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SDA Bocconi School of Management

## **Bioplastic : an economic and environmental evaluation**

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*Francesco.bertolini@unibocconi.it*

*Brussels*

MILANO | ITALY



## Establishing a bioeconomy is the European Union road

The road is very difficult and full of many hurdles

That's why we need more and more case studies to show that it is possible to have a successful bioeconomy, able to reach environmental and economic improvements.

## The framework

In 2011 Italy has banned plastic shopper sales.

European consumption 100 billion /year  Oil 910.000 tons

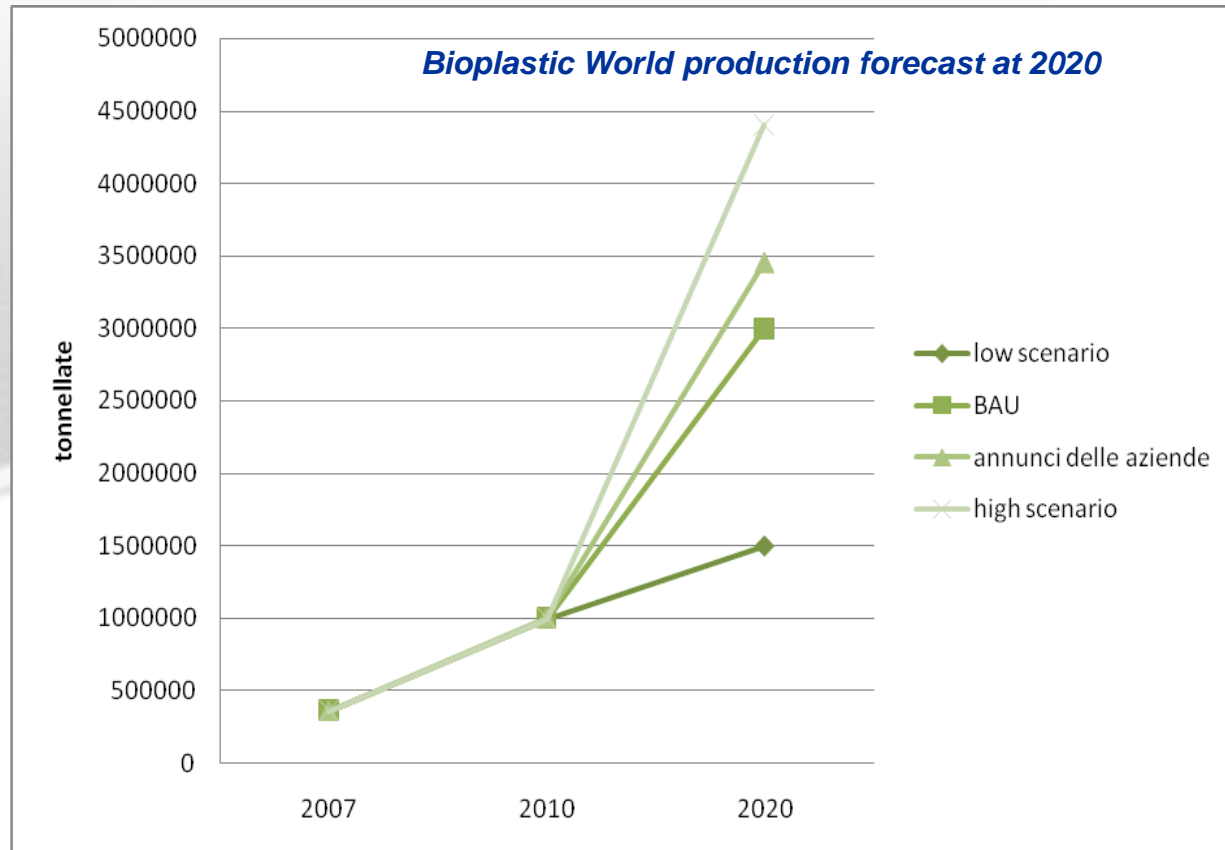
After 2 years it is possible to analyse the first impacts of this regulation, from an economic and environmental point of view.

**These are the main goals of this research**

# The framework:

## Plastic vs Bioplastic: worldwide trends

The global consumption of traditional plastic is about 250 ml/t. The worldwide production of bioplastic is about 1 million tonnes, only 0,5% of the plastic global market. In Italy the starch hectares used for bioplastics are less than 0,2% of the entire starch surface, mainly located in marginal areas, unsuitable for food.



# Shopper Ban

## Film Producers

**Plastic film producers industry:** the first data after the plastic shopper ban shows an employment reduction, even if it is important underline the increasing role of shopper segment in terms of employment and profitability.

| <b>Data for carrier bags segment Italy (<i>PlasticConsult 2012</i>)</b>  | <b>2010</b> | <b>2011</b> | <b>variazione %</b> |
|--|-------------|-------------|---------------------|
| Total revenues (incl carrier bags) million euros                         | 674,5       | 732         | +8,5%               |
| Total revenues carrier bags million euros                                | 258         | 305         | +18,2%              |
| <b>Overall Employment</b>  | 2315        | 2215        | -4,3%               |
| Employment for carrier bags  | 950         | 915         | -3,6%               |
| <b>Companies with at least 50% of revenues from carrier bags segment</b> | 25          | 27          | +8%                 |

This means that, in a general contraction of sales, the law has helped to maintain employment and to increase the profitability; further than fostering technological innovation

## Shopper Ban

### economic and environmental evaluation 2011 vs 2010

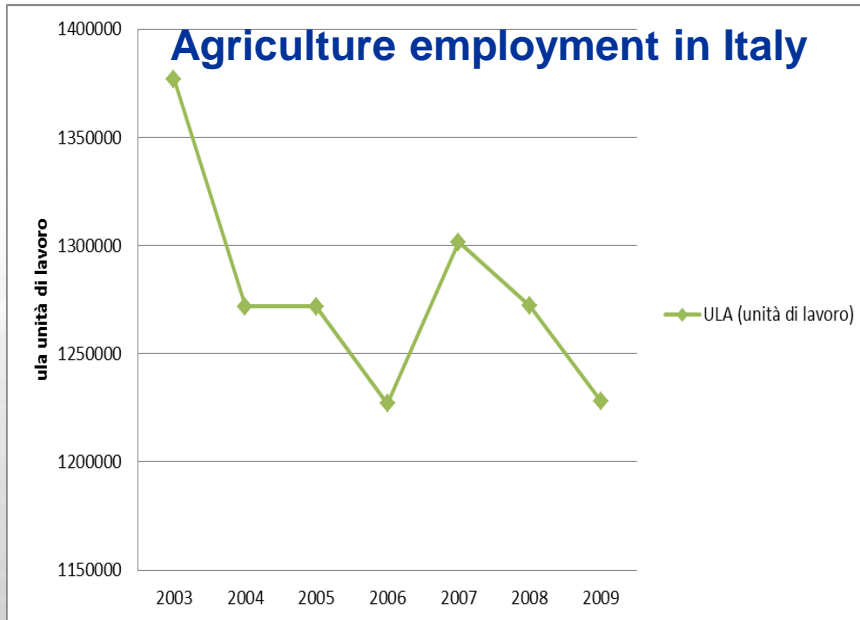
|                         |  |             |
|-------------------------|--|-------------|
| Consumption reduction : | 25%  |             |
| Waste reduction:        | 20.7%  | 30.000 tons |
| Environmental impact:   | - 39% oil consumption<br>- 29% CO <sub>2</sub> emissions |             |
| Economic impact:        | annual saving 5,1 ml€<br>- 26,4%                         |             |



This value is mainly represented by the landfill waste reduction.  
Furthermore the CO<sub>2</sub> reduction has been quantified according to an average value of European Union Allowances.

# Bioplastic

## Agricultural impact



2020 Forecast: only for Italian bioplastic production it is supposed an employment increase of 400% in 2020 in Italy

|   | 2012 production | 2020 production |
|---|-----------------|-----------------|
| <b>Employment for Italian Bioplastic production</b> | 79-119          | 400-603         |

Bioplastic value added of being compostable allow the development of the compost market, that, according to european approach to bioeconomy, close the natural cycle.



## Bioplastic

### Waste management impact

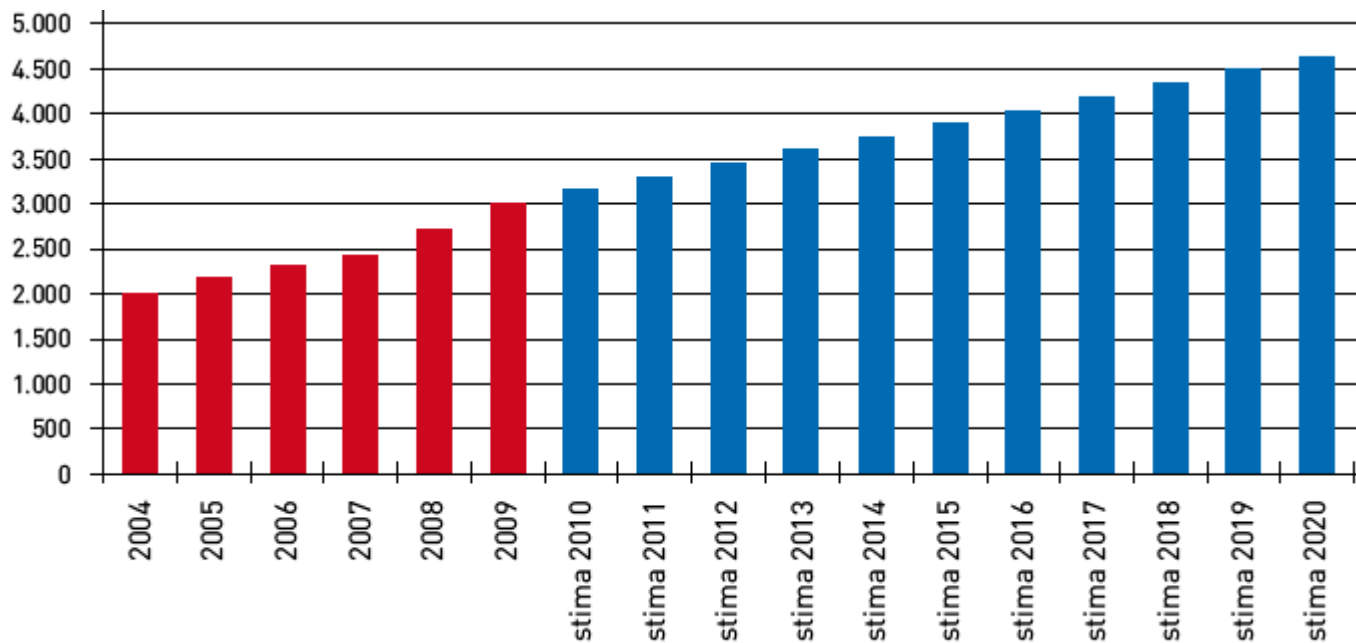
- The introduction of compostable plastic bags for the separated collection of organic waste is the only way to allow municipalities to reach the separated collection targets established by EU
- The extra cost that the composting plants should face due to the presence of traditional plastic bags has been estimated in 26 MI €
- **In terms of new employment:**
  - Multiply times of collecting waste (the organic waste needs a more frequent collection service) generates a theoretical multiply index of 2,3
  - Composting Plants: in 2011 in Italy the workers in composting plants were 2779. The collection of separated organic waste is not yet done in every municipality; This means that it's possible to estimate a 30% increase of employees in this sector.



# Bioplastic

## Waste management impact

Organic waste collection trend (2004 – 2020)



## Environmental and economical implications of most common bioplastic applications

The analysis extension to other bioplastic application (mulching films, organic waste bags, catering, fruit and vegetables bags in large scale distribution) has allowed to estimate the total benefit in terms of oil reduction (57%) , CO2 emissions (47%) and economic savings (around 82 ml€ / -80%).

These figures are very good, even if we have to be careful, because the research consider only niche applications; in many others bioplastics are not yet competitive



# Bioplastics and employment

|   | Today | 2020   | Δ           |
|---|-------|--|-------------|
| <b>Employment in agriculture originated from bioplastics production</b>               |       |  |             |
| Employment in agriculture originated from bioplastics production                      | 99    | 603  | 504         |
| <b>Employment originated from separate collection and treatment of biowaste</b>       |       |  |             |
| Direct employment from biowaste treatment plants (composting and anaerobic digestion) | 2779  | Forecast at 2020: 30% increase<br>In collection of organic waste | ?           |
| <b>Employment linked to the Matrica Project in Porto Torres</b>                       |       |  |             |
| Direct jobs chemical plant  | 0     | 685  | 685         |
| Indirect jobs chemical plant  | 0     | 68,5   | 68,5        |
| Direct jobs in agriculture  | 0     | 1244   | 1244        |
| Indirect jobs in agriculture  | 0     | 124  | 124         |
| <b>Employment linked to the reconversion project in Adria</b>                         |       |  |             |
| Direct jobs chemical plant  | 11    | 80   | 69          |
| Indirect jobs   | 1,1   | 8  | 6,9         |
| <b>Employees in the Novara and Terni hubs</b>   |       |  |             |
| Direct jobs   | 250   | 380  | 130         |
| Indirect jobs   | 25    | 38   | 13          |
| <b>Converters /film blowers</b>   |       |  |             |
| Direct jobs   | 480   | 700  | 220         |
| <b>TOTAL</b>  |       |  | <b>3065</b> |

## Conclusion

Italian case study represents an example of effective environmental regulation, with positive environmental and economic impacts; Italy has been a pioneer in this field with a law able to affect production and consumption process

This is a step, small but very important on the way to bioeconomy

