopro SBM		
	RSM		
	RSE		
	Hipro Sunfl. sd ml.	21.30	+1.50
	Maize DDGS	17.80	-0.20
Misc.	Peas		
	Beet pulp	11.00	

*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)

The maize price is unchanged in Romania, has decreased € 1.05 in Poland and € 0.20 in the Netherlands (-€ 0.30) but has increased € 0.10 in Spain. The changes in the wheat price are even more profound: +€ 2.25 in Romania, +1.30 in the Netherlands and + € 0.40 in Spain but -€ 1.90 in Poland.

No price was available for milo corn, which when priced attractive can reduce feed costs substantially.

Resultantly pig and broiler feed costs decreased 2% compared to the last period (report no 6/2016), those of layer decreased feeds 6%.

Feedstuff usage in feed formulations.

Pig feed formulations are based on maize and barley. Barley is the most attractive priced grain (€ 2.95 cheaper than maize) but the energy content is low. The usage rate of barley is reduced compared to last month (from 40 to 29%), due to the price increase. Wheat has become less attractive due to the price increase but also as an alternative protein source to soybean meal since the price of soybean meal decreased. The shadow price of wheat is only increased from € 14.30 (last month) to € 14.98, while the market price increased € 2.25. The value of wheat over barley is € € 1.48. Because the energy (sunflower seed oil) costs are decreased, the shadow price of maize has also been decreased (the value of maize over wheat is now € 1.37 and was last month € 2.05).

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 € 16.15. 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 4% maize DDGS are used. The shadow price of triticale is € 16.15, no price was available this time. High prices of the protein and fat rich feedstuffs increase the value of starch and protein richer grains (f.i. the value triticale is now only € 2.65 higher than that of barley and was € 3.49 last month).

Peas can be very attractive starch and protein source but no price was available (shadow price € 20.33). Hipro sunflowerseed meal is now even less attractive, the price increased while the price of Hipro soybean meal decreased. On the other hand a lower sunflower seed oil increases the value of the Hipro sunflower seed meal since the energy content is low. The shadow price of Hipro sunflowerseed meal is nevertheless € 9.75 (was € 6.98) at a market price of € 21.30. Wheat bran is therefore also not attractive (shadow price only € 7.44). No added fat or oil is used because it is still too expensive. Maize DDGS is marginally attractive (4% inclusion rate) as an energy source because the usage is maximised by the C18:2 content of the pig feed. Prices for rapeseed meal (shadow price € 16.86) and rapeseed expellers (shadow price € 21.36) were also not available. The value of wheat DDGS (shadow price € 11.67) is considerable lower than that of maize DDGS. The usage of Hipro soybean meal is increased to 12%, due to the limited usage of by-products.

Layer feed formulations are based on maize. Wheat is no longer attractive, the shadow price is € 16.28 at a maize price of € 16.35. The value of maize over wheat is now only € 0.07 due to the lower 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 € 20.64. Peas can also be attractive for layer feeds, the shadow price is € 18.63 (which is much lower than the shadow price of € 20.33 in pig feeds). The shadow price of milo corn is € 15.40. Wheat bran is not attractive, the shadow price is only € 6.09 due to the low energy content and the still high plant oil price. The shadow price of toasted soybeans has decreased from € 40.90 due to € 34.92 due to both lower plant oil and protein prices. 2.2% sunflowerseed oil is added. Hipro sunflower seed meal is too expensive (shadow price € 12.78). The shadow price of rapeseed expellers (shadow price € 30.32) is significantly higher than of rapeseed meal (shadow price € 18.51). 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 increased to 23% since no wheat is used.

Broiler feeds are maize based (no white meat requirement). Wheat is too expensive (shadow price € 8.51), 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 € 13.41. 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 reduced from € 55.36 to € 48.04 due to the lower sunflowerseed oil and Hipro price. The usage rate of sunflower seed oil is therefore still 3.5%. Hipro sunflowerseed meal is still not attractive due to the low energy content. Maize DDGS is no longer attractive as an energy + protein source (due to C18:2 limits), the shadow price is only € 16.02. The value of wheat DDGS is also low. Prices for rapeseed meal (shadow price € 6.63) and rapeseed expellers (shadow price € 19.27) were not available, rapeseed expellers are obviously more likely to be attractive (added value rapeseed expellers over rapeseed meal is € 12.64). Hipro soybean meal is therefore the most attractive protein source next to toasted soybeans, the usage rate is increased to 30% (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 € 52.65 in the grower/finisher pig feeds, € 44.53 in the layer feed and € 32.84 in the broiler feed based on the market price of € 30.60. This gives a spread of € 22.05 in pig feeds, € 13.92 in layer feeds and € 2.24 in broiler feeds. In the previous period, report no. 6/2016, these differences were € 4.76 in pig feeds, € 5.52 in layer feeds and € 8.07 in broiler feeds. The price margins (value) of Hipro soybean meal has increased significantly in pig and layer feeds due to the lower soybean meal price. In broiler feeds the margin of spread has decreased due to a higher inclusion rate.

The shadow price of the (47% Crude Protein) Hipro soybean meal is € 31.30 in the grower/finisher pig feeds, € 32.83 in the layer feed and € 33.89 in the broiler feed based on the 46% crude protein Hipro price of € 30.60. 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 € 0.70 in pig feeds, € 2.23 in layer and € 3.29 in broiler feeds. These differences were respectively € 1.01 in pig feeds, € 2.74 in layer and € 3.56 in broiler feeds in report no 6/2016 and are decreased in all feeds due to the lower Hipro soybean meal price. The decreases were largest in layer feeds.

The shadow price of a (43% Crude protein) Lopro quality is € 27.86 in the grower/finisher pig feeds, € 27.56 in the layer feed and € 24.30 in the broiler feed benchmarked at the Hipro soybean meal price of € 30.60. This gives a value difference of the Lopro versus the Hipro quality of € 2.74 in pig feeds (was € 3.75 in report no. 6/2016), € 3.04 in layer feeds (was € 4.38) and € 6.30 in broiler feeds (was € 7.01). The value of Lopro soybean meal is especially low in poultry (broiler) feeds and is decreased in all feeds.

The shadow price of toasted beans is € 30.28 in pig, € 34.92 in layer and € 48.04 in broiler feeds. Toasted soybeans are therefore only used in broiler feeds at a market price of € 47.50. 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:

- 12% Hipro in pig grower/finisher pig feeds.
- 23% Hipro in the layer feeds.
- 30% 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 (Argentina, Brazil and the U.S.) in feeds for different species (based on the 46% CProt Hipro SBM price of € 30.60 for August in week 31)

	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	-0.73	+1.70	+2.43	-0.84	+0.41	+1.25	-1.83	+0.62	+2.45

The value of Hipro soybean meal from Argentina is € 0.73-1.83/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.41-1.70 higher value than that from Brazil, despite a lower crude protein content, and € 1.25-2.45 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 decreased in all feeds due to both the lower Hipro soybean meal and the lower plant oil price. The added value in pig feeds went from € 2.30-3.49 in report no. 6/2016 to € 1.70-2.43, in layer feeds from € 0.52-1.73 to € 0.41-1.25 and in broiler feeds from € 0.60-2.62 to € 0.62-2.45. In pig and layer feeds the added value of high(er) quality Hipro soybean meal has decreased the most. On the other hand the usage rate of soybean meal has increased in all feeds.

In conclusion:

1. The market price of Hipro soybean meal decreased significantly in Romania as it has in other regions. 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 € 2.74 less in pig feeds, € 3.04 in layer feeds and € 6.30 in broiler feeds. The value of Lopro has decreased more than that of Hipro with the lower soybean meal price.
3. The difference in value in soybean meal due to 1.0 % crude protein is € 0.70 in pig feeds, € 2.23 in layer and € 3.29 in broiler feeds.
4. The usage rate of soybean products has increased and is still highest in poultry feeds.
5. U.S. soybean meal is worth € 2.43/100 kg more than Argentinean soybean meal in swine feeds, € 1.25 in layer feeds and € 2.45 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 € 1.70/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.41 in layer feeds and € 0.62 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 € 37.70) 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.
<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 €	-0.51	-0.42	+0.12	-0.67	-0.52	+0.15	-0.87	-0.68	+0.20
Energy €	-0.34	+0.08	+0.43	-0.38	+0.16	+0.47	-0.69	+0.54	+1.23
Dig. AA €	+0.14	+2.00	+1.82	+0.25	+0.68	+0.50	+0.23	+0.73	+0.49
Total €	-0.71	+1.66	+2.37	-0.80	+0.32	+1.12	-1.33	+0.59	+1.92

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 € 0.51/100 kg to the value of Hipro soybean meal in swine feeds (was € 0.58 in week 27), € 0.67 in layer feeds (was € 0.82) and € 0.87 in broiler feeds (was € 1.03). The value of protein in soybean meal decreased in all feeds but the most in poultry feeds, due to the lower plant protein prices. The Hipro soybean meal price decreased € 4.80 and that of rapeseed meal with € 1.60.

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

0.43), 68 kcal ME € 0.47 in layer feeds (was € 0.55) and 69 kcal extra in broiler feeds increases the shadow price with € 1.23 (was € 1.34). The energy costs derived from grains, with the exception of wheat, have decreased but those of fats & oils have increased. Consequently the value of Hipro soybean meal due to the energy content increased layer and broiler feeds but not pig in feeds. The lower price of toasted soybeans affected the value of Hipro soybean meal in broiler feeds the most.

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 € 1.66-2.37/100 kg in swine feeds for U.S. soybean meal over that from Argentina or Brazil (was € 2.07-2.22), € 0.32-1.12 in layer feeds (was € 0.38-0.66) and € 0.59-1.92 in broiler feeds (was € 1.34-1.53). These value differences have changed the most in pig and broiler feeds due to differences in digestible amino acid and phosphorus content and in layer feeds due to the lower plant protein costs compared to the last report (no 6/2016). 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 € 0.47 difference in layer feeds for a 68 kcal ME difference and a € 1.23/100kg 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 € 2.00.

Variation in nutrient values

The effect of variation in the nutrient value (4-5%) of soybean meal on the value (market price € 37.70/100 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	0.85	0.79	1.77
+/- 4% dig AA	1.07	0.21	0.20
+/- 100 Cal and 4% dig AA	1.92	0.99	1.98
+/- 0.1 g/kg dig P	0.02	0.03	0.03

Variation in the energy content has the largest effect on the value of soybean meal in poultry feeds but variation in the digestible amino acid content has the most value in pig feeds. In pig feeds the lower grain prices reduce the value effects of variation in the energy content and in broiler feeds the lower price of toasted soybeans. A variation of +/- 100 kcal has a € 0.85/100 kg effect on the Hipro soybean meal value in swine (was € 0.86 in report no 6/2016) and € 0.79 in layer feeds (was already € 0.79) but € 1.77 in broiler feeds (was € 1.96).

A variation of 4% in digestible amino acids changes the value of Hipro soybean meal with € 0.21 in layer (was € 0.17), € 0.20 in broiler (was € 0.59) but € 1.07 in swine feeds (was € 1.19). In pig and broiler feeds the lower price of Hipro soybean meal increases the usage (especially in pig feeds) but decreases the value effect due to the digestible amino acid content.

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 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 31, 2016. The Netherlands

Code	Article	Description	August	Nov-Jan
00010		Citruspulp Braz./USA	17.00	N.A.
00013		Peas <22%CP	23.20	23.80
00015		Barley (EU)	15.20	15.40
00026		Soybean hulls	16.00	16.30
00033		MOLASSES cane <47% _s	17.50	17.50
00034		Flaxseed	38.60	38.60
00038		Alfalfa 15% CP	19.00	19.00
00044		Rapeseed Expellers 8%	24.90	26.50
00061		Rye (EU)	14.70	14.90
00063		WHEAT EU (feed)	16.80	16.60
00064		PALMKERNELml<20%fiber	12.60	12.40
00075		Beet Pulp 20-25% _{sugar}	18.80	15.60
00076		MAIZE (EU)	19.30	18.50
00078		L-lysine HCl	140.00	140.00
00079		DL-Methionine	315.00	315.00
00080		Soybeans toast.pel.	46.50	44.40
00081		SBM 44/7 domestic	34.40	35.20
00084		SBM Hipro domestic	37.70	38.20
00090		Wheat middlings	12.50	12.70
00096		Soy oil liq.	70.50	68.50
00097		Palm oil	62.90	59.90
00099		Poultry Fat	57.50	N.A.
00100		Animal fat (lard)	56.50	N.A.
00105		Fish meal S. America	148.00	148.00
00107		MAIZEglut. fd ml 20-23%CP	17.20	17.10
00113		Sunflowerseedml<29%CP	17.80	17.70
00165		TRITICALE	15.50	16.00
00214		L-Threonine	165.00	165.00
00228		Monocal Phosph	44.50	44.50
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
00332		Vinasses beet	10.50	10.50
00488		MAIZE distillers sol	N.A.	N.A.
00489		WHEAT DDGS	N.A.	N.A.

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				23.20
00015	15.80	13.50	12.20	15.20
00061				14.70
00026		11.50		16.00
00033	13.80	11.00	13.55	17.50
00038	15.00			19.00
00044			21.25	
00061				
00063	17.20	17.25	12.65	14.70
00075		11.00	17.70	18.80
00076	17.80	16.35	14.95	19.30
00078			126.90	140.00
00079			310.10	315.00
00080				46.50
00084	37.70	30.60@	35.85	37.70
00090	12.50	13.40	10.45	12.50
00096	67.80	66.25	74.50	70.50
00097	65.70			62.90
00100	63.00		65.05	56.50
00105	97.50			148.00
00107		13.50		17.20
00113	17.00	21.30		17.80
00165			11.95	15.50
00214			152.30	165.00
00228			44.15	44.50
00266	23.00		18.85	21.10
00488		17.80	19.55	
00258	68.50			61.00

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