

Non-stop protein growth

Dry fractioning allows all-natural protein ingredient processing without the use of water and chemicals



To accelerate joint protein solutions, it will be necessary to boost plant-based consumption, reduce waste, scale up the integrated animal and plant protein foods. *Photo: Adobe / candy1812*

By 2050, the world population will call for approximately 70% more food to meet global demand. Demand can outstrip crop harvest, especially when resource limitations continue to constrain global food systems. As such, food issues are expected to become politically destabilizing, just like nuclear energy is today.

By Henk Hoogenkamp

According to the World Health Organization (WHO), approximately 130 mill. babies are born worldwide each year. With the planet's net-population growing by some 83 mill. people a year and the quality of life in developing countries improving, the demand for food will definitely expand. It is safe to predict that meeting the needs of some 10 bn. people expected to be living on planet Earth in 2050 will require some heroic efforts.

Most expert studies predict that the world needs to close a 60–70% food gap between crop calories available in 2021 and expected calorie demand in 2050. The world's middle class is especially growing fast and, as cities urbanize and people become more affluent, consumption of resource-intensive

foods like meat is expected to increase.

Although eating less meat is better for the environment, it is unrealistic to expect that total meat consumption will decrease. On the contrary, total world meat consumption will sharply rise, because of increased purchasing power in developing countries. Especially beef with a large environmental footprint – more land, more water, more feeds, and more greenhouse gas emissions – will negatively impact available resources.

Although beef is very tasty, healthy and universally liked by many, it is one of the least efficient foods to produce when considered from a feed-input-to-food-output perspective.

More of everything

As the world's population continues to expand and become more prosperous, it is not surprising that meat consumption is increasing. Total meat consumption is growing by 2% in volume on a global level, and demand is largely driven by emerging markets where increased prosperity in Asia-Pacific, African, and the Middle East regions results in a growing consumption of meat, including expensive meat options like veal and beef.

In most developed and affluent countries, meat consumption typically stagnates or declines due to consumers' increasing concern over the negative health effects associated with red meat consumption linked to colon cancer, cardiovascular disorders, hypertension, and obesity. Consumers also object to the highly intensive animal farming systems.

Another variable is the increase of popularity of a flexitarian's diet wherein consumers interchange their daily diet with plant-based food options and alternating with leaner types of meat and fish.

But make no mistake, animal-derived protein is still king. Affluent consumers continue to focus on their overall health and wellness. In the US and Canada, meat, eggs and dairy are the top three protein sources, followed by seafood and legumes (with nuts and seeds) respectively taking spots four and five. Though meat is a crucial source of protein, iron, vitamin B12 and zinc, excessive intake is associated with higher risk of degenerative conditions.

Protein sustainability

The quadrupling of the world's population since 1900 has caused a fundamental change in soil and

crop harvest management to meet the rapidly growing food demand globally. The future of food security needs to be based on the professionalization of agriculture through translational research and applications, education, output efficiencies, and the redirecting of feed to food.

For developing countries like India, Africa and China, the low levels of fertilizer nutrients uptake result in soil and water acidification, contamination of surface and groundwater, and rising greenhouse gas emissions.

Just consider the thought that feeding livestock accounts for about a third of harvested grain. In addition, farm animals consume some 8% of the global water supply and also produce around 15% of greenhouse-gas emissions.

Some countries like the US, Australia, Canada, UK, Denmark, Spain, Netherlands and Germany which are involved in heavy agricultural output, have exceeded or are almost exceeding safe bounds for animal farming. Subsequently, programs need to be put in place to scale back nutrient flows, loss of biodiversity, and greenhouse gas emissions.

The joint growth of both global population and income will push

dairy and meat production to unsustainable levels. For farmers, protecting the current status quo will ultimately discourage livestock foods harmful for climate and security. Considering that livestock has the world's largest land footprint, it is difficult to imagine where the additional agricultural arable space can be found to sustain the expected huge increase in demand for both dairy and meat products.

A rebalancing of agriculture will therefore be needed to halt or reduce current greenhouse gas emissions and cut nitrate-based fertilizers, especially by eating less meat and redirecting it to plant-based foods and cell-cultured meat options.

Billions and billions

The traditional conventional meat industry raises billions of slaughter animals earmarked for human consumption at huge environmental impacts like directing grain and pulses for animal feed. To raise billions of animals to feed humans has quite a few of heavy negative side effects, such as redirecting clean water usage, water pollution, destruction of wild habitats, and growing ethical and animal welfare concerns linked to large scale factory-size animal farming.

The potential downside risks for meat companies are the likely physical impacts of climate change and the rapid growth of alternative protein formulated foods. Key risks to the meat industry include increased cost of energy (electricity) due to carbon pricing, higher costs of animal feed due to poor crop yield, and increased livestock mortality due to heat stress, as well as increased costs for clean processing water and its recycling.

Climate change and other concerns such as antibiotic use and hormone use in animal farming will be some of the key drivers why the consumer of the future will not only choose „non-slaughtered“, sustainable and healthy cultured meat but also a large range of plant meat foods.

The current shift towards flexitarian and plant-based food lifestyles is certainly undeniable with novel plant formulated meat alternatives and cultured meat, as well as animal-free real dairy, ultimately disrupting the global legacy food industry. Within this scope of

change, it is important to know that current upstart biotech companies will leverage their cell- and fermentation-based intellectual property when the legacy food and pharmaceutical companies make a move to acquire these companies.

Supply security

Sustainable sourced protein ingredients will become of major importance to fairly balance nutrition globally. The current agricultural increase in productivity of slightly more than one percent per year needs changing, hence, intense farming based on new technologies have to be implemented.

Agricultural productivity is closely interconnected with food safety, genetically-modified organisms, health, nutrition, sustainability, environment, and obesity. Diet, climate change, and agriculture are intertwined, and it is difficult to tackle one without considering the others.

How can the world provide a sustainable protein supply that meets growing nutrition and health expectations? Demand for premium protein is experiencing exceptional global growth, and availability may ultimately fall short. As income levels in developing countries rise, together with subtle changes to a Western diet, per capita protein consumption is expected to grow by 15–20%. In addition, nutritional awareness by specific segments of the population in affluent countries affected by sarcopenia and those with an interest in lifestyle nutrition will put further pressure on premium protein availability.

Protein sustainability is not a simple issue, but the answer is most probably to optimize diet and health by promoting increased consumption of premium plant protein sources and reducing animal protein. To answer the rapidly changing market dynamics, it is likely that a blend of both plant and animal protein will optimize not only the maintenance of human health but also the utilization of available agricultural resources.

To make effective use of all protein sources, it is necessary for companies to stop polarizing practices selling single protein solutions. Collaborative action is essential to address complex issues that no single protein source can solve by acting alone.

To accelerate joint protein solutions, it will be necessary to take pressure off the animal sources. The way forward is:

- Boost plant-based protein consumption;
- Reduce protein waste;
- Scale up integrated animal and plant protein foods; and
- Utilize existing protein waste streams.

Protein choices

Health and wellness trends continue to drive “nutritionally-minded” consumer choices of active nutrition, including higher quality protein foods, “all-natural”, minimally-processed, authentic clean label, and especially great-tasting foods that entice repeat purchases.

Many traditional proteins – especially dairy protein ingredients like whey protein and caseinate – are considered the gold standard. This is especially true for organoleptic flavor-sensitive applications such as yogurt, infant

nutrition, coffee creamer, and cheese analogs like pizza mozzarella. For the emerging plant protein ingredients, it is often a challenge to duplicate the organoleptic consumer expectations and reach the same high level of animal protein performance in terms of dispersibility, solubility, emulsification, gelation, foaming, and whipping.

Psychologically speaking, when people feel guilty about their behavior, they tend to justify the behavior rather than changing it. Justifying behavior is easier than changing behavior. In a way it is a weird conclusion that despite increasing concerns over animal welfare and health attributes, consumers don't eat less meat.

Eating meat is thoroughly ingrained in most cultures. It is too early to say, but perhaps the huge consumption increase of plant-meat alternatives, is in addition to the animal-meat intake.

Even though an increasing number of people – and especially

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The growing demand for plant protein ingredients in the EU is the main reason that the regional supply chain is no longer aligned causing shortages.

Photo: imago images / agefotostock

girls going through puberty – have a high level of guilt when eating meat, in reality it is still difficult to curtail consumers meat-eating behavior and many look for an excuse to eat meat. To reduce their sense of guilt, consumers often select a "healthy" meat dish over the perceived tastier "un-healthy" option.

When moral standards and self-serving desires come into conflict, the consumers' self-interest often wins in order to justify their lifestyle.

Global protein market

The global protein ingredient market enjoys an annual growth of

four percent. This growth will continue until at least 2035. Most of the growth is driven by the developing world, particularly Indonesia, the Philippines, India, China, and sub-Saharan Africa. As of 2021, Asia has an estimated population size of 4.5 bn. with about 500 mill. continuously growing segment of middle-class consumers. The latter number is projected to reach 1.25 bn. by 2035, hence, this demographic obviously presents a large potential for growth in premium food, meat, and beverage products.

In terms of quantity, the total world market for functional pro-

tein ingredients is estimated at five million tons per year. Soy protein demand is hovering around two million tons per year, with wheat gluten protein making up about 900 000 t per year. Dairy protein, including milk powder, whey protein, and caseinates are slightly higher than one million tons per year. Pea protein has emerged as a formidable new source of plant protein with a market capacity in 2020 of about 240 000 t as new production capacities in Canada, the US, and in China becomes available. Rice protein is now also appearing on the radar screen in serious numbers with an annual production of approximately 32 000 t per year, which can rapidly grow if demand continues to increase. Most of the rice protein originates from China, India, Pakistan and Thailand.

EU cannot keep up

The growing demand for plant protein ingredients in the EU is the main reason that the regional supply chain is no longer aligned causing shortages in crops like lentils, chickpeas, fava beans, legumes, sunflower, rapeseed and soybeans. Obviously, plant protein consumption in a variety of foods and beverages is on the rise with double-digit growth patterns in most west-European countries. The downside is that EU farmers

have to get used to the new crops and set more agri-land available to meet demand. In many cases, this comes at the expense of the legacy crops such as wheat, corn, and potato.

In 2020, the EU demand – calculated as crude plant protein – amounted to 28 mill. t. The EU's self-sufficiency harvest for rapeseed (canola) is about 80% while soybean is a meager five percent. To put it in different numbers: the EU annually imports 18 mill. t crude protein, of which some 13 mill. t is soy-based. Despite the shortages, the EU harvest of plant protein crops has doubled or tripled since 2015. An example of which are soybeans and pulses like peas, chickpeas, fava beans, and lentils. Fortunately, biodiversity of some of these plants rich in protein are on the rise. Especially of interest is the emerging new technology to separate protein fractions from plants by means of dry fractioning. This allows an all-natural protein ingredient processing without the use of water and chemicals.



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