Boarding the rice bran bandwagon

There is no question that the world needs more affordable food. Even the most conservative estimates report that by 2050 another 2 billion people will live on planet earth. However, 3 billion additional population is more likely which will increase the current total of 6.4 billion (2010) to 9.4 billion in 2050. The question is how to provide sufficient high-quality food while preserving the environment.

In other words, develop new acreage for farmland or increase the potential and yield of existing farmland? Most probably the answer is to get more from existing farmland by creating higher yielding seeds and improved ways to protect crops from diseases such as insects and weeds.

By Henk W. Hooegenkamp

With the planet’s population growing by more than 70 million people a year and the standard of living in developing countries improving, the demand for food and meat is growing more than proportionally. It’s not a stretch to predict that providing wholesome nutrition for 9.4 billion people in 40 years may require at least 50% more food than is being produced today.

Growing more from less can be a mantra to take less new land into cultivation that spurs sustainable agriculture for generations to come. Obviously biotechnology needs to be a part of lifestyle embedded through decision-making including the elimination of risks.

Unpredictable rainfall — or better said the lack of it — already now greatly affects farming yields. Non-irrigated agriculture produces some 60% of the world’s food. That won’t be suf- ficient to feed a rapidly growing world population. If not addressed in a responsible and timely matter, major catastrophes are about to happen. For starters, already now agriculture consumes 2/3 of the world’s fresh water for irrigation. Genetic modification can significantly increase crop yields and allow reducing irrigation water. Producing and conserving more will be an indispensable tool for truly engaging in sustainable agriculture. In this respect it should be noted that in 2010 approximately 95% of all soy feed for animals are based on genetically manipulated soy seed species.

To meet the rapid growing needs, functional ingredients suppliers need a dynamic vision for the future and find ways to enhance the profitability of the entire value chain. One key to meeting this challenge: finding new and novel ways to utilise what is considered waste material, such as rice bran. At current agricultural harvest levels, some 60 million metric tons of rice bran is wasted. The world cannot afford to continue this shameful waste, especially since the bran and germ contain high quality oil, protein and bioactive compounds such as naturally occurring anti-oxidants. Moreover, rice bran is a highly cost-effective ingredient up to 80% lower in price than soy isolate.

Rice bran is well known and researched. However, only recently stabilisation technology has become available to catapult rice bran into the limelight for functional and nutritional applications in processed food and meat products. However, the world can also expect high-per- formance dietary supplements, cosmetics and even pharmaceuticals that will be created from stabilised rice bran extracts.

Rice bran is the outer bran and germ of the rice kernel – a label-friendly ingredient with functional and nutritious value.
mental image that is reflected in label declarations on consumer food packaging.

The behaviour of stabilised rice bran in complex meat emulsion systems is simple, yet very difficult to explain, because of lack of sufficient scientific insight. To date, R&D scientists at large food and meat manufacturers and academic institutions have begun a thorough evaluation of stabilised rice bran; it is only a question of time before scientific papers are published. In the meantime, empirical experience is driving most of the interest in soy protein technology.

Because rice bran retains moisture, it improves the shelf life of meat products, in addition to enhancing the nutritional profile by adding high levels of fibre. Both soluble and insoluble fibres are naturally present in rice bran, making it likely to become the ingredient of choice not for products targeting a health-conscious niche. Along with helping meat processors develop healthier formulations, the use of rice bran can generate significant cost savings, compared with expensive alternatives such as soy protein isolate (SPI).

**Soy saga**

Processed meats consume half of the world’s annual output of a million-plus metric ton of functional soy protein. But concerns over soy’s continuing price increases, hypoallergenic potential, conflicting health claims and the emergence of newer functional systems threaten its hegemony.

Despite the many lifestyle foods, nutraceuticals and vegetarian foods formulated with soy protein, its primary application is still processed meat. More than 440,000 metric tons of soy isolate and soy concentrates are used annually in emulsified meat formulations, such as hot dogs and deli meats, not to mention the significant soy protein usage in coarse-ground and whole-muscle meats products such as patties and roast beef. Soy ingredients have a proven track record for use in these formulated meat products, although serious issues surrounding meat production and ingredient technology are impacting consumer acceptance and soy’s markets in some countries such as the U.S. remains questionably. Also many meat processors are looking for ways to replace expensive vegetable protein sources and substitute with equally well performing lower cost solutions. Especially in the U.S., mustard flour is the ingredient of choice for emulsified meat products such as Frankfurters and Bologna’s. In Germany, Austria and Switzerland preference is given to the use of milk protein (sodium caseinate) as an emulsifier or binder in thermal- ly processed sausage.

It can be argued that soy protein’s usage in Eastern Europe, South Africa and some Asian countries has peaked due to inflated inclusion levels that have had a detrimental effect on product integrity. As living standards improve, a linear decline in soy protein use usually follows. In that sense, the dilution of soy protein offers a sustainable opportunity for stabilised rice bran.

**The food price predicament**

According to projections by the United Nations’ Food and Agricultural Organization (FAO), consumers worldwide will face for at least 10 more years high food prices. This dynamic is stressing economies all over the world. As usual, poorer countries have exacerbated hunger and even sparking civil disobedience and political unrest. The forces driving up the cost of food – and functional ingredients – includes rising energy prices, which trickle down and increase the cost of everything else, and strong demand for meat and dairy in developing countries, as well as China, India and the Philippines. The cost of livestock feed, together with competing demand for agricultural bio-mass to manufacture biofuels, has played havoc on the pricing of staple commodities and specialty crops alike.

Grain prices, including wheat, rice and corn, will probably remain at elevated levels for some time, due to surging demand in Asia and the diversion of farmland to growing crops for biofuels. Of course, livestock production and the accompanying grain consumption create an enormous ecological footprint. FAO estimates that grazing and feed production already uses 30% of the planet’s land surface and a significant share of global water resources. That pressure will only grow more severe, as demand for muscle foods (beef, pork, poultry, fish) continues to expand in developing countries, due to their growing population. The soy protein industry has echoed the special-interest groups by using these facts to leverage consumer concerns about meat’s environmental impact.

It is about time that the meat industry proactively addresses the perceived connection between meat products and ecological sustainability as well as the incidence of obesity, cardiovascular health and some other degenerative diseases. All else being equal, today’s consumers will preferentially seek environmentally safe, healthy meat products, as long as they deliver on quality and affordability. Although affluent consumers are trending toward greater consumption of organic foods and non-meat protein alternatives, a majority of the world’s population retains a strong affection for meat products, especially as per-capita incomes increase. At the same time, soy-based vegetarian foods are struggling to compete on price with traditional meat products. With no economic incentive, why should consumers in developing societies purchase foods based on analogue technology?

FAO estimates through 2040 predict a dramatic increase in meat consumption, perhaps as much as 50%, given the developing world’s desire to make up lost ground in satisfying its appetite for meat. This phenomenon will create a heavy environmental burden but also open up significant potential for functional ingredients to replace more lean meat replacement without affecting organoleptical properties.

**The ingredient angle**

Soy marketers have banded the meat industry with a clear message: Soy protein reduces environmental impact by eliminating the wasteful conversion of soybeans into animal feed and secondarily into meat. How wrong they were! The soy industry’s position has become a double-edged sword. Functional soy manufacturers need the processed meat industry to sustain their own existence, but...
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their business strategy focuses on replacing lean meat with soy-based alternatives. Moreover, at the lower end of the analogue category, burger patties based on low-cost textured soy protein (TSP) are more expensive than the lower-end meat-based alternatives. Thus, the soy protein industry’s green messaging about vegetable protein-based foods being cheaper doesn’t always resonate with consumers. Many industry observers have suggested that such messaging is part of the reason North American meat processors haven’t fully embraced functional soy protein. There is some truth to that observation, because even with the impact of food/feed/fuel competition, lean meat is still priced relatively low and consumers in affluent societies can afford to include costlier muscle meats routinely in their diets.

The increased awareness and manufacturing capacity of stabilised rice bran puts downward pressure on soy ingredient prices because of the risk of losing substantial market share. Companies look to reposition existing ingredients as alternatives and have options to reformulate out the higher priced ingredient.

(Part) Low inclusion-level replacement of soy protein by rice bran is a simple and straightforward exercise. Key to finding the optimum formulation is to have a sound knowledge of all technical solutions available. The rather quick rise of rice bran as a functional equivalent and cost-efficient substitute for functional soy ingredients has subdivided senior management of soy protein marketing companies. All of a sudden soy protein hegemony is challenged and meat formulations now have a viable alternative to serve as a least cost option. A strategy decision is not easy to make for soy protein manufacturers. Either they take the high road and stay true to a single soy solution, or team up with the least cost alternative and offer functional blends of – for example – stabilised rice bran and soy protein.

One thing is certain, if the soy manufacturers stick to the single solution offerings, many specialised spice and ingredient blending companies will enter the market place and supply convenience solutions in the form of unit packs. Not to forget that most soy protein powders are sold in blends, and thus lose brand identity. There is obviously a tremendous potential of industry interest and it is reasonable to expect that this surge will bear fruit when rice bran further gains popularity as a meat emulsion enhancer over the coming decade.

Soy’s non-allergenic competitor

Anaphylactic reactions are severe allergic responses that occur when body’s immune systems overreact to a particular allergen. Food, insect stings, medications, latex and other substances may cause these reactions. There is strong medical evidence that food allergy is increasing among Western populations.

Now, both FDA and USDA’s Food Safety and Inspection Service are taking food allergies much more seriously. The FDA has identified nine food categories that account for more than 90% of all food allergies:

- Peanuts
- Soybeans
- Milk proteins (casein)
- Eggs

Flexible packaging concepts

Podanfol stands since 1982 for uninterrupted development in flexible packaging concepts in the area of polymer-manufacturing casings and other related films for production of perishable foods.

Product portfolio

Podanfol’s casing range has risen during years of development in many countries, accompanying the production of a diversified range of foods and technologies. It is the preferred partner of many high capacity producers all over the world with the emphasis on the following casing characteristics:

- For high capacity slicing operations: PAL or PALFEX even when logs for slicing are longer than one metre, minimal give-away on high-end slicing equipment, carefully engineered peeling direction and peeling behaviour, customized film (patented solutions) are just the pre-requisite for successful rational slicing and packaging systems.

Committed to solutions

Sustained improvement of successful products and their adaptation to changing market conditions are part of Podanfol’s basic strategies. Its engineers cooperate directly with leading food producers to respond to their specific requirements for casings, films and flexible packaging in general.

Integrated Management System

Podanfol is currently building additional production facilities of 5,000 m² as an answer to the growing market needs. Latest range of products and highest hygiene standards (preparation for a BRC-KP certification as a higher degree of its existing HACCP and ISO certificates).

www.podanfol.com
Seafood (fish, shellfish)
Sesame seeds
Tree nuts (almonds, cashews, hazelnuts, pecans, walnuts, pine nuts)
Wheat
Sulphite

Soy proteins at inclusion levels from 1 to as much as 12%, are often the dominant ingredients in processed meat and meat analogues. For example, in South Africa an inclusion level of 10% soy protein isolates in hot dogs is quite normal. Here the soy protein counts as part of the minimum meat protein requirements. In a veggie hot dog, an soy protein isolate inclusion level of 10% is needed to simulate meat texture and appearance.

Concern over food allergens make it difficult for soy to be considered the lead protein in these applications. Increasing numbers of consumers prefer convenience foods, while insisting on the use of natural, healthy ingredients. This has created a growing demand for functional ingredients with superior nutritional profiles. A potential challenger for soy protein in processed meat applications is a newly developed functional as well nutritive ingredient made from rice.

Hypoallergenicity has been the main driver that countries such as Sweden and an increasing number of companies have almost completely eliminated soy protein ingredients from processed meat products and replaced it with pea protein and/or rice protein, and functional potato protein isolate looming on the horizon. From waste to wonderful rice has been a traditional crop for nourishment of billions of people. Following the successful completion of a series of research studies at renowned universities and plant testing, stabilised rice bran will be a welcome addition to the portfolio of food technologists looking for a replacement or enhancing soy protein isolates in hot dogs is quite normal. Here the soy protein counts as part of the minimum meat protein requirements. In a veggie hot dog, an soy protein isolate inclusion level of 10% is needed to simulate meat texture and appearance.

This ingredient is showing great potential in food and processed meat products. Actually, it is likely that stabilised rice bran will be able to cost-enhance vegetable protein sources in emulsified meats such as hot dogs as well as coarse ground meat products like burgers and patties. After all, this segment has the largest potential and probably is ready for (part) replacement and quick conversion.

NutraCea (NTRZ) is a pioneering food ingredient and nutraceutical company that has developed proprietary and patented application technology and have an ambitious programme to target processed meat applications using stabilised rice bran as a key ingredient to optimise product quality. Together with wheat, soy, potatoes and corn, rice has the potential to make its way into the food solutions for future markets.

References
Literature references can be downloaded at www.fleischwirtschaft.com/literature or requested from the author and the editorial office, respectively.

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