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

Erwin Vink, Senior Sustainability Manager, NatureWorks
ISCC Technical Stakeholder meeting, Shanghai, 2\textsuperscript{nd} of July 2019
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1. Introduction to NatureWorks.
2. The need for Sustainable Biomass for Bio-based polymer production.
4. Extension of ISCC PLUS to cover 100% of our volume.
NatureWorks LLC

• World leading bio-based polymer producer
  o 150,000 ton plant in Blair, NE
  o Significant manufacturing know-how with an extensive IP position

• Jointly owned by Cargill and PTTGC

• Established global market channels
  o Commercial partnerships with global brands
  o 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
  o Peer reviewed LCA’s and eco-profile demonstrate smaller carbon footprint and lower fossil energy use
  o Products enable portfolio of end-of-life options
  o Dedicated internal team for understanding environmental and end-of-life impacts
How Ingeo Biopolymers are made today.

Greenhouse gas

\[ \text{CO}_2 \]

\[ \text{H}_2\text{O} \]

Plants

Starch

Sugar production

Dextrose

Fermentation

Lactic Acid

Polymer production

Lactide

Monomer Production
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

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

Coatings
Adhesives
Intermediates
End of life options

- Incineration with Green Energy Recovery
- Organic Recycling – Industrial composting – Anaerobic Digestion
- Chemical Recycling by hydrolysis
- Mechanical Recycling
- Lactic acid market
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After a short first-use cycle, 95% of plastic packaging material value, or USD 80–120 billion annually, is lost to the economy.
The New Plastic Economy – Circular Model

THE NEW PLASTICS ECONOMY RETHINKING THE FUTURE OF PLASTICS, EMF, 2016

Need to secure that renewable resources are produced in a sustainable way.
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 400+ organizations:
- 150 businesses (Consumer Good Companies 6 of top 10), Retail (5 of top 15) and Packaging producers (4 of top 10)
- 16 governments, 26 financial institutions*, 6 investors, Leading Institutes like WWF, WEF, CGF and IUCN) representing 20% of all plastic packaging used globally.

Targets include:
- Eliminate problematic or unnecessary plastic packaging through redesign and innovation.
- Reuse models are applied where relevant.
- Make 100% of all plastic packaging reusable, recyclable or compostable by 2025 (signed by 107 of above businesses).
- The use of plastic is fully decoupled from the consumption of finite resources (fossil fuels).
- All plastic packaging is free of hazardous chemicals, and the health, safety, and rights of all people involved are respected.

* With 4.2 trillion US$ worth of assets under management
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.


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Sustainable Feedstock Sourcing Program: Where did this all started?

Early 2011: Multi-party Project Kickoff:

- WWF Germany
- NatureWorks
- Danone
- ISCC Systems
- Institute for Agriculture and Trade Policy
- 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 sustainable production of agricultural feedstocks, including the chain of custody.

• www.iscc-system.org/en/
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We implemented the 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 to grow Non GM corn

100% ISCC PLUS certified by 2020

ISCC PLUS + Non GMO for Tech. Markets certified

NatureWorks facility in Blair, NE

Ingeo

Ingeo

Ingeo

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 90-110 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
Value NatureWorks, our Partners and the Society in General

1. Take Responsibility by addressing Sustainable Feedstock Sourcing with 3rd Party Certification.
2. Provide Transparency / Traceability back to Farmer.
   • Maintain a database of the farmers that are in this program.
4. ISCC PLUS is Endorsed by multiple key stakeholders.
5. Differentiation from fossil based plastics; ‘Fossils’ have nothing in place.
7. Delivering on our Commitment to critically assessing the sustainability of each and every feedstock we use.
8. Do our part to contribute to the Society for more Sustainable Farming.
ISCC PLUS

Value NatureWorks, our Partners and the Society in General

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 |

ISCC is in line with OECD/FAO guidance for responsible agricultural supply chains.

OECD: Organization for Economic Co-operation and Development
FAO: Food and Agriculture Organization of the UN
Communication around the 100% coverage with ISCC PLUS

NatureWorks

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NatureWorks announces 100 Percent Third-Party Certified Sustainable Feedstock by 2020

Agricultural feedstocks for Ingeo biopolymer will be certified as environmentally and socially sustainable by the International Sustainability & Carbon Certification System.

MINNEAPOLIS, Minn., February 14, 2019 — A new initiative of NatureWorks

ISCC NEWSLETTER

About Process Certificates Trainings & Events Staff

Press release from NatureWorks: 100% ISCC Certified Sustainable Feedstock by 2020

NatureWorks press release, Minneapolis (USA), 14 February 2019

NatureWorks has announced that 100% of their feedstock for biopolymers and performance chemicals will be ISCC PLUS certified by 2020. More than 90 farms will be involved in the program contributing to the production capacity of 330,000 metric tons of biopolymers. Currently, already 65% of NatureWorks’ feedstock are produced under ISCC PLUS

Being certified since 2012, NatureWorks has been the first biopolymers manufacturer under the ISCC PLUS certification system. With their commitment to feedstock diversification and the decoupling of plastics from fossil feedstock the company is an important driver of the bio-economy.

The company has become a key driver of the bio-economy. In recognition of their leading role and the importance of biopolymers in a Circular Economy, NatureWorks is now a signatory of the Ellen MacArthur Foundation’s New Plastics Economy Global Commitment. NatureWorks first gained ISCC PLUS certification in 2012 for Ingeo production, one of the first biopolymers manufacturers to do so. Erwin Vink, Sustainability Manager at NatureWorks says: “ISCC PLUS certification has been adopted by global brands and is supported by non-governmental organisations. We particularly value ISCC for its emphasis on de-differentiation, protection of the environment, social principles and the inclusion of a GM free option.”

Currently over half of the corn used as raw material for Ingeo, is ISCC certified. NatureWorks will now ensure that by 2020, 100% of the agricultural input to its 150,000 tonne plant will be certified to the ISCC PLUS standard. This major commitment firmly aligns the company with the Ellen MacArthur Foundation’s aspiration that all biopolymers should be made from sustainably sourced biomass.

More than 90 farms, with an average of 330 hectares of corn per farm, will be...
Thank you

Naturally advanced materials made from locally abundant and sustainable natural resources

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