

Biobased innovation



Innovatie met biomassa: meer dan techniek

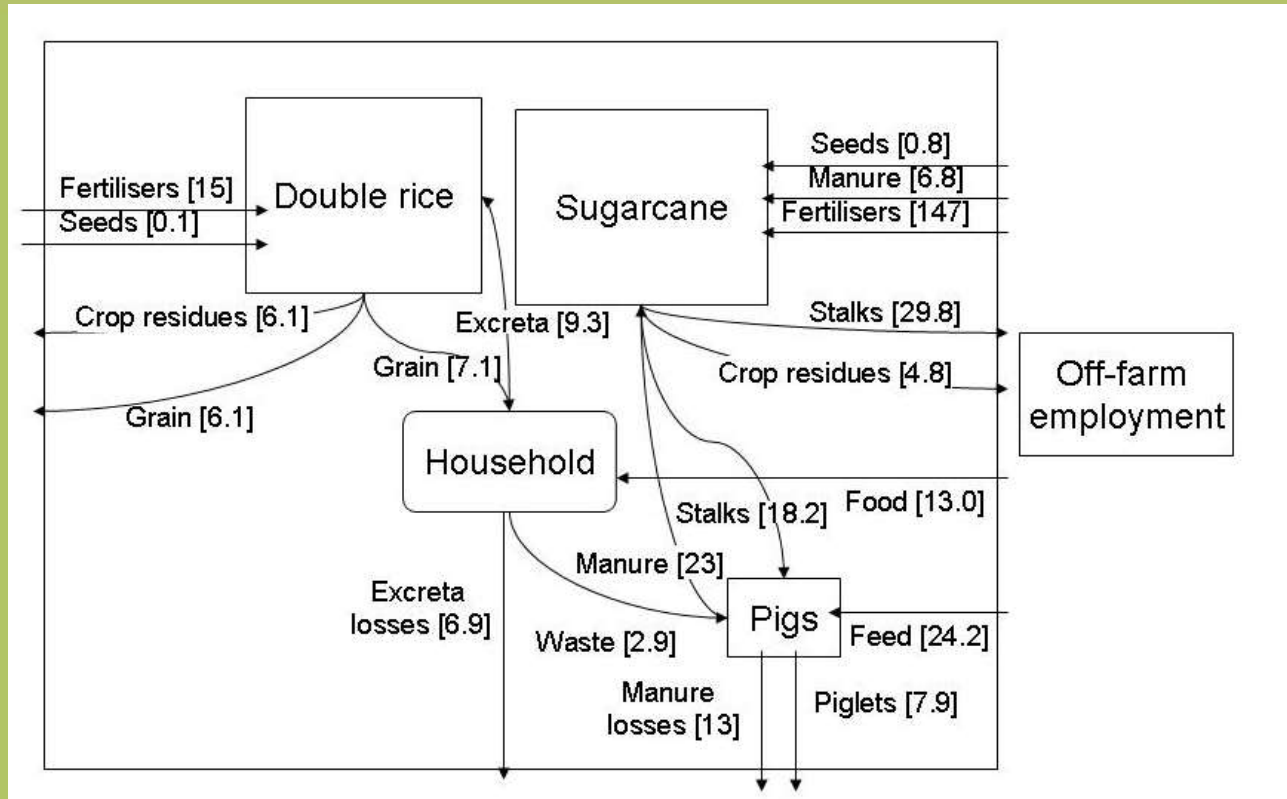
InnoTeP
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Farm household in China



Pujiang household
Nitrogen
flows in
kg/ha

Langeveld et al. (2006) *Evaluation of economic and ecological performance of two farm household strategies. Wageningen.*



Biobased innovatie



Inhoud



- Achtergrond, aanpak
- Innovatie in de techniek
 - Biobased productieketens
- Innovatie in de analyse
 - Food vs Fuel
- Innovatie in de beheersing
 - Certificering en beleid
- Afsluiting



Background



- Agronomy
 - Tropical land use
 - Agricultural systems
 - Input –output relations based on biophysical laws

- Approach and setting
 - Observations of local systems
 - Describe sub-systems
 - Determine relations
 - Mass, nutrient, energy, water balances
 - Household (actor) perspective
 - Policy & innovation orientation



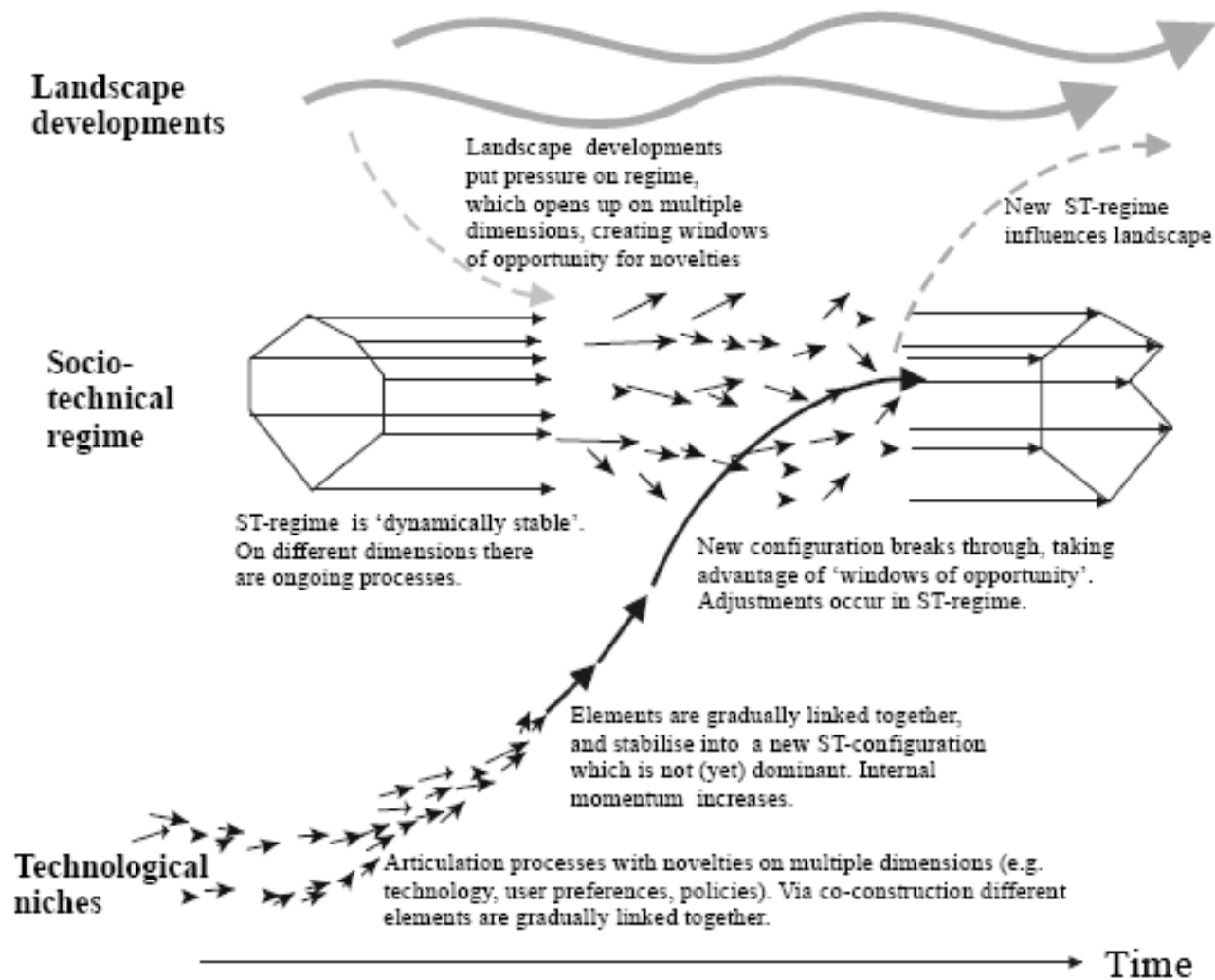


Figure 5. A dynamic multi-level perspective on system innovations (Geels, 2002b: 110)

Innovaties in fritesketens



Aardappelindustrie

- Oud: restromen zijn veevoer
 - Taak: voerproductie. Rol: afvalverwerker
 - Beoordeling: prijs (kwaliteit)

- Nieuw: reststromen zijn recyclebaar
 - Taak: verwerken. Rol: hergebruiker
 - Beoordeling: prijs/efficiency, milieu

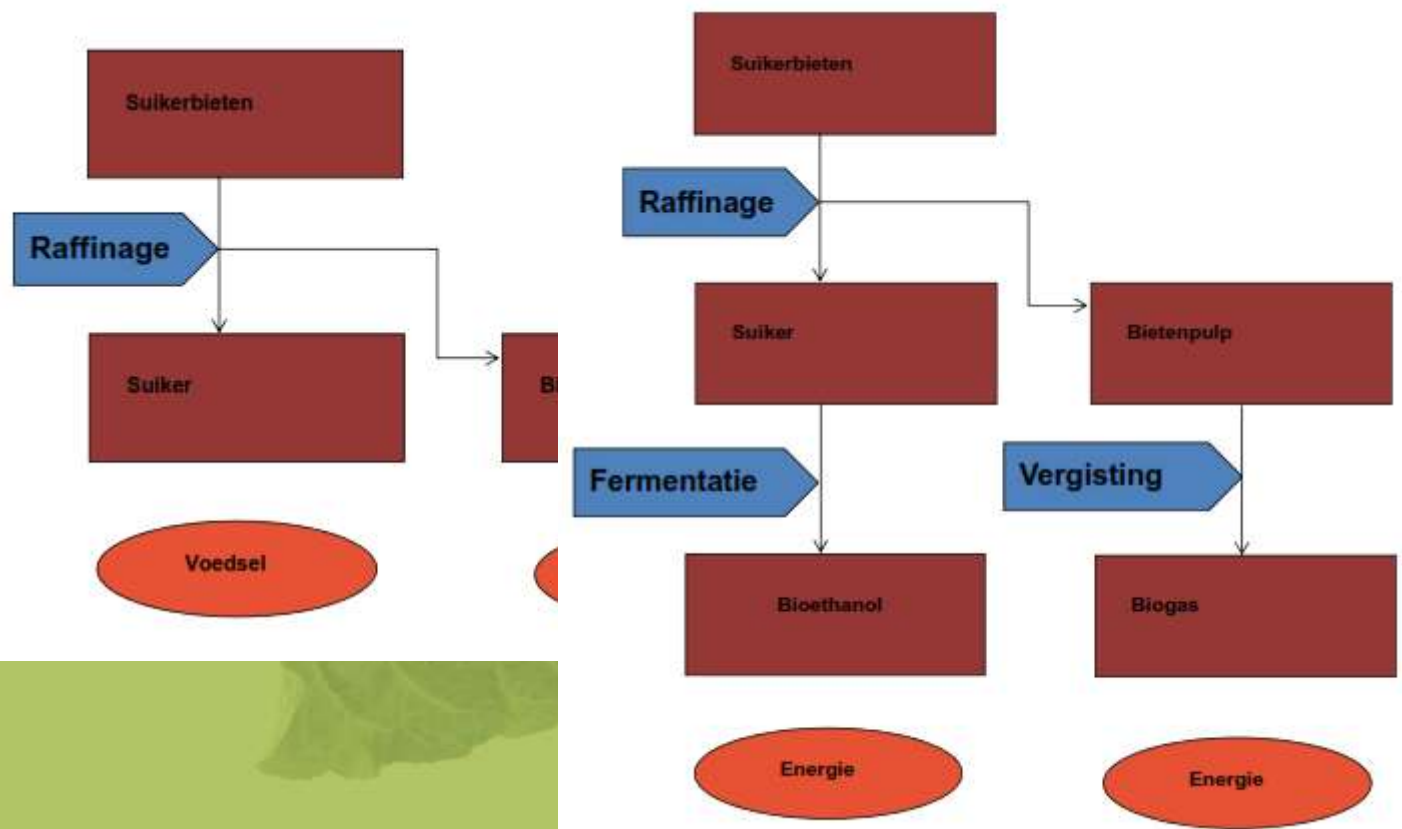
- Biobased: reststromen zijn grondstoffen
 - Taak: produceren. Rol: circulaire producent
 - Beoordeling: prijs, samenstelling, kwaliteit

Verwaarding reststromen

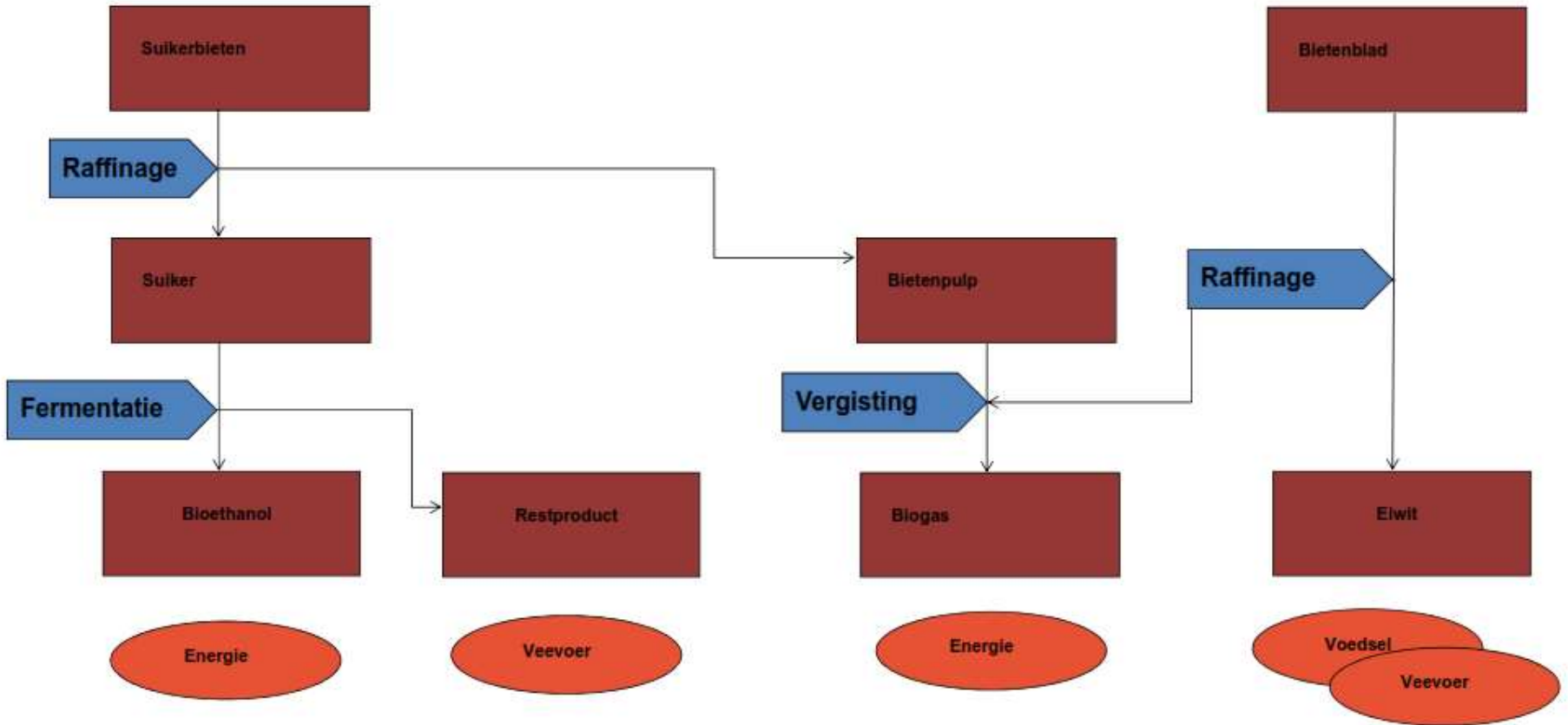


Source: Markusse (2012)

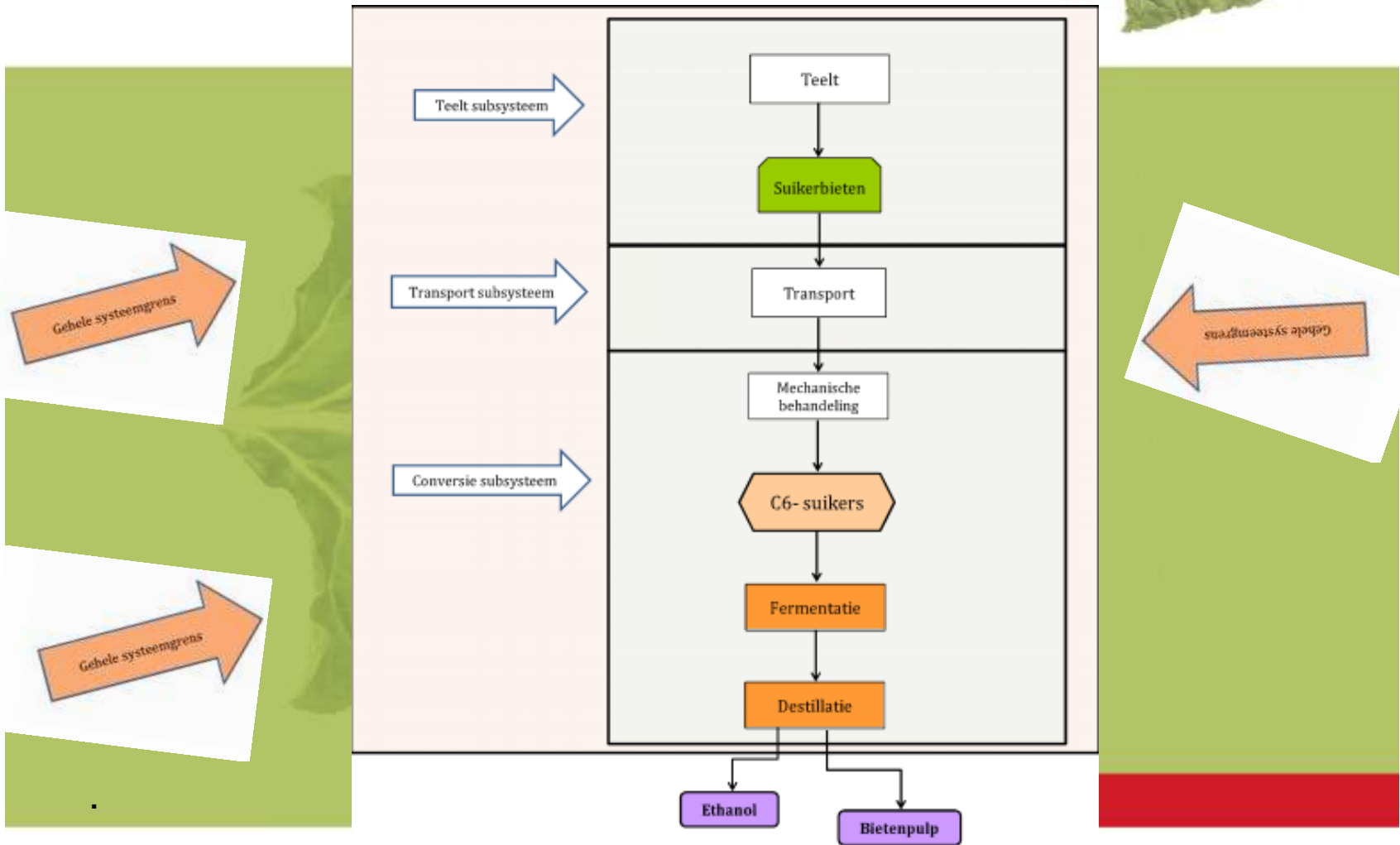
Suikerbiet



Suikerbiet



Ketengrenzen veranderen



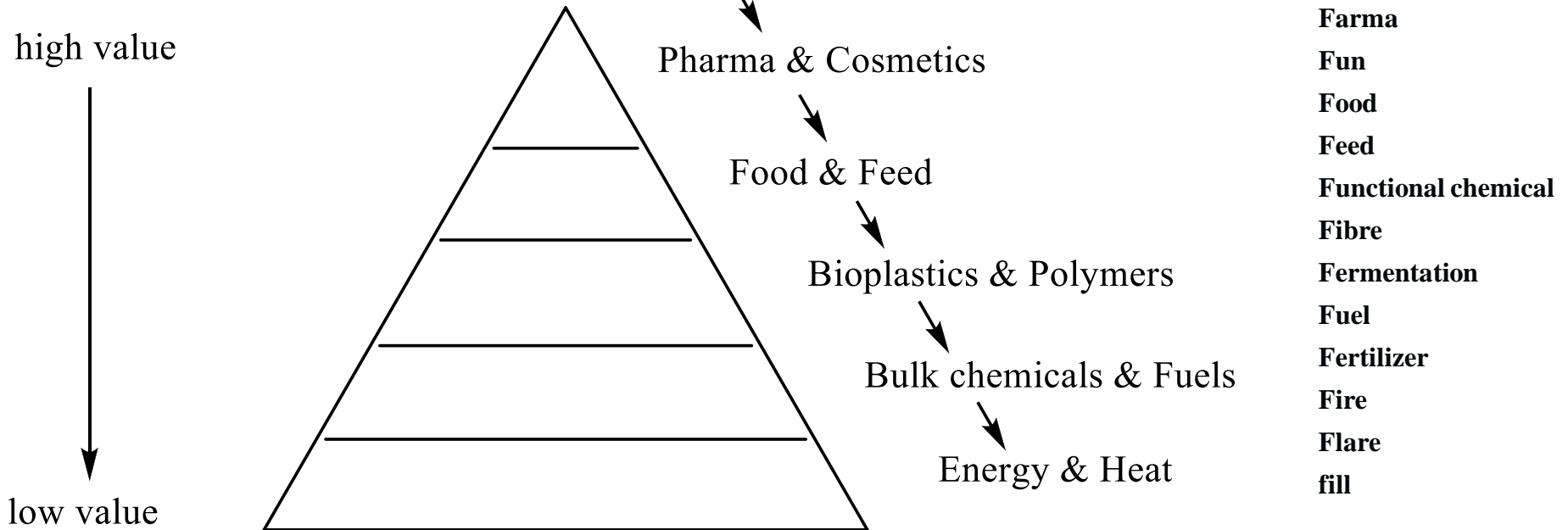
Source: Langeveld (2014)

Biobased economy



Biobased products

Biomass cascading:



Sanders, 2010

Innovaties in organisatie



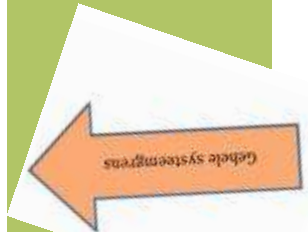
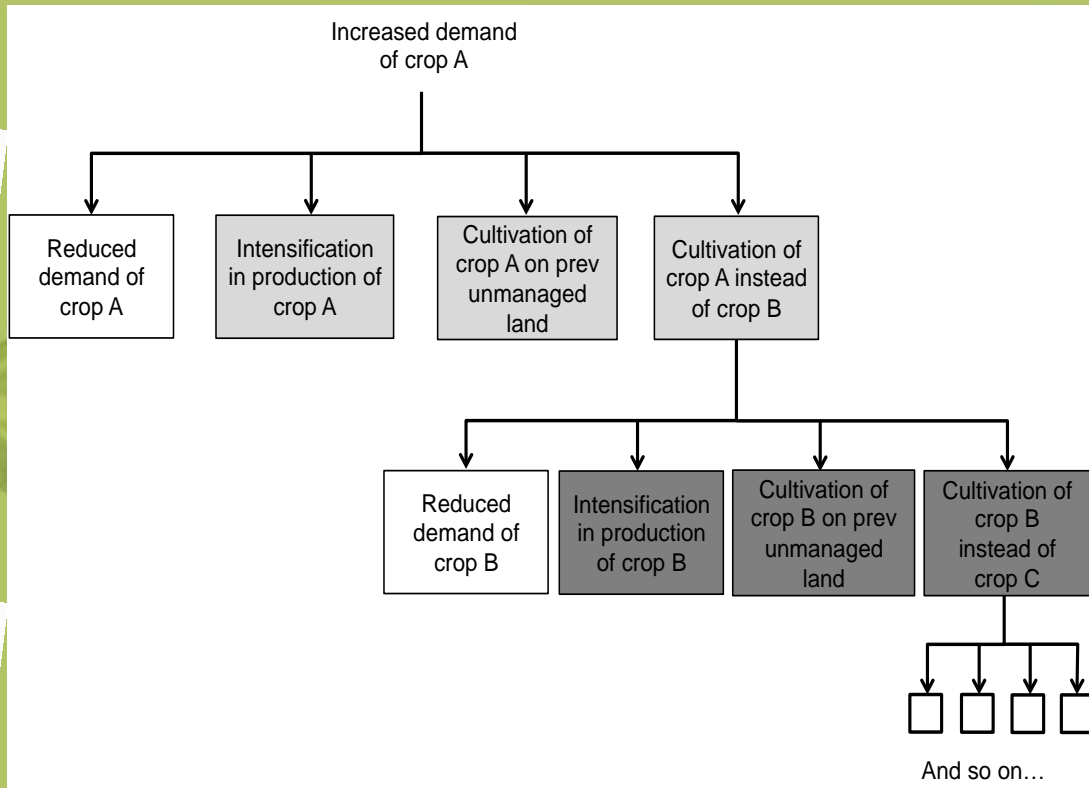
Ketengrenzen

- Oud: losse ketenonderdelen
 - Teelt, transport, verwerking, reststromen
 - Aparte bedrijven

- Nieuw: reststromen zijn recyclebaar
 - Taak: verwerken. Rol: hergebruiker
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- Biobased: reststromen zijn grondstoffen
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Ketengrenzen veranderen



Biofuel cropping systems



Table 15.1 Biofuel production in 2000 and 2010 (billion litres)

	<i>Ethanol</i>			<i>Biodiesel</i>		
	<i>2000</i>	<i>2010</i>	<i>Increase</i>	<i>2000</i>	<i>2010</i>	<i>Increase</i>
Brazil	9.7	27.6	17.9	Neg	2.1	2.1
USA	6.1	49.5	43.4	Neg	2.1	2.1
EU	1.5	6.4	4.9	0.8	10.3	9.5
Indonesia/Malaysia	NI	NI	NI	Neg	0.2	0.2
China	Neg	2.1	2.1	Neg	0.4	0.4
Mozambique	Neg	0.02	0.02	Neg	0.05	0.05
South Africa	Neg	0.02	0.02	Neg	0.05	0.05
All	17.3	85.6	68.3	0.8	15.1	14.3

Billion = thousand million; NI = not included; Neg = negligible.

Analyses innoveren



Table 4.8: Features of the two types of LCA model and economic models

	Attributional LCA approach	Consequential LCA approach	Economic equilibrium models
Type of question the model aims to answer	What are the total emissions from production of 1 MJ biofuel?	What is the change in total emissions when producing 1 MJ additional biofuel?	What is the land use change due to the implementation of a biofuel policy?
Scope	Specific process	Specific process	Global/regional
Perspective	Current/Future	Future	Future
Optimisation function	Not included	Not included	Profit function (often), welfare function
Marginal/Average input data	Average	Marginal	Average and/or marginal
Handling of by-products	Allocation/System expansion	System expansion	System expansion

Source: Ahlgren and Langeveld (in press). IEA Bioenergy



Innovation: land use data



→ Bottom-up

- Local production conditions
- Soils, inputs, conversion
- National sources, technical literature

→ Methodology

- Production statistics
- Infer land use, input use
- Land balances: full overview
- Dynamic approach
- Local, historical perspective

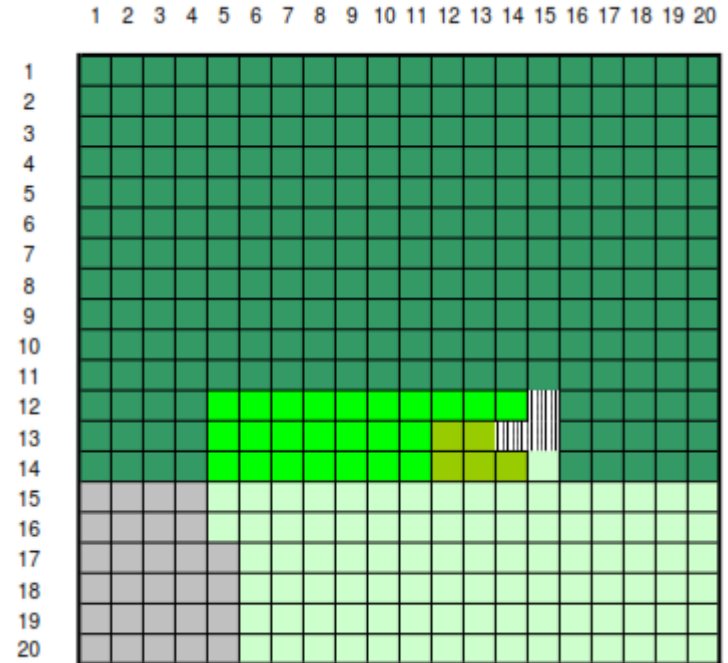


Innovation: land use data

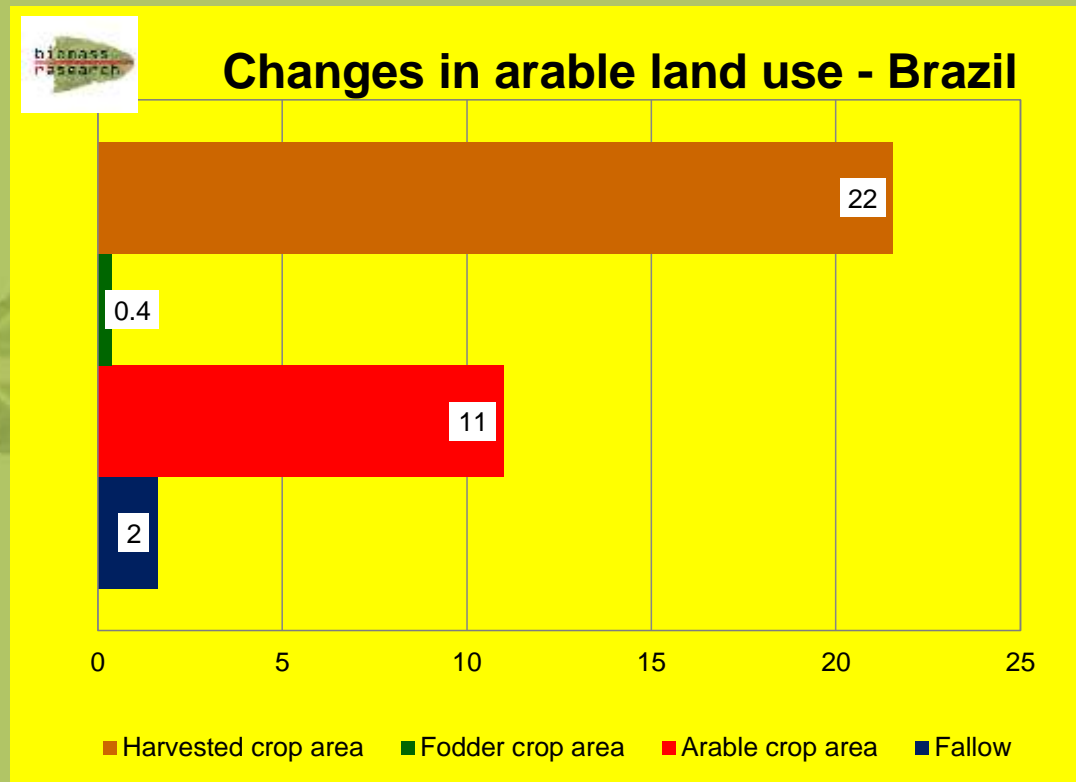


Definitions

- 1 Land use = Forest + Agriculture
- 2 Agricultural area = Arable + Grassland
- 3 Arable land = Arable crops + Fodder
- 4 Multiple Cropping Index = Area under multiple crops / area



Biofuel cropping systems



Source: Langeveld et al. (2014) Biofuel cropping systems. Earthscan



Biofuel cropping systems



Results

- Billion litres
- Billion tonnes
- Million ha harvested
- Multiple Cropping

Table 15.3 Biofuel expansion and other land-use changes between 2000 and 2010 (million ha)

	<i>Increased harvested area</i>	<i>Associated with Co-products</i>	<i>Net Increase Biofuel Area</i>	<i>Changes in Agricultural Area</i>	<i>Released from Increased MCI</i>	<i>Change in NHA</i>
Brazil	4.9	1.8	3.1	12.0	4.9	13.8
USA	11.0	5.9	5.1	-3.5	10.9	2.3
EU	6.6	3.2	3.4	-11.5	3.6	-11.2
Indonesia/Malaysia	0.02	0.01	0.01	8.9	2.0	10.9
China	2.2	0.4	1.8	-13.4	20.3	5.1
Mozambique	0.1	0.03	0.1	1.3	0.9	2.0
South Africa	0.1	0.04	0.1	-2.7	-1.2	-4.0
All	24.9	11.4	13.5	-9.0	41.5	19.0
Global total				-47.8	91.5	

Sources: Biofuel expansion data taken from Chapters 6–12. Changes in agricultural land, harvested area ratio, and harvested food area calculated from FAOSTAT (2010–2013), <http://faostat.fao.org> and Chapters 6–12.

Source: Langeveld et al. (2014) Biofuel cropping systems. Earthscan



Biofuel cropping systems



Table 15.5 Biomass used in biofuel production in 2000 and 2010 (million tonne)

<i>Biofuel Feedstock</i>	<i>Net Use for Biofuels</i>	<i>Changes in Biomass Availability</i>	<i>Increase of Biomass Productivity</i>	<i>Net Change in Biomass Availability</i>
Brazil	181.9	465.5	478.4	283.6
USA	50.2	48.1	137.8	-2.1
EU	20.0	-30.5	111.8	-50.5
Indonesia/Malaysia	0.3	48.0	27.9	47.7
Mozambique	0.3	4.0	6.3	4.0
South Africa	0.3	-3.8	Negligible	-4.1
China ¹	3.4	342.4	412.0	339.0
Total in this book	253.7	873.8	1172.2	617.6
Global		1413.1	1434.8	

¹Including biodiesel feedstocks.

Sources: Calculated from FAOSTAT (2010–2013), <http://faostat.fao.org>; Chapters 6–12.

Source: Langeveld et al. (2014) Biofuel cropping systems. Earthscan



Innoveren beheer



Examples of certification schemes:

- NTA 8080
- RSB
- RSPO
- Bonsucro



Certificering RSPO



Roundtable on Sustainable Palm Oil

- Crop specific certification scheme: oil palm
- Multi stakeholder process
 - Companies, NGOs , science
 - Related to producing, trading and processing palm oil
- About 14 % of crude palm oil globally: certified by RSPO
- By the end of 2015 all palm oil for Dutch consumer market is to be RSPO certified

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Innoveren: energie uit afval



Palm Oil Mill Effluent digestion

- Oliepalm fabrieken: afvalwater
- Open ponds: spontane methanisering
 - Methaan = broeikasgas
 - COD in lozingswater
- Closed tank POME digestion
 - Methaan = biogas
 - Nutrienten recycling, kwaliteit lozingswater
- Bijdrage aan RSPO certificering

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Innoveren: energie uit afval



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Afsluiting



Innovatie: meer dan techniek

- Het begint met een idee
 - Technologie, maar ook systeem
- Gevolgen zijn groot
 - Systeemwijde veranderingen: gevestigde belangen
- Andere kennis nodig
 - Ook dataverzameling en –analyse moet innoveren
- Ook beheer en beleid moeten innoveren
 - Certificering: innovaties vaak onderbelicht

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