

The background of the slide is a dark blue image. It features a silhouette of a person running on a globe. The globe is positioned in the lower right, and the runner is in mid-stride, moving from the left side of the globe towards the right. The overall scene is set against a lighter blue, hazy background that suggests a landscape or sky.

Well to Tank effects on air pollutants from biofuels: BOLK Phase 1

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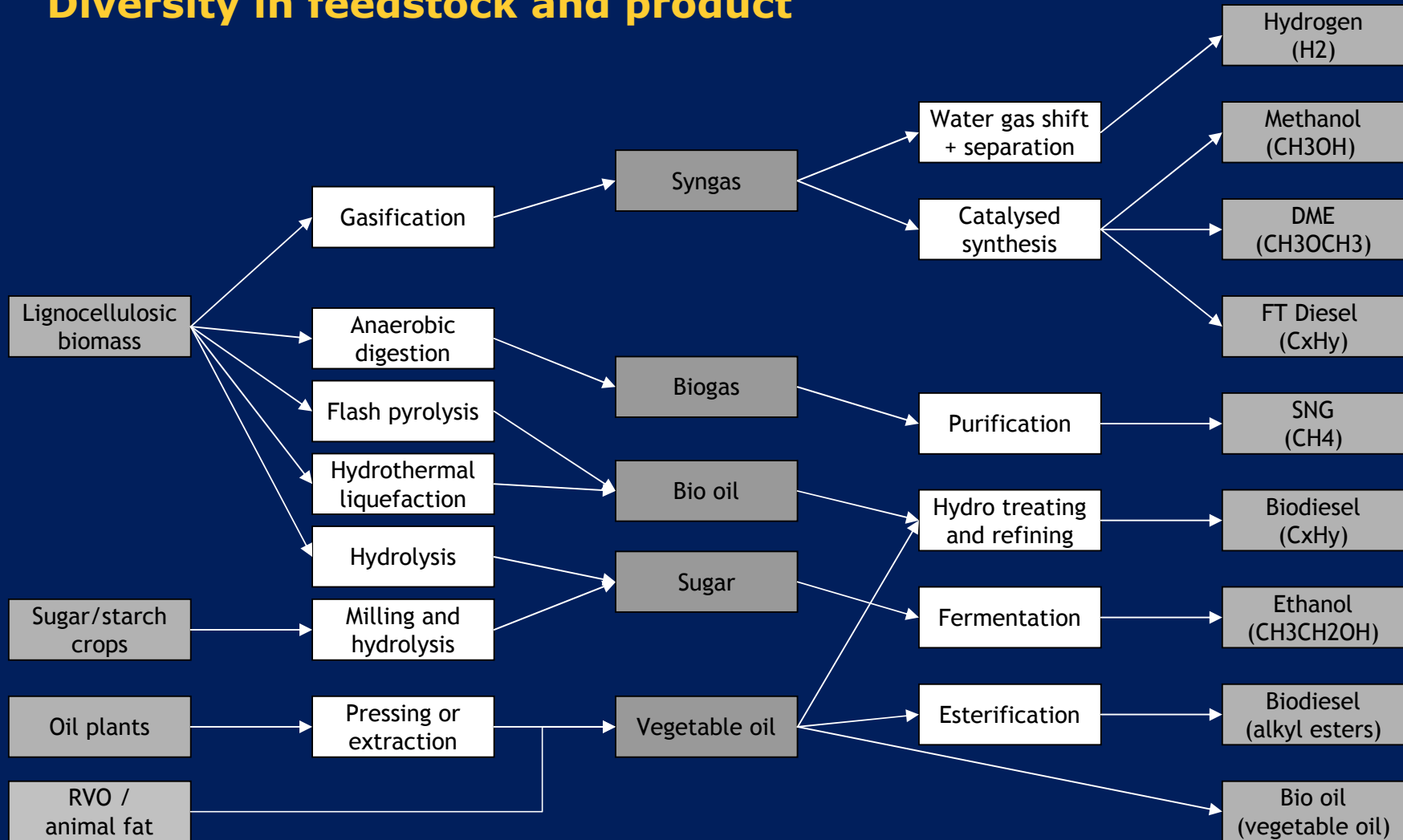
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Outline presentation

- Set up of project Ecofys within BOLK programme
- Phase I: Inventory
- Phase II: Emission analysis
- Phase III: Geographical split
- Concluding remarks
- Suggestions for further research

Phase I : Inventory

Diversity in feedstock and product



Phase I : Inventory

Factors of influence

- The development of the transport market
- The development of stationary applications
- The potential supply of feedstock
- The overall yields, costs, greenhouse gas savings and energy use

Phase I : Inventory

Analysed bioenergy chains

- Two alternatives for gasoline
 - Bioethanol from sugar cane
 - Bioethanol from sugar beet

- Two alternatives for diesel
 - Biodiesel from palm oil
 - Biodiesel from rapeseed oil

- Two alternatives for stationary power/heat production
 - Palm oil
 - Wood

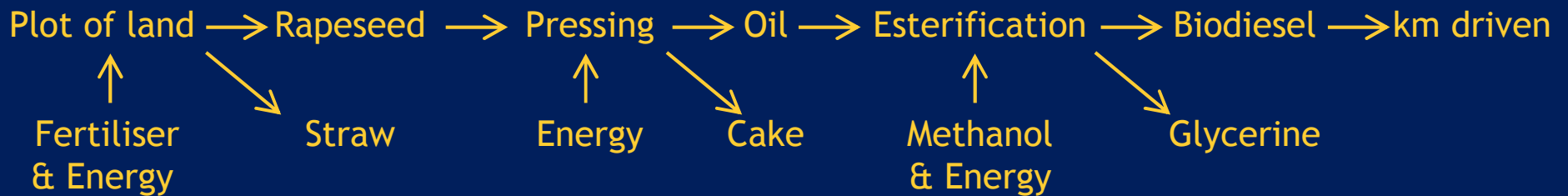
Phase II : Resulting local emissions

Well-to-tank emissions of individual supply chains

- Direct and indirect processes
- Assuming SOTA technology + technical improvement
- Simapro is used to model the LCA of the selected chains

Chain layout

Example biodiesel from rapeseed



Results Phase II

Example biodiesel from Rapeseed

g/tonne diesel	Feedstock production	Feedstock transport	Conversion process	Fuel distribution	Total
NOx	3,477	350	366	101	4,294
SOx	1,619	86	317	25	2,047
NH3	2,175	0	1	0	2,177
PM10	641	23	16	7	686
PM2.5	195	0	12	0	207
NMVOS total	162	9	1	3	175
Benzene	2	0	1	0	3
Ethene	0	8	0	2	11
Styrene	0	0	0	0	0
Toluene	1	0	0	0	2

Results Phase II

Total emissions overview

g/tonne product	Biodiesel from rapeseed	Biodiesel from palm oil	Ethanol from sugar cane	Ethanol from sugar beet	CPO	Wood pellets
NOx	4,294	2,081	3,059	4,133	1,782	464
SOx	2,047	1,320	820	1,441	1,158	543
NH3	2,177	875	98	152	830	4
PM10	686	235	223	312	208	25
PM2.5	207	82	25	58	71	47
NMVOS total	175	80	116	135	73	68
Benzene	3	2	3	4	1	1
Ethene	11	7	50	57	5	0
Styrene	0	0	0	0	0	0
Toluene	2	1	1	1	1	0

Results Phase II

- Most emissions in feedstock production phase
 - Ammonia from fertiliser
 - PM from tractor
- Chains with largest negative impact
 - biodiesel from rapeseed
 - ethanol from sugar beet
 - Ethanol from sugar cane runner up mainly on Nox.

Phase III : Geographical split

- Feedstock production for sugar beet and rapeseed chain within NL or EU.
- Other chains, feedstock production mainly outside EU
- Rapeseed and sugar beet chains 'easier' to influence due to main emissions in EU/NL

Concluding remarks

- Policy on agriculture and sustainability
 - Impacts selection of chains, agricultural / industrial processes
 - Impacts resulting emissions
- Detailed Simapro modelling suggest precise results:
- Updating parts of database is necessary
- European chains results quite negative compared to ROW
- Agricultural processes within EU easier to influence

Suggestions further research

Include other chains:

- Other currently commercial available biofuel chains
- So called second generation chains
- Diesel or gasoline chain which could be used as reference

Aspects for more detailed modelling:

- with a large impact on the outcomes
- Those that could be improved/changed by technological change
- Those related to alternative energy provision by use of residues
- With relatively out dated information in Simapro database