



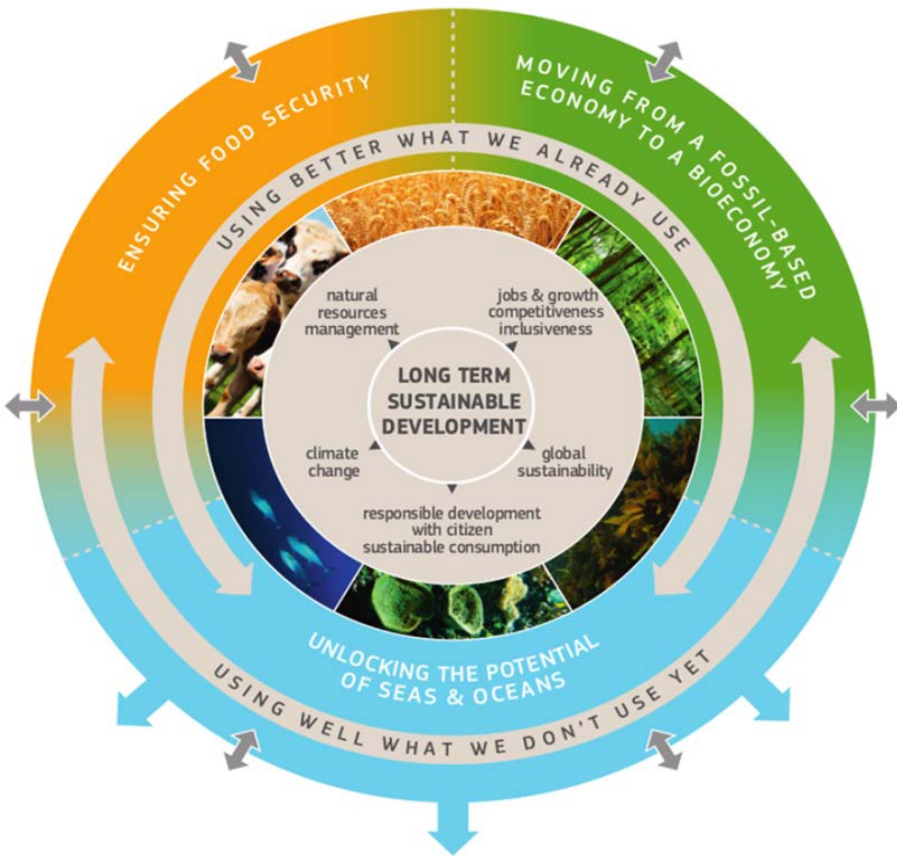
A Bioeconomy for Europe

Using resources from land and sea
for a post-petroleum economy

Hans-Joerg Lutzeyer
European Commission, DG Research and Innovation
Dir F – Bioeconomy

Aarhus University, Foulum, 14/09/2016

FACCE SURPLUS



Bioeconomy encompasses the production of **renewable biological resources** from land and sea and the conversion of these resources & waste streams into value added products (e.g. food, bio-materials, bio-energy and bio-products).

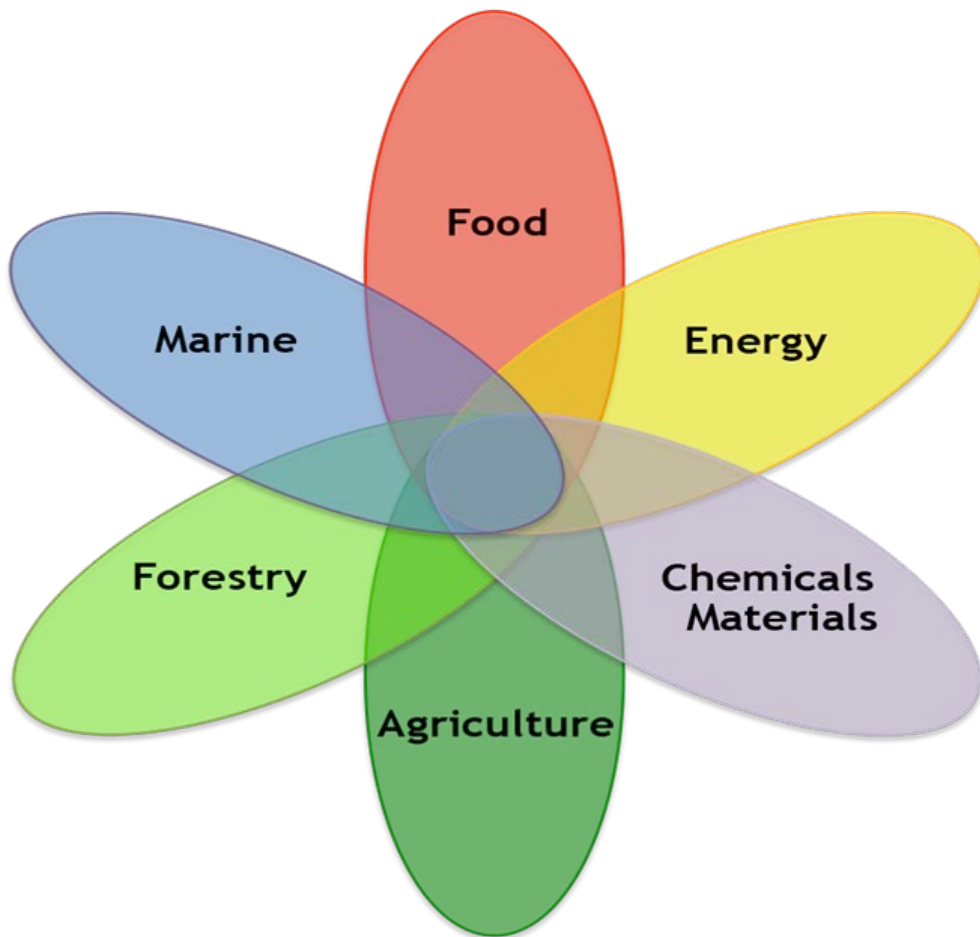
EU bioeconomy strategy, 2012

CHALLENGES:

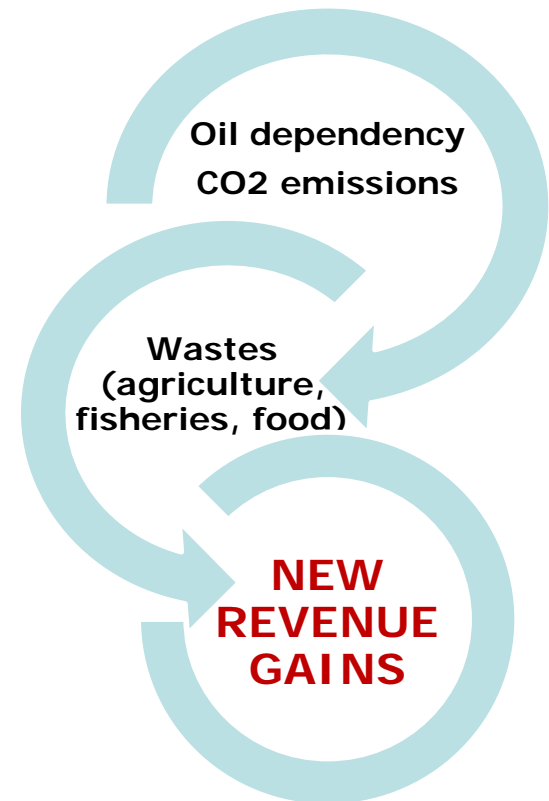
- ✓ Feed 9 billion people by 2050
- ✓ Unlock the potential of seas & oceans
- ✓ Mobilise rural and coastal economies
- ✓ Boost bio-based markets

H2020/SC2 WP2016-2017

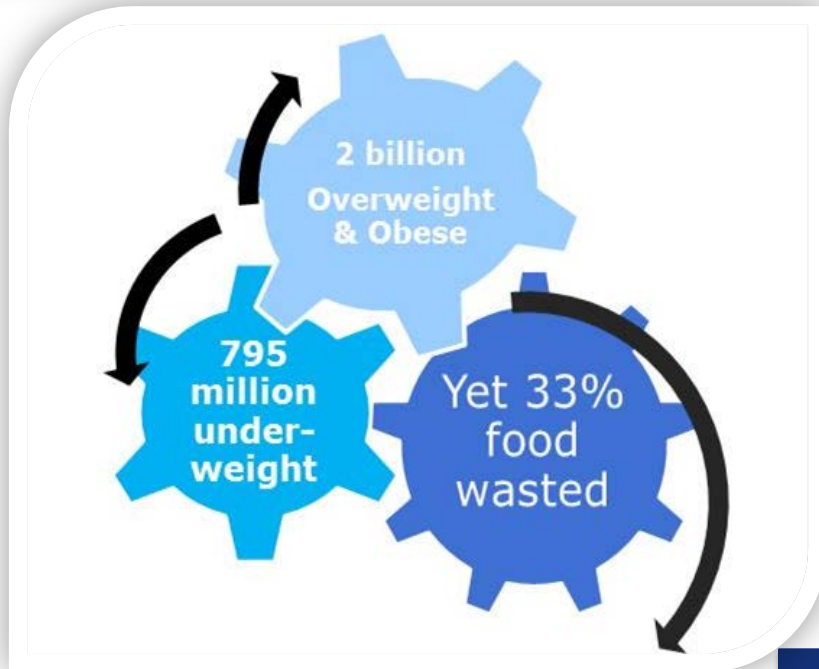
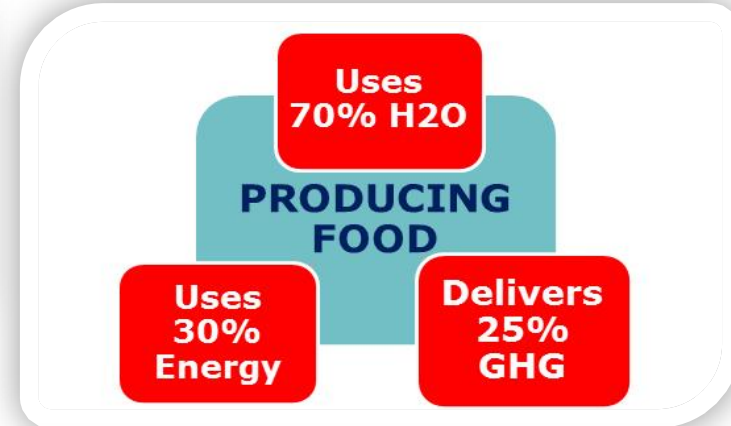
Bioeconomy -



Using biological
resources to
produce
**"more and better,
from less"**

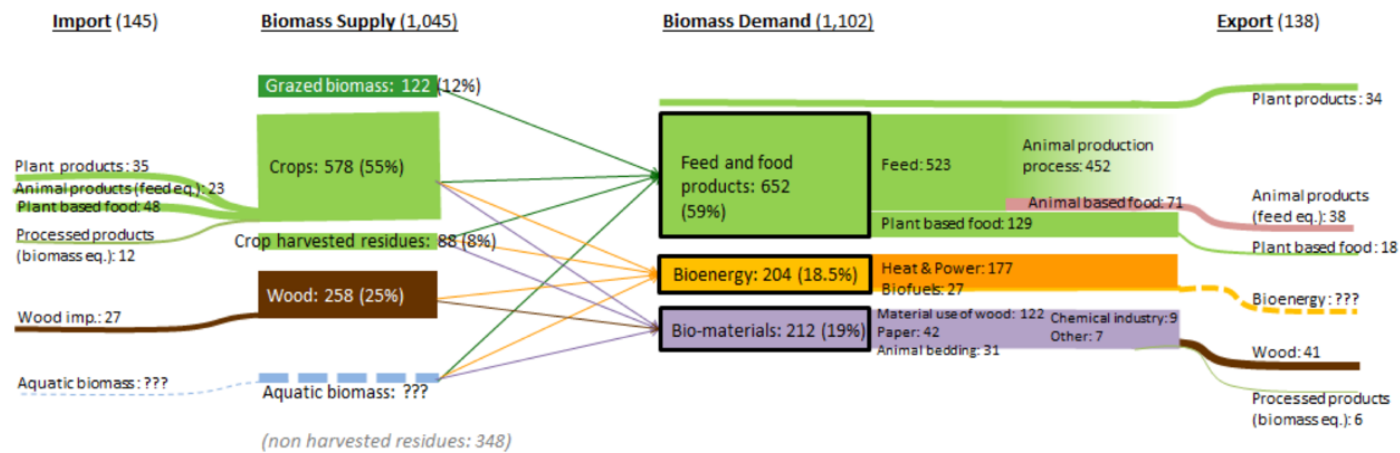


Challenges & Targets



Preliminary biomass balance in the European Union

Figure 2. Preliminary biomass balance in the European Union (million tonnes of dry matter, EU-28, 2013)



In the European Union the biomass is mainly consumed for **food and animal feed purposes, which represents 61% of the whole biomass consumption**. Animal feed use alone represents 48% of the total use of biomass. The sectors of bioenergy and biomaterials are similar in terms of the quantity of biomass they consume. Each of them consumes around 18% of the whole biomass.

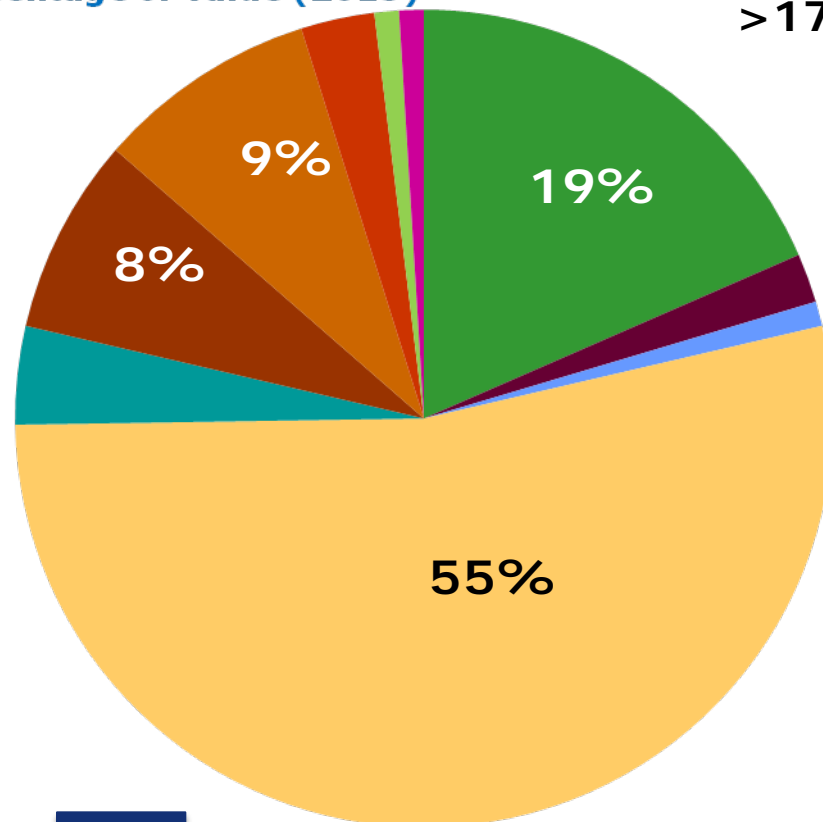
Bioeconomy is key for Europe

2 trillion euro
turnover

Employs
> 17m people

**Turnover in the EU-28 by the bioeconomy sector
In percentage of value (2013)**

- 19% ■ Agriculture
- 2% ■ Forestry
- >1% ■ Fisheries & aquaculture
- 55% ■ Food, beverage & tobacco industry
- 4% ■ Bio-based textiles
- 8% ■ Manufacturing of wood & wood furniture
- 9% ■ Manufacturing of paper & paper products
- 3% ■ Bio-based chemicals, pharmaceuticals and plastics
- >1% ■ Biofuels
- >1% ■ Bio-based electricity



FOOD Systems Research and Innovation: Food2030 - 4 Priorities



Reducing hunger & malnutrition, addressing food safety and diet-related illnesses, and helping citizens adopt sustainable diets and healthy lives



Building a climate and global change-resilient primary production system – e.g. PRIMA, EU/Africa HLPD



Implementing sustainability and circular economy principles across the whole food system – e.g. Food Waste



Boosting market creating innovation and investment, while empowering communities – e.g. FOOD KIC



A variety of crops and livestock products will have current models and locations of production challenged by climate change in the coming decades. Examples include:

- **Bananas** - Half of the current global banana growing area is likely to become unsuitable for banana cultivation by 2060.
- **Nectarines** - Warming temperatures are expected to mean that certain regions can no longer provide enough "chill hours" to set fruit.
- **Fish** - Temperature changes will have a mixed effect on fisheries as waters warm across the globe. Some species will be negatively affected and others positively.
- **Wheat** - Global wheat production has been estimated to fall by 6% for each °C increase of local temperature, barring adaptation. Yields will also become more variable, creating more volatility.
- **Sheep** - Bluetongue virus, a sheep disease, is spreading into northern Europe with rising temperatures.

"Food quality is declining under the rising levels of atmospheric carbon dioxide that we are experiencing."

*Professor Arnold Bloom,
University of California,
Davis*



Higher levels of contamination of vegetables from microorganisms such as E. coli and salmonella are likely due to flooding events and temperature changes.



Wheat contributes approximately 25% of the protein in human diets and a number of manufacturing processes, such as baking, require sufficient levels of this nutrient. Researchers have shown rising carbon dioxide levels in the atmosphere inhibit the conversion of nitrates into protein in wheat growing.

Agriculture



"Some of the most productive agricultural land in England is at risk of becoming unprofitable within a generation due to soil erosion ... Without further action the natural environment will be severely harmed by climate change."

*Committee on Climate Change
2015 Report to Parliament*



Intense and disruptive storms as well as droughts and rising food prices may undermine the stability of supply routes (e.g. Suez Canal).

Logistics

"Climate change is expected to challenge the effectiveness of current food safety management systems in the near future."

Editorial in Food Research International special issue on the impacts of climate change on food safety



Increased carbon-dioxide levels have the potential to impact upon the quality of **oilseed rape** and have implications for industrial processing. Researchers predict significant reductions in the concentration of healthy unsaturated fatty acids in the crop. As a major ingredient in the food industry, this has implications for household diets.



Processing



Mycotoxins are highly toxic chemical substances produced by mould that grows on crops such **maize, wheat, and rice**. With climate change they may become of increasing concern to food processors in the EU.



Household



PRINCIPLE

1

Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows
ReSOLVE levers: regenerate, virtualise, exchange

Bioeconomy



Regenerate Substitute materials Virtualise Restore

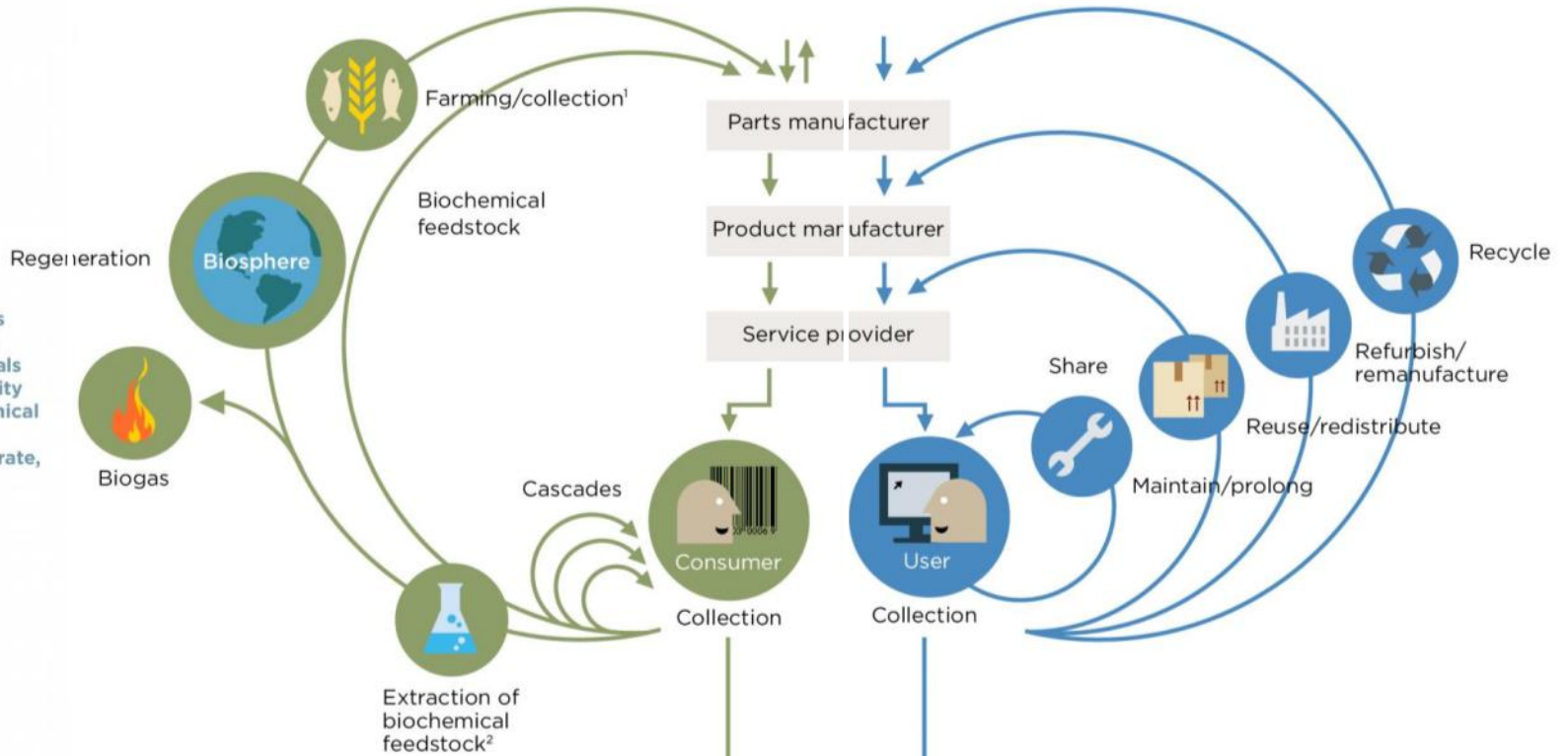
Renewables flow management

Stock management

PRINCIPLE

2

Optimise resource yields by circulating products, components and materials in use at the highest utility at all times in both technical and biological cycles
ReSOLVE levers: regenerate, share, optimise, loop



PRINCIPLE

3

Foster system effectiveness by revealing and designing out negative externalities
All ReSOLVE levers

Minimise systematic leakage and negative externalities

1. Hunting and fishing
2. Can take both post-harvest and post-consumer waste as an input

Source: Ellen MacArthur Foundation, SUN, and McKinsey Center for Business and Environment; Drawing from Braungart & McDonough, Cradle to Cradle (C2C).

EU Bioeconomy Strategy & Action Plan

Investment in R&I



- **Horizon 2020 (€3,8b SC2)**
- European Structural and Investment Fund (ESIF) - Smart Specialisation

Policy interaction & stakeholder engagement



- EU Policy coherence
- Regional and national bioeconomy strategies
- Bioeconomy SCAR Foresight
- Bioeconomy Observatory
- International cooperation

Enhancement of markets & competitiveness in bioeconomy



- Sustainable intensification of primary production
- Expansion of new markets
- BBI JU
- **FACCE Surplus**

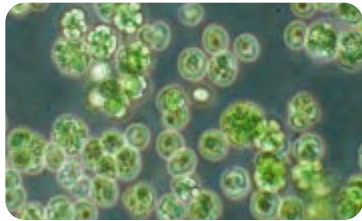
Creation of new **bio-based** value chains

Primary sector

Waste



Sugar beets



Algae



Wood residues



Biological waste



Fish waste

INTO



Cosmetics



Plastic bottles
Natural colourants
for candy



Car dashboards



Bio-based plastics



Oils
Pharmaceuticals

Bioeconomy vs. EU Strategy for Growth and Jobs (2014)



- 1. A new boost for jobs, growth and investment**
2. A connected digital single market
- 3. A resilient Energy Union with a forward looking climate change policy**
- 4. A deeper and fairer internal market with a strengthened industrial base**
5. A deeper and fairer EMU
6. A reasonable and balance free-trade agreement with the U.S.
7. An area of justice and fundamental rights based on mutual trust
8. Towards a new policy of migration
9. A stronger global actor
10. A Union of democratic change





ROADMAP

1st SEMESTER 2016:

- Jan:** Stakeholder interviews (NL Presidency)
- Mar:** Member States workshop
- Apr:** Stakeholders Panel, Utrecht Conference
Competitiveness Council
- May:** Agri- Council
- Jun:** Stakeholders Panel
New Bioeconomy Observatory web-site



2nd SEMESTER 2016:

- Sept:** Expert Group BioE Review
- Nov:** MANIFESTO
Workshop OECD/FAO
Competitiveness + Agri
Council
- Dec:** Expert Group Final Report



1st SEMESTER 2017:

- Mar:** BioE ACTION PLAN – Draft
WORKSHOP OECD/FAO/EUROSTAT/JRC
- Apr:** Member States Workshop
- Jun:** BioE ACTION PLAN – Final draft



2nd SEMESTER 2017:

- Sep:** BioE CONFERENCE (?)
COUNCIL CONCLUSIONS



BIOECONOMY UTRECHT 2016



EUROPEAN BIOECONOMY STAKEHOLDERS MANIFESTO

CHALLENGES & OPPORTUNITIES FOR EU REGIONS: (POINT 8)

- Need to revitalise **rural and coastal areas**.
- **Bioeconomy** for high-value production in the **regions**,
- New opportunities & jobs for farming, forestry and aquaculture.
- The **marine environment potential** as part of the circular bioeconomy.

GUIDING PRINCIPLES: (POINTS 16 & 17)

- Europe's **cities & regions** should play a key role for the BioE.
- We should fully **utilise the available biomass** and **better valorise the use of agricultural land...**
- **Marine production and aquaculture** offer new possibilities.

ACTIONS: (POINT 22)

- **Mutual learning** within & between regions, **peer-to-peer exchanges** at the EU
- **Link** between **regional bioeconomy strategies** and **smart specialisation**
- Creation of **new value chains, stairways of excellence, jobs and growth**
- **Redesign current agricultural-, energy and waste policies**

IN EUROPE:

Several MS have adopted **national Bioeconomy Strategies**.



**More than 10 Regions
are investing in
Research on
Bioeconomy (ESIF)**

Finland and Poland
the most involved countries
(Source: eye@RIS3)

Next steps for the EU Bioeconomy policy: ..with the support of the EU Regions

PRIORITIES

ACTIONS

**Boost
investments**

- Financial Instruments - **EIB/InnovFin**
- Synergies with **ESIF** (*SoE, Widening participation*)
- Link with other programmes (**EFSI**, COSME...)

**Favorable
policy
environment**

- Identify and address **regulatory & financial or other** barriers /gaps/needs (**REGIONS' INPUT!!!**)

**Address
Knowledge
gaps**

- **Study** to map EU regions BE Plans – RIS3 (2016)
- **Bioeconomy Knowledge Centre**

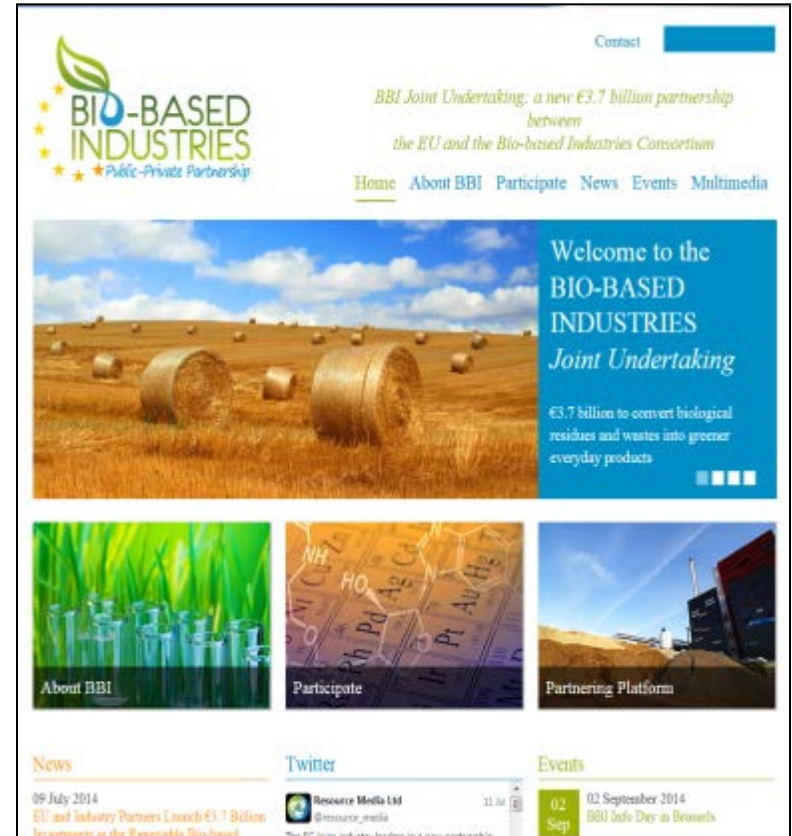
**Increase
stakeholders
engagement**

- **KEP-Knowledge Exchange Platform**
- Bioeconomy Stakeholder Panel
- Smart Specialisation Platforms, Networks (*ERRIN, ERIAFF*)

Bio-based Industries Joint Undertaking (BBI – JU)

Public Private Partnership **supporting R&I for bio-based industries:**

- **Partners:** European Commission and Biobased Industries Consortium (BIC)
- **Budget:** €3.705 billion (about 75% from industry)
- **Implementation:**
 - Principles of **openness, transparency and excellence**
 - Horizon 2020 rules for participation
- **Objectives:** At least **5 new bio-based value chains** for Europe based on **2nd generation/advanced biorefineries**



The screenshot shows the homepage of the BBI Joint Undertaking website. At the top, there is a navigation bar with a 'Contact' button. Below this, a banner features the BBI logo and the text: 'BBI Joint Undertaking: a new €3.7 billion partnership between the EU and the Bio-based Industries Consortium'. A main header area includes a large image of a field with hay bales and the text: 'Welcome to the BIO-BASED INDUSTRIES Joint Undertaking' and '€3.7 billion to convert biological residues and wastes into greener everyday products'. Below the header are three main content blocks: 'About BBI' (with an image of green grass), 'Participate' (with an image of chemical elements), and 'Partnering Platform' (with an image of a modern building). At the bottom, there are sections for 'News' (dated 09 July 2014), a 'Twitter' feed from Resource Media Ltd, and 'Events' (dated 02 September 2014).

www.bbi-europe.eu

FLASHLIGHTS: BIOECONOMY TODAY, OR MAYBE TOMORROW?

Is this Bioeconomy? Wood-based packaging

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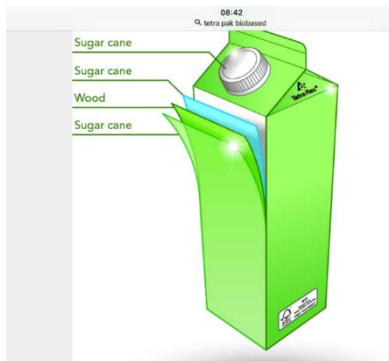
Home / Sustainability / Environmental innovation / Sustainable products / Tetra Rex Bio-based



Case study: THE WORLD'S FIRST FULLY RENEWABLE CARTON

In January 2015, Tetra Pak delivered a world first, when customer Valio started using our fully renewable cartons for its Eila® lactose-free semi-skimmed milk drink.

Read more
Awards and recognition for Tetra Rex® Bio-based



The journey towards renewability

The launch of the Tetra Rex® Bio-based package is an important milestone on a journey that began back in 2007, with the launch of the world's first Forest Stewardship Council™ (FSC™)-labelled cartons. As one of the world's largest consumers of paperboard, it was important for us to make a public commitment to obtaining our materials from sustainably managed forests. Since then, we have been working towards our ultimate goal – to produce a

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PACKAGE POISED FOR 2015 ROLL-OUT TO EUROPEAN CUSTOMERS

Tetra Pak unleashes plant power with 'world's first' 100% bio-based carton

By Ben Bouckley+ 17-Oct-2014 Last updated on 17-Oct-2014 at 15:25 GMT 2 comments

Related tags: Tetra Pak, Sustainability, Plant-based packaging, HDPE, LDPE, Paperboard

Tetra Pak claims to have harnessed the power of plants by launching the world's first milk carton made entirely from plant-based, renewable packaging materials.

The company will launch a 100% renewable version of its Tetra Rex package – developed in partnership and produced by biopolymer manufacturer Braskem – from 2015.

The bio-based packages will be available to buy from Swedish production centers in H1 2015 - Tetra Pak notes particular interest from Scandinavian clients - with the roll-out initially planned for European customers, with expansion to other regions based on demand.

The carton is the first to market using bio-based low-density polyethylene (LDPE) films and bio-based high density polyethylene (HDPE) caps derived from sugar cane, as well as Forest Stewardship Council (FSC)-certified paperboard.

Tetra Pak plans bio-based expansion 'subject to'

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 - What's hitting the shelves? Coffee & broccoli; coconut tea; and strawberry & cream gin
 - Metsä Board re-thinks Bag-in-Box concept with Elevated Drink Box
 - Beer: Low in sugar and carbs, but myths and misinformation abound, says report
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 - BREAKING DOWN THE MILLENNIAL MONOLITH CRA
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09:14 ec.europa.eu

Science for Environment Policy

Producing environmentally friendly biodegradable plastics from vegetable waste

Using vegetable waste to produce bioplastics can provide sustainable alternatives to non-biodegradable plastic, new research has found. The biodegradable plastic developed for this study, produced using parsley and spinach stems, cocoa pod husks and rice hulls, have a range of mechanical properties comparable to conventional plastics which are used for products from carrier bags to kitchenware and computer components.

Global plastic production has risen from 1.5 million tonnes per year in the 1950s to 288 million tonnes a year in 2012. This staggering increase has been driven by the low cost and range of mechanical properties that plastics can provide. However, the **waste** generated can be devastating to ecosystems. All five major oceanic gyres contain substantial amounts of plastic waste, which can injure or kill wildlife and spread invasive species. Furthermore, plastic does not biodegrade but remains in the environment for hundreds of years.

While biodegradable alternatives to plastic cannot solve this problem, they may help to reduce these harmful impacts on a longer time scale. In this study, researchers investigated the possibilities of using **agricultural** vegetable waste. Europe alone produces 24 million tonnes of vegetable waste, such as stems or husks, every year. This material contains cellulose, a natural polymer—or chain of molecules—that can be used to mimic non-biodegradable plastics.

4 December 2014 Issue 396
[Subscribe to free weekly News Alert](#)

Source: Bayer, I. S., Guzman-Puyol, S., Heredia-Guerrero, J. A., et al. (2014). Direct Transformation of Edible Vegetable Waste into Bioplastics. *Macromolecules*, 47, 5135–5143. DOI: 10.1021/ma5008557.
 Contact: iker.bayer@iit.it
 Read more about: [Waste, Sustainable](#)

Is this Bioeconomy? Plastics – biobased not always biodegradable and vice versa

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Science News

from research organizations

New biodegradable materials could replace plastic bags

Date: October 2, 2015

Source: Open University

Summary: As England gets set to start paying for plastic bags, researchers are making inroads into developing alternative biodegradable materials that could potentially replace fossil fuel derived polyethylene single-use carrier bags in the future.



Is this Bioeconomy? Biodegradable versus durable

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The Push for Bioplastics and the Myth of Biodegradability

by Tom Szaky

January 7, 2015



Related: Packaging, Chemistry and Materials, Coca-Cola.

This is the first of a three-part series by TerraCycle CEO Tom Szaky that examines the benefits, risks, misconceptions and long-term viability of bioplastics.

Since the relatively recent rise in conscious consumerism, **bioplastics** — plastics made from biomass such as plants and algae — have been receiving significant attention. With the bioplastic market **projected to grow** in the next few years, many are pointing to plant-derived plastic alternatives as the ultimate solution to our unsustainable dependence on fossil fuel-based plastics. But one particular type of bioplastic has recently mobilized a torrent of misinformation, misplaced optimism and confusion: plastics labeled “biodegradable.”

Why Durable Bioplastics, Not Biodegradable, May Be the Answer

by Tom Szaky

January 21, 2015



The ArtoSkin bioplastic facade created by Stuttgart University's ITKE (Institute of Building Construction and Structural Design) demonstrates the possible architectural and constructional applications of bioplastic materials. | Image credit: Institute for Building Construction and Structural Design

Related: Packaging, Terracycle, Building/Construction/Real Estate, Chemicals, Consumer Products, Manufacturing, Natural Resources.

To conclude this series about bioplastics and the biodegradability (or lack thereof) of plastic products and packaging, I want to discuss the future of what I consider to be one of the only viable alternatives to plastics derived from non-renewable resources: durable bioplastics.

The key word here is **durable**, because biodegradable plastics of any composition **are not the long-term sustainable solution** we need. When you compost a biodegradable plastic cup, that polymer can no longer be reused and maintained, meaning all of the energy and material inputs are lost in the soil. They can make sense in certain circumstances, particularly in countries that have large volumes of organic landfill waste. India is a prime example, where about **50-60 percent of the waste** sent to landfills is organic and could be composted, but only as a short-term waste-reduction strategy.

Durable bioplastics that can be recycled present us with a more viable opportunity to

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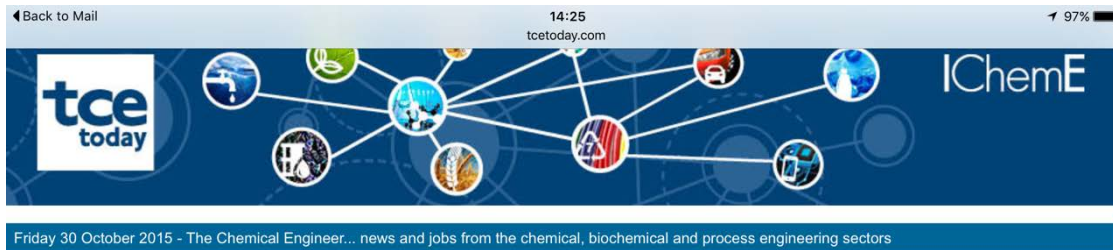
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By 2050, around 70% of the world's 9bn people will live in cities, generating more waste

23/10/2015

Biorefineries could solve urban waste problem Integrates recycling, power generation, composting

Helen Tunnicliffe

URBAN biorefineries could deal with municipal solid wastes such as plastics, paper and organic matter in built-up areas, according to UK researchers.

A biorefinery operates on a similar principle to an oil refinery, in that one plant can make many products from its feedstock and adjust the output according to demand. By 2050, around 70% of the world's 9bn people will live in cities, generating more waste and needing more energy. The researchers, from the universities of Oxford and Surrey, say an urban biorefinery could solve both of those problems.

The researchers, led by Oxford's Aidong Yang, considered paper, plastics and bio-organics. Bio-organic waste can be treated using either composting or anaerobic digestion (AD), which produces biogas that can be used in combined heat and power (CHP) plants, and solid residues that again can be used for compost. Paper can be processed using AD, composting, recycling, or incineration, with energy recovery for heat and power generation. Plastics can be recovered for re-use mechanically, or chemically, for example by pyrolysis or gasification, with incineration for energy recovery a final resort.

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Put your heads together
A new model for collaborative innovation



28 AUG 2013: REPORT

Incineration Versus Recycling: In Europe, A Debate Over Trash

Increasingly common in Europe, municipal "waste-to-energy" incinerators are being touted as a green trash-disposal alternative. But critics contend that these large-scale incinerators tend to discourage recycling and lead to greater waste.

BY NATE SELTENRICH

For communities short on landfill space, "waste-to-energy" incineration sounds like a bulletproof solution: Recycle all you can, and turn the rest into heat or electricity. That's how it's been regarded in much of Europe, where nearly a quarter of all municipal solid waste is burned in 450 incinerators, and increasingly in the United States, where dozens of cities and towns are considering new, cutting-edge plants.

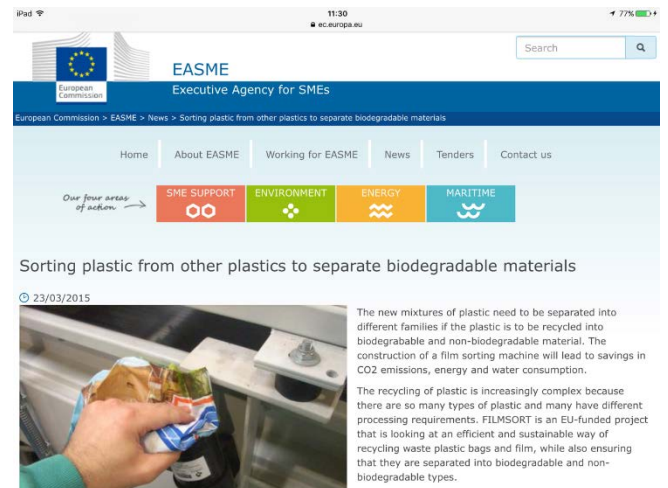


ABOUT
Nate Seltenrich is the author of the work on the environment published in High Country Environmental Health Perspectives Chronicle, and other print a



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New Link in the Food Chain? Marine Plastic Pollution and Seafood Safety

ISEE 2015 Abstracts Now Available

EHP is pleased to present the abstracts for the 2015 annual conference of the International Society for Environmental Epidemiology (ISEE), "Addressing Environmental Health Inequalities," held 30 August–3 September 2015 in São Paulo, Brazil.

New Editor-in-Chief

We are pleased to announce that Sally Perreault Darney has been selected as the new Editor-in-Chief of EHP. Sally comes to EHP from the U.S. Environmental Protection Agency, where she most recently co-led a large research project focused on assessing health disparities in vulnerable groups and providing healthy environments for children. Learn more about Sally and her vision for the journal in the September issue of EHP.

oceanconservancy.org

Stemming the Tide: Land-based strategies for a plastic-free ocean

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Home > Microplastics in personal care products: the tip of the iceberg







29 Oktober 2015

Microplastics in personal care products: the tip of the iceberg

nova-Institute shows that the amount of microplastics in personal care products washed to the sea, although appreciable, is dwarfed by microplastics from other sources

Microplastics are a major source of water pollution. The litter found in oceans and inland waters is dominated by plastics. This litter does not only consist of large items like plastic bottles and bags, it also contains microplastics if only because the large objects tend to decompose into small particles. A recent study by nova-Institute shows that the amount of microplastics in personal care products washed to the sea, although appreciable, is dwarfed by microplastics from other sources.

Nova-Institute concentrates on Germany and gives the figure of 500 tons of microplastics in personal care products (cleansers, shower gels and skin-care products) discharged annually into surface waters. Another estimated 300 tons may come from industrial products like detergents, disinfectants and blasting agents. Manufacturers of cosmetic products have responded to the criticism on their use of non-biodegradable microplastics and are on the road towards reduction or abandonment. However, this is not yet the case for other applications, markets or regions. So far, manufacturers of industrial products do not seem to be prepared to reduce their use of microplastics. For personal care products, there are alternatives such as beeswax, cellulose, casein and minerals, as well as innovative products like the bio-based plastics polylactic acid (PLA) and polyhydroxyalkanoate (PHA). Although we do not know yet for sure if all these alternatives are sufficiently biodegradable.

Major other sources of microplastics

But there are major sources of microplastics that are not at all affected by public opposition. Take

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Sixth WPC & NFC Conference, Cologne

Is this Bioeconomy? Aquaponics



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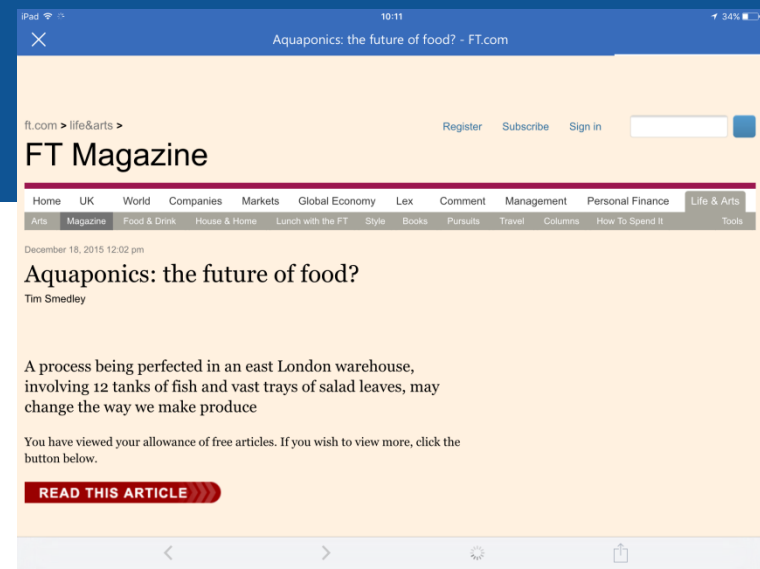
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WHAT ROLE WILL AQUAPONICS AND HYDROPONICS PLAY IN FUTURE FARMING?



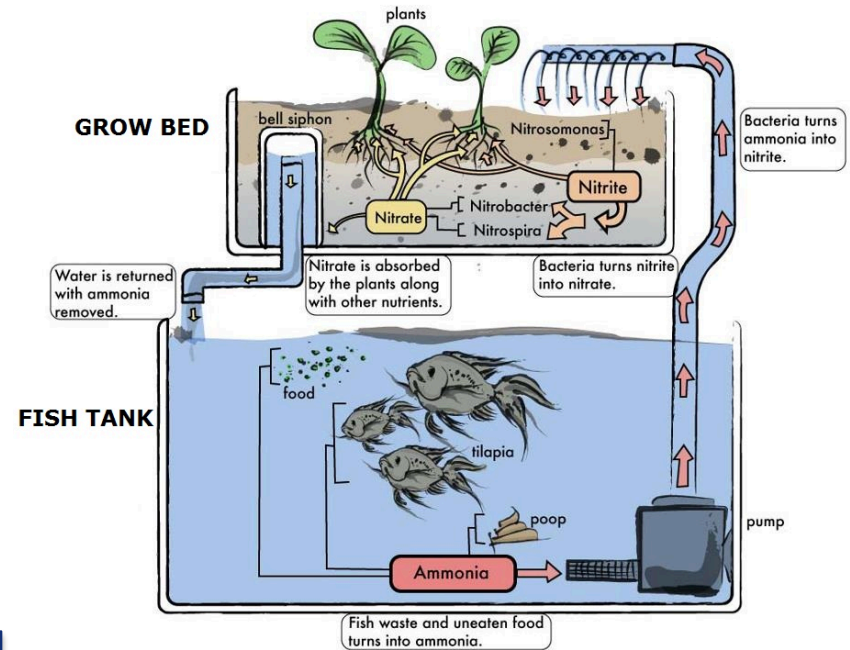
Editor's Note: USFRA's FoodSource is a place to get information on the most asked questions by today's consumers. After reviewing the topics, if visitors still have questions, they can submit their own on our website. This post is based on a recent question submitted through FoodSource.

Raising fish and plants together can be done – and can be accomplished successfully and sustainably. Aquaponics and hydroponics systems are quickly moving from the realm of experimental to commercial as researchers and growers alike have turned the systems into working models of sustainable food production. Aquaculture, for example, is one of the fastest growing segments of the U.S. and global agricultural economies, growing at a rate of 6.5 percent per year, according to the Fisheries Technologies Associates, Inc. The 2007 USDA census of agriculture counted 6,409 farmers and ranchers reporting freshwater aquaculture sales in the US. Total sales were \$1.4 billion.



AQUAPONICS BASIC DIAGRAM

<http://kanat.jsc.vsc.edu/student/grzyb/main.htm>





Is this Bioeconomy? Edible landscapes and food sharing

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VALEURS COMMUNES
SOLIDARITÉ

Nourriture à partager

INCROYABLES COMESTIBLES,
MOUVEMENT ANTI-CRISE.

En transformant l'espace public de leur ville en jardins potagers gratuits, des citoyens créent un nouvel art de vivre par le partage. Découverte.

Comment rendre attractive une petite ville en déclin du Nord de l'Angleterre ? En 2008, Todmorden, 14 000 habitants (contre 25 000 en 1900), subit la crise économique après le sinistre de ses industries dans les années 1970. Parce que les légumes et les fruits frais sont peu accessibles aux chômeurs, des citoyens décident d'en planter en bordure de trottoirs. Et lancent ainsi le mouvement des Incredible Edible, les Incroyables Comestibles en français, en référence aux lieux improbables (dans les jardins publics, sur les gazons de l'hôpital ou devant le poste de police...) où sont plantés blettes, rhubarbes et autres arbres fruitiers mis à la disposition des habitants. Quelque 70 bacs parsèment aujourd'hui la cité

CHIFFRES CLÉS

Il existe environ **250** communautés Incredible Edible à travers le monde. Chaque jour, un nouveau groupe au minimum démarre. Les Incroyables Comestibles français reçoivent **une quinzaine** de demandes d'information par jour, contre **trois** au début du mouvement.

VALEURS MULTIMÉDIAS #264 MAI/JUIN 2013 12

09:57 kitchencommons.net 31%

kitchen commons

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Kitchen Commons

Kitchen Commons fosters a network of community kitchens that bring people together to share food, resources and relationships. We support grassroots leaders and their kitchen partners through training and resources.

Community Kitchens Become a Member! Resources Pitch In!

Looking for a kitchen? Many hands make



http://pm22100.net/pages/enercoop/1/Incredible_edibles.html



Is this Bioeconomy? Neglected and forgotten crops revolution



Seeding the future: tapping gene banks to secure our food future

Wednesday 7 August 2013 9:30AM
Alecia Wood

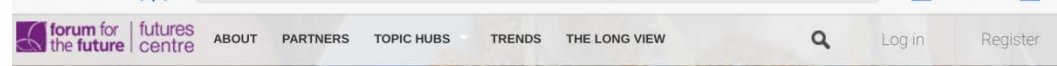


Presented by Michael Mackenzie



IMAGE: BOTANIST JO OSBORNE EXAMINES A SPECIMEN PRESERVED AT THE ROYAL BOTANIC GARDENS, LONDON. SCIENTISTS HOPE TO DISCOVER GENES THAT WILL PROVIDE BETTER TOLERANCE TO PLANT DISEASE AND STRESS. (PETER MACDIARMID/GETTY IMAGES)

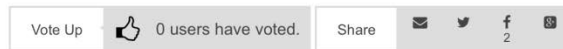
Thousands of years of crop domestication mean that fewer than a dozen flowering plant species now account for some 80 per cent of the world's diet. Some scientists argue the global food crisis could be solved by re-opening seed banks to refresh crop gene pools and increase diversity.

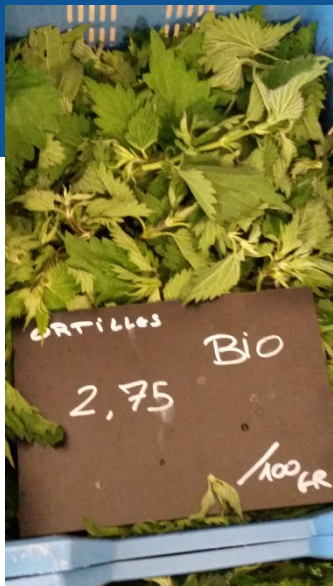


Could 'orphan crops' become a food security and income generation solution for the world's poorest communities?

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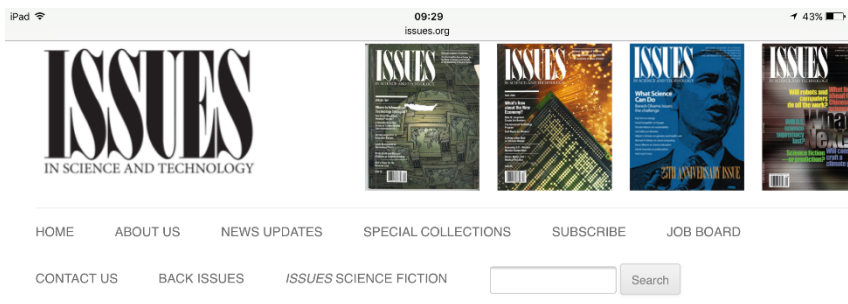




Belgomarkt, Bruxelles



Is this Bioeconomy? Perennials



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Perennial Grains Food Security for the Future

by [Jerry D. Glover](#), [John P. Reganold](#)

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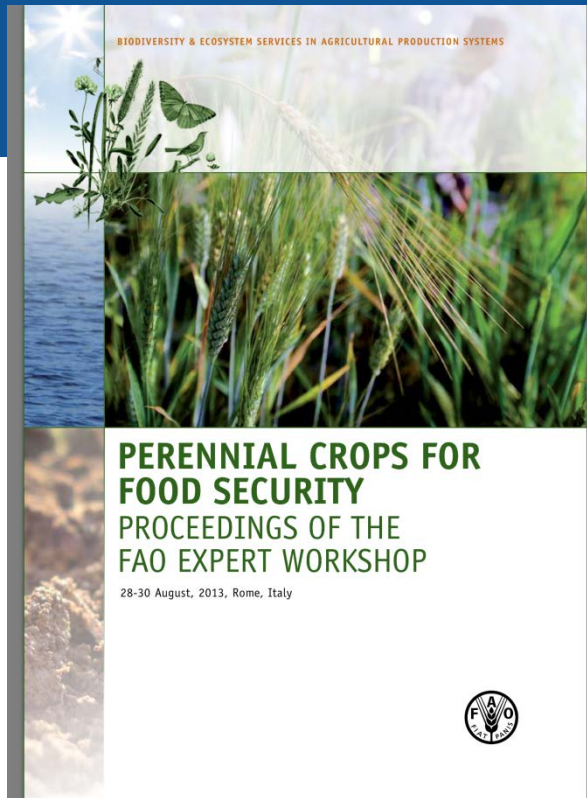
Developing perennial versions of our major grain crops would address many of the environmental limitations of annuals while helping to feed an increasingly hungry planet.

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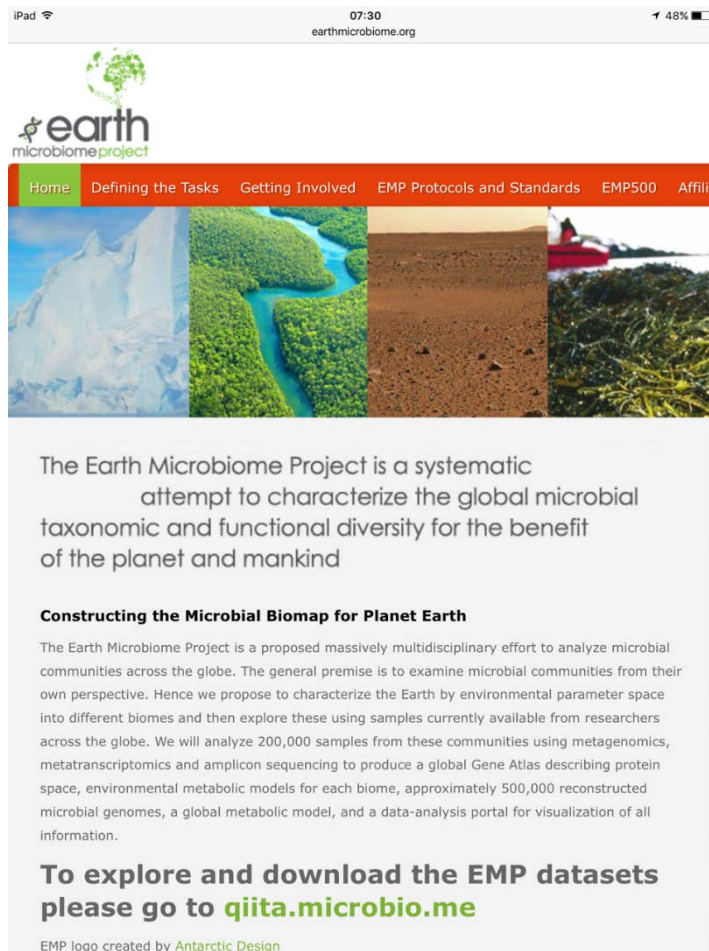


"Perennial cereals, legumes and oil species represent a paradigm shift in agriculture and hold great potential to move towards sustainable production systems. today, most agronomic practices used to grow annual crops require excessive water consumption, significant amounts of synthetic mineral fertilizers, labour, emissions of co2 and disrupt natural biological processes. Perennial crops instead are more rustic, improve soil structure and water retention capacity and contribute to increase climate change adaptation and mitigation practices and promote biodiversity and ecosystem functions."

<http://www.fao.org/3/a-i3495e.pdf>

Is this Bioeconomy?

Mapping the puzzle of microbiome potentials



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Home Defining the Tasks Getting Involved EMP Protocols and Standards EMP500 Affilia

The Earth Microbiome Project is a systematic attempt to characterize the global microbial taxonomic and functional diversity for the benefit of the planet and mankind

Constructing the Microbial Biomap for Planet Earth

The Earth Microbiome Project is a proposed massively multidisciplinary effort to analyze microbial communities across the globe. The general premise is to examine microbial communities from their own perspective. Hence we propose to characterize the Earth by environmental parameter space into different biomes and then explore these using samples currently available from researchers across the globe. We will analyze 200,000 samples from these communities using metagenomics, metatranscriptomics and amplicon sequencing to produce a global Gene Atlas describing protein space, environmental metabolic models for each biome, approximately 500,000 reconstructed microbial genomes, a global metabolic model, and a data-analysis portal for visualization of all information.

To explore and download the EMP datasets please go to qiita.microbio.me

EMP logo created by Antarctic Design



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Why It's Time to Map the Microbiome (Kavli Roundtable)

By Alan Brown, The Kavli Foundation | December 2, 2015 02:23pm ET

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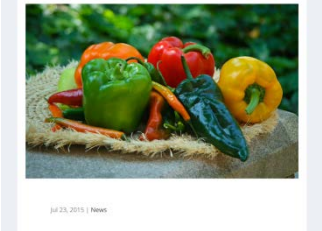
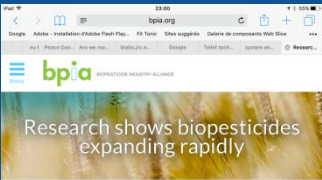
Alan Brown, writer and editor for The Kavli Foundation, edited this roundtable for Live Science's Expert Voices: Op-Ed & Insights.

Microbes make life on Earth possible, yet we know so little about them. Now, a team of scientists aim to change that through an ambitious effort — with researchers from 50 institutions — called the Unified Microbiome Initiative.

Their goal is to develop next-generation technologies to unlock the secrets of

microbiomes, complex ecosystems of microorganisms — from bacteria and fungi to algae and viruses — that inhabit nearly every square inch of the planet and have densely colonized our bodies.

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Is this Bioeconomy? Re-thinking plant protection

Kline

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Market Research Reports: Biopesticides

Global Biopesticides: An Overview of Natural and Microbial Pesticides

United States Published February 2015
Published January-June 2015
Base Year: 2013

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Description Contents Scope Key Benefits Methodology

DESCRIPTION

This report provides descriptions of the companies involved in biopesticides, the products and uses these companies have developed, the approximate market sizes by end-use crop and non-crop, plus an outlook for future technologies and products that are being developed and patented.

Technologies included are:

- Microbial species, such as fungi, viruses, or bacteria, acting as pesticides
 - Examples include Bacillus, Beauveria, and spinosad
- Natural materials with pesticidal properties, such as diatomaceous earth
- Plant extracts, such as neem, pyrethrum, and others as appropriate
- Biological seed treatments, including a cross-section of technologies used as protectants and stimulants
 - Examples include Bacillus, harpin, pseudomonas, and trichoderma

End use markets reported:

- Field crops (including cotton, corn, small grains, and soybeans)
- Fruit and vegetable crops
- Non-crop professional uses (including turf, ornamentals, forestry, and mosquito control)
- DTC consumer

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Medical Daily

VITALITY

Research shows biopesticides expanding rapidly

By Kline & Company July 14, 2015 | 8:20 am EDT

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Driven in part by societal concerns and in part by regulations, the bio-pesticides market, once a domain of a niche specialty for organic fruit, greenhouse,

and environmentally sensitive homeowner uses, is emerging to a much broader scope. In 2014, the market grew rapidly, posting double-digit growth, according to the recently published [Global Biopesticides: An Overview of Natural and Microbial Pesticides](#) report by global market research and consulting firm, [Kline](#). The company uses a wide definition of biopesticides in compiling its totals.

At \$1.6 billion, the biopesticide segment of the market is still less than 5 percent of the global crop protection industry, but is projected to increase its share over the next 10 years. All countries are projected to grow in the double digits or high single digits during this period. The main driver behind current growth is the advent of microbial seed treatments on field crops, such as corn, soybeans, and cotton.

The future of agricultural pest control is biopesticides, IoT insect monitoring systems

By Steve Brachmann October 8, 2015

0 Print Article



The name "pest," which at times means "nuisance" or "annoying," doesn't do the best job at portraying the devastating

Strawberries Rate Worst In 'Dirty Dozen' List Of Fruits And Vegetables With Most Pesticides

Apr 19, 2016 01:21 PM By Samantha Olson



Nearly all of the strawberries tested by the USDA contained multiple types of pesticides. Shah Marai/AFP/Getty Images

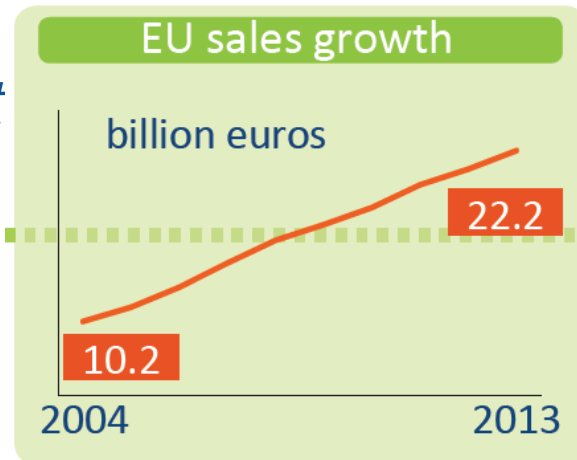
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Strawberries are a beloved fruit, eaten by the truckloads in America. But biters beware; according to a new report, along with every bite comes a little dose of pesticide residue. The annual "Dirty Dozen" list, released by the Environmental Working Group (EWG), revealed that strawberries earned the top spot as this year's biggest pesticide carriers. Apples, which have taken first place for the last five years, came in second, followed by nectarines, and peaches.

Is this Bioeconomy? Organics



The study found that the yield gap between organic and conventionally grown crops could be lowered to just 8 per cent *Getty Images*



Source; European Parliament Research Service
<https://epthinktank.eu/2015/05/20/organic-food/>



Marché bio les Tanneurs, Bruxelles



Is this Bioeconomy? Rewilding



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Feature Review [Switch to Standard View](#)

Are we ready for back-to-nature crop breeding?

Michael G. Palmgren, Anna Kristina Edenbrandt, Suzanne Elizabeth Vedel, Martin Marchman Andersen, Xavier Landes, Jeppe Thulin Østerberg, Janus Falhof, Lene Irene Olsen, Søren Brøgger Christensen, Peter Sandøe, Christian Gamborg, Klemens Kappel, Bo Jellesmark Thorsen, Peter Pagh

DOI: <http://dx.doi.org/10.1016/j.tplants.2014.11.003> | CrossMark

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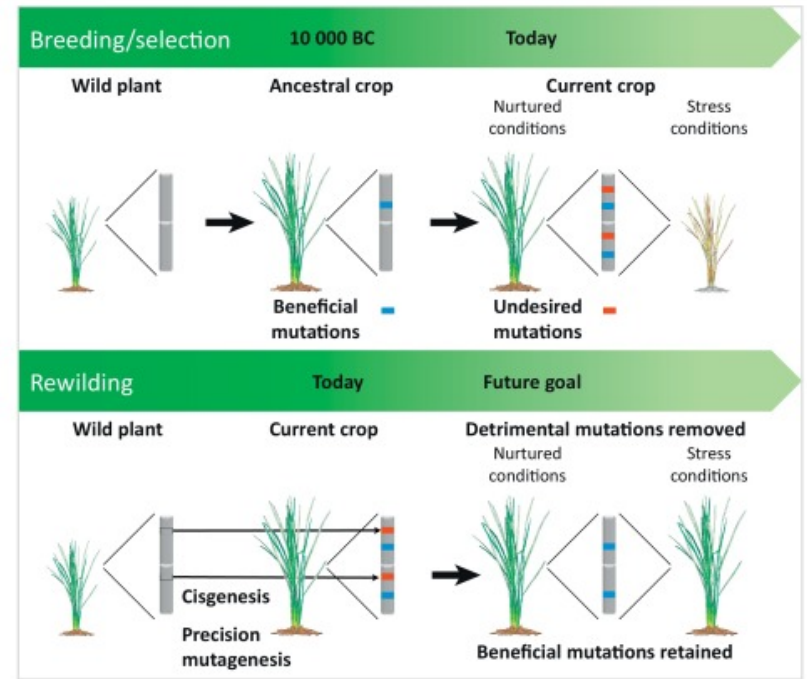
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- Highlights**
- Reverse breeding is here defined as introduction of ancestral traits into crops.
 - Reverse breeding provides a promising future path for sustainable agriculture.



Is this Bioeconomy? Marketing uglies and recycling food waste



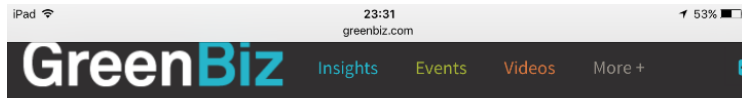
Delhaize, Drôles de legumes



Brussels Beer project, Beer from recycled bread



Is this Bioeconomy? Low-impact foods



What's Next Why low-impact diets are the next big opportunity

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Matt Loose
Director
SustainAbility



Aimee Watson
Analyst
SustainAbility

Matt Loose and Aimee Watson
Wednesday, November 5, 2014 - 4:00am



Window Farm.

What if everyone could have access to food that meets their dietary needs without preventing future generations from meeting theirs? That's the idea at the heart of sustainable nutrition. Increased attention to the environmental impacts of food types drives interest in sustainable nutrition, helping spur innovation and interest in those foods that can deliver nutritional value with a reduced **environmental footprint**.

The agricultural footprint — the land required to grow the



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Earth's first superfood? Solazyme's whole algae protein gains traction as formulators seek more vegan options

By Elaine Watson+
10-Sep-2015
Last updated on 10-Sep-2015 at 18:58 GMT



AlgaVia whole algae protein - which contains 63% protein, along with fiber, lipids and micronutrients such as lutein and zeaxanthin - has a slightly nutty taste similar to crushed pistachios.

Related tags: Algae protein, Solazyme, Algae, AlgaVia, Protein

New sources of protein from edible insects to hemp are being incorporated into a growing number of products from bars to beverages. But does microalgae have what it takes to become a serious player in the so-called 'alternative proteins' market?



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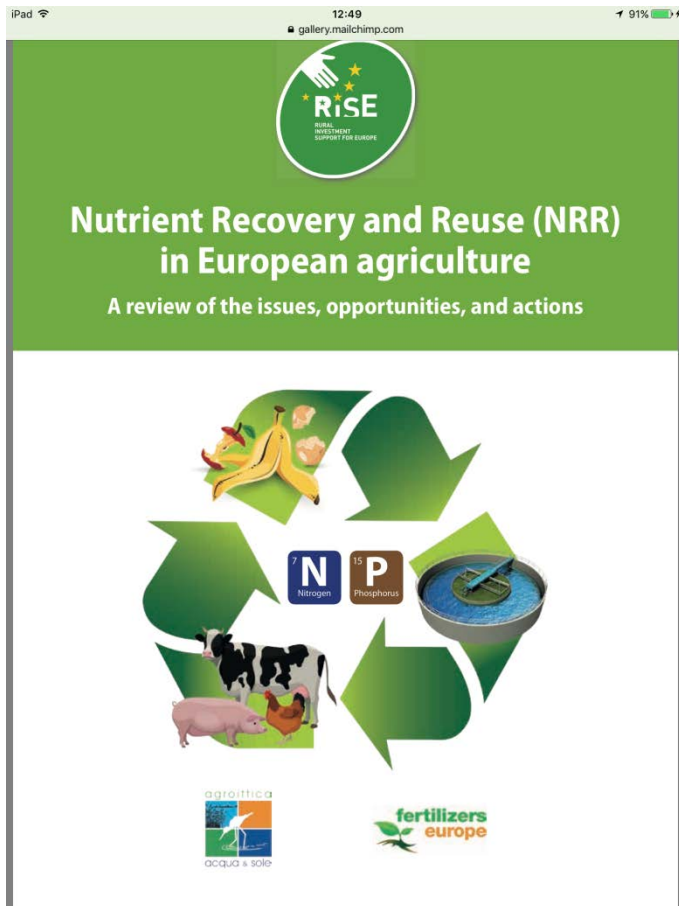
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Is this Bioeconomy?

Mainstreaming Nutrient Recovery and Reuse globally




“Every ton of nutrient which is intercepted from a waste flow and processed into a form suitable to be used to fertilize crops represents a ton less which would have leaked into water, the air, or the atmosphere, or ended up in land fill.

Europe can perform a leadership role in improved nutrient management. Since the transition is unavoidable this would also create first mover advantage and economic opportunities.”

Is this Bioeconomy?


Re-thinking human waste and toilet technology

Back to Mail 22:48 horizon-magazine.eu



29 October 2015

by Michael Allen



Urine can be turned into commercially available fertiliser. Image credit: Shutterstock/ Peter Gudella

Office blocks and universities could turn pee into commercially available phosphorus and nitro fertilisers, thanks to a bioelectrical reactor in development by researchers across the EU.

Fresh urine contains approximately nine grammes of nitrogen and one gramme of phosphorus per litre, as average person produces between one and one-and-a-half litres a day which currently goes to waste. Researchers believe human urine could provide 18 % of the phosphorus and 25 % of the nitrogen current used for soil fertilisation in the EU.

By extracting these compounds rather than flushing them down the sewer, we could reduce energy-intensive ammonia production and cut our reliance on imported phosphorus ore.

'We require phosphorus to ensure the production of crops and, with a growing human population and almost no phosphorus reserves in Europe, we rely on imports,' said Dr Philipp Kuntke, from Dutch water research firm Wetsus, who was involved in the project, known as ValueFromUrine.

It's possible thanks to urine-separation toilets and urinals, which stop it being diluted by other wastewater streams.

It means the EU-funded project, which finishes next year, has been able to develop a three-step process that uses a bioelectrical


“With a growing human population and almost no phosphorus reserves in Europe, we rely on import.”

Dr Philipp Kuntke, Wetsus

Salt

The innovation turning human waste into a powerful stink-free resource

By Jeff Smith on October 8, 2015



VAST ENERGY VALUE IN HUMAN WASTE

22:55 wateronline.com

This story is part of an Ashoka series in collaboration with Salt, spotlighting leading young innovators to support the Unilever Sustainable Living Young Entrepreneurs Awards, a global competition launched by Unilever in partnership with Cambridge Institute for Sustainability Leadership. To follow the conversation on Twitter, search #GlobalGoals for a #Bigeni. Back to Mail

Water Online

Drinking Water Wastewater Industrial Utility Management Providers ACE16

From The Editor | May 22, 2014

'Peecycle' Please: Will Urine Separation For Nutrient Recovery Take Off?

By Kevin Westerling @KevinOnWater

Is it feasible to separate nutrient-rich urine before it reaches the wastewater treatment plant?

It might be a pipe dream, but researchers are investigating the potential of keeping urine separate from the rest of the wastewater we humans produce. The urine would be diverted as close to the source as possible – at the toilet, via dedicated plumbing – and then stored, treated, and converted into fertilizer. While it's not realistic to expect urine-diverting (UD) toilets in every home, they could reasonably be installed in high-occupancy buildings.



Fertile Ground For Research


The goal is not only to make fertilizer, but to decrease the amount of nutrient removal required at the wastewater treatment plant (WWTP) – or the “water resource recovery facility” (WRRF), which is the term the Water Environment Research Federation (WERF) prefers. The new moniker certainly fits in this case, as the WERF-sponsored research project is right in line with its mission to capture and

20th Anniversary

HOME ABOUT RESEARCH TRAINING PUBLICA

In Ghana, fertilizer pellets from fecal sludge are becoming a reality

By Jeff Smith on October 8, 2015



02 VAST ENERGY VALUE IN HUMAN WASTE


22:55 wateronline.com

But what will be unusual about this fertilizer plant is the raw material that will be used: human waste from public parks and streets in the area. To be more precise – 12,600 cubic meters a year of waste when the plant is at full operation.

Making wealth from waste

In Ghana, fertilizer pellets from fecal sludge are becoming a reality

By Jeff Smith on October 8, 2015



02 VAST ENERGY VALUE IN HUMAN WASTE

22:55 wateronline.com

Construction workers wearing yellow hard hats and rubber rain boots were recently laying cement blocks in a dirt leveled field near the busy port town of Tema, Ghana. Work was in the early stages of a low-cost, mostly open-air plant that eventually is anticipated to produce 500 metric tons a year of fertilizer powder and pellets for the agriculture sector under the trademarked name “FertiFec.”

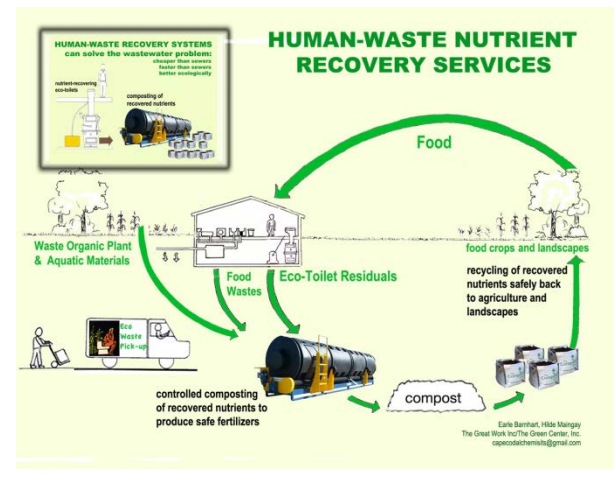
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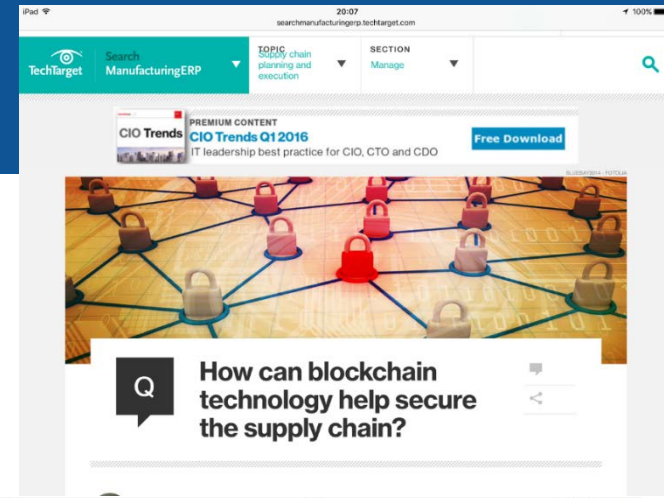
Power to the poop: one Colorado city is using human waste to run its vehicles



Renewable natural gas is a growing industry for fuel, electricity and heat, but advocates say it's a largely untapped market in the US.

Melanie Scordino





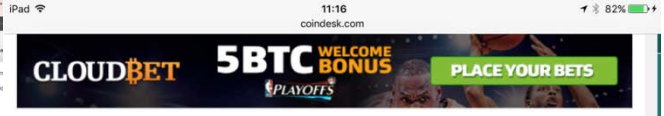
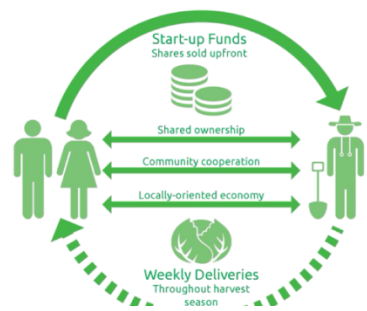
Is this Bioeconomy? Provenance technology for supply chain traceability

10:59 consensys.net

FarmShare: Blockchain Community-Supported Agriculture By William E Bodell III // STRATUM

1. Introduction:
This document is intended to provide an overview of the potential application of internet-connected sensor devices and a blockchain-based alternative ownership model in the context of a rural agricultural community. The proposal builds upon the existing business model known as Community-Supported Agriculture (CSA), which aims to create mutually beneficial relationships between farmers and local communities by involving CSA members/subscribers in the production and decision-making processes. The FarmShare application serves as a platform for facilitating collaboration between farmers and shareholders, which has generally proved difficult for CSA organizations relying on traditional modes of planning and communication.

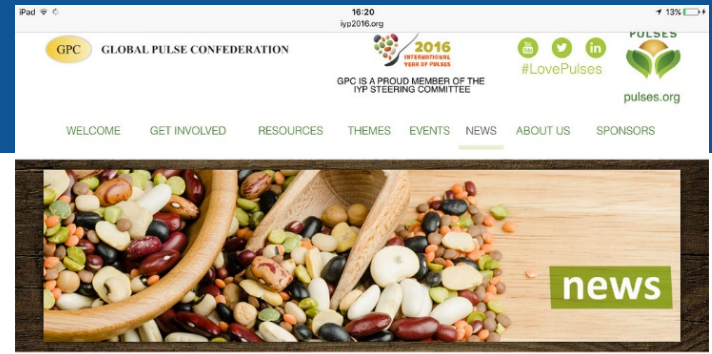
1.1 Community-Supported Agriculture
Community-supported agriculture is an alternative economic model for the production and distribution of locally grown food. It originated in the 1980s in the north eastern United States, based on the concept of biodynamic agriculture first proposed by Rudolf Steiner. CSAs operate on a shared risk-reward model, in which a community of shareholders funds the operation of a local farm at the beginning of the growing season in exchange for weekly deliveries of fresh produce and other food products (such as eggs, dairy, meats, etc) over the course of the harvesting period.



Reid Williams is a senior designer and engineer at IDEO Futures, where he works at the intersection of technology, design, and new venture creation. Alongside Joe Gerber, he is kicking off the *Bits + Blocks Lab*, a pop-up blockchain startup creation lab hosted at the Harvard Innovation Lab.

This post, which examines how the technology behind bitcoin could make supply chains much more transparent, is part of the *Humans + Bits + Blocks* series.





Is this Bioeconomy? Alternative sources of protein

Food Research: High Quality Plant Proteins

Published: 17 March 2015

Plant-derived proteins provide an ideal answer to the increasing demand for nutritious protein-rich food, now and into the future as population growth further increases the need for proteins. However, many plant proteins available today have lost functionality during the isolation and drying processes. Scientists around the world are trying to find ways to



Home > New Plant Protein Powerhouses

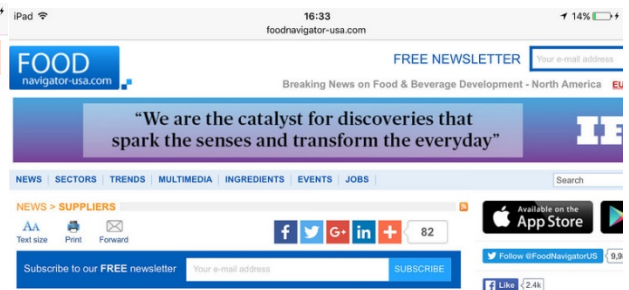
Proteins & Enzymes

New Plant Protein Powerhouses

The most abundant dietary protein sources on earth are in fruits and vegetables—and food and beverage processors are poised to take full advantage of that



Pure powder derived from highly sustainable Wolffia (duckweed) is at least 45% protein, as well as eco-friendly and non-GMO.
SOURCE: Hinoman Ltd. (www.hinoman.biz)



Earth's first superfood? Solazyme's whole algae protein gains traction as formulators seek more vegan options



AlgaVia whole algae protein - which contains 63% protein, along with fiber, lipids and micronutrients such as lutein and zeaxanthin - has a slightly nutty taste similar to crushed pistachios.

Related tags: Algae protein, Solazyme, Algae, AlgaVia, Protein

New sources of protein from edible insects to hemp are being incorporated into a growing number of products from bars to beverages. But does microalgae have what it takes to become a serious player in the so-called 'alternative proteins' market?



A new source of plant protein



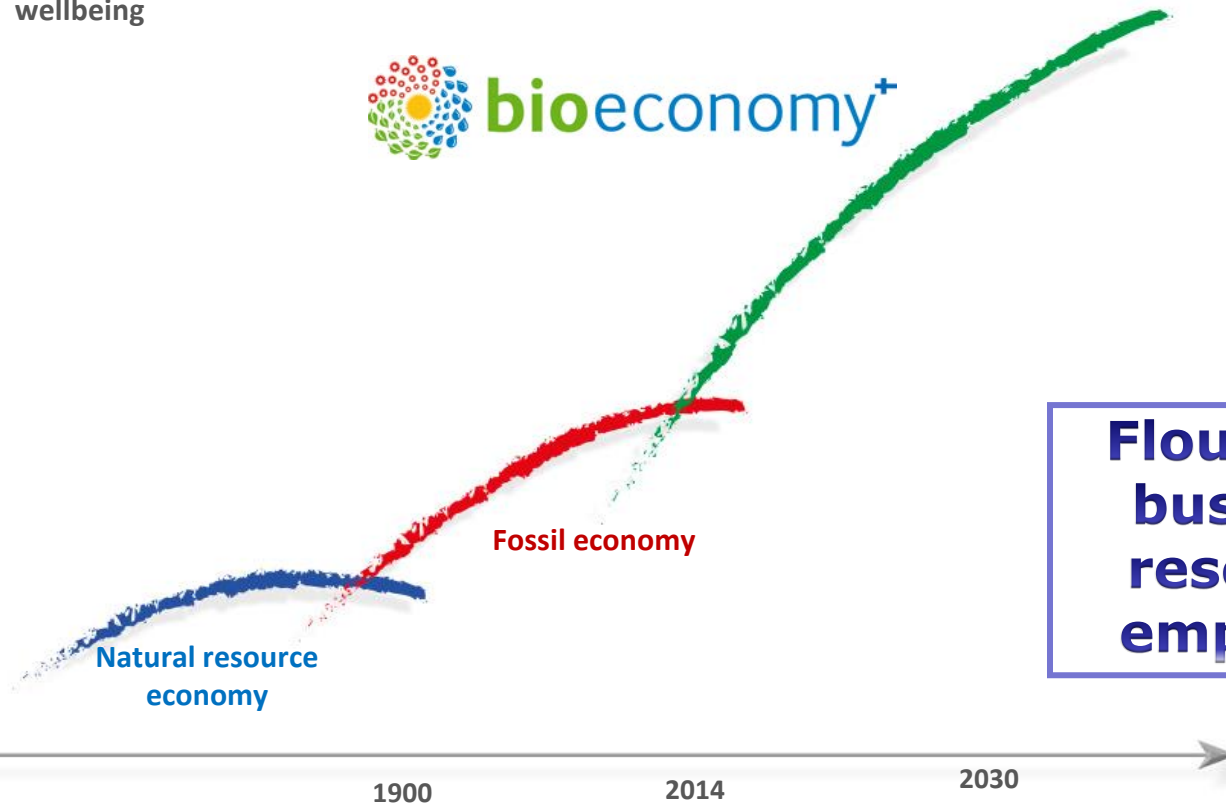
Meat production is very energy and water intensive. Alternative, more sustainable proteins may help to reduce pressure on natural resources in the future. In this article Cecilia Wittjyer of Parabel describes a new source of plant protein from water lentils.

The water lentil
(Lemna sp. from the family Lemnaceae) is considered to be the world's smallest flowering plant. It consists mainly of leaf protein and has been eaten whole for hundreds of years in different parts of the world. Recently a breakthrough discovery in methods for extracting plant protein from aquafarmed water lentils by the US company, Parabel, has created the opportunity to commercialise a new plant protein. The protein concentrate, known as LENTEIN, won the IFT Food Expo Innovation Award this year and is finding application in nutritional and functional foods as well as animal feed. The company has identified optimal growing conditions for the water lentil, which allow it to double its biomass in 24 hours. This means that the crop can be harvested daily and the yield per acre is many times higher than GM Soy. The system is designed to be modular to allow for flexible and rapid implementation. An aquafarm can be scaled to fit each site. The technology can produce biomass on a large scale at consistent rates all year round (Figure 1).

GDP and
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Sustainable
development

Non-fossil,
post-petroleum
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**Flourish local
businesses,
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Source: Finnish Bioeconomy Strategy, 2014



FOOD 2030 R&I Framework

1. To promote a **systems approach** to research and innovation,
2. To better **structure, connect and scale-up EU R&I**, in a global context
3. To **step-up EU investment** ambition (public and private)
4. To mobilise international stakeholders to **tackle global societal challenges**

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