

## Legislative Framework Status for Using Insects as a Feed Component Source

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In the last decade, the consumption of insects as a source of energy through food and feed has brought important benefits for the environment, economy and securing sufficient amounts of food in the world. Insects are powerful bio-converters that can transform low-quality biomass into nutritionally valuable proteins. In addition, in recent decades, world population has doubled which led to increased food consumption, primarily meat. Therefore, there is a need for additional sources of proteins and other components for fattening animals from sustainable sources which includes farmed insects [1]. The results of studies conducted so far, in which insect meal has been used as a partial or complete replacement of the protein component in standard feeding, differ significantly [2]. Leiber, *et al.* [3] found that chicken feed containing crude protein originating from *Hermetia illucens* had similar or better conversion efficacy results compared to soybean proteins. Also, partial replacement of soybean meal with different combinations of alfalfa or pea protein with the proteins originated from *Hermetia illucens* does not affect the growth performance of fattening chickens compared to standard poultry feed. De Marco, *et al.* [4] conducted a study on the nutritional value of feed produced from *Tenebrio molitor* and *Hermetia illucens* meal used in feeding chickens which showed that both types of feed are valuable sources of readily digestible amino acids as well as metabolic energy. Due to the fact that proteins used in standard fattening are primarily from soy meal, and in a much smaller proportion or very rarely from other sources. Essential amino acids (methionine, tryptophan) had been supplemented as in synthesized forms, which are very expensive, and therefore significantly raise the cost of feed per kg. Therefore, it would be economically viable and environmentally acceptable to find a replacement for the protein component [5,6]. The latest researches are focused on the production of mixtures that would meet the nutritional needs of chickens in fattening by all parameters and which would not adversely affect the quality and safety of poultry meat or consumer acceptance.

Continuous increases in chicken meat consumption is the result of various factors such as lower costs, very good availability, greater convenience and ease preparation, as well as increased consumer awareness of health effects due to lower cholesterol content in poultry meat compared to red meat [7-9]. The International Agency for Research on Cancer (IARC) have conducted a meta-analysis of 800 epidemiological studies and found that at least half indicate an increased risk of colon cancer in consumers of red meat, especially beef, pork and meat of other large livestock [10].

However, the current legislative framework defines the types of substances to be considered as feed, addresses the issues of food safety and animal by-products, but does not allow the use of insects as a source of protein or other substances in feed. Because of the growing interest in using insects as a source of protein in feed across the Europe, legislation needs to be refined and adapted to the requirements and needs of feed manufacturers in terms of providing the possibility for insects using as a feed component.

Some Member States of the European Union, such as Hungary, Austria and Italy, have banned the commercial production and sale of edible insects, but have not resolved the issue of using insects in terms of feed components. Other countries, such as the Czech Republic,

allow the cultivation and sale of edible insects even without a defined legislative framework. Belgium, the Netherlands, France and the United Kingdom allow the use of certain species of insects for food and have national regulations in the this [11], but not in the area of feed.

One of the main reasons for the growing interest in using insects as a component of animal feed is the possibility of their cultivation on bio-waste and animal by-products and slaughterhouse waste, resulting in reduced waste, environmental conservation and lower production costs of the feed component of animal origin. However, European legislation in this regard has not yet been defined thus does not allow development of a circular economy. Areas without a traditional history of entomophagy (insect consumption) and a food safety policy that prioritizes avoidance and risk reduction, such as Europe, have strict rules on the use and production of insects and consider this type of product to be “new food” that must be labeled in accordance with the Regulation (EU) 2015/2283 of the European Parliament and of the Council of 25 November 2015 on novel foods, amending Regulation (EU) No 1169/2011 of the European Parliament and of the Council and repealing Regulation (EC) No 258/97 of the European Parliament and of the Council and Commission Regulation (EC) No 1852/2001 [12]. By May 2017, Commission Regulation (EU) 2017/893 of 24 May 2017 amending Annexes I and IV to Regulation (EC) No 999/2001 of the European Parliament and of the Council and Annexes X, XIV and XV to Commission Regulation (EU) No 142/2011 as regards the provisions on processed animal protein, identify seven species of insect that can currently be farmed in the European Union, and which meet the safety requirements for insect production in terms of farm and animal feeding [13]. There are also special requirements that insect production must meet certain criteria: insects must not be pathogenic or have other adverse effects on plants, animals or human health, must not be vectors of human, animal or plant pathogens and must not be invasive of the species.

There are also restrictions on substrates that must contain products of non-animal origin or restricted sources of animal origin, such as fishmeal, dissolved fats, blood and gelatin from non-ruminants, milk, eggs, honey, etc. Meat is not listed, however feces, catering waste, household and other waste is strongly forbidden for use. These restrictions reduce the risk of contamination during the production of insect larvae, but at the same time greatly limit their production. This issue is defined by Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 laying down health rules as regards animal by-products and derived products not intended for human consumption and repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation) [14]. The named Regulation, by Article 3, includes “farmed insects” in the definition of “farmed animals”, therefore the same feeding rules apply to the farming of insects as well as to the rearing of other animals used as food for humans. Thus, insects cannot be bred (fed) on animal by-products, as this could pose a risk to human or animal health. The background to this strict rule is in the historical fact resulted with the crises in the case of bovine spongiform encephalopathy (BSE) as well as the occurrence of dioxins in poultry feed.

According to the FAO document (FAO, 2013), insects are a natural source of protein for both fish and poultry. In accordance with this, the International Platform for Insects for Food and Feed (IPIFF) requires revision and amendment of existing regulations in a way to allow insect farming as a source of protein in animal feed for aquaculture, poultry and pig products on substrates 100% of plant origin [15].

From the safe production of insects point of view as a component of animal feed, the requirements of Directive 2002/32/EC [16] of the European Parliament and of the Council of 7 May 2002 on undesirable substances in animal feed - Council statement, as regards the maximum levels for nitrite, melamine, *Ambrosia* spp., the inevitable transmission of certain coccidiostats and histomonostats, must be complied. In this context, Van Huis [17] considers that cadmium levels in the insect substrate should be taken care of, while other pollutants, such as lead or zinc, pose less danger.

Due to all listed issues, using insects as animal feed has become one of the burning questions in the EU and on the level of the European Commission (EC). Because of numerous consultations, the Directorate-General for Health and Food Safety (DG SANTE) developed the Strategic Safety Concept for Insects as Feed in 2017. However, the EC has not yet adopted this document. The document refers to Regulation (EC) No 178/2002 [18] of the European Parliament and of the Council of 28 January 2002 laying down the general principles and

requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety, as well as on the Regulation (EC) No 1831/2003 [19] of the European Parliament and of the Council of 22 September 2003 laying down requirements for feed hygiene, clearly indicating the requirements for the general safety of products originating from insects. Furthermore, it addresses the issues of risk assessment regarding the insects made by the European Food Safety Authority (EFSA) and some national institutions of EU Member States dealing with food and feed safety issues, such as Belgium, France and the Netherlands. In addition, the document also considers insect species suitable for the production of protein sources as feed, including *Tenebrio molitor*, *Hermetia illucens*, *Alphitobius diaperinus*, *Acheta domesticus*, *Gryllobates sigillatus* and *Gryllus assimilis*. The document proposes to include these species of insects in the Annex to Commission Regulation (EC) No 609/2013, which contains the Feed Catalog. At the same time, the document also considers the types of substrates that would be suitable for the production of insects and emphasizes that they absolutely must comply with existing regulations. Furthermore, approval of production methods must be obtained from a national food and feed safety institution based on a risk assessment and defined production protocol as well as a Hazard Analysis and Critical Control Point (HACCP) plan. The EFSA Scientific Opinion of 8 October 2015 [20] provides the basis for the revision of the ban on animal feed with regard to the use of insects as PAPs in animal feed, which feed on substrates currently permitted by law for non-ruminant animals [21,22].

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