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PEAT, PLASTIC AND FERTILISERS IN ORGANIC GROWING ACROSS EUROPE - CURRENT USE AND FUTURE OPTIONS

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Abstract: The use of contentious inputs in organic growing was mapped across Europe in the H2020 project Organic-PLUS (GA774340) during 2018. This paper presents results on peat, plastic and animal-derived fertilisers in horticultural growing. Broadly, the use of peat and plastic is similar to non-organic production. Many organic growers use transplants, and the growing media usually contain peat. For plastic, the use is widespread for mulching and frost protection. Plastic is also used as tree guards and attaching clips. As a fertilisation input, dried poulty manure is used in all countries. Many more commercial fertiliser products are in use. They are often made from animal hide or vinasse. The application of such products varies widely between countries. The project aims to develop alternatives to these contentious inputs, which will be presented.

Introduction: The Organic-PLUS project provides scientifically informed decision support to assist EU, national and regional policy makers in phasing out contentious inputs from organic production across Europe. In addition to peat, plastic and animal-derived fertilisers, the project evaluates the use of plant protection inputs in horticultural growing (copper, sulphur, mineral oil etc.) and animal production inputs (antibiotics, synthetic vitamins etc.). Relevant alternative solutions are tested, and assessments made of phase-out scenarios. 10 universities, 6 research institutes and 10 multi-actor organisations from 12 European countries collaborate in this 4.1m Euro project (2018-2022). This paper presents results from work package (WP) SOIL, and describes the current use of peat, plastic and fertilisers in organic growing and some promising alternatives.

Material and methods: During 2018, two project WPs (PLANT, SOIL) collaborated to map the current use of inputs for plant protection (Katsoulas et al. 2018), and the use of peat in growing media, plastic use e.g. for mulching, and commercial fertilisers, especially those derived from animal by-products or manure from non-organic farms (Løes et al. 2018). The mapping used expert knowledge and a per-crop approach. From 14 crops in 10 countries, information was received from experienced advisors and/or farm managers. Spreadsheet-tables were filled in to describe the typical use of inputs during the growing cycle. The crops selected are important organic crops in the respective country. In total, 60 questionnaires were received, comprising of the following crops: apple, broccoli, cabbage, carrot, cereals, citrus, cucumber, eggplant (aubergine), lettuce, olive, potato, pepper, strawberry and tomato. The information was analysed per topic and country, and general findings were highlighted.

After the mapping activity, studies have been designed to test alternatives to peat, plastic and animal-derived fertilisers. For peat, promising alternatives comprise mature composts from horse manure, tree leaves, wood chips, pruning

materials (olives, fruit trees) and grass clippings (or mixtures of these materials). Extruded materials from various forest and gardening waste is also tested as growing media. For plastic, biodegradable plastic (BDP) must be distinguished from bioplastic (BP). BDP is often made with (some) fossil materials, whereas BP is made from lactic acid from renewable sources (e.g. maize). Whether such materials can be completely compostable is intensively discussed. In our project, completely degradable bioplastic foils from non-GMO materials are developed by an industry partner in Poland, and tested in field experiments in UK (leek, cabbage) and Turkey (pepper, cabbage). For fertilisers, several field experiments are ongoing in cereals (Denmark, Norway) and vegetables (Norway, Germany). Several fertilisers are studied such as legume-based fertilisers, directly applied residues from food industry, various digestates from anaerobic digestion of household waste etc., various composts, marine materials such as seaweed fibre and fish bones, and composted sediments from carp ponds.

Results: Regulations for the use of peat, plastic and fertilisers

The current regulation (EC889/2008) and the upcoming EC848/2018 mention “peat” only once, connected with growing of mushrooms. Annex 1, which is listing permitted soil amendments, mentions peat but restricted to horticultural use. The word "plastic" is not used in EC889/08 or EC848/18. Contrarily, Canadian and USDA organic standards put strict limits to plastic use. E.g., BP from polyhydroxyalkanoate (PHA) is accepted (microbial synthesis), whereas BP from polylactide acid (PLA) is not (chemical synthesis). Traditional plastic (not PVC) may be used for mulching, but must be removed after the growing period. In practice, biodegradable plastics are currently banned in organic growing in USA and Canada.

For fertiliser regulations, EC848/18 puts a stronger emphasis than EC889/08 to restricting the use of off-farm inputs to reduce contamination risks, hence limiting the ability to close nutrient gaps (Løes & Adler 2019). Fertiliser products from human excreta, and mineral N fertilisers, are not allowed. Non-organic inputs must be a natural(ly derived) substance. Mineral fertilisers must be of low solubility. Chemically synthesised inputs are limited to exceptional cases, with Annex 1-materials only, when the need for them is essential. Annex 1-materials must be of plant, animal, microbial or mineral origin. Exceptionally, products not being “identical to their natural form”, e.g. hydrolysed proteins and anaerobic digestates including animal by-products, may be applied, avoiding direct contact to edible parts of the crop. All substrates used for hydrolysis, digestion, composting etc. must be Annex 1-materials, hence excluding large amounts of food residues. In several countries, the use of digestate in organic growing is almost impossible (Løes et al. 2017).

Status of the use of peat, plastic and fertilisers

The purchase of transplants of tree crops (apple, citrus, olive), strawberries, grafted tomatoes and vegetables is very common. For tomatoes and strawberries, certified organic plants are available. For trees, organic nurseries are available but conventional trees are also planted and then converted.

For plastic, the use is extensive for mulching, solarisation and protection against frost, less often for insect protection. Plastic materials are used as tree guards, for attaching of plants to strings or sticks and to protect grafting wounds. The use of plastic for tunnels and greenhouses is extensive, especially in Southern Europe.

Conventional animal manure is used in all countries, commonly from poultry. Horn grid, meat and bone meal, blood meal and feather meal were not much observed, but many products applied are made from animal hides. Seaweed products are quite common, whereas fish-based products were only mentioned in the UK. In Northern Europe and Turkey, less types of organic fertilisers were mentioned than in Greece, Italy and Spain. Plant-based products, often from vinasse (sugar production residual), are more common than animal-derived. Information about raw materials in fertiliser products is often not readily available.

Discussion: Organic growing has not come very far to phase out peat or plastic. Both inputs are still widely used, but they are not renewable and fossil-fuel based products come with a large environmental burden. The consumption of these materials is in fact quite comparable to non-organic production systems. Regulations for organic production could well do more to restrict or eliminate the use of these materials in organic growing, to maintain the image of organic production as an environmentally sound farming system ahead of its time.

For fertilisers, the case is more differentiated: Some consumers, like vegans, see all animal inputs as contentious. Others want to make better use of all the available fertility from recycling. We find that in spite of strict regulations limiting the use of recycled fertilisers in organic growing, a broad range of commercial fertiliser products is widely used and in demand. A significant variation in the specter of fertiliser products between countries may be explained by different economic conditions of the growers, cultural differences, the extent of organic production and related markets, and the distribution of fertiliser companies.

Lack of information about fertiliser ingredients is a challenge for the organic industry, which is dependent on transparency to maintain consumers' trust. More transparency, better labelling and amended regulations, opening up for recycled

fertilisers to possibly replace some contentious animal-derived fertilisers made from factory farm-animal husbandry, is required for further growth of a sustainable organic production in Europe.
Alternatives to peat, plastic and animal-derived fertilisers are intensively studied in the Organic-PLUS project and will be presented.

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