Baltic Compact

Conference: “A greener agriculture for a bluer Baltic Sea”, Helsinki, 27 August 2013

INNOVATIVE MANURE HANDLING TECHNOLOGIES - AGRO TECHNOLOGY ATLAS

by

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Agro Business Park

Baltic Sea Region Programme 2007-2013

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✓Environmental technology
✓Agro
✓Food
✓Bioenergy

Innovation & entrepreneurship

OFFICE RENTAL
Complete facilities for innovative companies

GUIDANCE
Sparring and network from idea to growth company

CAPITAL
Venture capital for companies with growth potential

PROJECTS
Development of future technologies and network

AgroTechnologyATLAS – the "ATLAS"

- The ATLAS - http://agro-technology-atlas.eu - contains research-based information about agro-environmental technologies as well as related organic material, and tools for various scenario calculations.

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”The ATLAS”

- 'ATLAS' according The Free Dictionary: "A volume of tables, charts, or plates that systematically illustrates a particular subject".
- This Technology ATLAS is interactive: You can find data, information, illustrations, graphics and tables about the individual technologies, you can join them in combined technologies and see their combined costs and effects, and you can even send pre-defined amounts and types of livestock manure mixtures through the technology processes, and see qualities and amounts of end and by-products, as well as emissions and environmental impacts.

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- Agro Business ark was partner and Work Package leader in the Baltic Sea Programme /Interreg project Baltic Compass (http://www.balticcompass.org),
- BalticCOMPASS aims at fostering win-win solutions for farming business and the environment.
- WP4 had the objective to accelerate investments in innovative agro-environmental technology. We did this via
  - Network activities
  - Sector Study
  - **ATLAS of Technologies**
  - Support to prepare and implement investments

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Purpose of the ATLAS

- The ATLAS shall lead to a wider use of the best available agro-environmental technologies.
- Larger use means more investments, business development, jobs and economic prosperity, but it also means more efficient use of (expensive and depleting (P)) nutrients, reduced pollution per produced unit of food, working for biobased economies and higher recycling. This is the key to produce more food with less environmental impact.
- Science-based, impartial, and verified information is costly to produce, and there is therefore all kind of reason for sharing this as much as possible.
- A survey has shown, that 63% of customers/investors, do not trust company information!!
- Autorities' regulation of livestock farming must be based on validated information.

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ATLAS ”justification”

- The ATLAS builds on the believe that access to trustworthy information is a fundamental enhancer for investments in the technologies, and that this likewise is prerequisite for the authorities’ ability to appraise farms’ environmental permit applications in a justified and professional manner.
- Such information is typically rather expensive to produce; a technology verification, such as a VERA Verification Statement, would typically cost more than € 50,000, and the information is in many cases transferable to neighbor countries with similar climate conditions, also because livestock production systems, and farming systems in general, are rather similar among countries in the macro-region, especially for the large farms with intensive production.
- There is therefore every good reason for sharing the already produced and existing information, and the role of the ATLAS is simply to structured this information and make it easily accessible.

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The ATLAS' legal context

- Agro-environmental technologies are on the ATLAS defined as those primarily having relation to agriculture and livestock production in EUs Nitrates Directive (91/676/EC), Water Framework Directive (2000/60/EC) and Industrial Emissions Directive (2010/75/EC). The technologies includes as well some Best Available Techniques, as defined in the Reference Document on Intensive Rearing of Poultry and Pigs as found at http://eippcb.jrc.ec.europa.eu/reference/.

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Content of the ATLAS

- Technologies
  - 11 categories of technologies
  - 58 technology descriptions for the present
- Organic material and biomass
  - Livestock manure types, 14 categories, around 130 datasets
  - End and by-products from manure processing, 11 categories, around 130 datasets
  - Energy crops and straw
  - Industrial wastes
  - Organic household waste
  - Food waste
  - ”Blue” biomass

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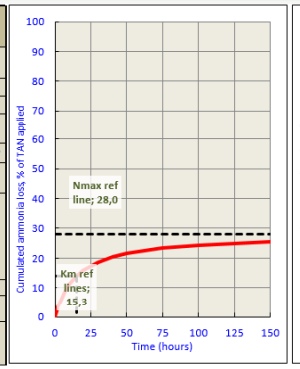
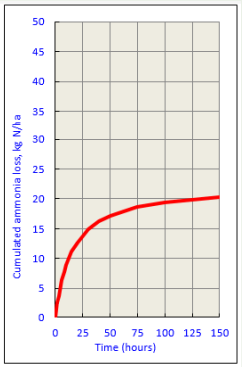
Content of the ATLAS

- Tools
  - Tool for mixing organic material and biomass
  - Pre-feasibility calcuation tool for biogas projects
  - Alfam - interctive model for estimating ammonia evaporation during field spreading of slurry
  - Tool for assessing the spatial smell implications of a given biogas plant
  - KTBL calculation tool for biogas (Wirtschaftslichkeitsrechner Biogas)

Dependent factors	Selected value	Possible values
Soil moisture	1	0 = Dry 1 = Wet
Air temperature	16	°Celcius, range from -6°C to 36°C
Wind speed	6	Meter per second, range from 0 to 9 m/s
Slurry type	1	0 = Cattle 1 = Pig
DM	6,5	% dry matter in slurry, range from 1 to 11%
TAN	3,2	TAN = Total Ammonia Nitrogen per kg slurry, range from 0,2 to 4,0
Application technique	2	1 = Broad spread 2 = Band spread / trailing hose 3 = Trailing shoe 4 = Open slot 5 = Closed slot 6 = Pressurised injection
Application rate	25	Ton per ha, range from 10 to 100 ton/ha
Slurry incorporation	0	0 = No incorporation 1 = Shallow cultivation
Measuring technique	1	1 = Wind tunnel 2 = Micromet. mass balance 3 = Lennart boxes (dyn. chambers)





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User network of the ATLAS

- Anyone can register as user of the ATLAS
- Users will see a list of other users, they can add and edit (own) biomass datasets, and use the tools.
- Users will receive the newsletter: ”Innovative Agro-Environmental TECHNOLOGIES for Sustainable Food Production in the Baltic Sea Region” four times per year – and are most welcome to provide input to the newsletter.

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So WHAT makes agro-environmental technologies interesting in the future?

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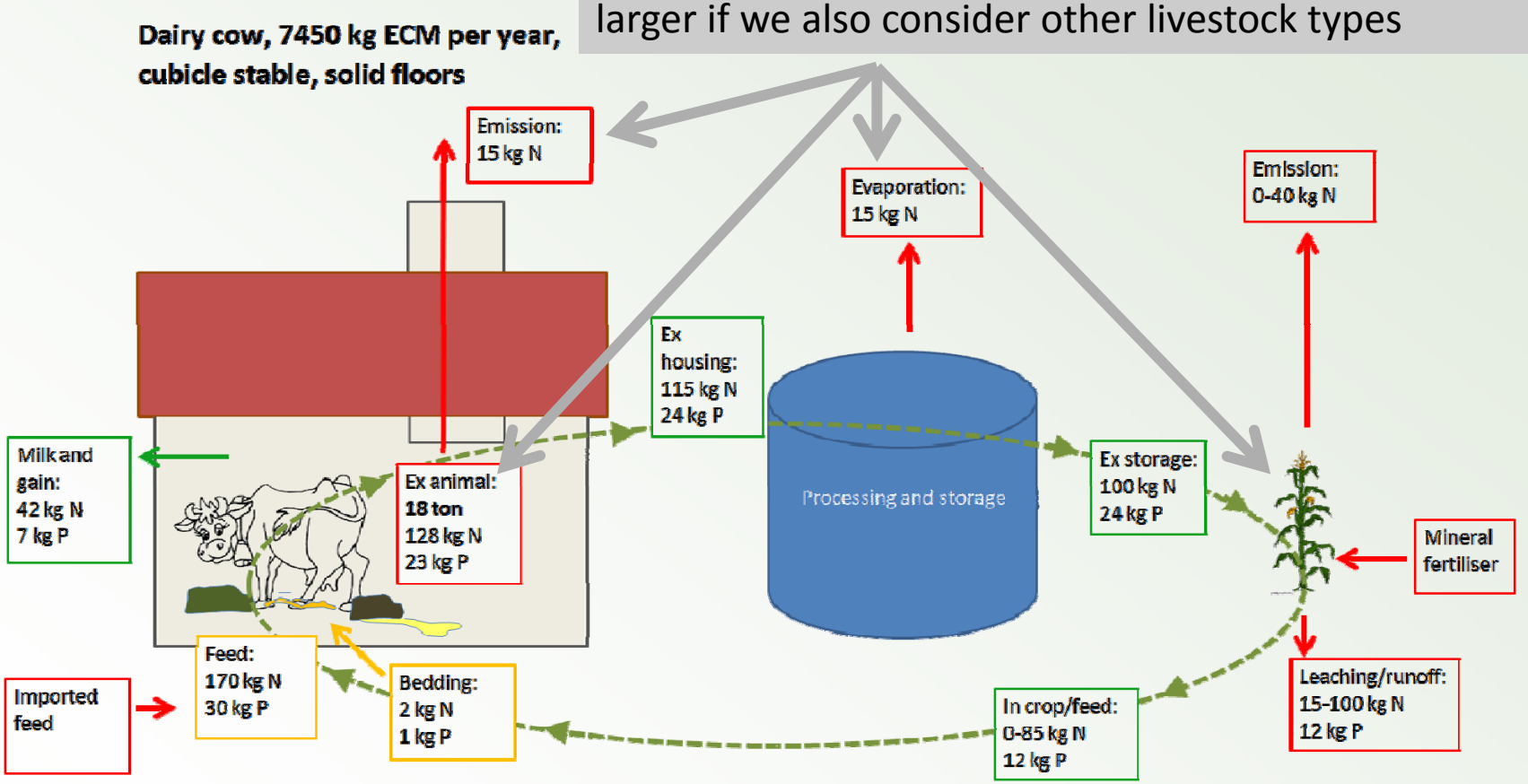
Future scenarios: Optimising nutrient recycling

Huge variations, and the variations are even much larger if we also consider other livestock types



Today less than half of N and P is recycled in farming – this can be done better!

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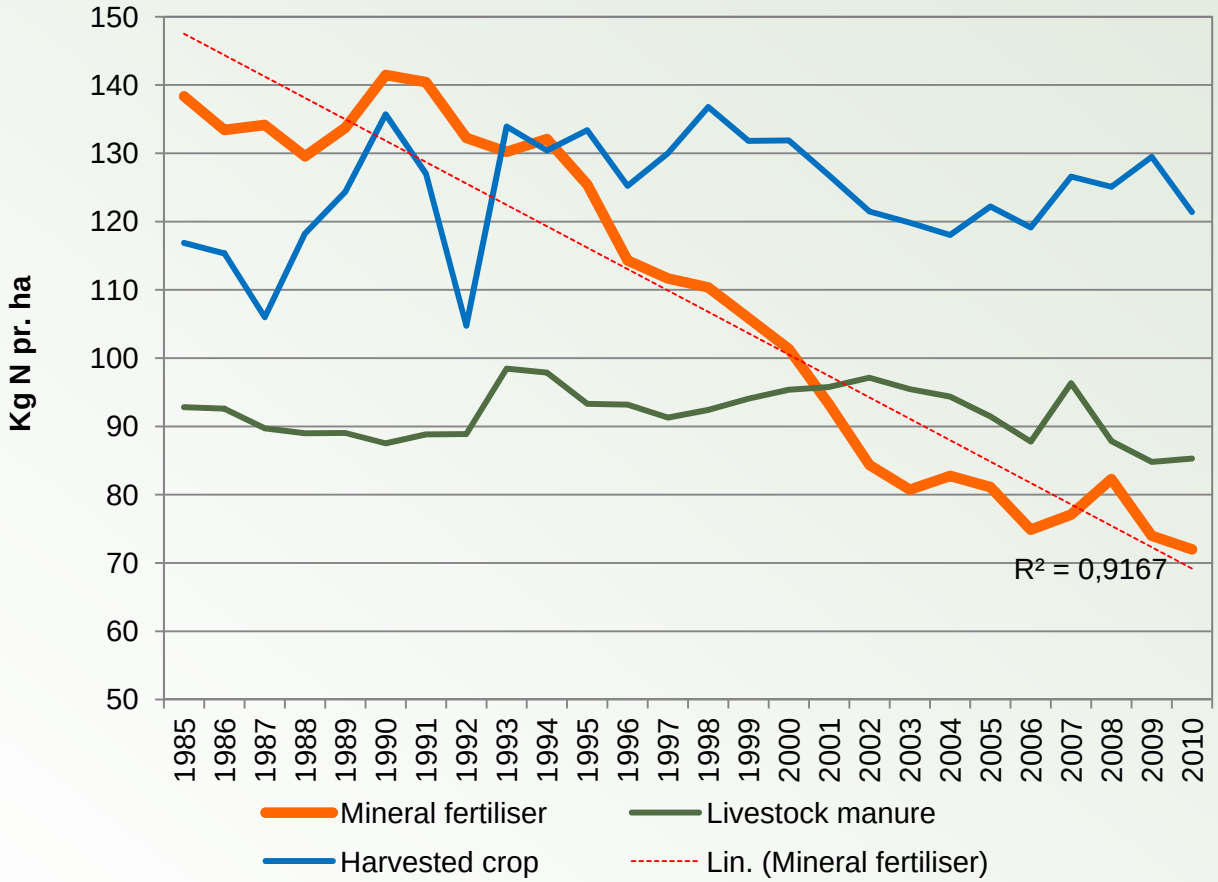
Future scenarios: Mineral fertilisers on return

- The curve shows Danish consumption of N-fertiliser per ha over the last 25 years (Leif Knudsen, Knowledge Centre for Agriculture).
- Consumption of N in manure has been rather stable, but N in mineral fertiliser is halved – the N-yield is more or less the same.
- The Danish Government has set the target of a fossil free society in 2050.



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Future scenarios: Paradigm shift

- From indirect to direct regulation of farming
  - From fertiliser norms, same for all, to pollution rights, individually determined according local nature vulnerability
  - From number of animals / manure production, to allowed emissions
- From absolute to relative pollution: The future question is not how much manure nutrients a pig produce, but how effective the nutrients are recycled on the pig farm – THE NUTRIENT LOSS PER PRODUCED UNIT OF FOOD WILL COME INTO FOCUS.
- Use of agro-environmental technologies with proven environmental effect will in the future, more directly than today, be the tool to obtain production permits.

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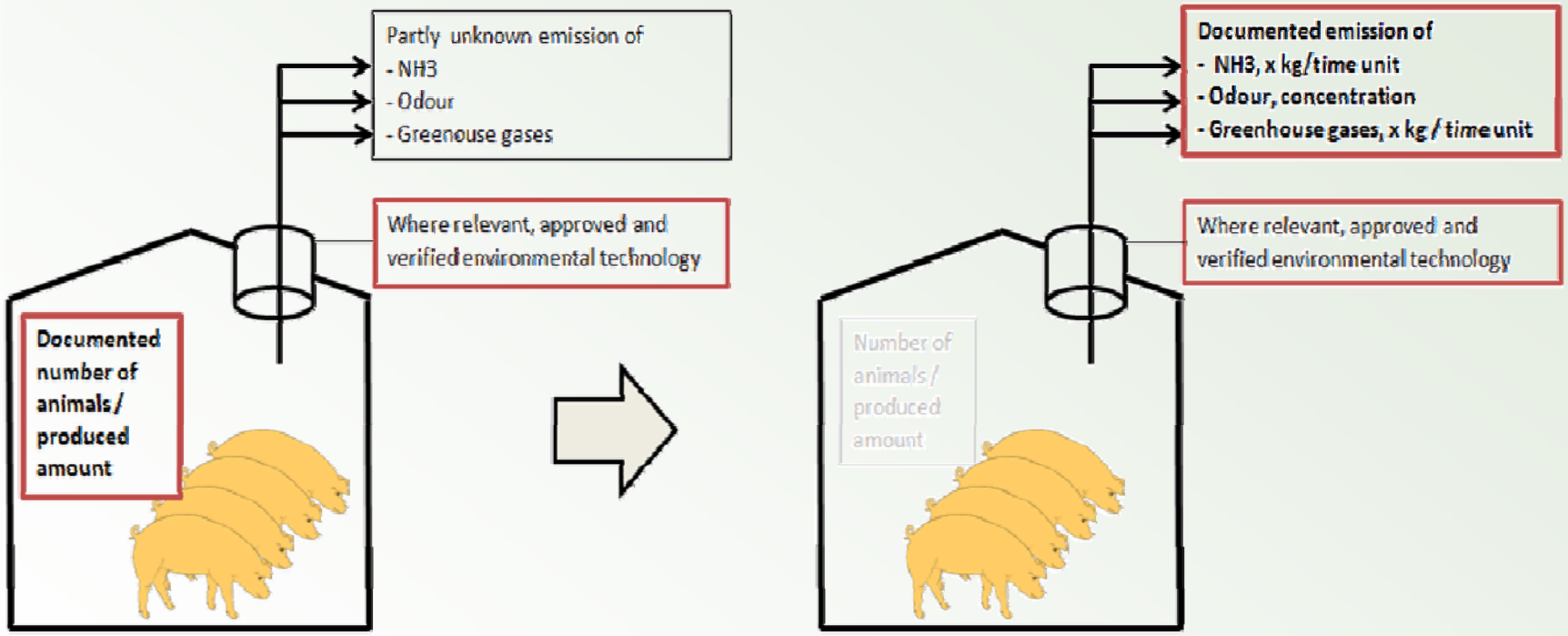
Future scenarios: Paradigm shift



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Future scenarios: Increasing farm size

- In the milk recording year 2011/12, the average size of a Danish dairy cow herds was 156 cows (Source: Knowledge Centre for Agriculture). In 1999/2000 the average was 69 cows.

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Examples of prospective, innovative agro-environmental technolgies – here a farm-scale biogas plant

Technology example 1: Mobile slurry separation

- Slurry separation is a central technology in manure processing.
- There are about 10 different separation technologies, and the choice should be based on the actual situation and need, as well as investment and running costs.
- Making slurry separation mobile saves investment costs, as one farm typically cannot utilise the capacity.

The Börger Bioselect BC50 plant is installed on a triple axed trailer with an insulating tarpaulin, and rotates between 8 pig production sites every 14 days.

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Technology example 1: Mobile slurry separation

- Delivering separation solids to a regional biogas plant has several benefits:
  - Saves around 95% of the transport.
  - Leaves the separation liquids with a high fertilising value on the farm.
- The setup on Bornholm with a Börger screw presser secures
  - Small investment costs because the separator sucks the slurry direct from the slurry channels;
  - Low electricity consumption;
  - High capacity up to 65 m3/hour;
  - the separation solids remain its full biogas potential; and
  - The separation liquids contains a good balance between N and P (does not remove so much P as many other separation types).

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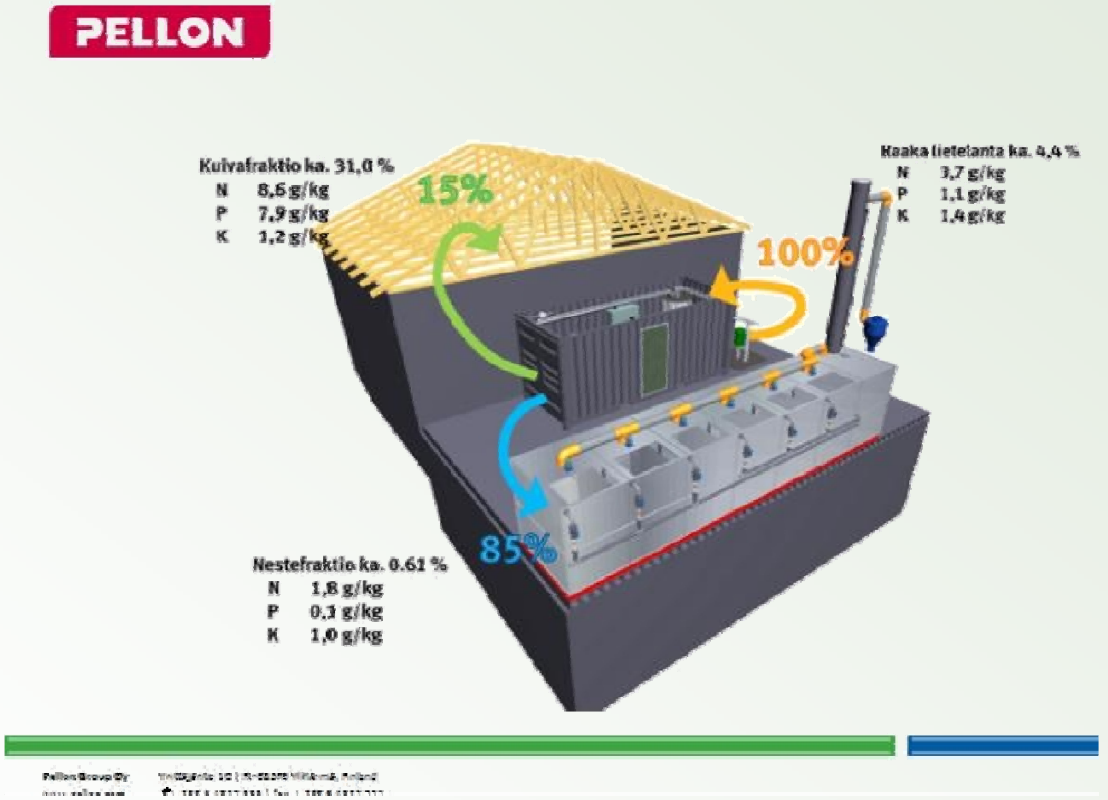
Technology example 1: Slurry separation

- There are also other separation technologies and ways to configure them. The Finnish company Pellon has built a unit where separation is built together with other manure treatment technologies.



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Technology example 2 – air cleaning

- In a world with more and more people requiring more and more food, while in the same time reducing the impacts on nature and environment, air cleaning of livestock houses become more and more relevant.
- Biological aircleaning reduces smell from exhaust ventilation air from pig houses with 40 (Dorset Biological Combi Aircleaner) - 73% (Farm AirClean) (Danish Environmental Protection Agency, 2013), and reduce dust with 90%.

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Technology example 3 – cover on slurry tanks

- Roofs on tanks with pig slurry would typically reduce the ammonia emissions with 50%, and further avoid the slurry to be diluted with rainwater. It is generally considered that a there is a loss of 15% N via ammonia evaporation, with a variation dependent on many factors.

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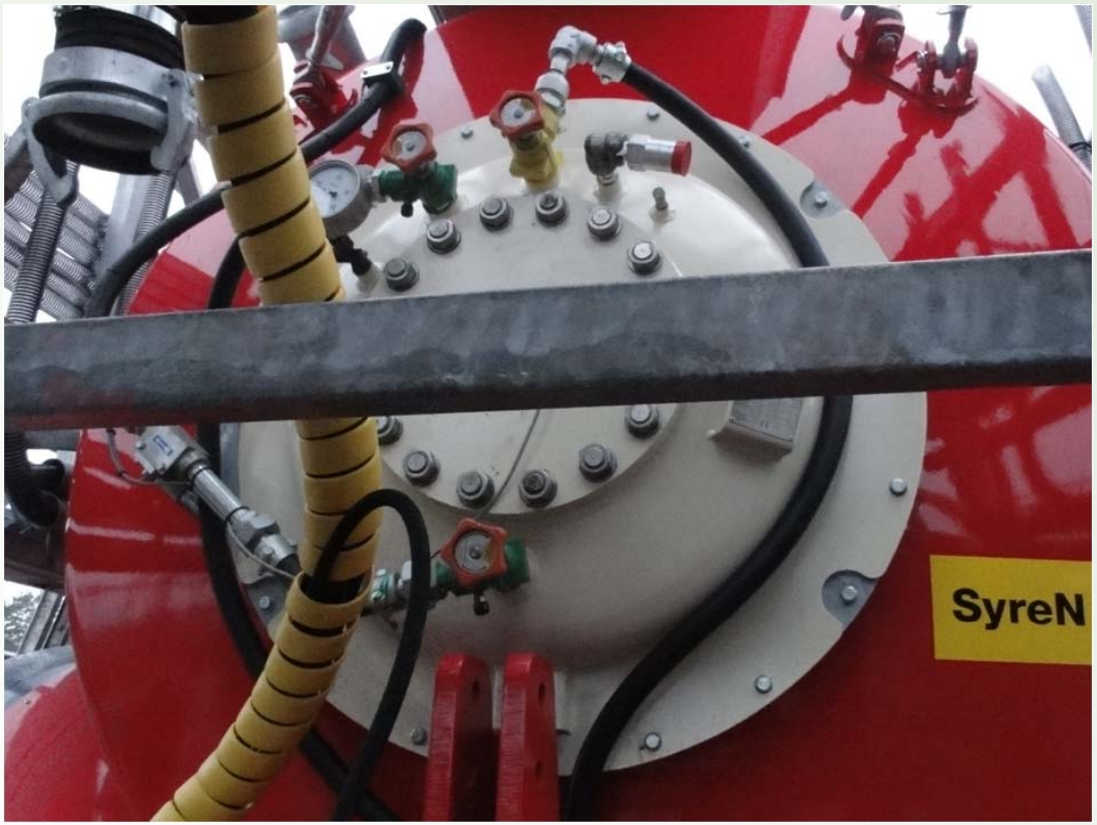
Technology example 4 - improved nutrient recycling: Slurry acidification

- Acidification of slurry reduce ammonia evaporation during spreading with 50%.
- The balance between ammonia and ammonium depends on pH.
- If for instance 15% of N avoids evaporation as ammonia, the relation between organic and mineralised N in the slurry is changed, and the bio-availability increased.
- Acidification is therefore a tool for tightening nutrient –recycling.

Technology example 4 - improved nutrient recycling: Slurry acidification

- SyreN+ - Acidification and balancing of liquid manure with macro and micro nutrients during field spreading
- The nutrients in the acidified slurry is further balanced with N in the form of liquid ammonia from an built-in tank (centre of photo)



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Technology example 5: Biogas

- Biogas is a focal technology for good manure management, and it has multiple benefits.
- Small scale or large scale depends much on the livestock density in the region!
- Biogas production
  - require planning – no solution fits all situations;
  - The large potential for delivering environmental services to the society when produced on livestock manure and other wastes, is turned into an environmentally harmful RE production, when based in maize silage;

500,000 ton biomass/year, whereof 450,000 ton livestock manure from 150 farms

9,650 ton pig slurry per year from 1 farm

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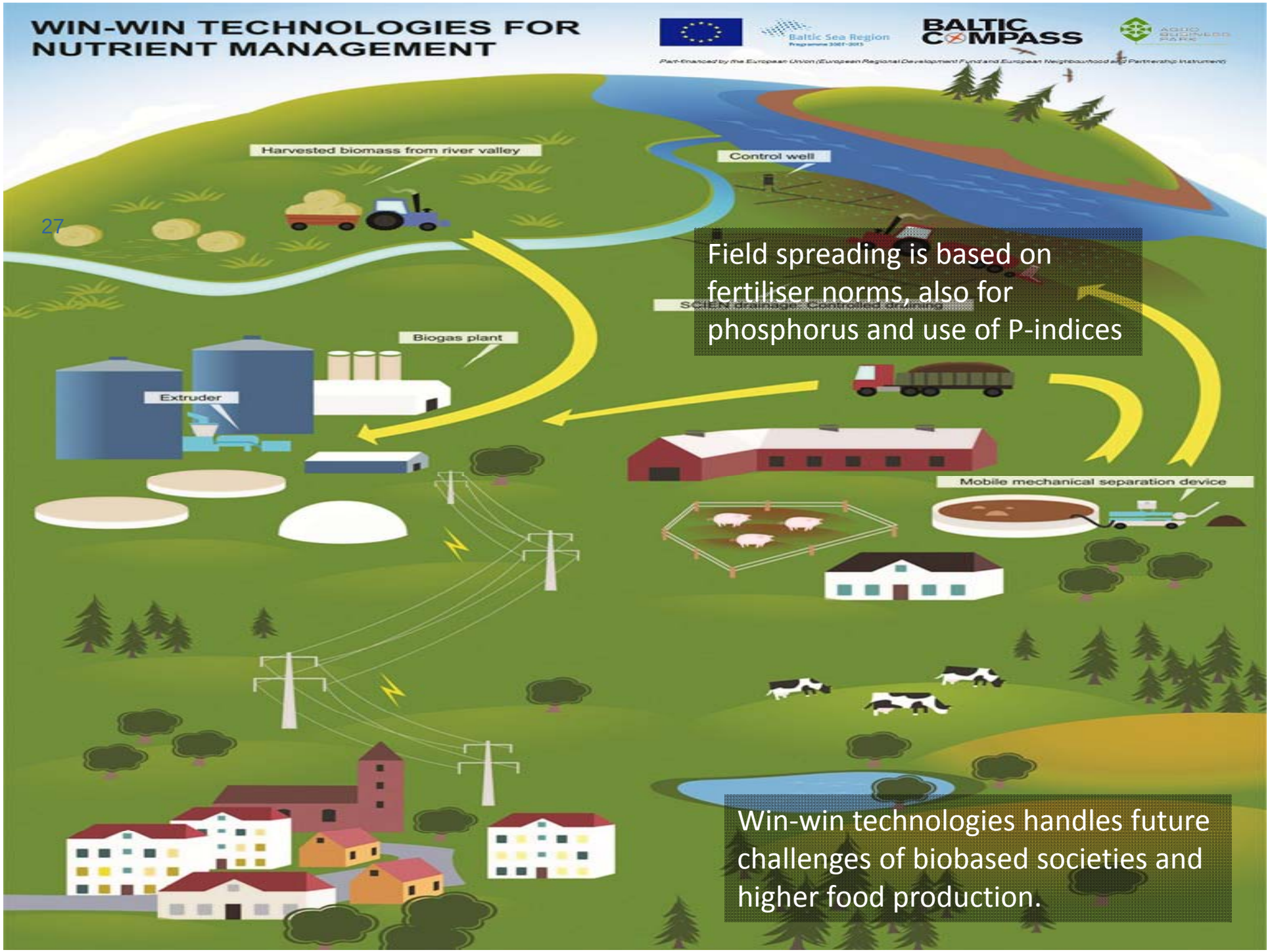
WIN-WIN TECHNOLOGIES FOR NUTRIENT MANAGEMENT
BALTIC COMPASS
Harvested biomass from river valley
Control well
Biogas plant
Extruder
Mobile mechanical separation device
Field spreading is based on fertiliser norms, also for phosphorus and use of P-indices
Win-win technologies handles future challenges of biobased societies and higher food production.

Current challenges

- The information on the ATLAS is currently much based on the DG ENV financed project “Manure processing activities in Europe”, as well as maintenance undertaken by Baltic COMPASS, Baltic Compact and Baltic Manure.
- The VERA secretariat, which builds on a cooperation between German, Dutch and Danish authorities, maintains the ATLAS with information about new VERA Verification Statements.
- The current challenge for the ATLAS is to expand and further share the recognition and use, and we are for this purpose looking for the possibility to establish a steering committee of users and information providers representing research and authorities.

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Summing up

- Recommendations for farmers, companies:
  - Farmers and their advisers can use the ATLAS to find trustworthy information about agro-environmental technologies and biomasses, and use the tools for specific planning purposes.
  - Companies can have their scientifically verified technology documentation included in the ATLAS and be mentioned as suppliers.
- Recommendations for policy makers
  - Politicians should use the ATLAS as a basis for conditioning environmental services for the technologies they subsidize.
  - Optimising nutrient recycling means favouring technologies, that *relatively* reduce losses of nutrients in livestock houses, from manure stores, in connection to field application of manure and in connection to other field management.

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Thanks for your attention, and welcome to contact me

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