BIOPLASTICS:

AN ITALIAN CASE STUDY OF BIOECONOMY IN ITALY

A Smart Chemistry for a Smarter Life in a Smarter Planet

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ITALIAN POLICY ON BIOWASTE


WASTE MANAGEMENT SITUATION

CHEMICAL INDUSTRY SITUATION

- CASH COST ETHYLENE (2010)
  - Western Europe, nafta: 761€/ton
  - Middle East, ethane: 93€/ton
- DEINDUSTRIALIZED CHEMICAL SITES

RESEARCH & DEVELOPMENT STEPS ON BIODEGRADABLE BIOPLASTICS

DEDICATED PLURIENNUAL CROPS IN MARGINAL AREAS/SCRAPS FOR FEED/FOOD & CHEMICALS

BUILDING BLOCKS FOR POLYESTERS AND BIO CHEMICALS

POLYESTERS PROCESS

COMPLEXED STARCH PROCESS

INTEGRATED LOCAL BIOREFINERIES FOR ADDDED VALUE PRODUCTS

MAJOR POLLUTANTS >20000 TON PLASTICS:

- Shopping bags; Other bags; Other plastic products

Figure 2.7 – Raccolta differenziata per frazione terrenoologico, anni 2006-2010

Figure 5. Scarti trattati /t/annd. Anno 2009

Figura 6. Produzione di amme. Anno 2009 (elaborazione CIC)

Marchio compost di qualità CIC

BIODEGRADABLE BIOPLASTICS INTEGRATED CHAIN

INTEGRATED LOCAL BIOREFINERIES FOR ADDDED VALUE PRODUCTS
ISPRA REPORT: Separate collection of different fractions (years 2006-2010)

<table>
<thead>
<tr>
<th>Year</th>
<th>Organic Fraction</th>
<th>Paper</th>
<th>Glass</th>
<th>Plastics</th>
<th>Metals</th>
<th>Wood</th>
<th>RAEE</th>
<th>Altri</th>
<th>Textiles</th>
<th>Selettiva</th>
<th>Altro</th>
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</thead>
<tbody>
<tr>
<td>2006</td>
<td>2.701,1</td>
<td>2.528,5</td>
<td>1.239,6</td>
<td>458,5</td>
<td>337,0</td>
<td>580,7</td>
<td>106,3</td>
<td>158,3</td>
<td>70,4</td>
<td>32,3</td>
<td>162,9</td>
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<tr>
<td>2007</td>
<td>2.909,6</td>
<td>2.698,1</td>
<td>1.297,2</td>
<td>500,3</td>
<td>361,8</td>
<td>642,6</td>
<td>116,2</td>
<td>201,3</td>
<td>73,4</td>
<td>30,5</td>
<td>120,1</td>
</tr>
<tr>
<td>2008</td>
<td>3.340,4</td>
<td>2.934,1</td>
<td>1.496,2</td>
<td>577,4</td>
<td>353,7</td>
<td>681,0</td>
<td>156,6</td>
<td>221,2</td>
<td>80,3</td>
<td>32,2</td>
<td>59,7</td>
</tr>
<tr>
<td>2009</td>
<td>3.743,7</td>
<td>2.962,1</td>
<td>1.702,6</td>
<td>613,4</td>
<td>340,2</td>
<td>675,5</td>
<td>216,9</td>
<td>328,7</td>
<td>71,5</td>
<td>36,6</td>
<td>85,5</td>
</tr>
<tr>
<td>2010</td>
<td>4.186,8</td>
<td>3.062,7</td>
<td>1.778,5</td>
<td>648,6</td>
<td>317,8</td>
<td>691,9</td>
<td>253,7</td>
<td>315,6</td>
<td>80,3</td>
<td>37,6</td>
<td>79,1</td>
</tr>
</tbody>
</table>
1. The revised WFD\(^1\) requires Member States to:
   - Take measures to encourage the separate collection of biowaste for composting and AD.
   - Recycle 50% of all waste from households by 2020

2. The Landfill Directive\(^2\) requires Member States to:
   - Divert from landfill 65% of biowaste by 2016
   - Pretreat all waste before landfilling

\(^1\) Directive 2008/98/EC  
\(^2\) Directive 99/31/EC
Italian Legislation requires to:

1. Collect separately 65% of all MSW by the end of 2012\(^1\)

2. Start implementing SSO specific for food scraps at regional and municipal level\(^2\)

3. Collect organics in bins and/or one way bags certified compostable according to standard EN13432\(^2\)

\(^1\) D.Lgs 152/2006
\(^2\) D.Lgs 205/2010
8-10 lt kitchen bins, compostable bags

30-40 lt single households

120-240 lt multifamily buildings
The organic waste collection system (ISSO)
ITALIAN POLICY ON CARRIER BAGS

1. Financial law 2007: Shopping bags since January 2011 have to be either biodegradable and compostable or reusable

2. New law 28, 24/3/2012: non reusable shopping bags have to be certified biodegradable & compostable according to the norm EN13432 by accredited bodies. Threshold thickness for reusable bags

DIRECT RESULTS

• 50% REDUCTION OF CARRIER BAGS USE IN THE LARGE RETAIL

• 50% OF COMPOSTABLE BAGS FOR SEPARATE COLLECTION OF ORGANIC WASTE ARE SHOPPING BAGS – HIGHER QUALITY OF COMPOST

• RECYCLING OF BIODEGRADABLE AND COMPOSTABLE BAGS IN TRADITIONAL RECYCLING STREAM TESTED BY CONAI/ COREPLA (NATIONAL CONSORTIUM OF RECYCLING) – UP TO 10% WITH NO ISSUES. REPORT AVAILABLE.

• MARINE BIODEGRADATION - RESULTS OF BIODEGRADATION TESTS: LESS THEN 1 YEAR FOR BIODEGRADATION

• MORE THAN 80% OF BAGS PRODUCERS ARE ABLE TO CONVERT BIODEGRADABLE BIOPLASTICS

• STILL 72% OF CARRIER BAGS ARE NON BIODEGRADABLE BECAUSE OF UNCERTAIN LEGISLATIVE FRAMEWORK
OTHER RESULTS AFTER ONE YEAR FROM THE INTRODUCTION OF THE ITALIAN POLICY ON CARRIER BAGS

Citizens: improving sustainable consumption and promoting responsible attitudes towards the environment (ISPO Survey February 2012)

- New capacity of biodegradable polyesters for more than 200,000 ton built in Europe and new monomers plants under development/construction
- In Italy chemical industrial site converted in Lazio (Patrica) from PET to Origo-Bi
- One fermentation plant in Veneto (bio-BDO) and an integrated biorefinery in Sardinia under construction (about 700 million euros invested between 2012-2015 in R&D, pilot and demo plants)
- In 2011 start-up of first dedicated crops by SINCRO (a J-V between Novamont and a cooperative of 600 farmers of COLDIRETTI Association) in Umbria for biolubricants in agriculture and by Novamont in Sardinia for feeding the Matrica biorefinery

Shopping bags sector: Trend 2010 vs 2011

<table>
<thead>
<tr>
<th>Data</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues</td>
<td>674,5</td>
<td>732,0</td>
</tr>
<tr>
<td>Production (tonnes)</td>
<td>145,000</td>
<td>115,000</td>
</tr>
<tr>
<td>Export</td>
<td>12%</td>
<td>14%</td>
</tr>
<tr>
<td>%production Biopolymers</td>
<td>8%</td>
<td>28%</td>
</tr>
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</table>

Benefits upstreams
NOVAMONT’S INDUSTRIAL INITIATIVES RELATED TO BIOPLASTICS IN ITALY

NOVARA
Novamont Headquarted and R&D site

PORTO TORRES
Matrica biorefinery

ADRIA Fermentation Plant as industrial pilot
1600 m³ fermentation capacity / Mater-Biotech
START UP : 2014  1,4 BDO from RRM

TERNI (Origo-Bi + Mater-Bi production)
R&D vegetable oil crops / biolubricants from local crops

PIANA DI MONTE Verna
(Biotechnological center)
Active since January 2013

HEADQUARTERS
PRODUCTIVE SITES
R&D CENTRES
The Case

(PORTO TORRES/SARDINIA)

50/50 J-V between eni Versalis and Novamont for the transformation of the Porto Torres chemical site of ENI in a third generation biorefinery for bioplastics, biolubricants and biofillers/additives for low rolling resistance rubber

- The Biorefinery will directly employ about 680 people with significant indirect local effects,
- Integrated agricultural chain: pluriennial, low input crop, non irrigated land
- Use of non food oil and progressively of lignocellulosic residues
“NATIONAL TECHNOLOGY CLUSTER” IN THE FIELD OF “GREEN CHEMISTRY”

WHEN
Proposal submitted to the Italian Ministry of Education, University and Research in September 2012 (DM 30th May 2012 no. 257) - A plan for strategic development for the next 5 years

WHO
109 public and private entities, operating in the field of Bioeconomy
Involvement of Italian major public research bodies working on biomass collection and transformation: CRA, CNR, ENEA
Support (also financial) of 8 Italian Regions

WHAT
Hub for all the Italian players already pursuing a strategy in the field of Bioeconomy, but also for newcomers, ensuring coherence between regional, national and EU programmes.

WHY
In line with the most recent orientations of the European Commission, to trigger the development of biobased industries in Italy, through an holistic approach to innovation, aimed at revitalising Italian chemistry through environmental, social and economic sustainability.
THE REPORTS TAKEN IN CONSIDERATION AND SUMMARIZED

- Plastic Consult: The Structure of the bubble film Extrusion Sector (Assobioplastiche)
- CIC: (The Italian Composting Association): Technical Reoprt 2012
- ISPO: Private Institute for Social, Economic and Opinion Research (Renato Mannheimer): Green Chemistry Observatory: Attitude of the Italian Public towards the bio-carrier bags (Assobioplastiche)
- GIONHA Project (Governance and Integrated Observation of Marine Natural Habit) by the Regional Environmental Protection Agency of Tuscany, the Environmental Office of Corsica, the Regional Government of Liguria, the Autonomous Region of Sardenia and the Provincila Government of Livorno
- ECOPEC/Novamont:
  - Review on marine biodegradation of compostable carrier bags
  - Biobased and Biodegradable carrier bags. Is competition between bioplastics and food a real issue?
Edited by Walter Ganapini

BIOPLASTICS: A CASE STUDY OF BIOECONOMY IN ITALY

A smart chemistry for a smarter life in a smarter planet

Foreword by Corrado Clini
Italian Minister of the Environment

Introduction by Catia Bastioli
President of Kyoto Club

You can download the English version of the book at

www.novamont.com/e-book
Thank you!

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