Sustainable Biomass for Bio-based Polymers
Full Scale Implementation of ISCC PLUS

Erwin Vink, Sustainability Manager, NatureWorks

9th ISCC Global Sustainability Conference, Brussels, 14 February 2019
Content

2. The need for Sustainable Biomass production.
4. Extension of ISCC PLUS to cover 100% of our volume.
World leading bio-polymer player
• 150,000 ton plant in Blair, NE
• Significant manufacturing know-how with an extensive IP position

Jointly owned by Cargill and PTTGC

Established global market channels
• Commercial partnerships with global brands
• Sales team in 15 countries across North America, Latin America, Europe, and Asia

Dedicated in-house Applications Development and R&D Facilities

Competitive on a cost and performance basis with traditional plastics (PS, PET)

Strong environmental expertise and product characteristics
• Peer reviewed LCA’s and eco-profile demonstrate smaller carbon footprint and lower fossil energy use
• Products enable portfolio of end-of-life options
• Dedicated internal team for understanding environmental and end-of-life impacts
How Ingeo Biopolymers are made today.

1. Plants
2. Starch
3. Sugar production
4. Dextrose
5. Fermentation
6. Lactic Acid
7. Monomer production
8. Lactide

Greenhouse gas CO₂

H₂O
NatureWorks is committed to feedstock diversification and Sustainable Feedstock Sourcing. by producing Ingeo biopolymers from the right, abundant, local resources,

Today
Sugars from corn, sugar cane, wheat, beets or cassava.

Industry developing
Sugars from cellulosic materials like corn stover, wood, bagasse, switch grass and straw.

Industry developing
CO$_2$ to lactic acid technology
CH$_4$ to lactic acid technology
“Direct GHG Conversion”
The Global Market for Ingeo biopolymers

<table>
<thead>
<tr>
<th>Rigids</th>
<th>Food Serviceware</th>
<th>Films</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigids</td>
<td>Food Serviceware</td>
<td>Films</td>
</tr>
<tr>
<td>Wovens Non Wovens</td>
<td>Durables</td>
<td>Lactides</td>
</tr>
</tbody>
</table>

- **Rigids**
- **Food Serviceware**
- **Films**
- **Wovens Non Wovens**
- **Durables**
- **Lactides**
- **3D printing**

Coatings
Adhesives
Intermediates

© 2015 NatureWorks
End of life options

- Incineration with Green Energy Recovery
- Organic Recycling – Industrial composting – Anaerobic Digestion
- Chemical Recycling by hydrolysis
- Mechanical Recycling
- Lactic acid market
Content

2. The need for Sustainable Biomass production.
4. Extension of ISCC PLUS to cover 100% of our volume.
The New Plastic Economy – Linear Model

After a short first-use cycle, 95% of plastic packaging material value, or USD 80–120 billion annually, is lost to the economy.

14% incinerated with/ without E recovery
40% landfilled
32% leakage
The New Plastic Economy – Circular Model

THE NEW PLASTICS ECONOMY RETHINKING THE FUTURE OF PLASTICS, EMF, 2016
How does the EMF bring these ambitions into practice?

On the Our Ocean Conference in Bali on 29th October 2018 the Ellen MacArthur Foundation launched the New Plastic Economy Global Commitment to eliminate plastic waste and pollution.

This commitment was signed by 250+ organizations, representing 20% of all plastic packaging produced globally.

**Targets include:**

- Eliminate problematic or unnecessary plastic packaging.
- Ensure 100% of plastic packaging can be easily and safely reused, recycled, or composted by 2025.
- Decouple from Fossil Resources.
NatureWorks contribution to the New Plastics Economy Global Commitment

NatureWorks committed to the following goals in support of sustainable agriculture for biopolymer production:

1. By 2019, 60% of our feedstock will be sustainably produced via ISCC PLUS.

2. By 2020, 100% of our feedstock will be sustainably produced via ISCC PLUS.

3. By 2025, we ensure that 100% of new feedstocks for additional manufacturing capacity will be sustainably produced via an independent, 3rd party program.
Content

2. The need for Sustainable Biomass production for Packaging.
4. Extension of ISCC PLUS to cover 100% of our volume.
Sustainable Feedstock Sourcing Program: Where did this all started?

Early 2011: Multi-party Project Kickoff:

- WWF Germany
- NatureWorks
- Institute for Agriculture and Trade Policy
- Danone
- ISCC Systems
- MEO Carbon Solutions
- Control Union
October 2011: Audit the Ingeo production chain
• In Feb 2012, ISCC Systems GmbH launched the ISCC PLUS Certification scheme.

• ISCC PLUS is a scheme certifying the sustainability of agricultural feedstocks used for bio-based products.

• www.iscc-system.org/en/
Content

2. The need for Sustainable Biomass production.
4. Extension of ISCC PLUS to cover 100% of our volume.
We implemented the basic ISCC PLUS Certification and included the Add-on: Non GMO for Technical Markets.

- Yellow Dent #2 feed corn sourced from farms within 50 miles of our plant in Blair, NE
- Contract farmers for Non GM corn
- 100% ISCC PLUS certified by 2020
- ISCC PLUS + Non GM for Tech. Markets certified
- NatureWorks facility in Blair, NE
- General market for Ingeo products
- Part of Ingeo market has the special request for a non GM feedstock.*

* Tracked using mass balance book keeping system.
Farmers, Yields, Gross/Net Land Use

• Running the Ingeo polymer plant at full capacity (150,000 tons of Polymer) with 100% ISCC PLUS coverage in 2020 we need a **gross** area of 34,500 ha of land. (Corn yield – 15% moisture) = 11.6 t/ha).

• This involves about 90-120 farmers with an average of 330 ha corn/farm.

• Since we only use the starch fraction (57.5%) we need a **net** area of 19,830 ha of land.
ISCC PLUS: what does it take to implement?

1. Determine Volumes needed.
2. Weigh Costs vs. Value.
3. Identify key partners in your Supply Chain.
4. Select, motivate, educate, train and audit farmers.
5. Be aware of seasonal impacts.
   • Seed selection, growing season
6. Set up mass balance book keeping system from farmer to product.
7. Maintain documentation of the process.
8. Inform and educate partners of the program
9. Set up communication towards customers and public.
ISCC PLUS – Value for Partners and NatureWorks

1. Take **Responsibility** by addressing Sustainable Feedstock Sourcing with 3\textsuperscript{rd} Party Certification.
2. Provide **Transparency / Traceability** back to Farmer.
   • Maintain a database of the farmers that are in this program.
3. ISCC PLUS is **endorsed** by multiple key stakeholders.
4. **Differentiation** from fossil based plastics; ‘Fossils’ have nothing in place.
5. Maintain **Leadership** in Sustainable Biopolymer Production.
6. Do our part to **contribute** to the Society for more Sustainable Farming.
Value for Society
ISCC contributes to the UN Sustainable Development Goals

PRINCIPLE 1: Zero deforestation after 2007
Protection of primary forests and forested areas, high carbon stock land, peat- and wetlands, protected and highly biodiverse areas

PRINCIPLE 2: Good agricultural practice
Agricultural and forestry production shall protect soil, water and air and ensure a sustainable use of land

PRINCIPLE 3: Safe working conditions
Ensure workers health and safety during work. Improve competence and knowledge via training

PRINCIPLE 4: Social conditions
Ensure good labor conditions and limit impacts to surrounding communities

PRINCIPLE 5: Compliance with laws
Comply with all regional and national laws and international treaties

PRINCIPLE 6: Good management practices
Recording system and compliance of subcontractors

Contribute to:
- Affordable and clean energy
- Good health and well-being
- Clean water and sanitation
- Zero hunger
- Quality education
- Gender equality
- Climate action
- Life on land
- Life below water
- Peace and justice
- Responsible consumption and production
- Partnerships for the goals
Thank you

Naturally advanced materials made from locally abundant and sustainable natural resources

Erwin Vink
Sustainability Manager
Mobile: 0031(0)620415133
erwin_vink@natureworkspla.com

@natureworks
Like us on Facebook
Connect with us on LinkedIn

www.natureworksslc.com