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Plastics in agriculture: a contribution to Intensive Ecological Agriculture (IEA)

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CPA: French Committee for Plastics in Agriculture. CPA was created 55 years ago, with the purpose of promoting techniques using plastics in agriculture. Since 2009, CPA has been in charge of agri-waste management in France (60 000 tons collected and recycled).

APE Europe: European Association of Plastics Converters for Agriculture. APE Europe promotes techniques using plastics in agriculture in Europe and participates in the development of National Collecting Schemes (NCS) in every country in Europe.

Resume

Mr Bernard Le Moine received masters degree in political science at the University of Toulouse and in marketing at Aix-en-Provence in France.

Bernard has 25 years experiences in the US and Europe, in sales and marketing in the corrugated board, fertilizers and agri-plastic industries. Since 2006 he has been involved in agri-waste management and cooperates in the establishment of National Collecting Schemes in Europe.

Since 2009, Bernard is general manager of the Comité français des Plastiques en Agriculture (CPA) and APE Europe, the European association for the agri-plastics industry.

Abstract

For over five decades now, plastics in agriculture have allowed farmers to obtain a better quality and better efficiency in crop production. By using agri-plastics, professionals (farmers and growers, distributors and plastics producers) are involved from the start in the **protection of the environment**.



The use of plastic increases production in quality and quantity, while reducing the consumption of valuable resources (water, pesticides, fertilizers, energy). Plastics retain CO₂ and warm the soil, preserving humidity and reducing the leaching of pesticides and fertilizers. Plastics protect plants, roots, soil structure. This is the contribution of agri-plastics to an **Intensive Ecological Agriculture** necessary to feed the growing human population. Without plastics, 60% of fruit, vegetable and dairy production would be endangered.

Michel Griffon (IEA)³: *“Agri-plastics will face a growing demand in volume and in techniques. Bioplastics, encapsulated fertilizers in a polymer, agri-plastics as a repulsive support for insects, with a metabolized weedkiller effect...: **agri-plastic is a very promising product.**”*

Once collected, non-dangerous, used agri-plastic, made of homogeneous polymer, is a **resource** and is recycled. The European plastics industry mobilizes itself and gets involved in national collecting schemes (NCS) providing farmers with solutions for their waste management. By developing R&D projects, they improve quality and valorization: Agri-plastic brings its contribution to the **circular economy**.

Agri-plastic is an ally for farmers and growers. Farmers, distributors and producers are allied in the protection of the environment.

Introduction

Plastic is attacked from all directions as being a danger for the environment. There is no week without articles in newspapers and magazines or documentaries on TV against plastics as a threat for mankind, the sea, the planet and our children, although **we are providing solutions** for agriculture and the environment. For part of the population, using plastic is ridiculous and dangerous, whereas for us it is obvious.

However, imagine a world without plastics? Imagine agriculture today without plastic? Plastic is badly appreciated by civil society because it is unknown. You are invited to think about our product, its role in the production process, its impact on the environment and how the agri-plastics community (farmers, growers, distributors, producers, researchers...) contributes to an **Ecologically Intensive Agriculture** and to the **Circular Economy**.

³ Michel Griffon: President of the Ecologically Intensive Agriculture Association.



Hopefully, we will find key elements to explain more and more how positive our contribution is to feeding mankind today and tomorrow and to protecting the environment. As professionals in the agri-plastic activity we are well aware of the role of plastic and it is our responsibility to communicate properly to the public to improve our product's image, providing jobs and efficiency for agriculture.

Plastic improves agricultural production

For crop production in horticulture, fruit and vegetables, plastic plays an amazing role in greenhouses, small tunnels, mulching and irrigation pipes. Conceived and used since its origin in agriculture as an accelerator and amplifier of natural effects on plant growth, agri-plastic fulfils a biomimetic perspective: it duplicates and improves what exists in nature.

Plastics' impacts on fruit and vegetable production are:

- Allowing better control of climatic conditions for the root systems, vegetable leaves and fruit, photosynthesis, temperature.
- Encouraging the mulching effect, capturing CO₂, heating the soil and preserving soil humidity.
- Resistance to climatic change, protection against bad weather (rain, hail, sun...)
- Increasing production by enlarging the harvesting calendar, improving the yield by square meter, and the dried material content, allowing precocity.
- Improving production quality with a more regular plant growth, and a reduction in rot and waste.
- Limiting the "splash" effect from rain conducive to proliferation of fungus at the foot of plants.
- By the transfer or production from open field to greenhouses, and the increasing production per square meter, plastics liberate cultivation surfaces for other crops, increasing overall production.

In most countries, for many crops, production is no longer done without plastic. Some crops have disappeared from open field to be produced only under greenhouses. In some regions (Middle East, Africa...), production is simply not possible without plastic. If growers couldn't use plastic any more, 75% of the production would collapse for most fruit and vegetable production.

But plastic is not only influential for horticulture, fruit and vegetables. Plastic is also widely used for cattle farming with silage sheets, stretch, twines and nets for round bales. Plastic is an astonishing auxiliary for fodder:

- In feeding cattle with a high nutritious value and appetizing fodder



- In preservation, allowing stock building over a long period range without reducing nutritious capacities and minimizing dried material losses
- In protection from air and water or undesirable micro-organisms.
- To avoid losses during difficult climate conditions (rain) that can generate important fodder losses due to rot.
- In handling for stock and transport, reducing losses.
- A complete control in quantity and quality of herd and flock feeding all year long.
- To build stocks during favourable seasons of fodder production to balance with unfavourable seasons.

On top of that, plastics reduce investments for the farmer: no need to build barns, which always have the risk of fire... In many ways, plastic is a must for cattle farming, without plastic, meat and milk production would be reduced by 60% in developed countries.

Plastic protects the environment

Agricultural production's impact on the environment can be positive or negative. In many ways, the search for high yields has led to negatives external factors. As Michel Griffon⁴ explains: “*For example, the use of important quantities of fertilizer (NPK) described as an 'intensive' usage, contributes to a forcing of the mineral fertility function, with the risk of amputating a part of the natural fertility, that is to say, the fundamental ecological mechanism of fertility (soil biology's role).*” Forcing in modern agriculture has introduced important distortions. The result is the yield limitation by unit of production for the best or, for the worst, a yield reduction. Plastics will reduce or avoid those negatives external effects, while keeping those high yields.

The first impact of plastics on the environment can be observed even before the first harvest. Growers will limit consumption of pesticides (weedkiller, fungicide), fertilizers, water (micro-irrigation) and energy for a production improved in quantity and quality. It is difficult to find recent specific analysis measuring the impact of the use of plastic on inputs: this aspect has been obvious since the start of plastics developments, for every grower and for all of us. We can bet that the gap is significant in quantities and economically, as it is on the environment.

There are numerous impacts on the environment from plastic in agriculture:

- Roots, plant, cultivation, crop protection and preservation.
- Soil-structure protection: preservation of carbon, humidity, lower chemical inputs...
- Water-table preservation due to drip-to-drip irrigation, limiting or avoiding chemical leaching.
- Limits surfaces' occupation mobilized for cultivation.

⁴ Michel Griffon, *Pour les agricultures écologiquement intensives*, Edition de l'Aube, 2010.



Then, is it still possible to say that plastic is an ally for the environment? For some aspects, as we can see, we can certainly be affirmative. But before ascertaining such a statement, we must definitely consider agri-waste management.

Agri-plastics contribute to the circular economy

Agriculture generates all kind of waste. Among them, plastic is significant for growers and cattle farmers. Difficult to manage, sometimes dangerous, the elimination of plastic waste is a real constraint for them: cumbersome, difficult to manipulate, contaminated with soil and vegetables, it is not easy for cultivators and farmers to dispose of. Worldwide, every year several millions tons of used agri-plastic waste must be removed from agriculture. In Europe, we consider that more than 1 050 000 tons of used plastics are generated in agriculture, 60% coming from films.

Used plastic can be highly contaminated. For instance, 300 kg of plastic put on the field means 1000 kg or more of used film to be removed! Fertilizer and pesticide containers and packaging can be contaminated with dangerous substances.

However, plastic in agriculture is recyclable. Mainly made of polyethylene (HD & LD) or polypropylene, agri-plastics waste presents significant volumes of a homogeneous polymer. Properly prepared by the grower and the farmer, and collected, agri-plastics waste turns out to become a resource for the economy. The generated granule is used in a new product allowing the circular economy.

Unfortunately, because of a lack of collecting organization, bad practices, such as burning or burying, remain, today, the first way of elimination.

In many regions of the world, as in Europe, public authorities look forward to reducing the volume of waste by the development of the eco-conception, recycling and limiting landfilling or waste's exportation.

Farmers and growers are responsible for plastic waste generated by their activity. Due to technical or economic reasons, they are not in a position to manage this waste properly. They need and expect from their suppliers appropriate and environmentally responsible solutions to eliminate used agri-plastics.

For instance, in Europe, the responsibility can be transferred to the producers (plastics converters) under the legal frame of the Extended Producer Responsibility⁵. In several countries, farmers and growers, distributors and producers (plastics converters) are, all together, involved in agri-plastic

⁵ Extended Producer Responsibility (ERP) : OECD principle 1994



waste management. Countries organized with a National Collecting Scheme (NCS) are showing very good results with a collecting rate of over 75%, sometimes 90%, and a recycling rate of 98%.

Nevertheless, agri-waste management is very expensive. A 24 tons load of used mulching with a soilage rate of 70% represents 7 tons of plastics and 17 tons of soilage. With a rate of 30%, the ratio is the reverse: 18 tons of plastics and 6 tons of soilage. To transport 1000 tons of equivalent plastic, 143 trucks are needed for the first case, when only 55 trucks will be necessary for the second case. Furthermore, to be recycled, used plastic necessitates shredding, cleaning, grinding and drying operations before extrusion, so many operations generating costs. Therefore, it is necessary to develop solutions to ease the collecting and recycling of used plastics. For instance, in France, the R&D project “RAFU” aims for soilage contamination to be divided by four.

Developing collecting solutions and R&D projects on agri-plastics waste are the answers for an efficient waste management of plastic in agriculture.

Plastic is fantastic

The future for plastic in agriculture is very exciting. We can see, during the CIPA conference all innovations, present and future. Let Michel Griffon⁶ give us a few examples: *“Plastics could become supports for insect repellents and have a weedkiller effect at micro-local level. Their bio-sourced origin could maybe ease their decomposition, giving a contribution to fertilizing. The development of bioplastic, or bio-sourced, eventually bio-imitating of humus-molecule-function (nutriment fixing) plastics may contribute to nutritive substances for plants, while having a nutritive vocation and a soil structuration effect... I am convinced that plastics can be a biomimetic cover formula and a substratum for biological molecules to control disease and crops’ devastators (insects, pets...). Plastics could contribute to breaking the glass ceiling of yields observed in much conventional agriculture...”*

The human population will grow by 2.5 or 3 billion people: 9 billion by 2050. Asia, Africa, South America will have to multiply by three their agricultural production when the soil surfaces suitable for cultivation are not increasing anymore (even regressing in some cases) and the yield per hectare will be reduced. Europe and North America are safe: soils are cultivated and yields very high (one grower was able to feed five mouths in 1950, 100 today!). But they are facing another challenge: to do more with less.

To feed the future population is the biggest challenge the world is facing over the next decades, as the Braskem’s R&D vice-president forecasts: *“a high growth of demand for plastic in Brazil to face the increasing food needs and answer the necessity to acquire food autonomy”*.

⁶ Michel Griffon, CPA general assembly, June 2015



Plastic, since the beginning, has been an ally for cultivators and the environment. Its contribution to production and the environment is very high and will remain so for a long time.

As a conclusion, in order to enlarge the discussion, I will say that with **Ecologically Intensive Agriculture and the Circular Economy**, plastics for agriculture will be close to the **Blue Economy concept**, as developed by Gunter Pauli. Zero waste, is achievable by professionals all together: users, distributors, converters, researchers involved in the protection of the environment while contributing to feeding mankind. They can be proud of it.

Many thanks for your attention.

Bernard Le Moine
Paris, 2nd September 2015.