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# **Soybean Meal Quality by Origin:**

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

Report: USSEC No. 11/2014

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J. Doppenberg, Ph.D.

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Schothorst Feed Research

**Report: USSEC No. 11**

**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: December 2014 and January-March 2015**

**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   | 40.50       | 40.70 | 40.60  | 40.00 <sup>&amp;</sup> |

\*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%. <sup>&</sup> Hipro with 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 € 40.50/100 kg in the Netherlands for week 49)

|           | Swine                |                   |                 | Layer                |                   |                 | Broiler              |                   |                 |
|-----------|----------------------|-------------------|-----------------|----------------------|-------------------|-----------------|----------------------|-------------------|-----------------|
|           | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. |
| Protein € | -0.59                | -0.47             | +0.14           | -0.72                | -0.42             | +0.16           | -0.86                | -0.69             | +0.20           |
| Energy €  | -0.34                | +0.09             | +0.43           | -0.37                | +0.15             | +0.53           | -0.60                | +0.46             | +1.05           |
| Dig. AA € | +0.51                | +2.37             | +1.84           | +0.37                | +1.40             | +1.16           | +0.39                | +2.09             | +1.68           |
| Total €   | -0.42                | +1.99             | +2.41           | -0.72                | +1.13             | +1.85           | -1.07                | +1.86             | +2.93           |

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

### *In conclusion*

The value of Hipro soybean meal from the United States has increased considerable, specifically because of a higher energy and digestible amino acid content (high prices of the synthetic amino acids DL Methionine and L Threonine). Hipro soybean meal from the United States has a € 11.30-19.90/1000 kg higher value (absolute) than Brazilian Hipro SBM. Compared to the Argentinean origin the added value of U.S. SBM is € 18.50-

24.10/MT. U.S. Hipro soybean meal has the highest added value for swine (€ 19.90-24.10) and broiler (€ 18.60-29.30) feeds, followed by layer feeds (€ 11.30-18.50/MT). Differences in the energy and digestible amino acid + P content together contribute 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 € 15.50-25.50 (U.S. vs Brazil) and € 16.90-27.30/MT (U.S. vs Arg).

## **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 47 are used for the November-December and January-March 2015 period. 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 has decreased € 0.30 compared to week 47. This price decrease is less than the price increase in the last period (€ 2.70 from report no 9 to 10). The future price for January-March 2015 has increased € 1.00 but is still € 1.20 lower than the current price. The prices of most other protein rich feedstuffs have also increased, this makes soybean meal relatively more attractive. Future prices for the other protein sources are similar to the current prices, making Hipro soybean meal in the near future more attractive.*

*All grain prices have increased along with most fat & oil prices (despite the lower crude oil prices). Future prices (January-March) are similar to the current prices. Although the wheat inventory is high in the EU, increased export drives up the price (momentarily). Increased planting of soybeans will put more pressure on the soybean meal prices in the near future and might drive up the maize price.*

*Resultantly the current and future feed cost (January-March) have increased. Future feed costs are lower than those of November specifically those of poultry feeds.*

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

#### *Price developments.*

The Hipro (49/3.5) soybean meal price for December has decreased with € 0.30 from week 47 to week 49. It increased with € 2.70 from week 39 to 47 after a period of fluctuating prices. The future price (January –March 2015) is € 1.20 below the current price. In the near future soybean meal prices are expected to continue to decrease gradually.

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

Table 3. Feedstuff prices of week 49 in the Netherlands for December and January-March

| Period            |                     | Dec.  | Jan.- March | Change<br>week 49-47 | Future vs<br>current |
|-------------------|---------------------|-------|-------------|----------------------|----------------------|
| Grains            | Maize               | 16.90 | 17.00       |                      | +0.10                |
|                   | Wheat               | 18.40 | 18.50       | +0.50                | +0.10                |
|                   | Triticale           | 17.30 | 17.30       | +0.50                |                      |
|                   | Rye                 | 16.70 | 16.80       | +0.60                | +0.10                |
|                   | Barley              | 18.10 | 18.10       | +1.00                |                      |
| Grain by products | Wheat bran          | 13.90 | 14.00       | +1.40                | +0.10                |
|                   | Maizegl. feed meal  | 19.40 | 18.50       | +0.40                | -0.90                |
| Fats & oils       | Animal fat          | 48.50 |             | -5.50                |                      |
|                   | Palm oil            | 61.70 | 63.30       | +0.60                | +1.60                |
|                   | Soy oil             | 68.50 | 67.00       | +2.50                | -1.50                |
|                   | PFAD                | 62.00 | 62.00       | +2.50                |                      |
|                   | Toasted Soybeans    | 41.60 | 41.80       | +2.60                | +0.20                |
| Protein rich      | Hipro SBM           | 40.50 | 39.30       | +0.30                | -1.20                |
|                   | Lopro SBM           | 38.00 | 36.80       | +1.50                | -1.20                |
|                   | RSM                 | 22.80 | 23.00       | +1.00                | +0.20                |
|                   | RSE                 | 25.00 | 25.00       | +0.30                |                      |
|                   | Lopro Sunfl. sd ml. | 18.10 | 18.20       | +0.10                | +0.10                |
|                   | Maize DDGS          | 21.00 | 20.60       | +0.70                | -0.40                |
| Misc.             | Peas                | 25.00 | 25.00       | +1.60                |                      |
|                   | PKM                 | 13.50 | 13.70       |                      | +0.20                |
|                   | Beet pulp           | 14.70 | 15.70       | +0.90                | +1.00                |

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

The prices of all grains increased compared to week 47. The wheat and triticale prices increased the least (but the most in the period before). The future (January-March 2015)

prices of all the grains are very similar to the current prices. The prices of the grain by-products show the same trends as the grain prices (maize gluten feed meal is on the short term quite expensive). Animal fat has decreased in price (to the same extend as it increased last period), but the plant oils have all increased. However, since the crude oil price has decreased considerable the plant & oil prices are expected to decrease. The toasted soybean price has increased in line with soy oil.

Resultantly current and future prices for feeds of all species have increased. January-March feed prices are lower than currently, those for broiler feeds will decrease the most.

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

Pig feed formulations are based on rye and triticale. Maize is hardly interesting and wheat too expensive (shadow price € 17.94). Wheat bran is now less attractive (usage rate 7%, shadow price € 13.92). Rapeseed meal is more attractive than rapeseed expellers (RSE shadow price € 24.34). Also Lopro sunflower seed meal (shadow price € 18.53, usage rate 10%) is very attractive. The usage of maize DDGS is low, due to C18:2 restrictions. Hipro soybean meal is more attractive than Lopro soybean meal, but the usage is low (2.4%). Beet Pulp is not attractive (shadow price € 13.57) but palmkernel meal (shadow price € 14.23, usage rate 5%) is. Animal fat is the most attractive fat source (shadow price PFAD € 48.79), the usage rate is rather high (4.8%).

Layer feed formulations are based on maize and some wheat. Maize has become more attractive compared to wheat, due to the decreased Hipro soybean meal prices. Only 9% wheat is used. Rapeseed expellers are more attractive than rapeseed meal (shadow price RSM € 19.39). The usage of maize DDGS is high (10%, shadow price € 25.08). Lopro sunflower seed meal is attractive (shadow price € 18.47) but the usage rate is rather low (<1%). Wheat bran (shadow price € 13.63) and maizegluten feed meal (shadow price € 16.61) are not attractive. The Hipro soybean meal usage has increased considerable, since toasted soybeans have become too expensive. Lopro soybean meal is unattractive (shadow price € 35.43) and peas (shadow price € 21.42) are not attractive. Animal fat is also here the most attractive fat source.

Broiler feeds are based on wheat since the usage rate of maize is maximised (white meat requirement). Toasted soybeans are used in addition to Hipro soybean meal only because the fat & oil addition is maximised. Hipro soybean meal (shadow price € 40.97) usage has therefore increased at the expense of toasted soybeans. Maize DDGS and rapeseed expellers are both still used at the maximum inclusion rate. Peas (shadow price € 22.79) are not attractive, the shadow price of Hipro sunflowerseed meal (32% crude protein) is € 16.93 (market price € 24.60). Rapeseed meal has a shadow price of only € 19.49 compared to the market price of € 25.00 for rapeseed expellers. Animal fat is the most attractive fat source, usage is maximised (at 5%).

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

The shadow price of Hipro is € 42.17 in the grower/finisher pig feeds, € 43.13 in the layer feed and € 40.97 in the broiler feed at a market price of € 40.50. The spread in the Hipro soybean meal price is lowest in broiler feeds (€ 0.47) and quite high in swine (€ 1.67) and layer (€ 2.63) feeds before the usage rate will be affected.

The shadow price of the Lopro quality is € 36.57 in the grower/finisher pig feeds, € 35.43 in the layer feed and € 33.44 in the broiler feed at a market price of € 38.00. Consequently this makes Lopro soybean meal too expensive for all feeds (€ 1.43 for pig, € 2.57 in layer and € 4.56 in broiler feeds). Or the other way around the difference in value between the Lopro and Hipro soybean meal is € 3.98 in pig, € 5.07 in layer and € 7.06 in broiler feeds.

Toasted soybeans are priced attractive compared to Hipro soybean meal (€ 40.50) and soy oil (€ 68.50) in December. The price of toasted beans is at € 41.60 lower than the formula:  $75\% \text{ Hipro} + 7.5\% \text{ maize} + 17.5\% \text{ SBO} = 40.50 \times 0.75 + 16.90 \times 0.075 + 68.50 \times 0.175 = € 43.63$ . However when animal fat is used instead of soy oil, toasted soybeans are not attractive; the 'shadow price' of toasted soybeans drops to € 40.13, which is € 1.37 below the market price. In layer feeds therefore no toasted soybeans are used and in broiler finisher feeds 14%.

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

The usage rate of soybean meal is:

- 2-4% Lopro in pig grower/finisher.
- 15-16% Hipro in the layer feeds.
- 10% Hipro in broiler grower/finisher feeds (additionally 14% toasted soybeans are used as a protein and fat source).

#### *Value differences (€/100 kg) of soybean meal of differing qualities in 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 € 40.50 for December and € 39.30 for January-March in the Netherlands for week 49)

|            | Swine                |                   |                 | Layer                |                   |                 | Broiler              |                   |                 |
|------------|----------------------|-------------------|-----------------|----------------------|-------------------|-----------------|----------------------|-------------------|-----------------|
|            | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. |
| December   | -0.42                | +1.99             | +2.41           | -0.72                | +1.13             | +1.85           | -1.07                | +1.86             | +2.93           |
| Jan.-March | -0.47                | +1.81             | +2.28           | -0.73                | +0.63             | +1.36           | -1.26                | +1.45             | +2.71           |

The value of Hipro soybean meal from Argentina is € 0.42-1.26/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.63-1.99 higher value than that from Brazil, despite a lower crude protein content, and € 1.36-2.71 more than that from Argentina. The highest added value of high(er) quality soybean meal is obtained in pig (€ 1.81-2.41) and broiler (€ 1.45-2.93) feeds. The added value is only slightly influenced by the Hipro soybean meal market price (period).

In conclusion:

1. The current market price of Hipro soybean meal in the Netherlands has increased € 0.30 compared to week 47 (see report no 10/2014) and the January-March price € 1.00. The future price of Hipro soybean meal for the January-March period is € 1.20 lower than currently, indicating that soybean meal prices are decreasing in the near future.
2. Hipro soybean meal is priced attractive compared to Lopro soybean meal and toasted soybeans for all feeds. Only in broiler feeds toasted soybeans are used because the addition of fats& oils is maximised.
3. The usage rate of soybean meal is highest in poultry feeds, the added value of high(er) quality Hipro soybean meal is highest in pig and broiler feeds.
4. *The high synthetic DL methionine and L Threonine prices continue to increase the added value of high(er) quality Hipro soybean meal in all feeds but especially in pig and broiler feeds.*
5. U.S. soybean meal is worth € 2.28-2.41/100 kg more than Argentinean soybean meal in swine feeds, € 1.36-1.85 in layer feeds and € 2.71-2.93 in broiler feeds. The additional value of U.S. soybean meal is highest over that from Argentina in pig and broiler feeds in both periods
6. U.S. soybean meal is worth € 1.81-1.99/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.63-1.13 in layer feeds and € 1.45-1.86 in broiler grower/finisher feeds. The additional value of U.S. soybean meal is highest over that from Brazil in pig feeds in both periods.

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

#### Price developments.

Feedstuff prices of week 48 were obtained from the Cambra Oficial de Comerç Industria i Navegacio de Barcelona. The Hipro (49/3.5) soybean meal price for December has increased with € 0.70 from week 45 to 48 to € 40.70/100 kg. The Hipro soybean meal price is € 0.20 higher in the Netherlands and € 0.10 than in Poland. In Romania the price is € 0.70 lower, but the quality is lower (46% protein). Hipro Sunflowerseed meal and rapeseed meal increased in price too along with soybean meal.

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

Table 5. Feedstuff prices of week 48 in Spain for December

| Period            |                     | December | Change<br>week 48-45 |
|-------------------|---------------------|----------|----------------------|
| Grains            | Maize               | 16.50    |                      |
|                   | Wheat               | 19.10    | +0.40                |
|                   | Triticale           |          |                      |
|                   | Rye                 | 17.50    |                      |
|                   | Barley              | 18.30    | +0.50                |
| Grain by products | Wheat bran          | 16.00    | +0.50                |
|                   | Maizegl. feed meal  |          |                      |
| Fats & oils       | Animal fat          | 54.00    | -7.50                |
|                   | Palm oil            | 64.00    |                      |
|                   | Soy oil             | 69.00    |                      |
|                   | Fatty acids         | 60.00    | -3.50                |
|                   | Toasted Soybeans    |          |                      |
| Protein rich      | Hipro SBM           | 40.70    | +0.70                |
|                   | Lopro SBM           |          |                      |
|                   | RSM                 | 24.30    | +0.70                |
|                   | RSE                 |          |                      |
|                   | Hipro Sunfl. sd ml. | 23.30    | +0.30                |
|                   | Maize DDGS          |          |                      |
| Misc.             | Peas                |          |                      |
|                   | PKM                 |          |                      |
|                   | Beet pulp           | 16.80    | -0.10                |

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

The prices wheat and barley increased compared to week 45, but the maize price did not change. The wheat bran price increased in line with the wheat price. Animal fat

decreased substantially in price, plant oils are relatively expensive. No price for milo corn was available, the shadow price is € 17.76 in pig feeds, € 15.29 in layer and € 19.95 in broiler feeds (benchmarked at the maize price of € 16.50).

The feed prices for all species have hardly changed due to the lower fat price.

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

Pig feed formulations are based on maize, 19% rye is also used. Rye is used because of the C18:2 restrictions which maximises maize usage. Barley (shadow price € 16.51) and wheat (shadow price € 18.78) are too expensive. Wheat bran (shadow price € 11.80) and beet pulp (shadow price € 15.22) are not attractive, but palmkernel meal (shadow price € 14.92, usage rate 5%) is. Hipro soybean meal usage is decreased because Lopro sunflower seed meal (shadow price € 16.33) is attractive. Rapeseed meal (10%; usage is maximised) is also attractive. No price for maize DDGS was available (shadow price € 17.59). Hipro sunflower seed meal (shadow price € 21.42) is unattractive compared to Lopro sunflower seed meal. The usage of animal fat has increased considerable (to compensate for the low energy feedstuffs).

Layer feed formulations are also based on maize. Wheat is not attractive, even not as an additional source of protein (shadow price € 18.09). Wheat bran is not attractive (shadow price € 12.05). The Hipro soybean meal usage is increased (19%). Rapeseed meal remains very attractive (shadow price € 28.22, usage is maximised). Lopro sunflower seed meal (usage rate 5%) is more attractive than the Hipro quality not (shadow price € 23.05). No price for maize DDGS was available, but it can be attractive (shadow price € 25.29). Fish meal is too expensive (shadow price € 79.13). Animal fat is again the most attractive fat source.

Broiler feeds are based on wheat since the usage rate of maize is maximised (white meat requirement). Toasted soybeans are attractive (usage 18%) in addition to Hipro soybean meal since the addition of fat & oil is maximised. Hipro soybean meal is still a major protein source (usage rate 11%). Rapeseed meal is attractive (shadow price € 26.50), but Hipro sunflowerseed meal not (shadow price € 16.84). Maize DDGS will be attractive at a price below € 23.73. The shadow price for peas is € 23.68 and that of fish meal € 88.53. Animal fat is the most attractive fat source since the C18:2 content is maximised.

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

The shadow price of Hipro is € 45.65 in the grower/finisher pig feeds, € 41.68 in the layer feed and € 41.30 in the broiler feed at a market price of € 40.70. The spread in the Hipro soybean meal price is € 0.60-0.98 in broiler and layer feeds and even € 4.95 in pig feeds, without its usage rate being affected.

The shadow price of the Lopro quality in the same feeds is € 36.69 in the grower/finisher pig feeds, € 35.31 in the layer feed and € 33.85 in the broiler feed. Consequently the difference in value between the shadow price of Lopro and the market price of Hipro

soybean meal is € 4.01 in pig, € 5.39 in layer and € 6.85 in broiler feeds.

The shadow price of toasted soybeans is € 19.60 in pig and € 40.50 in layer feeds. In broiler feeds toasted beans are used because the amount of added fat & oil is maximised (shadow price € 44.51 at a soy oil price of € 69.00).

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

The usage rate of Hipro soybean meal is:

- 5% usage in pig grower/finisher pig feeds.
- 19% in the layer feeds.
- 11% in broiler grower/finisher feeds, additionally (18%) 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 € 40.70 for December in week 48)

|          | Swine                |                   |                 | Layer                |                   |                 | Broiler              |                   |                 |
|----------|----------------------|-------------------|-----------------|----------------------|-------------------|-----------------|----------------------|-------------------|-----------------|
|          | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. |
| December | -0.44                | +1.77             | +2.21           | -0.80                | +0.71             | +1.51           | -1.11                | +1.50             | +2.61           |

The value of Hipro soybean meal from Argentina is € 0.44-1.11/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.71-1.77 higher value than that from Brazil, despite a lower crude protein content, and € 1.51-2.61 more than that from Argentina. The highest added value of high(er) quality soybean meal is obtained in pig (€ 1.77-2.21) and broiler (€ 1.50-2.61) feeds. The added value is only slightly influenced by the Hipro soybean meal market price but more by quality differences.

The high synthetic DL methionine and L Threonine prices increase the added value of high(er) quality Hipro soybean meal significantly in pig (was € 0.60-1.19 in report 9/2014 and is now € 1.77-2.21) and broiler feeds (was € 0.49-1.73 and is now € 1.50-2.61).

In conclusion:

1. The market price of Hipro soybean meal in Spain has increased € 0.70 compared to report no 10/2014. The price of Hipro soybean meal in Spain is comparable to the Netherlands and Poland but higher than in Romania.
2. The usage rate of soybean meal is high in poultry feeds, the added value of high(er) quality Hipro soybean meal is highest in broiler feeds too.
3. *The high synthetic DL methionine and L Threonine prices continue to increase the added value of high(er) quality Hipro soybean meal significantly in all feeds but especially in pig and broiler feeds.*
4. U.S. soybean meal is worth € 2.21/100 kg more than Argentinean soybean meal in swine feeds, € 1.51 in layer feeds and € 2.61 in broiler feeds. The additional value of U.S. soybean meal is highest over that from Argentina in broiler feeds.
5. U.S. soybean meal is worth € 1.77/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.71 in layer feeds and € 1.50 in broiler grower/finisher feeds. The additional value of U.S. soybean meal is highest over that from Brazil in pig feeds.

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

#### Price developments.

The market price of Hipro soybean meal has increased with € 2.50 compared to report no. 10/2014 (feedstuff prices of week 47). The price increase of Hipro soybean meal has been more than in other regions, but was previous period less than in other regions. Consequently the price is comparable to other regions (see table 1). In Romania a lower quality Hipro SBM is offered for a lower price. Other protein rich feedstuffs like rapeseed products, maize DDGS and protein rich grains like wheat, triticale and barley are priced low in Poland (see table 2B in the Appendix), making soybean meal relatively expensive .

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

Table 7. Feedstuff prices of week 49 in Poland for December

| Period            |                     | December | Change<br>week 49-47 |
|-------------------|---------------------|----------|----------------------|
| Grains            | Maize               | 13.10    | -0.10                |
|                   | Wheat               | 14.05    | -0.05                |
|                   | Triticale           | 12.15    | +0.05                |
|                   | Rye                 |          |                      |
|                   | Barley              | 13.60    | -0.30                |
| Grain by products | Wheat bran          | 8.10     | +0.10                |
|                   | Maizegl. feed meal  |          |                      |
| Fats & oils       | Animal fat          | 61.90    | +0.25                |
|                   | Palm oil            |          |                      |
|                   | Soy oil             | 67.15    | +0.10                |
|                   | Fatty acids         |          |                      |
|                   | Toasted Soybeans    |          |                      |
| Protein rich      | Hipro SBM           | 40.60    | +2.50                |
|                   | Lopro SBM           |          |                      |
|                   | RSM                 | 19.50    | +0.70                |
|                   | RSE                 | 21.20    | +1.65                |
|                   | Hipro Sunfl. sd ml. |          |                      |
|                   | Maize DDGS          | 19.05    | +0.45                |
| Misc.             | Peas                |          |                      |
|                   | PKM                 |          |                      |
|                   | Beet pulp           | 18.00    | -0.35                |

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

Resultantly feed costs for pig, layer and broiler feeds all increased 2%.

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

Pig feed formulations are based on triticale, wheat and maize. Triticale is cheapest of all grains. Maize is attractive but usage is restricted because of the C18:2 limitations. Barley is too expensive (shadow price € 13.60). Wheat bran is very attractive (shadow price € 8.66, usage rate 20%), but beet pulp not (shadow price € 10.27). Hipro soybean meal usage is low (4%) because rapeseed expellers are very attractive (shadow price € 22.44, usage rate 10%). Maize DDGS is hardly attractive, the usage is restricted by the C18:2 limitations (usage rate only 0.1%). Rapeseed meal is not attractive (shadow price € 18.45) at the low rapeseed expellers and relative high fat & oil price. The addition of animal fat is high (2.4%).

Layer feed formulations are based on maize and wheat. Wheat is priced low and attractive as an additional source of protein (shadow price € 14.73). Wheat bran is hardly attractive (usage rate 2%, shadow price € 9.11). The Hipro soybean meal usage remains relatively low (15%), because maize DDGS is now attractive (10% usage rate, shadow price € 21.81). Rapeseed expellers are also attractive (shadow price € 22.64, usage is maximised at 2.5%). Rapeseed meal is therefore unattractive (shadow price € 13.22). The shadow price of Hipro sunflowerseed meal is € 19.15. Animal fat is used next to soy oil as an added fat source.

Broiler feeds are mainly based on wheat since the usage rate of maize is maximised (white meat requirement). Toasted soybeans (14%) are used in addition to Hipro soybean meal since the fat & oil addition is maximised. Hipro soybean meal is the major protein source, but the usage rate is reduced due to the usage of maize DDGS (4%, shadow price € 20.51). Rapeseed expellers are attractive (shadow price € 24.61, usage is maximised at 2.5%). Rapeseed meal is too expensive (shadow price € 11.01). The shadow price for peas is € 19.71. Animal fat is the most attractive fat source since the C18:2 content is maximised, the usage of soy oil is only 0.5%.

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

The shadow price of Hipro is € 57.85 in the grower/finisher pig feeds, € 45.98 in the layer feed and € 49.48 in the broiler feed at a market price of € 40.60. The spread in the Hipro soybean meal price is € 5.38-17.25, without its usage rate being affected. However the spread is the highest in pig feeds where the usage is lowest.

The shadow price of the Lopro quality in the same feeds is € 36.20 in the grower/finisher pig feeds, € 34.88 in the layer feed and € 31.26 in the broiler feed compared to the market price of € 40.60 for Hipro soybean meal. Consequently the difference in value between the shadow price of Lopro and the market price of Hipro soybean meal is € 4.40 in pig, € 5.72 in layer and € 9.34 in broiler feeds.

The shadow price of toasted beans is € 32.26 in pig and € 41.54 in layer feeds. In broiler feeds toasted beans are used because the amount of added fat & oil is maximised and the price of Hipro soybean meal is high (shadow price € 54.10).

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

The usage rate of Hipro soybean meal is:

- 4% usage in pig grower/finisher pig feeds.
- 15% in the layer feeds.
- 12% in broiler grower/finisher feeds, additionally (14%) toasted soybeans are used as a protein and fat source.

*Value differences (€/100 kg) of soybean meal of differing qualities in 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 € 40.60 for December in week 49)

|          | Swine                |                   |                 | Layer                |                   |                 | Broiler              |                   |                 |
|----------|----------------------|-------------------|-----------------|----------------------|-------------------|-----------------|----------------------|-------------------|-----------------|
|          | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. |
| December | -0.84                | +1.59             | +2.43           | -1.02                | +0.26             | +1.28           | -1.71                | +0.72             | +2.43           |

The value of Hipro soybean meal from Argentina is € 0.84-1.71/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.72-1.59 higher value than that from Brazil, despite a lower crude protein content, and € 1.28-2.43 more than that from Argentina. The highest added value of high(er) quality soybean meal is on average obtained in pig feeds (€ 1.59-2.43). The added value is only slightly influenced by the Hipro soybean meal market price but more by quality differences.

In conclusion:

1. The market price of Hipro soybean meal in the Poland has increased € 2.50 compared to report no 10/2014. The price of Hipro soybean meal in Poland is comparable to the Netherlands and Spain (but higher than that of the lower quality in Romania).
2. The usage rate of soybean meal is high in poultry feeds, the added value of high(er) quality Hipro soybean meal is highest in pig feeds.
3. U.S. soybean meal is worth € 2.43/100 kg more than Argentinean soybean meal in swine feeds, € 1.28 in layer feeds and € 2.43 in broiler feeds. The additional value of U.S. soybean meal is highest over that from Argentina in pig and broiler feeds.

4. U.S. soybean meal is worth € 1.59/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.26 in layer feeds and € 0.72 in broiler grower/finisher feeds. The additional value of U.S. soybean meal is highest over that from Brazil in pig feeds.

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

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

#### Price developments.

The market price of Hipro soybean meal has significantly decreased (with € 5.60) compared to report no. 9/2014 (after in increased with € 5.90 last period). The price of Hipro soybean meal is lowest of all regions, but the crude protein content is low for a Hipro soybean meal quality (46% crude protein). The price of toasted soybeans is now higher than that of Hipro soybean meal, as elsewhere. The Hipro sunflowerseed meal prices are very low in Romania (€ 18.70 versus € 24.60 in the Netherlands), besides maize (€ 12.50/ 100 kg) and sunflowerseed oil are cheap too.

Hipro soybean meal is therefore relatively an expensive protein source.

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

Table 9. Feedstuff prices of week 49 in Romania for December

| Period            |                     | December | Change<br>week 49-47 |
|-------------------|---------------------|----------|----------------------|
| Grains            | Maize               | 12.50    | +0.70                |
|                   | Wheat               | 17.60    | +0.80                |
|                   | Triticale           | 17.50    | +0.75                |
|                   | Rye                 |          |                      |
|                   | Barley              | 17.90    | +0.65                |
| Grain by products | Wheat bran          | 13.20    | -3.05                |
|                   | Maizegl. feed meal  |          |                      |
| Fats & oils       | Animal fat          |          |                      |
|                   | Palm oil            |          |                      |
|                   | Sunflower oil       | 67.70    | +5.90                |
|                   | Fatty acids         |          |                      |
|                   | Toasted Soybeans    | 42.50    | +0.10                |
| Protein rich      | Hipro SBM           | 40.00    | -5.60                |
|                   | Lopro SBM           |          |                      |
|                   | RSM                 |          |                      |
|                   | RSE                 |          |                      |
|                   | Hipro Sunfl. sd ml. | 18.70    | +0.65                |
|                   | Maize DDGS          |          |                      |
| Misc.             | Peas                | 18.50    | +0.40                |
|                   | PKM                 |          |                      |
|                   | Beet pulp           |          |                      |

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

Resultantly feed costs for pig feeds have increased 5%, but those for layer feeds have decreased 1% and broiler feeds 3%.

*Feedstuff usage in feed formulations.*

Pig feed formulations are based on maize (no C18:2 limitations are used). Triticale is attractive (usage rate 19%, shadow price € 17.66. Wheat (shadow price € 17.44) and barley (shadow price € 14.32) are too expensive. Wheat bran is also not attractive (shadow price € 7.62). Hipro sunflowerseed meal is attractive as a protein source (shadow price € 18.70, usage rate 9%). Hipro soybean meal usage is increased compared to last period, due to the price decrease. Prices for rapeseed meal (shadow price € 25.52), rapeseed expellers (shadow price € 25.72), peas (shadow price € 23.39) and maize (shadow price € 8.92) or wheat (shadow price € 15.12) DDGS were not available. No additional fat is used.

Layer feed formulations are also based on maize. Wheat is too expensive, the market price is € 5.10 higher but the shadow price is only € 1.94 higher than that of maize. Wheat bran is not attractive. Peas (shadow price € 18.96) are not attractive so that Hipro sunflowerseed meal (shadow price € 19.15, usage rate 1.9%) becomes somewhat attractive. The Hipro soybean meal usage is substantially increased (from 13 to 23%) because toasted soybeans are now unattractive. With the exception of rapeseed meal (shadow price € 25.01), the shadow prices of the other protein sources are higher than for pig feeds: i.e. rapeseed expellers (shadow price € 34.89) and maize DDGS (shadow price € 22.60). Sunflowerseed oil is not needed as an additional fat source.

Broiler feeds are maize based (no white meat requirement). Wheat is too expensive (shadow price € 11.23). Toasted soybeans are attractive (shadow price € 50.15) because the addition of sunflowerseed oil is maximised (at 3.5%). Hipro soybean meal is the only protein source (usage rate 30%). Both peas (shadow price € 17.68) and Hipro sunflowerseed meal (shadow price € 16.81) are not attractive. Prices for rapeseed meal (shadow price € 22.74), rapeseed expellers (shadow price € 27.72) and maize (shadow price € 23.04) or wheat (shadow price € 20.21) DDGS were not available and are with the exception of rapeseed expellers not likely to be attractive.

*Value of Hipro soybean meal in feed formulations.*

The shadow price of Hipro (46% CProt) is € 61.65 in the grower/finisher pig feeds, € 40.10 in the layer feed and € 40.08 in the broiler feed at a market price of € 40.00. The spread in the Hipro soybean meal price is € 0.08-21.65, without its usage rate being affected. Obviously the spread is the highest in pig feeds however the usage is lowest.

The shadow price of the generic CVB quality Hipro soybean meal (46.8% Crude Protein) is € 40.49 in the grower/finisher pig feeds, € 42.46 in the layer feed and € 42.19 in the broiler feed compared to the market price of € 40.00 for the currently available quality

(45.8% crude protein). The difference in value (due to 1.0 % crude protein) is € 0.49 in pig, € 2.46 in layer and € 2.19 in broiler feeds.

The shadow price of toasted beans is € 42.44 in layer and € 50.15 in broiler feeds (at a market price of € 42.50) since the plant oil addition is maximised in broiler feeds.

Hipro soybean meal is therefore the most attractive protein source in poultry feeds.

The usage rate of Hipro soybean meal is:

- 11% usage in pig grower/finisher pig feeds.
- 23% in the layer feeds.
- 30% 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 a Hipro SBM price of € 40.00 for December in week 49)

|          | Swine                |                   |                 | Layer                |                   |                 | Broiler              |                   |                 |
|----------|----------------------|-------------------|-----------------|----------------------|-------------------|-----------------|----------------------|-------------------|-----------------|
|          | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. |
| December | -0.56                | +1.20             | +1.76           | -1.11                | +0.25             | +1.36           | -1.28                | +0.23             | +1.51           |

The value of Hipro soybean meal from Argentina is € 0.56-1.28/100 kg lower than that from Brazil. Hipro soybean meal from the U.S. has a € 0.23-1.20 higher value than that from Brazil, despite a lower crude protein content, and € 1.36-1.76 more than that from Argentina. The highest added value of high(er) quality soybean meal is obtained in pig (U.S. versus Brazil) and broiler feeds (U.S. versus Argentina). The added value is only slightly influenced by the Hipro soybean meal market price but more by quality differences.

In conclusion:

1. The market price of Hipro soybean meal in the Romania has decreased significantly after a significant increase last period. The price of Hipro soybean meal in Romania can fluctuate considerable and is presently lower than in other regions (but the quality

is lower too). Toasted soybean are priced unattractive compared to Hipro soybean meal.

2. The usage rate of soybean meal is high in poultry feeds. In pig feeds the usage rate is moderate but the added value of high(er) quality Hipro soybean meal is high.
3. U.S. soybean meal is worth € 1.76/100 kg more than Argentinean soybean meal in swine feeds, € 1.36 in layer feeds and € 1.51 in broiler feeds. The additional value of U.S. soybean meal is highest over that from Argentina in broiler feeds.
4. U.S. soybean meal is worth € 1.20/100 kg more than Brazilian soybean meal in swine grower/finisher feeds, € 0.25 in layer feeds and € 0.23 in broiler grower/finisher feeds. The additional value of U.S. soybean meal is highest over that from Brazil in pig feeds.

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

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

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

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

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

The value difference caused by each factor is given in table below where a comparison is made to Brazilian soybean meal for each species. This analysis is based on the shadow prices in the Netherlands (Hipro soybean meal € 40.50) for December 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 nutrient differences compared to the Brazilian and Argentinean product

|                                                          | Swine                |                   |                 | Layer                |                   |                 | Broiler              |                   |                 |
|----------------------------------------------------------|----------------------|-------------------|-----------------|----------------------|-------------------|-----------------|----------------------|-------------------|-----------------|
|                                                          | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>vs Arg. | Argent.<br>vs Brazil | U.S.<br>vs Brazil | U.S.<br>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 €                                                | -0.59                | -0.47             | +0.14           | -0.72                | -0.42             | +0.16           | -0.86                | -0.69             | +0.20           |
| Energy €                                                 | -0.34                | +0.09             | +0.43           | -0.37                | +0.15             | +0.53           | -0.60                | +0.46             | +1.05           |
| Dig. AA €                                                | +0.51                | +2.37             | +1.84           | +0.37                | +1.40             | +1.16           | +0.39                | +2.09             | +1.68           |
| Total €                                                  | -0.42                | +1.99             | +2.41           | -0.72                | +1.13             | +1.85           | -1.07                | +1.86             | +2.93           |

*A difference of 0.9% crude protein with the higher soybean meal prices adds or decreases € 0.59/100 kg to the value of Hipro soybean meal in swine feeds (was € 0.59 in week 47), € 0.72 in layer feeds (was € 0.76) and € 0.86 in broiler feeds (was € 0.83). The value of protein in soybean meal protein decreased in layer feeds but increased in broiler feeds. The price of most protein sources increased, the price of Hipro soybean meal increased € 1.50. In broiler feeds the value protein increased because the price of wheat increased considerable and in the Netherlands broiler feeds are primarily wheat based.*

The energy costs have decreased in broiler feeds but increased in swine and layer feeds. The higher grain and plant oil prices have increased the energy costs in poultry feeds. However in swine feeds the lower animal fat price has decreased it. Consequently 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 € 0.50) and 68 kcal ME € 0.53 in layer feeds (was € 0.59) and 69 kcal extra in broiler feeds increased the feed shadow price with € 1.05 (was € 0.93).

Altogether the value differences due to protein content are larger in poultry than swine feeds but largest in broiler feeds. Differences in the amino acid pattern and digestibility (along with the digestible phosphorus content) create an added value of € 1.84-2.37/100 kg in swine feeds for U.S. soybean meal over that from Argentina or Brazil, € 1.16-1.40 in layer feeds and € 1.68-2.09 in broiler feeds. These value differences are largest in swine feeds. Due to the high DL Methionine (and L-Threonine) cost the value differences due to digestible amino acids between the different origins has increased in broiler feeds (and to a lesser extend in layer feeds). 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 € 0.53 difference in layer feeds for a 68 kcal ME difference and a € 1.05/100kg 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 € 2.37.

#### *Variation in nutrient values*

The effect of variation in the nutrient value (4-5%) of soybean meal on the value (market price € 40.50/100 kg in the Netherlands for December) is given in the following table.

Table 12. Price effect of variation in nutrient value

|                           | Swine | Layer | Broiler |
|---------------------------|-------|-------|---------|
| +/- 100 cal               | 0.85  | 0.79  | 1.52    |
| +/- 4% dig AA             | 1.21  | 0.62  | 0.91    |
| +/- 100 Cal and 4% dig AA | 2.06  | 1.40  | 2.43    |
| +/- 0.1 g/kg dig P        | 0.01  | 0.03  | 0.04    |

Variation in the energy content has the largest effect on the value of soybean meal in broiler feeds. A variation of +/- 100 cal has a € 0.79/100 kg effect on the Hipro soybean meal value in layer feeds but € 0.85 in swine feeds and even € 1.52 in broiler feeds. Variation in the AID (or SID) amino acid content has the largest impact in swine feeds and has increased in broiler feeds due to the high synthetic amino acid prices. A variation of 4% in digestible amino acids changes the value of Hipro soybean meal with € 0.62 in layer, € 0.91 in broiler and € 1.21 in swine feeds. The effects of energy and digestible amino acids on the value of soybean meal are additive. Digestible phosphorus has the highest value in poultry feeds.

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

Sincerely yours,

Jannes Doppenberg, Ph.D.

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

## Appendix

### Least cost formulations set up

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

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

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

### Matrix values

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

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

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

**Table 2A Feedstuff prices in €/100 kg week 49, the Netherlands**

| Code  | Article | Description                       | Nov.-Dec. | Jan.-March |
|-------|---------|-----------------------------------|-----------|------------|
|       |         |                                   |           |            |
| 00010 |         | Citruspulp Braz./USA              | 14.70     | 15.20      |
| 00013 |         | Peas <22%CP                       | 25.00     | 25.00      |
| 00015 |         | Barley (EU)                       | 18.10     | 18.10      |
| 00026 |         | Soybean hulls                     | 14.60     | 15.10      |
| 00033 |         | MOLASSES cane <47% <sub>s</sub>   | 18.20     | 18.20      |
| 00034 |         | Flaxseed                          | 48.70     | 48.70      |
| 00038 |         | Alfalfa 15% CP                    | 18.70     | 18.70      |
| 00044 |         | Rapeseed Expellers 8%             | 25.00     | 25.00      |
| 00061 |         | Rye (EU)                          | 16.70     | 16.80      |
| 00063 |         | WHEAT EU (feed)                   | 18.40     | 18.50      |
| 00064 |         | PALMKERNELml<20%fiber             | 13.50     | 13.70      |
| 00075 |         | Beet Pulp 20-25% <sub>sugar</sub> | 14.70     | 15.70      |
| 00076 |         | MAIZE (EU)                        | 16.90     | 17.00      |
| 00078 |         | L-lysine HCl                      | 165.00    | 165.00     |
| 00079 |         | DL-Methionine                     | 1.100.00  | 550.00     |
| 00080 |         | Soybeans toast.pel.               | 41.60     | 41.80      |
| 00081 |         | SBM 44/7 domestic                 | 38.00     | 36.80      |
| 00084 |         | SBM Hipro domestic                | 40.50     | 39.30      |
| 00090 |         | Wheat middlings                   | 13.90     | 14.00      |
| 00096 |         | Soy oil liq.                      | 68.50     | 67.00      |
| 00097 |         | Palm oil                          | 61.70     | 63.30      |
| 00100 |         | Animal fat (lard)                 | NA        | NA         |
| 00105 |         | Fish meal S. America              | 160.50    | 160.50     |
| 00107 |         | MAIZEglut. fd ml 20-23%CP         | 19.40     | 18.50      |
| 00113 |         | Sunflowerseed<29%CP               | 18.10     | 18.20      |
| 00165 |         | TRITICALE                         | 17.30     | 17.30      |
| 00214 |         | L-Threonine                       | 550.00    | 550.00     |
| 00228 |         | Monocal Phosph                    | 51.50     | 51.50      |
| 00256 |         | Fatty Acids 20% Lin.              | 63.00     | 63.00      |
| 00258 |         | Palm oil Fatty Acids              | 62.00     | 62.00      |
| 00266 |         | Rapeseed meal34%CP                | 22.80     | 23.00      |
| 00332 |         | Vinasses beet                     | 11.00     | 11.00      |
| 00488 |         | MAIZE distillers sol              | 21.00     | 20.60      |
| 00489 |         | WHEAT DDGS                        | NA        | NA         |

NA = price not available

**Table 2B. Feedstuff prices of week 49 for Spain\*, Romania# and Poland compared to the Netherlands**

\* Feedstuff prices for the Northern Barcelona area from week 48.

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

|              |                                 | Spain        | Romania#      | Poland       | Netherlands  |
|--------------|---------------------------------|--------------|---------------|--------------|--------------|
|              |                                 | €/100 kg     | € /100 kg     | €/100 kg     | €/100 kg     |
| <b>Code</b>  | <b>Description</b>              |              |               |              |              |
| 00013        | Peas <22%CP                     |              | 18.50         |              | 25.00        |
| 00015        | Barley (E.E.G.)                 | 18.30        | 17.90         | 13.60        | 18.10        |
| 00061        | Rye                             | 17.50        |               |              | 16.70        |
| 00026        | Soybean hulls                   | 15.20        |               |              | 14.60        |
| 00033        | Molasses cane <47% <sub>s</sub> | 15.30        | 10.00         | 15.50        | 18.20        |
| 00038        | Alfalfa                         | 15.50        |               |              | 18.70        |
| 00044        | RSM.expell 8% fat               |              |               | 21.20        | 25.00        |
| 00061        | Milo corn                       |              |               |              |              |
| 00063        | Wheat EEG (feed)                | 19.10        | 17.60         | 14.05        | 18.40        |
| 00075        | Beet Pulp                       | 16.80        |               | 18.00        | 14.70        |
| 00076        | Maize (E.E.G.)                  | 16.50        | 12.50         | 13.10        | 16.90        |
| 00078        | L-lysine HCl                    |              | 148.90        | 130.70       | 165.00       |
| 00079        | DL-Methionine                   |              | 331.50        | 323.35       | 1100.00      |
| 00080        | Soybeans toast.pel.             |              | 42.50         |              | 41.600       |
| <b>00084</b> | <b>SBM Hipro domestic</b>       | <b>40.70</b> | <b>40.00*</b> | <b>40.60</b> | <b>40.50</b> |
| 00090        | Wheat bran                      | 16.00        | 13.20         | 8.10         | 13.90        |
| 00096        | Soy/Sunflo oil liq.             | 69.00        | 67.70         | 67.15        | 68.50        |
| 00097        | Palm oil                        | 64.00        |               |              | 61.70        |
| 00100        | Animal fat (lard)               | 54.00        |               | 61.90        | 48.50        |
| 00105        | Fish meal 65%                   | 90.00        |               |              | 160.50       |
| 00107        | Maizeglutenfeedmeal             |              |               |              | 19.40        |
| 00113        | Sunflower seed meal*            | 23.30        | 18.70         |              | 18.10        |
| 00165        | Triticale                       |              | 17.50         | 12.15        | 18.40        |
| 00214        | L-Threonine                     |              |               | 184.75       | 550.00       |
| 00228        | Monocal                         |              | 57.70         |              | 51.50        |
| 00266        | Rapeseed meal34%CP              | 24.30        |               | 19.50        | 22.80        |
| 00488        | Maize distillers sol            |              |               | 19.05        | 21.00        |
| 00258        | Palm oil fatty acids            | 63.50        |               |              | 62.00        |

&46% Crude Protein. \* Hipro Sunflower seed meal in Romania and Spain; Lopro in the Netherlands.