

# Plant-based innovations

## Manufacturing and ingredients



### I.T.S. creates Vegan Boost to deliver authentic flavour in plant-based bakery

International Taste Solutions (I.T.S.) has developed new flavour enhancers that “replicate the indulgent characteristics of traditional bakery products” in plant-based alternatives.

The Vegan Boost range offers an all-in-one solution that can be used to accentuate buttery and creamy flavours in a range of dairy- and egg-free cake and patisserie products.

The natural flavour solutions come in liquid and powder formats. Meanwhile, a higher strength range, Vegan Boost Extra, is available if more intense flavours are required.

Vegan Boost can also help to mask off-notes from ingredients used to replace dairy and egg in plant-based bakery items.

“Consumer demand for plant-based products is rising, but until now the bakery sector has been a little behind the curve,” said I.T.S. head of innovations, Carl Smith. “Vegan Boost offers no-nonsense flavours, and it provides an easy-to-use solution that is proven to work.”

### InnovoPro introduces chickpea protein-based egg white substitute

InnovoPro has unveiled a new functional egg white replacement system, CP-Foam 1001, which can be used to make vegan desserts such as meringue and mousse.

The new solution has been designed for manufacturers of desserts that usually require strong and stable foamed egg white. Products created using CP-Foam 1001 in place of egg white are said to retain the same taste, texture and mouthfeel as the original recipe.

According to InnovoPro, the egg white replacement ingredient can easily be foamed with just water and sugar to create stiff peaks that are light in colour and stable during baking.

The company claims that CP-Foam 1001 offers superior protein content and better foaming capabilities than aquafaba, and that unlike potato protein – another common egg white alternative – the solution has a clean taste.

CP-Foam 1001 is made from a blend of dry ingredients based on InnovoPro's trademarked chickpea protein: CP-Pro 70.





## Yemoja announces red microalgae formulation for mimicking meat juices

Marine ingredient start-up Yemoja has developed a red microalgae solution that can be used to add “authentic ‘bloody’ juiciness” to plant-based meat products.

The company’s formulation, Ounje, mimics the red juices of animal meat without the need for artificial colour additives.

The solution combines deep red algae – which are grown indoors in high-precision photobioreactors – with other derivatives from the same *Porphyridium* strain.

“While working on a new formulation for cosmetic applications, we serendipitously discovered that this specific composition yields a substance that resembles blood in appearance and texture,” said Amikam Bar-Gil, co-founder and CTO of Yemoja.

“Encouraged by the first test results, we decided to push the boundaries further and take it to the next level, trying it out in test products. The results were an immediate proof of concept.”



## Plantish unveils 3D-printed whole-cut vegan salmon fillet

Israeli food tech start-up Plantish has unveiled a whole-cut plant-based salmon fillet, which was created using its patent-pending 3D printing technology.

The boneless fillet is said to mimic cooked salmon in texture, taste, appearance and structure, while also offering the same nutritional value.

According to Plantish, the complexities of producing whole-cut plant-based fish lie not only in creating an authentic taste, texture and mouthfeel, but also in delivering on two other ‘crucial criteria’: structure and scalability.

The company – which is less than a year old – is developing additive manufacturing (3D printing) technology, that it says will produce plant-based fish alternatives at a low cost and on a large scale.

The food tech start-up created Plantish Salmon by “reverse engineering the actual fish”, then assembling ingredients such as algae extracts and legume proteins into the right configuration using additive manufacturing.

Plantish Salmon will be launching in select pop-up locations by the end of 2022, while its official launch is planned for 2024.



# Eggs reimaged

How do you like your eggs in the morning? Scrambled, fried...or made from mung beans? How about pea or chickpea protein for that matter? Thanks to plant-based innovation, all this is now possible. Meanwhile, ingredient companies are developing new functional solutions that can help remove eggs from the food manufacturing equation. We take a closer look.



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It is a favourite, age-old conundrum: what came first, the chicken or the egg? When it comes to the development of the plant-based market, however, there would appear to be a clear frontrunner.

While the meatless chicken category now boasts countless iterations (whole cut, breaded, shredded, deep fried...), faux egg products have only recently started to become more mainstream.

Rik Roberts, general manager at Plant Heads, believes the reason the category's development has lagged behind other plant-based alternatives is that the egg is "really difficult" to replicate.

"As you know, an egg can do a multitude of things. In cooking egg white is used for aeration generally; while egg yolk is used to emulsify," he told *The Plant Base*.

"Combined together, they both help the item you're cooking to rise and bind, leading to a lightening in texture. Making something that aerates isn't difficult, or making something to emulsify isn't hard – making something do both, at the same time, is."

Yet, if the market is a tough egg to crack (no pun intended), the opportunity is sizeable. Alongside

poultry meat, eggs are among the most widely eaten animal-source foods globally.

According to the US Department of Agriculture (USDA), the country's titanic agriculture machine produced more than 113 billion eggs in 2019.

Moreover, as Andrew Noyes, head of global communications at Eat Just, points out: "Despite the newness of the category, plant-based eggs are making progress – and growing quickly".

Very quickly in fact. Looking at the US again, dollar sales of plant-based eggs in retail grew 706% from \$3 million in 2018 to \$27 million in 2020, according to SPINS data supplied by the Good Food Institute.

What's more, in addition to products that seek to replicate both the function and full sensory experience of eggs, the market for substitute ingredients that provide one or more of the same functional properties has witnessed an explosion of innovation.

Among these, InnovoPro's CP-Foam 1001 offers a functional egg white replacement system, while EggField's core product covers binding, foaming and emulsification. And targeting home cooks, Atlantic Natural Foods' The Neategg can be used to replace egg as a binder in recipes such as for cake.

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## Whipping up excitement

The growing appetite for plant-based foods generally is undoubtedly one factor accelerating innovation in egg alternatives.

The rapid growth of the vegan movement – which, in the UK, quadrupled its followers between 2014 and 2019, according to research by Ipsos Mori for The Vegan Society – has driven demand for plant-based alternatives of every variety.

“As more people are reducing their animal protein intake, and moving across into a vegan/plant-based lifestyle, they hanker after the meals they used to eat,” said Plant Heads’ Roberts.

Meanwhile, abstinence initiatives, such as Veganuary and Meatless Mondays, are spurring trial of plant-based alternatives among meat eaters and vegetarians, and fuelling the flexitarian movement.

No doubt hoping to gain a foothold with this year’s Veganuary cohort, London-based Oggs announced a raft of restaurant partnerships for January. The new menu items run the gamut from Bella Italia’s CarbOggnara – made using the brand’s Scrambled product – to cocktails and puddings that incorporate Oggs’ aquafaba (chickpea water) ingredient.

In addition to the soaring popularity of plant-based, Laura Lapp, Atlantic Natural Foods brand ambassador and creator of The Neategg, points out that “eggs are among the most common food allergies in children, and eggs are in the majority of baked goods” – highlighting the need for products that can replace egg as an ingredient.

Atlantic Natural Foods’ The Neategg is made from just chia seeds and garbanzo beans. “Egg replacements provide a safe way for those with allergies to enjoy these traditionally egg-containing foods,” said Lapp. “Even better, The Neategg is gluten-free, making it friendly to those with complex allergies.”

## Crunch time

If the egg substitute market is currently relatively small, plant-based alternatives could have significant impact both in terms of animal welfare and the environment.

Male chicks – of no use in egg production – are considered a byproduct of the industry and are customarily killed upon hatching. Methods include: gas, electrocution and maceration (in layman’s terms, the grinding up of live chicks).

According to the Royal Society for the Prevention of Cruelty to Animals (RSPCA), around 45% of egg-laying hens in the UK are still kept in cages, with limited ability to move around and perform natural behaviours.



Silvan Leibacher, co-founder and CEO of EggField, believes there is a particular imperative to provide an alternative for eggs used in food manufacturing, as these may not be produced to the same welfare standards that consumers expect from whole eggs.

“In Switzerland, the organic share of eggs is almost a third – when we talk about shell eggs. It’s a lot lower when we talk about egg as an ingredient,” he told *The Plant Base*. “Producers ▶





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Animal products – meat, farmed seafood, eggs and dairy – were found in one landmark study to contribute 56-58% of food's different emissions



are obviously very cost sensitive so they often use eggs that are maybe not being produced to the most ethical standards."

On environmental grounds too, the case for plant-based alternatives is compelling. Animal products – meat, farmed seafood, eggs and dairy – were found in one landmark study, published in the journal *Science*, to contribute 56-58% of food's different emissions, while providing just 18% of our calories.

San Francisco-based unicorn company Eat Just, which offers pourable, 'folded' and sous vide bite products under its Just Egg brand, has now sold the plant-based equivalent of 200 million eggs.

"In doing so, we've saved 7.2 billion gallons of water..., avoided 29 million kilograms of CO<sub>2</sub>e (that's the equivalent of taking 6,287 cars off the road for a year), and spared 11,800 acres of land," Noyes said.

### 'Eggs' for every occasion

What do you cook when you are pushed for time, money or ideas? If you are not vegan, it is likely an omelette will be somewhere on the list – or scrambled, boiled or fried eggs for that matter.

Cheap, filling, nutritious, versatile and easy to prepare, eggs' many attributes have earned them the status of a household staple, and so there is a healthy market waiting for faux eggs – products that can simulate eating an egg.

Plant-based manufacturers, however, have their work cut out to deliver against even just some of these attributes, while also tackling the mammoth challenge of taste and texture.

Noyes claims that Eat Just searched thousands of plant samples for the right functional properties, before the food tech firm alighted upon one that "magically scrambles like an egg". Noyes told *The Plant Base*: "The unlikely source was a 4,400-year-old legume called the mung bean".

Oggs first made a name for itself selling its aquafaba ingredient, but now offers a plant-based egg product that can be scrambled like its animal-derived counterpart.

"Our Scrambled Oggs is made from chickpea protein which gives it that bite you would expect from a scrambled egg. It contains garlic, onion powder and a touch of black salt to create that soft egggy flavour," said Oggs founder, Hannah Carter.

"In terms of functionality and texture, it can be used in the place of eggs as a source of protein





in a variety of dishes, such as scrambled [egg], omelettes, quiches, carbonara and more."

According to Roberts, the current focus for Plant Heads, which owns Crackd The No-Egg Egg, "is on everything – taste, texture and functionality". The company's newly launched second-generation Crackd product features pea protein, alongside kala namak and a secret ingredient that aims to "'dial up' the eggy flavour". On top of this, the new offering is fortified with vitamins B12 and D.

"What I think is going to be very difficult, nigh on impossible, is having one product that can either be the yolk or the white in the same bottle," said Roberts, adding however that "there's so much development going on in this space..., I'll probably look back at this comment in 12 months and blush at my naivety".

### Focus on functionality

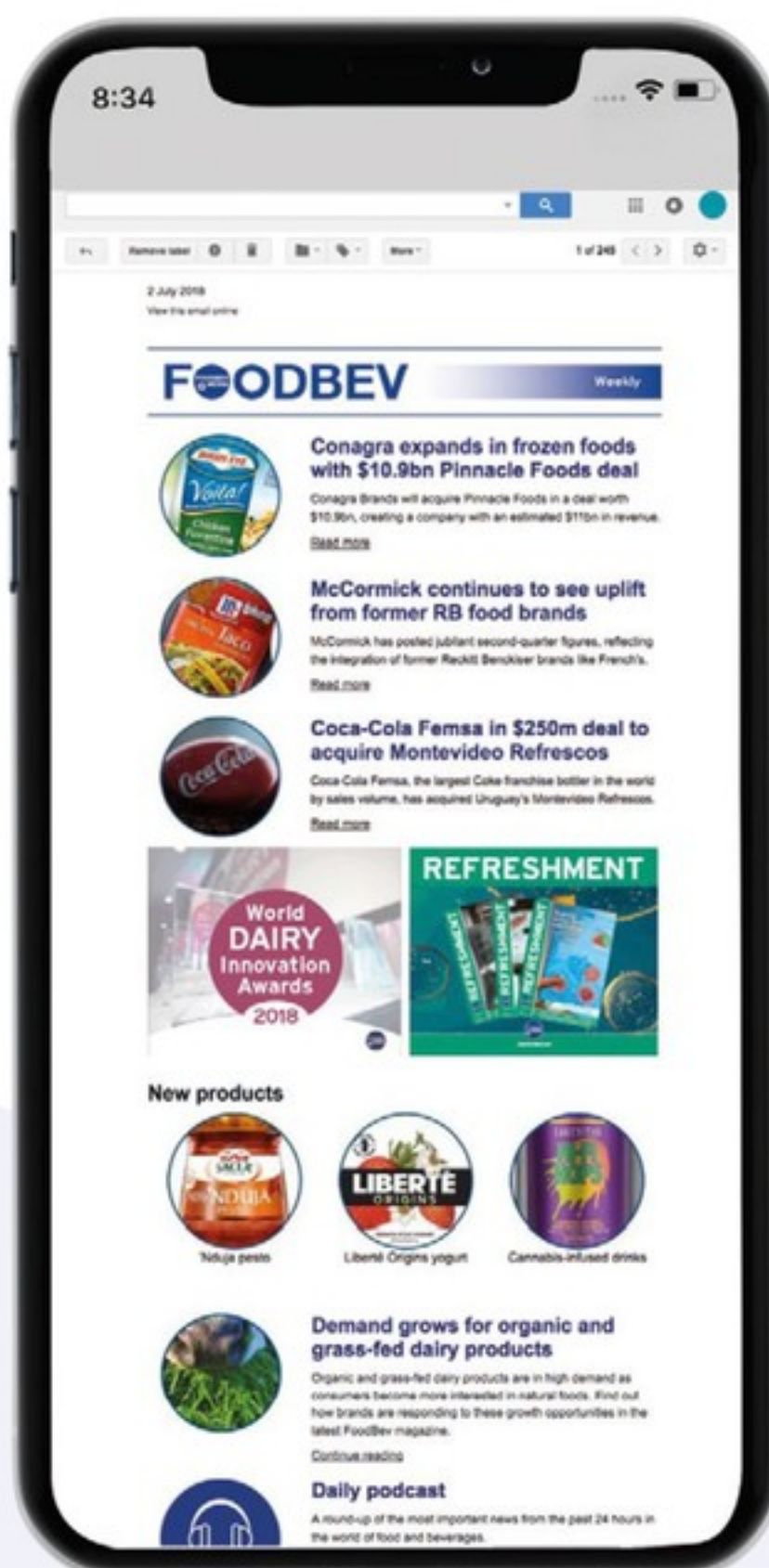
While faux egg products also have to consider an authentic taste and appearance, for producers of egg replacement ingredients for food manufacturing, the focus is almost entirely on functionality.

The use of eggs is ubiquitous in the food industry, as Shiru's VP of product Jason Voogt elaborates.

"In baking, eggs act as a binder, thickener, coating and leavening agent. In sauces, mayonnaise, salad dressings and soups, eggs act as an excellent emulsifying agent ▶

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and thickener. In some desserts...eggs provide gelation," Voogt said. He added that: "In other products...egg whites are used for their excellent foaming properties".

Shiru is developing egg replacement ingredients using its artificial intelligence-enabled technology platform, which it says can identify plant proteins with strong performance across specific, desirable functional parameters.

"Shiru has developed a comprehensive database of the world of proteins in edible plants and has annotated them by a broad range of parameters that can be used to predict their functional performance," said Voogt. "This database is queried by key features for the desired ingredient, and hits are then tested in the lab to quantify their functionality."

The company then uses precision fermentation to make exact molecular replicas of plant proteins that can, for example, match the gelation properties of eggs.

For its part, InnovoPro has focused on replicating eggs' foaming properties with its latest solution.

"CP-Foam is a dry blend that includes our chickpea protein as well as other ingredients...You mix it with water and sugar and voilà, you get the same foam as with an egg white, and it performs the same," Guy Manor, VP business development at InnovoPro, told *The Plant Base*.

Manor sees plant-based desserts as a fast-growing category and says that "we had customers coming and asking about solutions". CP-Foam has already been used in a range of applications, from meringues to mousses.



EggField offers two products that together cover five functionalities of eggs – binding, foaming, gelation, emulsification and high protein content – and which can be used separately or in combination depending on the requirements of the recipe.

"For us, the egg is a bit of a shortcut in communication. We talk about egg replacement because we offer solutions that replicate effects that can be created by employing egg," Leibacher said.

He believes that far from providing an inferior option, plant-based solutions have the potential to go beyond the functionalities offered by eggs and open up new possibilities in cooking.

After all, as he puts it: "The egg has not been made to make a perfect cake...but is actually the perfect product to grow a chicken".

### Egg without the hen

As plant-based continues its meteoric trajectory, the animal-free space is also heating up. With the likes of Perfect Day having pioneered precision fermentation in the dairy category, a number of companies now use the technology to produce milk proteins. Meanwhile, animal-free egg proteins have exploded onto the scene.

Animal-free products defy conventional definitions of plant-based foods, which Plant Based Foods Association for one considers to be "foods made from plants that do not contain any...molecularly identical ingredients to animal ingredients".

Nevertheless, like their plant-based counterparts, animal-free ingredients claim to offer ethical and environmental benefits when compared with animal-derived proteins.

Ingredient-backed food tech firm The Every Company, formerly Clara Foods, offers animal-free soluble egg white protein and an egg white replacer. CEO and founder Arturo Elizondo says the company's 'nature equivalent' proteins provide manufacturers with one-to-one replacements for animal-made egg ingredients.

Moreover, Elizondo told *The Plant Base* that Every's ingredients offer "greater food safety (by eliminating the risk of zoonotic disease) and greater sustainability, including lower greenhouse gas emissions and water use".

The burgeoning egg alternatives market is not only expanding the culinary horizons of vegans and those with allergies, it is good news for animals and the environment too



Nowadays, you can make an omelette without breaking eggs – and much more besides. The burgeoning egg alternatives market is not only expanding the culinary horizons of vegans and those with allergies, it is good news for animals and the environment too. As innovation speeds up on both the ingredient and consumer product sides, expect to see more manufacturers and consumers flocking to the category. And with such a diverse array of products to sample, who can blame them? ●