



**DELIVERABLE D.T1.1.4 “ANALYSIS OF PAPER-PLASTIC VALUE CHAIN AND INNOVATION SYSTEM”**

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## FOREWORD- COUNTRY CONTEXT

In Italy the multi-material cellulose based packaging represents approximately 3-4 % of the total paper based packaging produced in the country. This calculation takes into account rigid multi-material products such as milk containers (132Mt of multi-material/5057 Mt of total paper based packaging) as well an estimation of the share of flexible multi-material packaging made of paper/plastic. **The vast majority of the multi-material production is presently made of paper and conventional plastic.** The percentage of paper/plastic products with respect to the total of paper packaging has shown only a slight increase in the last two decades due to the fact that mono-material paperboard (3719 Mt) is still largely predominant in secondary packaging. Besides, different packaging solutions are possible for many dry food products like secondary paper package with an internal plastic bag in contact with food. However, the multi-material products based on paper and plastic are becoming more common in order to provide enhanced barrier performance and better protection against migration of contaminants and also to replace part of the petroleum based plastic in combined multi-material products (e.g. paper tray plus plastic film). Typically, different types of plastics or bioplastics are applied as a thin layer on the food contact side of package to provide barrier against grease, water or gases. These products pose additional constraints in recycling of paper products, therefore the organic recovery (compostability) may represent a good option in Italy thanks also to the large infrastructure of composting plants present in the country (more than 350 plants). Nevertheless, in some cases, such as multi-material products in contact with dry food, the recyclability is still a potential option providing that the design of the material/product is evaluated for its impact on recyclability. In this context, the Italian paper value chain has recently agreed on a standard methodology to assess recyclability of paper based products ([www.atichelca.it](http://www.atichelca.it)) thus contributing to proper recycling oriented eco-design.

## ANALYSIS OF THE VALUE CHAIN IN ITALY

In Italy basically all the actors of the paper and bioplastic value chains are well represented from raw material producers to final packaging converters and users. However, due to the fact that multi-material biocomposites based on paper and bioplastic are still scarcely represented in the market, it is not easy to collect specific data regarding these products. In the following sections some recent statistics are presented to depict the framework of the different sectors that contribute to the paper/bioplastic value chain.

## PULP AND PAPER INDUSTRY AND PAPER CONVERTING SECTOR

The pulp and paper sector in Italy has an annual turnover of 6.900 Mln€ and is composed by more than 150 (19.500 employees) factories scattered mostly in northern and center part of Italy. Only two of these factories produce cellulose chemical pulp, the others are paper producer using either imported cellulose or paper for recycling as raw material. Paper for recycling is the main raw material used by the Italian paper industry accounting for approximately 57% of the total cellulose material. Italy is the fourth country in Europe for paper production, (8.8 Mt in 2016) as well as the fourth utilizer of paper for recycling (10.2%) after Germany (35%), France (11.1%) and Spain (10.9%), which makes recovered paper collection and paper for recycling quality a key issue for the industry (*source: Assocarta/CEPI*). Municipal Recovered paper collection in the Northern part of Italy, included in CE area, has the highest rate (54%) and volume (1.7 Mt) of recovered paper collection of the country. In this region there are 33 out of the 55 paper recycling mills present in Italy (22° *Comieco report*). The total paper recovery overcomes 62% with a national paper recycling rate of 48.5%, however as far as paper based packaging is concerned the recovery is 88.2% with a recycling rate that reaches 79.6 %.

The paper converting sector is highly represented in Italy, at national level 2366 companies operate (38340 employees) producing 5.057.000 t of paper based packaging with an annual turnover of 7.270 Mln€. Most of it is paperboard 3.719.000 t followed by folding boxboard 769.000 t, the rest are sacks and other smaller categories.

Paper comprises also a large share of rigid multi-material packaging (70-80% of the total product) which for the most are liquid containers for milk, fruit juices, wine and other products. There are only five companies operating in Italy producing this type of products. This sector produces 139.000 t of products with an annual turnover of 470 Mln€ and employs about 1500 people. Apparent consumption in the country

## BIOPLASTIC AND CONVERTING SECTOR

The sector comprises 2400 companies and 32.000 employees with an annual turnover of 14.673 mln €. The plastic packaging placed on the market in Italy in 2016 was 3.240.000 t including the plastic sacks for the municipality collection. Apparent consumption in the country was 2.700.000 t (43% PE, 22% PET, 21% PP, 8% PS/EPS, 2% compostable). The flexible packaging represents 43% of the total and the compostable plastic represents 4% of the total of flexible packaging.

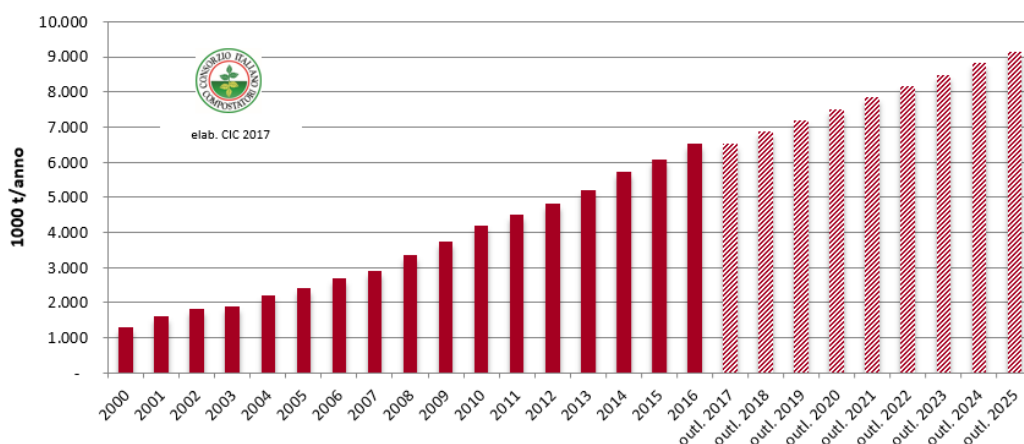
According to a relatively recent study, carried out by Plastic consult, approximately 50.500 t of bioplastic were produced in 2016 with a 59% increase with respect 2013. Of this amount, 73% was represented by shopping bags with an annual turnover of 240 mln €. The trend in 2016 seems to show a further growth. The sector of compostable bioplastics is comprised by 152 companies of which 17 raw material producer, 103 first converters, 32 secondary converters. The annual turnover of the sector is 352 mln€ (38.1% raw material producers, 56.8% primary converting, 5.1% secondary converting) with 3.930 employees.

The Shopping bags dominate the market of compostable plastic (94%), other flexible films for food contact and non-contact packaging (2%), disposables (2%), other containers (2%).

## COMPOSTING SECTOR

The sector is composed by 326 plants that treats 7.1 mln t of organic waste, 274 of them are aerobic composting plants whereas 52 are integrated with anaerobic digestors producing biogas. Paper represents approximately 2% of the organic waste and is normally compatible with the composting process. Yet, plastic is 4.5% of the organic waste collected and represents a serious contaminant of the process. Bioplastic is still only 37% of the total plastic fraction. In this context the reduction of the overall conventional plastic, especially shopping bags, is an important strategy to reduce the contamination of the organic waste, otherwise also a part of the bioplastic is missed due to screening operation aimed at elimination of conventional plastic

Fig. 1. Growth of composting sector in Italy in the last 15 years and outlook to 2025.



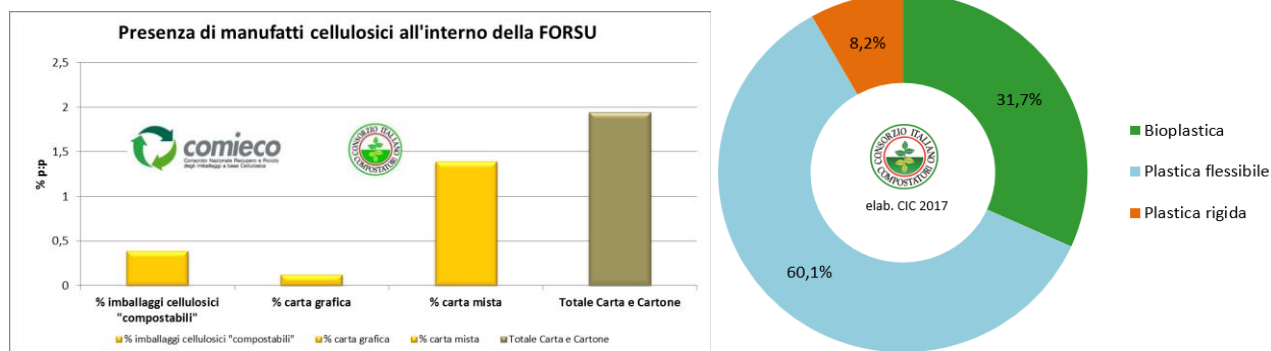


Fig. 2. Contaminants in the organic waste in Italy. A) paper grades, B) Types of Plastics

## LEGISLATION CONTEXT

The EU Directive 94/62/CE on packaging and packaging waste represents the general framework of any action intended to reduce the impact of packaging on the environment. The subsequent Landfill Directive 1999/31/EC of 26 April 1999, has also contributed to decrease the environmental impact of packaging reducing the amount of biodegradable materials sent to landfill. The actual implementation of these directives may be highly dependent from country to country. In Italy since the late 90s a number of measures has been taken to improve waste management in compliance with these directives until the final approval, in January of 2011 of the law on the mandatory use of biodegradable/compostable shopping bags. At that time, this law did not include the ultralight shopping bags as well as plastic bags with thickness greater than 150 microns that are considered reusable. Recently, from August 13, 2017 a new law has been enforced (D.L 123/2017), the new law implements the EU directive 2015/720 and applies to all shopping bags with and without handles including the ultralight bags for fruit and vegetables in the supermarkets. The law is mandatory from January 2018 and foresees fines from € 2.500 to € 25.000 with potential increase up to € 100.000 for those commercial entities bypassing the law. The Italian law foresees different scenarios based on the type of packaging, the main specifications requested are:

### Primary packaging (take away products e.g. fruit and vegetables, cold cuts, meat)

Material thickness (single side): <15 micron

- Certification of Biodegradability and Compostability (UNI EN 13432:2002) by accredited entities.
- Certification of minimum content of renewable raw material (EN 16640:2017) by accredited entities (at least 40% from 1.1.2018; 50% from 1.1.2020; 60% from 1.1.2021)
- Food contact compliance according to Italian legislation DM 21/3/1973 and European legislation (UE) 10/2011, (CE) 1935/04 and (CE) 2023/06]
- They cannot be sold for free
- Correct and clear identification statements must be printed on the bag (e.g Biodegradable and compostable according to EN 13432:2002, minimum % renewable content.)

### Shopping bags

Material thickness (single side): no limitations

- Certification of Biodegradability and Compostability (UNI EN 13432:2002) by accredited entities
- They cannot be sold for free
- Correct and clear identification statements must be printed on the bag (e.g Biodegradable and compostable according to EN 13432:2002)

## Reusable conventional plastic bags

Material thickness (single side): limitation on materials both for handles (> 200microns) and bulk of the bags (>100microns)

- Lower thickness is permitted in shops not selling food, however in this case at least 10% of recycled plastic must be used.
- They cannot be sold for free
- Correct and clear identification statements must be printed on the bag (e.g Thickness and minimum % recycled material content)

## Green Public Procurement

- Implementation of national strategy or Action plan
- Mandatory rules
- Identification of group of products relevant for paper/bioplasic value chain

## INNOVATION SYSTEM

In Italy the paper bioplasic packaging products still represents a niche market. However, there is a sort of a trend to replace conventional plastic with paper to increase the amount of renewable and recyclable material. In some instances, especially for fruit and vegetables, a paper tray can be combined with a bioplasic film, these materials can be easily separated by consumers and disposed in the paper bin and organic recovery, respectively. Similarly, paper sacks with a bioplasic window maybe directly sent to paper recycling and/or organic recovery depending on the type of end of life certification and the infrastructure present in a specific municipality. More complex multi-material biocomposite products (laminated or extruded) cannot be separated by consumers and therefore certification of recyclability or compostability is necessary to assess the proper waste management option. In Italy multi-material liquid packaging made of paper/conventional plastic is collected in most of the municipalities and sent to paper recycling in two paper recycling mills, one located in Verona (inside CE area) that produces paper based sacks and the other located in Tuscany just outside of the CE area producing toilette paper. Presently the situation of paper/bioplasic products is not yet clear because a limited amount of these products have been tested for their recyclability behavior. In contrast, there are on the market several paper/bioplasic products certified for their compostability, among them, trays, plates and glasses made of paper coated with biopolymers (PLA, Mater-bi and others) allowing resistance with liquids up to 70°C as well as products microwave approved.

## CONCLUSIONS

In Italy the share of bioplastics in packaging has increase by 59% from 2013 to 2016 mainly thanks to the progressive implementation of 2011 legislation. However, it represents, only 1.5% of the plastic on the market. The implementation of the new legislation concerning ultralight plastic bags is expected to further increase the share in flexible packaging. Currently it is difficult to define the relevance of paper/bioplasic products in the market, there are few leading companies present in the market with paper/bioplasic products but clear statistics are not yet available. The volumes and associated value are difficult to estimate. All discussion started in 2018 regarding the plastic strategy will possibly affect the market of single use products shifting part of conventional plastic to bioplasic also associated with paper to produce biodegradable and compostable products as well as replacing conventional plastic with bio-based plastic in paper based multi-materials that could be recycled in paper mills.

