

CREATING ALTERNATIVES TO MEAT AND MILK PRODUCTS



The appetite for alternative meat and milk proteins appears to be gathering momentum among a more diverse eating culture. Is it time for New Zealand to make the next big leap and seek out its own alternatives?

A trend away from meat

The recent introduction of the first lab-grown hamburger, which is produced from cultured meat, will be of interest and concern to meat producers globally. This discovery prompts us to think deeply about the future of New Zealand meat industries and ask these questions:

- What drives consumers to base their main protein intake from meats, plants or even insects?
- How will consumers perceive novel or unfamiliar meat and milk alternative products if they are produced and presented in a way that is more acceptable to them?

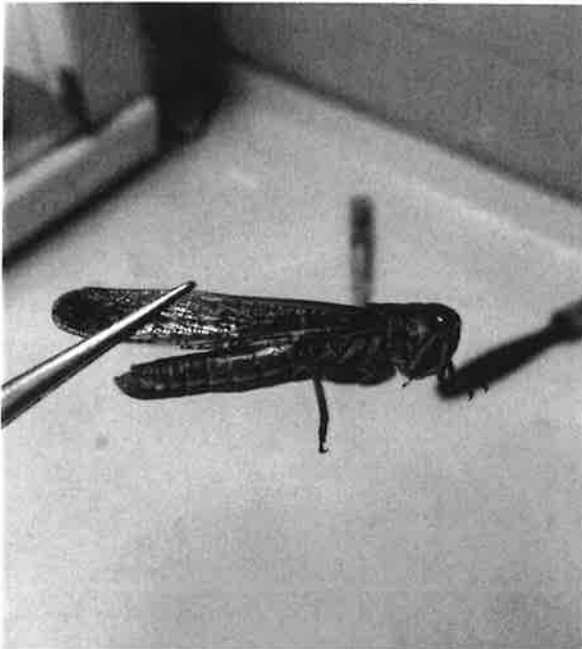
Some global consumers enjoy meat and milk products, others the crunch of insects, or the unique sensory properties of tofu, hummus and falafel. For some, plant-based foods are their only realistic option. One hundred grams of protein from crops generally take far less water and natural resources to grow than one hundred grams of meat. As such, some regions of the world are more suited to growing crops instead of raising animals, skewing the local population's diet in that direction. Some cultures treat livestock as prized possessions, to be killed for meat

only on special occasions, or passed between families as dowries. In such cultures, it is more practical to consume protein from plant sources. Thus, the global consumer drivers are diverse and varied.

Shifting away from animal-based proteins, such as meats and milk to plant-based proteins, has become a trend in western diets. This movement is due to consumer choice and perceptions driven by social, ethical and environmental concerns. Some will not eat animal products because of animal welfare concerns. Others will not consume them because they believe raising livestock causes environmental damage, such as the pollution of rivers and the creation of methane, a greenhouse gas. Some may be vegetarian or vegan for religious and/or social reasons.

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Insects are an interesting source of protein, because it takes even less water and natural resources than plants and animals to grow for the same quantity of protein.



Whole locust insect (L) and ground locust powder (R): Photos: Courtesy of Claudia Clarkson

The research community and the food industries have therefore been putting much effort into exploring the use of plant-based proteins and finding novel protein sources, such as from insects and algae, to replace animal-based proteins like meat and milk.

Exploring plant proteins

An animal-based protein, such as eggs, meat, milk and seafood, is known as a 'complete' protein source because it contains all the 21 amino acids. In comparison, plant proteins are 'incomplete' because they lack, or do not have enough of, certain amino acids. This deficiency must be accounted for by consuming a variety of complementing protein sources. Since humans cannot synthesise nine out of 21 amino acids, they need to source these from their diet to maintain optimal health.

While plant protein may not be a complete protein, it has been a part of the human diet for millennia in both minimally and extensively processed forms. The earliest extraction and processing of plant protein came from soybeans. The creation of a myriad of products from it, such as tofu, tempeh and soy milk, can be found in the Central and Southeast Asian cultures and tofu has been a widely accepted product in the western diet. In the Arabic and Indian cultures, hummus and falafel made from chickpeas, and curries made with dhal or split lentils, are popular.

Consumers are demanding more variety in plant-based foods. Western businesses also use different marketing strategies to promote existing plant-based foods, for instance, trying to make more creative products such as an Asian tofu burger or meatless burgers. Various food processing technologies and product formulations have also been developed to make new products that mimic meat and milk products. For example, meat texture-like soy proteins have been created from wet extrusion to increase their appeal.

Apart from legumes, another source of plant protein is from seeds and tree nuts. Substituting animal-based milk with various plant milk products has seen a wide variety of products available in the global market, such as soy milk, coconut milk, rice milk, almond milk, hazelnut milk, cashew milk, hemp milk, and recently flaxseed milk. This is helpful for those who may be lactose intolerant and cannot consume bovine milk.

Exploring unfamiliar sources of protein

Insect protein

But where else can we find protein, if not in animals or plants? Although it is tempting to continuously improve the production of animals and crops to feed the growing world population, humanity cannot afford to not look elsewhere and the first place to find dietary protein is



Legumes and nuts products at traditional Chinese market in Shanghai

Another potential alternative to animal proteins is being developed in New Zealand in the form of isolated wool protein. The use of wool protein as a food ingredient is currently being investigated.

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Insect protein is considered an emerging and niche protein source in the west, but we are only just beginning to find out more about it. Studies on the amino acid profile of insect profile are ongoing and the current literature indicates that this profile is for a 'complete' protein. However, scientists are still not entirely sure how the human body reacts to or will utilise insect-based protein.

Traditionally, insects have been consumed in many cultures as food, but not as a staple. They are eaten as snacks or supplements to the main diet more than anything else. Some Asian countries, such as Thailand, have launched packaged baked insects as snacks. Unfortunately, from a marketing perspective, while they are enjoyed in many cultures insect products can cause an involuntary feeling of fear and even disgust in western consumers.

To counteract the revulsion felt by many at the sight of whole insects, it is possible to process them so they no longer have wings, legs or antennae by producing insect flour, such as ground cricket flour which contains 60-70% protein. Commercially available insect protein isolate is still limited and can only be obtained from specialty and online stores at a premium price. This is because even though resources used in their production is low, the demand and economy of scale has not been achieved to bring the price down to a competitive level.

However, entrepreneurs have been creative at making products based on insect proteins. For example, protein bars made from insect proteins are marketed as a nutritious, delicious and environmentally responsible protein source for athletes, and some chefs have incorporated ants into gourmet ice-cream.



Plant protein products sold on the same shelf as whey protein products

Wool protein

Another potential alternative to animal proteins is being developed in New Zealand in the form of isolated wool protein. In considering animal, plant and insect proteins, the perspective has always been to create more protein with less resources. Wool protein is a source of protein from, arguably, waste. Wool processing has waste, and the waste has protein. Could that protein be efficiently extracted to create innovative protein products? The use of wool protein as a food ingredient is currently being investigated.

Price point

Scientific concerns aside, the main economic challenge now in putting insect or alternative protein into the western human diet is the price and availability. Until they are more accepted by consumers, thus increasing the supply and the decreasing price, they may remain at the fringe of consumer demand.

How does science fit into this?

The obstacles facing alternative protein sources, and the wider area of food security, are constantly being tackled through research and technology. New methods for creating more nutritious, minimally processed foods in greater yields are constantly being explored:

- In the livestock industries, scientists are looking into translating one tonne of plant feed into the maximum amount of meat
- In the plant foods industries, current research is ensuring the plant protein consumed by humans is in the most digestible and beneficial form possible.

Scientists are working hard on studying the potential of alternative sources of protein, such as insects and wool, and incorporating them into our diet. It will be the combination of scientists, industries and governmental bodies working together that will create acceptable and sustainable alternative protein foods.

The final challenge outside the production aspect is ensuring we are not venturing blindly into the unknown. Cooperation from the public health sector will greatly accelerate our knowledge of the long-term effects or unexpected health impacts of consuming alternative proteins. For example, the mismanagement of providing incomplete protein can lead to amino acid deficiency and insect protein is yet to be fully understood.

Diversification to feed a global population

For New Zealand, the heavy emphasis on the dairy and meat industries has built a world-class reputation for its exported produce. However, diversification is needed to ensure sustainability of the soil, the environment and, ultimately, the future. Increasing meat production through efficient meat extraction and waste minimisation will allow greater resources to be diverted to alternative protein production, be it in the field of environmentally-friendly nitrogen-fixing crops or theoretical domes of sustainable and cheap locusts and crickets. It is through this that New Zealand, and the world, will eventually be able to feed its population a wide, diverse and balanced diet for optimal health.

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