POLICY BRIEF

The Potential of Novel Foods in Addressing Food Security in the Philippines

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Policy Implications

- Novel foods are produced to present innovative solutions to address obstacles in food security. Some novel foods also aim to prevent the depletion of natural resources and reduce the strain on the environment caused by agricultural production activities. Similar with other emerging technologies, novel foods face barriers toward the attainment of its potentially significant benefits and economic impact.
- Building a strong and science-based regulatory framework, an enabling policy environment, and a progressive innovation ecosystem are prerequisites to realize the significant potentials of novel foods towards attaining food security in the Philippines.

Introduction

Aiming for food security for a growing population entails environmental constraints and societal challenges.

The Philippines is highly vulnerable to a changing climate and an increasing population amidst a diminishing area of tilled or arable lands, which can greatly impact national food security. The country's population was projected to reach 138.67 million by 2055 (Philippine Statistics Authority, 2024). As of 2023, 44.7% of Filipinos suffer from moderate to severe food and nutrition insecurity and 28.8% of children below five years old suffer from stunting which are both higher than the world average of 29.5% and 22.3%, respectively. It is also reported that the purchasing power parity (PPP) of Filipinos to afford a healthy diet is higher than the world's average at USD 4.364 PPP per person in 2021. The Food and Agriculture Organization (FAO) also estimates that as of 2021, 84.3 million Filipinos are unable to afford a healthy diet.

A possible solution to food insecurity, while promoting sustainable agriculture and helping mitigate climate change, is through the development, production, and utilization of novel foods. In the USA, novel foods are not considered as a food group that needs to be subjected to biosafety regulations. The US Food and Drug Administration (FDA) assesses novel foods similar to how regular food is regulated, regardless of their technological, temporal, or geographical background (Vapnek et al., 2021).

The European Food Safety Authority (EFSA) (2024) defines novel foods as "those that have no significant history of consumption, or foods produced by a method that has not previously been used," and "not only innovative foods resulting from technological processes but also traditional foods coming from third world countries." It specifies that these foods have been nonexistent in the world market but are present in the traditional diets of third-world countries. Common examples of novel foods are chia seeds, noni fruit juice, exotic fruits, herbs and nuts, some kinds of tea leaves, and, in some cases, insects and exotic animals.

The Philippine FDA Circular No. 2020-033 defines novel foods as "new in the international or local market" and classified as high-risk foods. They may also contain "pathogenic microorganisms, support the formation of toxins or the growth of pathogenic microorganisms, and may contain harmful chemicals" (FDA, 2020).

Novel foods may thus be described as food products (including ingredients) that have been newly created through innovative means; items produced using advanced technologies and production methods; and foods that are traditionally consumed in regions outside of the local area (Vapnek et al., 2021).

Discussion

Biotechnology, the study and use of living organisms or its components to make commercial products, has been applied for the development of novel foods (Maryanski, 1990). Specifically, it can produce novel foods and apply relatively novel processes "to produce or improve existing foods" (Maryanski, 1990). These biotechnological processes include recombinant DNA or genetic modification and microbial fermentation, among others.

Plant-based milk alternatives that come from grains, nuts, seeds, vegetables, and other plant proteins are also examples of novel foods. These novel foods are produced mainly through extraction and homogenization of the plant material (Reyes-Jurado et al., 2023). Plant-based milk alternatives are reported to benefit lactose-intolerant individuals as they are also good sources of protein, calcium, and other nutrients (Shubrook, 2023).

Another form comes from biomanufacturing or cultivated meat industry which aims to come up with more sustainable meat production. A company, such as Multus, a start-up from Imperial College London, is an example of an initiative that promotes and supports the transformation of the market towards more sustainable food, particularly in meat production. It was reported that as of 2023, there are now over a hundred companies that work on cultivated meat production. In January 2024, Multus launched the first food-safe (FSSC22000-certified) commercial facility that can produce growth media for 500,000 kg of cultivated meat per year (Linton, 2024). Aside from cultivated meat, soybean plants have also been genetically modified to include pig protein to replace a quarter of its beans' soluble protein, thus making this substitute more meat-like.

Molecular farming for novel food components

According to Bright Green Partners (BGP) (2024), foods developed from its molecular components, or molecular farming, transform ordinary plants and food into "biofactories or bioreactors that can produce beneficial proteins, pharmaceuticals, or biochemicals." It entails reconstructing wastes or underutilized resources to produce high-value products or more desirable forms of food through the study of biochemistry and molecular biology of food composition. Good Food Institute (GFI) stated that molecular farming enables plants to express target molecules such as animal protein which allows for its production in the plant. This method thus offers greater options for consumer preferences.

As of 2024, promising start-ups on molecular farming include Nobell Foods, Moolec Science, Mozza, and ORF Genetics that are genetically engineering plants for nutrient quality improvement, and gene encoding animal proteins to plants and plant-based cheese alternatives (BGP, 2024).

Nobell Foods' genetically engineered plants were developed to produce casein and other dairy proteins, and to create plant-based dairy products that replicate the taste and texture of their animal-based counterparts.

Moolec Science integrates genes encoding animal proteins into plants, such as soy and pea, aiming to produce dairy and meat proteins directly within the crops.

Mozza is engineering plants to produce mozzarella cheese proteins, offering a unique plant-based cheese alternative that could cater to the growing demand for dairy-free products.

The ORF Genetics uses barley to produce growth factors that are used by the cultivated meat industry.

The companies mentioned have research laboratories that are operating mainly in the USA, Canada, United Kingdom, and Europe.

Presently, very few companies on plant-based meat alternatives are based in Asia (e.g., Japan and Singapore) with most private investments in North America and Europe (Ahmad et al., 2022).

The second leading country in protein alternatives next to the USA is Israel, which was reported to have received almost USD 1 billion in investments (Baker, 2022). Examples of companies in Israel that delve into novel foods are Aleph Farms and SuperMeat, both of which develop and produce meat from stem cells.

Food from new sources and traditional food as novel food

Traditional food was recognized by EFSA as a subset of novel food, and includes foods produced from plants, microorganisms, fungi, algae, and animals like insects, as well as food that is traditionally consumed in countries outside EU. According to the European Algae Biomass Association (EABA), 29 algae species are already being used as food or food ingredients while six (6) microalgae species are considered as novel food as of 2024 (Zittelli et al., 2021). Macroalgae, such as seaweeds, are linked with health benefits such as lowering blood pressure and preventing strokes. They are also a rich source of protein, minerals, and vitamins. Microalgae, on the other hand, are beneficial for human consumption because of their high protein content, with balanced amino acids patterns, carotenoids, fatty acids, vitamins, polysaccharides, sterold, phycobilins, and other biologically active compounds (Zittelli et al., 2021). In 2022, the Philippines was one of the top exporters of seaweed amounting to USD 36.7M among the other top exporters which are mostly Asian countries including Indonesia, South Korea, Japan, and China (Observatory of Economic Complexity (OEC), 2022).

Entomophagy, the practice of eating insects, is not new in several countries in Africa, Asia, Latin America, and Oceania as there are two (2) billion people reported that eat insects as part of their diet (Aljazeera, 2024). Edible insects, parts of it or in its powder form, are being consumed as alternatives to pork and beef because of high protein content and high levels of vitamin B12, iron, zinc, fiber, essential amino acids, omega-3 and omega-6 fatty acids, and antioxidants (Nowakowski et al., 2022).

As of August 2023, four (4) insect species have been authorized by the European Commission as novel foods (Comans, 2023).

In 2024, the Singapore Food Agency approved 16 insect species as fit for consumption including crickets, grubs, moth larvae, and one species of honeybee (Sullivan, 2024).

In the Philippines, several regions or provinces are known to traditionally consume insects such as honey bees in Laguna; locusts in northern Luzon like Pangasinan, Pampanga, and Ifugao; mole crickets or kamaro in Pampanga; grasshoppers, beetles, and crickets in Batanes and Isabela; weaver ants in northern coasts of Luzon; beetles in Visayas, Ilocos region and Mindanao, among others. The main explanation behind entomophagy in the Philippines is not well-researched but one reason why people eat insects is to reduce pests that attack food crops, particularly in rice fields (Yen, 2014), or as an alternative to expensive meat and other viands especially during the '80s severe economic recession (Insect as Food, n.d.).

As a premier research and development institute, the University of the Philippines Los Baños - National Institute of Molecular Biology and Biotechnology (UPLB-BIOTECH), conducts basic and applied research on molecular biology and biotechnology addressing

problems related to agriculture, forestry, environment, energy, and industry that will have a positive impact on society. In its effort to contribute towards addressing hunger and food and nutrition security, UPLB-BIOTECH has developed several products that may be considered novel foods or inputs in novel food development and production:

- *Microbial enzymes* - enzymes such as cellulase, glucoamylase, lipase, alpha-amylase, xylanase, proteases, and pectinases are used in the conversion of different molecules into other products that can be used by the food and beverage industry and other commercial products;

- *Microbial Rennet* - locally-sourced from fungi that can be used as a substitute to commercial or imported rennet which is the key ingredient in solidifying milk for cheese production;

- *MONASCUS RED® food colorant* - used as an alternative to synthetic, petroleum-based colorants, and improves the appearance and taste of food, beverages, and food products with nutritional functionality (high antioxidant activity and contains cholesterol-lowering properties);

- *Probiotic guava leaf-based beverages* - a ready-to-drink fermented guava leaf tea and a probiotic guava leaf-based beverage ingredient in a versatile powder form containing Proculant™ (a probiotic inoculant) and guava leaf extract; and

- *Proculant™* - a microbial starter culture for various probiotic functional foods, particularly dairy, plant-based non-dairy, fish, and meat products.

Challenges to the adoption of novel food products

Regulation of novel foods varies depending on the jurisdiction and relevant legislation (Vapnek et al., 2021). The US regulation of novel foods, particularly cultivated meat, is shared between the FDA and the US Department of Agriculture (USDA). The EU has an established, sometimes described as "complex", regulatory guidelines for novel foods. In other countries such as Canada, Israel, Japan, and Singapore, differing and continuously evolving regulatory guidelines are also implemented (GFI, 2024).

In the Philippines, novel foods developed through modern biotechnology are regulated in terms of biosafety, in contrast to traditional foods in its native form or produced through cooking, frying, or fermentation, which are regulated for food safety, as per the Food Safety Act of the country. The regulatory framework for products of modern biotechnology in the country (e.g., GM crops) has been described as well-structured, comprehensive, and adaptive, following international standards on biosafety. Despite the robust National Biosafety Framework through Executive Order No. 514 of 2006 which established a science-based approach to risk assessment and management, challenges from opposing groups prevail and even hamper development (Manalo, 2024).

Studies have also identified psychological barriers to adopting novel foods such as plant-based meat alternatives (Goldstein et al., 2017). Food neophobia (fear of new things), unfamiliarity, and lack of knowledge on the product are some of the identified challenges in the consumer's acceptance of novel foods. In addition, novel foods in the form of meat, eggs, among others produced in the laboratories were construed to be costly. Despite these challenges, a well-informed and educated public on the science behind these products and potential positive socio-economic impact, can alleviate the apprehensions and propel innovative programs on novel foods towards the attainment of sustainable development in the country.

Conclusion

Initiatives on novel foods all aim towards shared positive societal outcomes to ease the strain on agriculture and the environment and ensure food safety in products in the market. Novel foods have different origins and processes of development, mainly based on the idea of providing more food with less and cheaper resources. To make novel foods work for food security in the Philippines, a strong political will and proactive support of these initiatives are needed to realize its immense potential.

Photo source: BIOTECH

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Policy Recommendations

- Strengthen collaboration among academe (research institutes), industry, and government offices (regulatory and funding agencies, policymakers) on the development and implementation of strong, science and product-based policy considerations applicable to novel foods that would highlight their nutritional and economic benefits.
- Foster a shared understanding among the regulatory agencies and policymaking bodies through scientific information, education, and communication towards an enabling policy environment for novel foods.
- Facilitate a thriving innovation ecosystem where both knowledge and market economies mutually support each other through incentives for researchers and innovators, funding support for public research institutes, and streamlined technology transfer processes, among others.

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