We are proud to present our first ever whey paper with a vision on the whey industry going forward. We felt compelled to write it now, as we live in a world with unprecedented changes affecting our industry. We see a need for customers and producers of whey products, as well as policy makers, for an understanding of the impact of these changes and felt that as an industry we are obliged to share our insights.

The idea of our EWPA Whey Protein 2030 paper is to analyse the future potential of our sector within different scenario settings. We have developed four scenarios and assessed the respective ‘state of whey’ 2030. This paper does not reflect an ‘out of the box’ thinking – it is the result of a discussion of executives and experts of the whey sector.

We are grateful for the high level of engagement of our members – it were the energy, ideas, reflections and questions of the Task Force members as well as from the wider EWPA membership that allowed to draft this paper and to flesh out different scenarios of the whey future.

And there is another key take away from the exchanges within the EWPA community:

We have the mission to create added value for our customers and profit for our companies today and in the future. But our purpose goes beyond profit.

We deliver unique nutrition for all consumer groups and truly essential nutrition to specific groups, we deliver tailored nutrition options for those who enjoy enhancing their physical performance and we deliver the highest quality ingredients for a huge range of foodstuffs.

As part of the dairy industry, we are a driving force for the livelihoods of our farming communities in rural Europe. And we are front-runners in terms of circular economy and sustainability.

This is the Whey!

Benno van Mersbergen, Chair WWP 2030

Luis Cubel, EWPA President

Our Whey forward

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What is whey and how is it made?

Whey is one of the primary proteins along with casein, found in cow milk and is an important by-product of the cheese-making process. Whey is found in the watery portion (serum) of milk when it is coagulated and separated from the cheese. Cow milk protein contains about 80% casein and 20% whey protein. The latter is very valuable due to its higher content in essential amino acids, high solubility, and, therefore, fast absorption and easy digestion by the body. Whey can be processed into a highly nutritious and easily digestible powder, used for functional and nutritional foods or beverages. The most marketed forms of whey are whey protein concentrate (WPC), whey protein isolate (WPI) and whey protein hydrolysate (WHP).

What are the health benefits of whey protein?

The recommended consumption of whey dates back to ancient Greece, when even Hippocrates suggested it to be drunk to improve the immune system, increase power, and increase muscle growth. Its nutritional value and health benefits were rediscovered around the 16th century in Europe when noticed by farmers that the pigs that drank whey developed much faster than those that did not. Farmers then started to drink the whey themselves and noticed positive changes in their health.

Nowadays, with its known high nutritional value and myriad of proven health benefits, whey is added to the diet of all age groups going from infant formulas, the diet of children and adolescents and to the supplementation of the diet of the elderly and those in need of medical nutrition. Additionally, considering its high bioavailability,
Whey protein is recognised as high-end quality protein

Digestible Indispensable Amino Acid Score (DIAAS).
Protein quality reflects the composition and bio-availability of essential amino acids

Health benefits

Whey protein is celebrated as having the highest biological value of any protein source. It provides the human body with essential amino acids (EAA), free branched-chain amino acids (BCAA), and many vital nutrients needed for optimal body function.

Furthermore, dietary guidelines have established the physiological needs of the human body to be met with the intake of ‘high-quality protein’. There is no clear definition of what constitutes such ‘high-quality protein’. Means to identify ‘the ability of a diet to meet the requirements of all the dietary indispensable amino acids (IAAs)’ were recently elaborated by the Food and Agriculture Organisation (FAO) of the United Nations to rank all dietary proteins by their quality. This new scoring system, known as the Digestible Indispensable Amino Acid Score (DIAAS), is based on the relative digestible content of the IAAs and the amino acid requirement pattern. It has become an ideal tool for setting dietary requirements for protein intake.

Population reference intakes (PRIs) for protein:
Before addressing the true health benefits of whey protein, an overview of the Population Reference Intake (PRIs) for protein is appropriate. A PRI indicates the amount of an individual nutrient that the majority of people in a population need for good health according to their age, gender, and physical condition (e.g., pregnant or breastfeeding women). According to EFSA’s Panel on Dietetic Products, Nutrition, and Allergies, the PRIs set for protein are as follows for different age groups and physical conditions:

- **Adults** (including older adults): 0.83 g per kg of body weight per day
- **Infants, children, and adolescents**: between 0.83 g and 1.31 g per kg of body weight per day depending on the age
- **Pregnant women**: additional intake of 1 g, 9 g, and 28 g per day for the first, second, and third trimesters respectively, in addition to the PRI for non-pregnant women
- **Lactating women**: suggestion of additional intake of 19 g per day during the first six months of lactation and 13 g per day after six months, in addition to the PRI of non-lactating women

As a consequence of a more sedentary lifestyle, besides ageing, sarcopenia - a condition characterised by the progressive and generalised loss of muscle mass, strength, and function are becoming a significant concern in the ageing population. It is proven that an adequate intake of high-quality protein combined with resistance training is the most efficient way of preventing sarcopenia and mitigating the accelerating effects of ageing and the lack of physical activity.

**Pregnant and lactating women**

During pregnancy, protein requirements increase to meet the demands of both the mother’s body and the growing baby. However, food aversions and nausea can often make it difficult to stick to a healthy, nutritious, and varied diet with sufficient protein intake. Whey protein can then become a convenient and easily digestible source of protein, which, combined with a healthy and balanced diet, can help meet the nutritional needs of the mother-to-be.

During lactation, the mother must have adequate protein intake in order to provide the infant with all the nutrients it needs while still maintaining her own muscle mass. If the diet does not supplement mothers with the necessary macronutrients, they might suffer from deficiencies. An increased intake of whey protein is, therefore, a convenient way to meet a nursing mother’s elevated protein needs. Furthermore, an increased protein intake has been shown to help women regain their pre-pregnancy weight.

**Application of whey protein and health benefits**

**Medical nutrition and functional foods**

Functional foods can be defined as ‘those that ensure adequate nutritional effects and additional benefits in one or more body functions, improving health, the well-being or reducing the risk of diseases’. An increase in
Whey protein paper: Outlook 2030

Health benefits

dietary protein promotes health, and helps the recovery and treatment of the acutely and chronically ill. Often a contributing factor in hospital patients losing muscle mass and muscle functionality are a lack of protein and undernutrition due to a lack of appetite or difficulty to eat solid foods as well as the inability to absorb the necessary nutrients. While in bed rest, to help counteract muscle loss, whey protein supplementation has shown to stimulate muscle growth.

Furthermore, cancer patients appear through a supplemented diet with whey protein to tolerate better the effects of chemotherapy.

Non-communicable diseases (NCDs) or known as chronic diseases have become a major concern worldwide. Globally, NCDs account for 41 million deaths each year, which amounts to 71% of all deaths, with the leading causes being cardiovascular diseases, cancers, and inter alia, diabetes. In the European Union (EU), they have become the leading cause of preventable deaths, with a disease burden of 80%. Whey protein, due to its valuable constituents such as essential amino acids, antioxidants, functional peptides and immunoglobulins, offers a wide array of benefits in the prevention of these NCDs such as cardiovascular diseases, cancers, diabetes, metabolic diseases, as well as osteoporosis. Several studies have shown that whey protein inhibits the development of several types of tumours and cancers and is, therefore, considered to have anticarcinogenic properties.

With its myriad health benefits, whey protein seems to address and help prevent the most common NCDs that affect the global population.

Sports nutrition

Building muscle and overall strength has become part of many people’s fitness routines and is considered one of the most efficient ways to promote and maintain muscle mass. The positive effects of strength training combined with supplementary protein intake, can be felt in many aspects of overall health and well-being. The easiest and primary way of noticing these benefits is mostly through the relief of pain, that might have built up through a sedentary lifestyle and the consequent loss of muscle mass, and the obvious benefit that it makes daily physical tasks easier.

Strengthening our bodies also creates and maintains muscle tone and mass, which naturally starts to decrease with age when lean muscle tissue is slowly replaced by fatty tissue. It has been well established that a protein-rich diet coupled with strength training counteracts age-related loss of muscle mass, i.e., sarcopenia.

Weight management

The core of weight loss is to consume fewer calories than our body burns. However, when the body detects a lack of calories, our bodies will create the natural feeling of hunger to force the body to consume more calories. When dieting, it is crucial to get enough protein and the essential amino acids to keep the body from breaking down muscle mass due to the calorie deficit, resulting in muscle loss instead of the intended fat loss. High protein content in our diet creates longer-lasting satiety, providing the body with sufficient energy to maintain muscle mass even with a calorie deficit, whilst still promoting fat loss.

Specific dietary requirements

• Lactose intolerance: Considering that whey protein isolate and whey protein hydrolysate have little to no lactose, they are a welcome and convenient source of protein even for those suffering from lactose intolerance.

• Gluten intolerance/celiac disease: Whey protein is naturally gluten-free since it contains no gluten and is, therefore, safe to consume for people with celiac disease.

• Vegetarians: Whey protein is a great option for vegetarians or flexitarians looking to cut down on meat while ensuring they get enough protein to fill the protein gap.

Whey protein and sustainable food systems

Whey protein: The circular application of dairy waste into high value ingredients

Sustainable food systems should allow for maximal utilisation of resources and minimal waste. This is exemplified by the use of by-products from food production into animal feed or as sources for food and feed ingredients. Whey processing leads the way in this area by transforming a food by-product from cheese manufacture into a highly nutritious product for human consumption. Especially in recent years, whey processing management has innovated to become more environmentally friendly and sustainable. It now creates a complete valorisation of most of the whey, making it a highly valuable product in circular food systems. The reduction of dairy waste to meet the 2030 Agenda for Sustainable Development goals (SDGs) is exemplified by the use of by-products from food and feed industries.

In addition, life cycle assessments (LCA) evaluate the environmental impact of products all the way from their extraction through to their disposal. Some believe that whey protein is less environmentally friendly than plant-based alternatives. However, a study has shown that whey was among the best-performing foods from an environmental aspect via the LCA. Whey protein is, therefore, an earth-friendly choice for eco-conscious consumers.

The future of whey outlets and consumer trends

With an increasing part of the global population becoming more and more conscious about their health and well-being through a healthy lifestyle and balanced diet, there is a clear and sustained growing trend for whey protein supplementation, especially compared to other sports supplements. This was mainly the case during the COVID-19 pandemic, which saw an increase in the consumption of whey protein as recreational users grew.

The whey protein market is expected to show growth in the coming years with an increasing demand for whey protein supplements in various shapes and forms, especially with the urban population’s aspirations for a healthier lifestyle.
EWPA questions the capability of a supply of whey solids sustaining the potential demand on the global market. To conduct a realistic scenario analysis, assumptions on several steps in the whey value chain have to be made at a time when the global dairy market balance is affected by several disruptive developments:

- Milk production in several of the key export regions in the world appears to be facing limitations
- Environmental policy ambitions and their implementation at agricultural level are posing additional barriers for further growth
- Milk production costs are on a new level
- Changing consumer preferences regarding a possible demand growth or acceleration of demand in alternative protein sources

In a milk supply scenario where abundant availability is no longer a given, the allocation of milk to the different product streams becomes more critical. The prioritisation of the key sources of whey - cheese and casein - is the next step in the analysis, as it will determine the availability of whey solids in the future.

The final step in the analysis is where supply and demand of whey meet and a look at one of the key questions underneath the 2022 Whey Protein Outlook 2030: "Will whey solids availability continue to be sufficient to satisfy the demand for whey solids in all product formats, be it sweet whey powder, demineralised whey powder and all of the concentrated whey product options like WPC's and WPI?"
Milk production growth: 2022–2030 forecast

Given the current challenges in terms of the cost of milk production as well as the political priorities, a continuation of the recent historic average growth rates for milk production in the key export regions of the world would require:
- Higher farming margins than in the 2016-2020 period
- A solution to the environmental challenges (GHG emission, nitrates) in regions with high animal density
- Adapted implementation of some of the current farming policy projects, mainly in the EU and Oceania (especially sustainability and organic farming)

Given the current political reality in the EU and Oceania, it seems highly questionable if all of these conditions can and will be met. Therefore, a fall to lower growth levels for these two key export regions is likely. A slightly higher growth rate, under the assumption that sustainability ambitions are not strengthened, seems possible in the U.S.

U.S. assumptions and considerations

Milk production in the U.S. is projected to be about 110 million tons in 2030. With slow growth in domestic demand as the economy recovers from the pandemic, the dairy herd growth will remain relatively flat in the middle of the decade but will grow in the later years. Global demand for U.S. dairy products is expected to continue to grow over the next 10 years, the largest increases can be found in exports of products with high skim-solids content, such as dry skim milk products (non-fat dry milk and skim milk powder), whey products, and lactose.

Cheese demand growth: recent history

Cheese production is the key source of whey solids, and the allocation decisions that will be made within the dairy portfolio will be crucial for future whey solids availability. What certainly helps is that cheese consumption is still the main growth driver of overall dairy consumption in the Western world and beyond. New applications with cheese as an ingredient, like in meals, finger food, and sauces continue to fuel cheese consumption growth even in the saturated Western markets but also in new emerging cheese markets.

Graphs 4 and 5 provide an overview of recent growth rates of cheese demand in the biggest cheese markets in the world: the EU and the U.S. In 2020, demand was subdued due to COVID, where lockdowns and closures of restaurants led to a significant drop in food service demand in EU and the U.S.
Cheese production growth: 2022-2030 forecast

EU assumptions and considerations
Sustaining an EU cheese production growth rate close to 1% appears to be realistic, as local demand growth alone continues to require a production growth rate of around 1% or even slightly higher initially. Recent allocation data in the last quarter of 2021 and the first two quarters of 2022 also show that even in a market that goes backwards in terms of milk production, cheese production continues to increase. A growth rate close to 1% is also possible because liquid milk and many of the fresh dairy categories require year after year less milk. Due to the likely reality of ongoing milk shortages in the years to come, a baseline growth rate of cheese production of 0.5% - 1.3% seems reasonable.

U.S. assumptions and considerations
Strong local U.S. demand – lately averaging 1.7% - continues to fuel new investments in cheese capacities, of which quite a few are already in the pipeline. Given all these capacity investments underway and the strong local demand, it seems realistic to assume that cheese continues to be prioritised when it comes to milk allocation. If U.S. processors also manage to leverage their connection with the leading quick service restaurants (QSR) players in the world, then export opportunities will only raise the assumed growth rate. For this analysis, we have therefore assumed a base growth rate of 1.8% for U.S. cheese production going forward.

Oceania assumptions and considerations
Despite New Zealand’s ambitions to allocate more milk to added value options, the export profile historically continues to gravitate towards whole milk powder (WMP), possibly also because of the growing Chinese ownership in New Zealand processing. We will therefore assume a zero-growth baseline for Oceania cheese production.

Global whey solids availability is expected to grow

Our analysis of the supply side of the whey sector shows a continued growth of whey solids availability in the three main regions by 1% - 1.5%. Next to sustained cheese whey growth in the U.S. and EU, we also expect EU casein whey will continue to grow, in line with historic growth. This means that despite the relatively weak outlook for milk production, the market may get some comfort from the demand growth in cheese, which guarantees growing volumes of milk being allocated to cheese manufacturing.

Whey balance – scenarios towards 2030

Estimating the future, especially towards 2030, is impossible. Nevertheless it is possible to identify key themes and developments that will shape the future of the global whey market in the medium term, towards 2030. Scenario planning enables understanding and preparation for future developments. It allows to explore opportunities that might lead to new strategic insights, more flexibility, and benefit the sector by identifying future opportunities.

We decided to work on the basis of two high-impact, high-uncertainty axes, resulting in four contrasting scenarios. The scenarios have been identified through several participatory workshops with experts from the whey sector. Participants discussed the relevant political, economic, social, technological, regulatory, and environmental influences to identify the main drivers and barriers in the global whey market. These drivers and barriers were afterwards ranked in order to find the realistic and most impactful scenarios. For each scenario the impact on the whey balance towards 2030 was evaluated.

Two of the most important developments that are likely to shape the availability and valorisation of whey solids will be environmental regulations in the key whey-producing regions, as well as global consumer trends and their attitude towards animal-based proteins.

There is an increased focus on environmental regulations that could lead to lower dairy production and/or an increased focus on farm level innovations to lower environmental impact of dairy production in the key exporting regions. Meanwhile there is a countering trend that food security becomes a political priority in an increasingly geopolitical unstable world. Outcome of this political debate is a key influencer for the global whey industry for the remainder of this decade.

"dietary revolution” going on. The extent to which this really shifts global diets remains to be seen. It could be the shift to plant-based protein accelerates and these products become a viable replacement for animal-based proteins. Nevertheless the penetration of the revolution on a global scale and throughout all layers of society is a question. It can be imagined the current growth rate will not be sustained. Also slow consumer acceptance of highly technological alternatives could lead to a dietary evolution instead of a revolution.

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Axis 1: Environmental regulations

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<tr>
<th>Environmental regulations</th>
<th>Sustainable production</th>
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<tr>
<td>Food security</td>
<td>Sustainable production</td>
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<tr>
<td>Implications:</td>
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<tr>
<td>Food security/low political priority</td>
<td>Sustainability has political priority</td>
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<tr>
<td>Adapted implementation of environmental regulations</td>
<td>Roll-out of F2F strategy</td>
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<tr>
<td>Continued milk/cheese production growth; continued growth in whey supply</td>
<td>Significant increase of environmental regulations</td>
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<td>Significant impact on whey/ cheese production growth; limited whey supply</td>
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Source: EWPA analysis 2022

Axis 2: Consumer preferences

<table>
<thead>
<tr>
<th>Dietary revolution</th>
<th>Dietary evolution</th>
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<td>Implications:</td>
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<tr>
<td>Acceleration of vegan trend</td>
<td>Slow increase in consumer demand for dairy protein alternatives (e.g. plant-based; cellular technology)</td>
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<tr>
<td>Fast consumer acceptance of cell-culture and precision fermentation-based dairy protein alternatives</td>
<td>Continued strong dairy protein demand growth</td>
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<tr>
<td>Slower dairy protein demand growth</td>
<td>Continued pork demand growth; expansions of pig herds in Asia; increased whey feed demand</td>
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<td>Slower pork demand growth; decline in pig herds in Asia; limiting whey feed demand</td>
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1. Whey for all scenario

Global policymakers prioritise food security in their policy making. Continued inflationary pressure and scarcity in global food availability (partly driven by ongoing conflicts) have put a hold on further implementations of environmental restrictions. This means the decline in European dairy herds will be limited/stopped for now, while on-farm costs will remain relieved from extra mitigation efforts.

As a result, European milk output will be maximised, with no limitations on the growth of the European whey pool. In Oceania, a similar trend can be observed. North American whey supply continues to grow as of today.

At the same time, consumer preferences have developed at a high pace. New alternatives to traditional diets have been embraced, ranging from increased penetration of vegan options to fast acceptance of new technologies. Cell-culture and precision fermentation-based proteins have become a part of the regular diet and continue to grow.

Especially in sports and active nutrition applications, as well as in Western food, the demand for whey protein grows at a much slower pace than today.

2. New Horizons scenario

European policymakers put a high priority on reducing emissions and continue to roll out the Farm to Fork Strategy, and globally similar trends can be observed. As a result, increased environmental restrictions continue the need to reduce dairy herds while also increasing on-farm compliance costs. This is putting global milk output under significant pressure, resulting in a limitation of the whey pool growth.

Meanwhile, consumers have changed their diets, moving away from animal-based protein towards alternative proteins like plant- or fermentation-based proteins. Besides a slowdown in whey proteins demand for performance and active nutrition applications, this trend also has led to lower meat consumption, like veal and pork. As a result, global milk output continues to grow, as well as the global whey pool.

The whey market moves into a new equilibrium, where reduced supply and demand establish a new balance. Innovations in whey protein are accelerated and whey is more and more a specialty ingredient. It is applied where alternatives have proven to be less popular or less functional. Whey proteins with specific health benefits for infants, athletes, patients, and for healthy ageing will dominate the whey protein market, as well as specialty whey proteins with unique functionality for taste and texture in food applications. Whey will no longer be applied because of traditional or cost-saving reasons.

3. Wheyvolution scenario

The further implementation of environmental restrictions within Europe is progressing at an adapted rate. Global conflicts and geopolitical tensions have increased across the world, putting more limitations on trade. This creates a lot of uncertainty in food availability, which puts food security globally higher on the priority list. As a result, milk output continues to grow, as well as the global whey pool.

Meanwhile, consumers continue to have whey protein as part of their diet as they value its nutritional benefits. We see a continued and consequent growth in demand for high-whey proteins, especially in performance and active nutrition.

Whey demand for infant formula applications continues to increase at a steady rate in line with the growth of the global
While whey availability is limited, global whey demand continues to grow. Not least COVID-19 has made consumers more conscious about healthy and nutritional food, which is translated into continued strong demand for high-whey proteins. Plant and technology-based alternatives are growing as well, but don’t reach the same level of consumption as whey protein. Especially where whey is superior in nutritional value and functionality, the market is craving whey proteins. The supply limitations will force formulators to use alternatives where they are available. Whey will be used where it is indispensable, and no good alternatives are available.

4. Indispensable whey scenario

The urgency to cut back on global emissions has received more and more attention, which has led to a significant tightening of environmental restrictions by rolling out the Farm to Fork Strategy in Europe and similar policies globally. Consequently, the reduction of dairy herds have accelerated, while higher environmental costs have put extra pressure on farmer margins. As a result, global milk and whey output has seen a significant slowdown compared to historical growth.

Conclusion

Whey for All, New Horizons, Wheyvolution or Indispensable Whey – which of these four overall scenarios will become the predominant force in shaping our whey future 2030 is to a good extent up to us, the whey people. Another determinant factor is the policy choice - here we only have the option to inform the decision makers and to promote our purpose.

Our key take away from the analysis carried out is:

- Whey demand for nutritional and specialized applications will continue to grow
- Supply of high quality whey is limited and growth is unlikely to keep up with demand
- The analyzed drivers, as well as ongoing whey innovation will lead to an increased value of whey compared to the past – this new whey value is the reality already today
- In this more and more volatile world, large producers partnerships providing certainty to both parties in uncertain times.

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Endnotes


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61 Ibid.
Applications of whey in the industry sectors

Food & Dairy Industry
Ice cream, Cookies, Yoghurts, Beverages

Infant Formula
Powdered and liquid formula

Sports Nutrition
Protein Waters, Protein Bars, Shakes

Pharmaceuticals
Medicines, Inhalers, Tablets

Specialised Nutrition
Elderly Foods, Slimming Foods

Medical Nutrition
Hospital Feeding

And many more...

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EWPA promotes good communication and understanding on Whey and related issues towards potential customers and consumers.