

Wat is de rationale voor Regionale Biomassaketens?

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Amersfoort, 1 december 2011

Biomassa en Bioenergie in Nederland

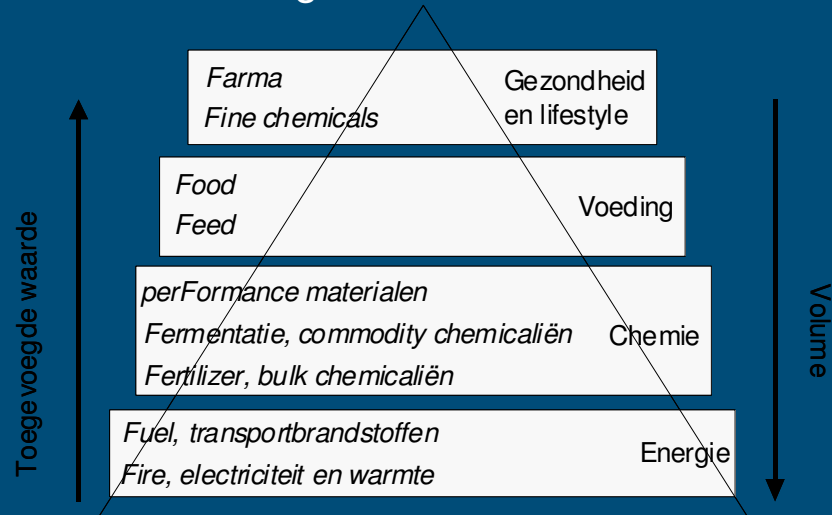


- 4 million ha total and 2 million ha agriculture
- Small country large ambitions!
- Much emphasis is laid on development of a Biobased Economy which is wider than bioenergy
- 14% Energy (50% bioenergy), 10% renewable transport fuel in 2020
- + Renewable chemistry?



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Niet alleen energie!! Value vs volume?



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Biomass Balance for the Netherlands (Mton DM)

	Rabou et al. 2006	Meesters et.al., 2010
Domestic harvestable production	31	27.8
Plus: Import	33	39.9
Minus: Export	-22	-28.6
Balance	42	39.1

=740 PJ =24% Primary energy use (3300 PJ)

What part can we use for energy production?

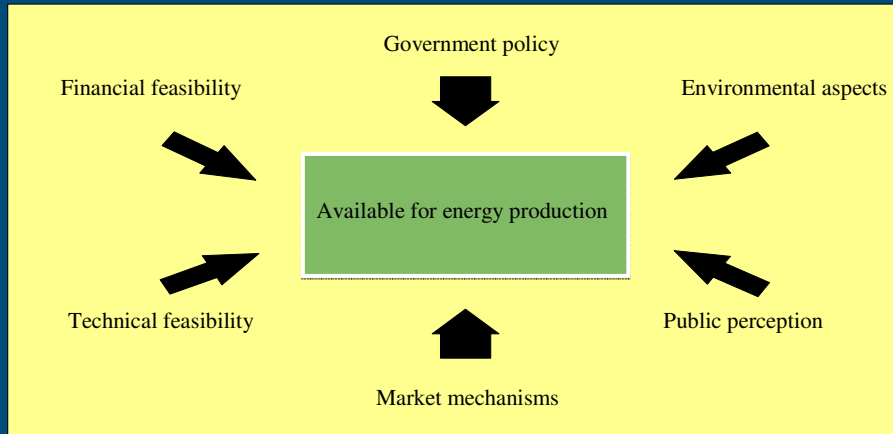
•Meesters, K., P. Boonekamp, M. Meeusen, D. Verhoog en W. Elbersen. 2010. Monitoring Groene Grondstoffen. Rapport voor het Platform Groene Grondstoffen.

•Rabou, L.P.L.M., Deurwaarder, E.P., Elbersen, H.W., Scott, E.L., Biomassa in de Nederlandse energiehuishouding in 2030, 2006.

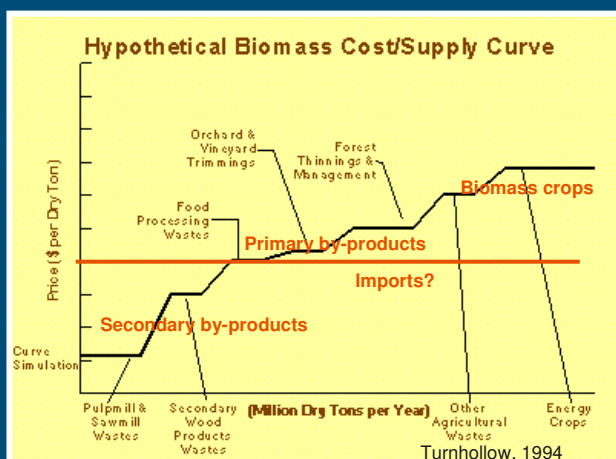


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Biomassa = biomassaketens



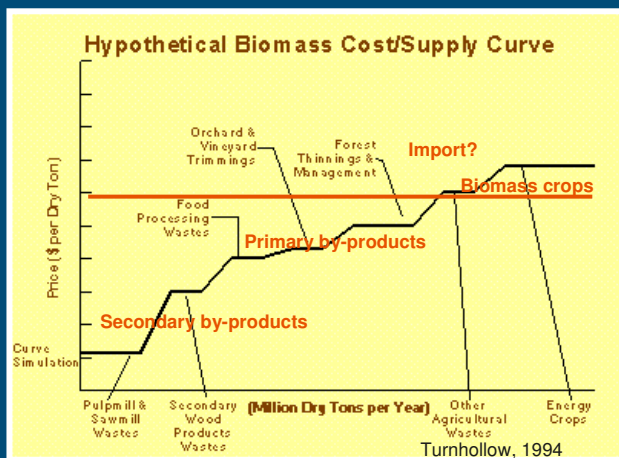
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- Tertiare bijproducten
- Secundaire bijproducten
- Primaire bijproducten
- Gewassen
- (Import)



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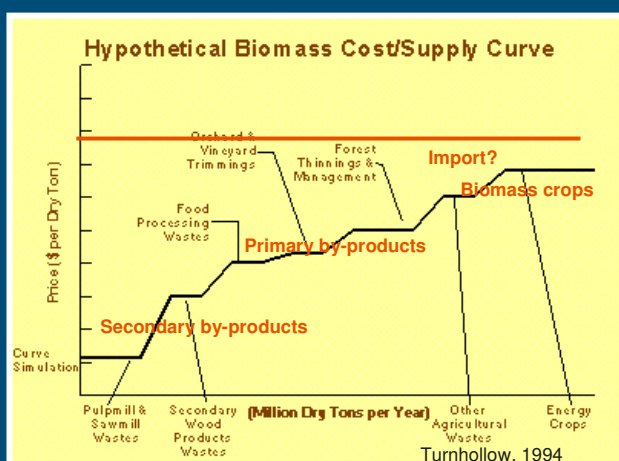


- Tertiare bijproducten
- Secundaire bijproducten
- Primaire bijproducten
- Gewassen
- (Import)



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Een biomassawet?



- Tertiare bijproducten
- Secundaire bijproducten
- Primaire bijproducten
- Gewassen
- (Import)



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Nu 9 miljoen ton
gebruikt voor energie
(E + W)
Nog 4 a 7 miljoen ton
te benutten!
Nog belangrijker:
efficiënt benutten!!!

Stream	Available (stream dry-weight)			Technology	Final energy		
Year / stream	2009	2020	2020		2009	2020	2020
	(tW)	(tW)	(tW)		(tW)	(tW)	(tW)
Saver	-	94	137	CHP vsh/CHP-sh	-	0.0	2.1
Grass steam	-	4	9	CHP vsh/CHP-sh	-	0.0	0.1
Wet crop residue cogeneration	-	-	297	AD-sh/AD-sh	-	-	2.7
Wet crop residue hydrocatalysis	-	-	148	AD-sh/AD-sh	-	-	1.3
Corn stover	-	-	28	AD-sh/AD-sh	-	-	0.3
Wood chipping and cogeneration	80	10	64	CHP vsh/CHP-sh	0.4	0.3	0.3
Press from slatted without harvesting	-	-	75	CHP vsh/CHP-sh	-	-	0.9
Wood from forest with harvesting	1341	631	626	CHP vsh/CHP-sh	10.7	5.5	5.5
Wood from landscaping	1	48	192	CHP vsh/CHP-sh	0.0	0.2	2.2
Wood chips	4	103	34	CHP vsh/AD-sh	-	-	0.3
Powergrasses	8	32	312	AD-sh/AD-sh	0.0	0.1	4.7
Heats	-	-	91	CHP vsh	-	-	0.2
Reed	1	-	16	Heats	0.0	-	0.3
Energy crops cultivated on agricultural land	-	30	30	CHP vsh/CHP-sh	-	-	0.2
Energy crops cultivated on non-agricultural land	-	-	241	CHP vsh/CHP-sh	-	-	2.2
Wood from forest with harvesting	200	200	200	Heats	0.7	0.7	0.7
Waste biomass from built environment	-	21	-	AD-sh	-	-	0.2
Grass for bio fuel cogeneration	-	-	200	AD-sh	-	-	1.8
Waste used for small processing, industry	504	504	504	CHP vsh	4.3	4.3	4.3
Drylandland (cogeneration)	1551	2346	2000	CHP vsh	5.4	8.5	7.4
Wood from forest with harvesting	1954	1954	1954	WGS, AD-sh, CHP vsh, press	14.9	14.9	14.9
Waste water treatment sludge	241	349	349	AD-sh vsh/AD-sh	0.4	0.6	2.4
Residual biomass	-	-	3	AD-sh	-	-	0.1
Swill	2	-	-	AD-sh/AD-sh	0.0	-	-
Waste and MSW incineration	-	-	-	-	-	-	-
Forest residue products	45	45	22	AD-sh/AD-sh	0.2	0.2	0.2
Forest residue products	9	9	33	AD-sh/AD-sh	0.0	0.0	0.0
Animal manure	215	215	85	AD-sh	1.6	1.6	0.6
Pork/dried chicken	104	52	22	AD-sh vsh	0.6	0.3	0.1
Cocoa shells	56	56	56	Heats	0.9	0.9	0.9
Coffee grounds	16	16	16	CHP vsh	0.2	0.2	0.2
Algae and seaweed streams	-	54	71	AD-sh/AD-sh	-	0.3	0.1
Dewatered / spent grain	-	-	-	AD-sh/AD-sh	-	-	-
Vergasse, waste	21	6	3	AD-sh/AD-sh	0.1	0.0	0.0
Fish waste	-	0	0	AD-sh/AD-sh	-	0.0	0.0
Wasteed fish	1181	1181	1181	AD-sh vsh/AD-sh	1.9	1.9	1.9
Paper waste	120	-	-	Heats	2.8	-	-
Composites and cellulose	44	718	718	AD-sh	0.6	8.6	8.6
Frying oil	232	232	232	CHP vsh	1.5	1.5	1.5
Extrude	10	12	10	NG/W vsh	0.0	0.0	0.0
Old and pressed wood	109	1524	109	CHP vsh	5.6	94.6	5.6
Wasteed from fish and household waste	1881	5505	3454	NG/W vsh	3.3	8.6	9.4
Plastic/Petroleum related waste	715	1828	715	AD-sh	0.5	1.5	0.5
Composites and cellulose, wood and sawmill waste	100	1206	91	AD-sh	1.5	1.5	1.5
Various waste	31	31	31	AD-sh	0.2	0.2	0.2
Residue from compaction, green waste	30	30	30	CHP vsh/CHP vsh	0.2	0.2	0.4
Subst Management Plant (SMP)	1047	-	1041	Distilling	4.6	-	4.2
TOTAL	18477	17576	15636		43.9	93.8	93.8

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(Koppejan et al., 2009).

Stream	Ktonne dry matter		
	Gross availability	GE	RC
Straw	935	94	187
Grass straw	85	4	9
Wet crop residue agriculture	742	-	297
Wet crop residue horticulture	280	-	140
Green manure	70	-	28
Fruit farming and arboriculture	80-130	52	64
Wood from forest without harvesting	376	-	75
Wood from forest with harvesting	1244	62	498
Wood from landscape	480	48	192
Natural grass	1080	54	378
Grass verges	640	32	512
Heath	146	-	44
Reed	40	-	16
Energy crop cultivation in agriculture	9900	50	50
Energy crop cultivation outside agriculture	500	25	250
Wood from built environment	280	280	280
Wet biomass from built environment	490	25	-
Grass for bio-refining	10000	-	200
SURTOTAL Primary		776	3220



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Secundair

Stream	Ktonne dry matter		
	Gross availability	GE	RC
Dehydrated (poultry) manure	2538-2933	2346	2030
Liquid manure	3321-5131	257	4993
Manure		2603	4023
Waste wood from wood-processing industry	576	383	383
Waste water treatment sludge	349	349	349
Aquatic biomass	0.5	-	5
Swill	0	-	-
Food and Stimulants industry			
Potato residue products	178	45	22
Oilseed cake	3093	9	93
Animal meal	213	213	85
Potato/wheat starch	415	104	52
Cocoa shells	56	56	56
Coffee grounds	16	16	16
Sugar beet residue flows	132	33	17
Brewers' spent grain	100	-	-
Vegetable waste	23	6	3
Fish waste	15	0	0
Residual fats	100	100	100
Frying fats	130	-	-
Total		1314	1181
Total secondary byproducts		3917	5204



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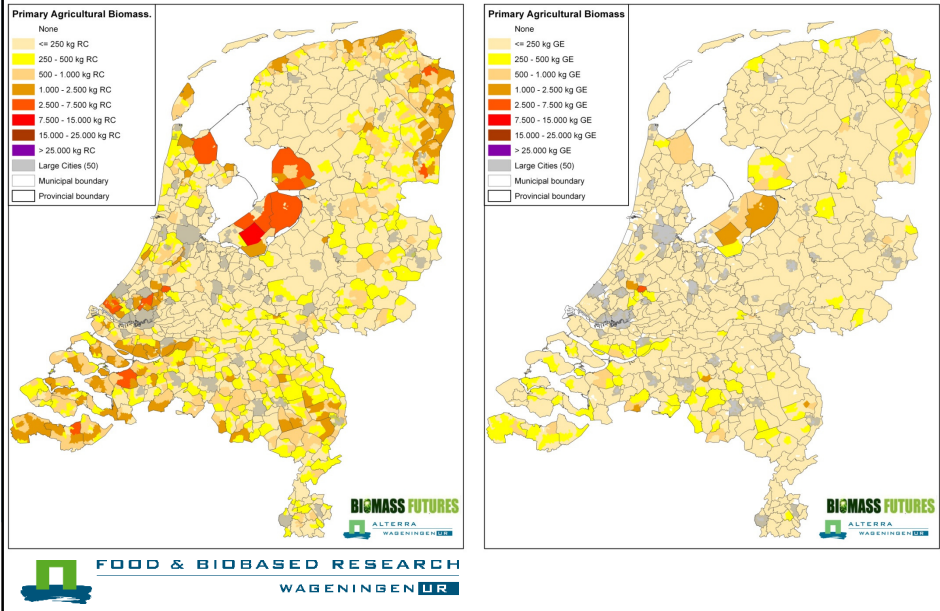
Biomassa voor elektriciteit en verwarming

Biomassa type	Kton DS
Primaire biomassa (op het veld)	726 tot 3.220 (teelt <500)
Secundaire biomassa (bij fabriek)	1.471 tot 1.336
Tertiaire biomassa (afval)	8.851 tot 6.945
Gewassen (teelt, algen, wieren)	Nihil - > 10.000

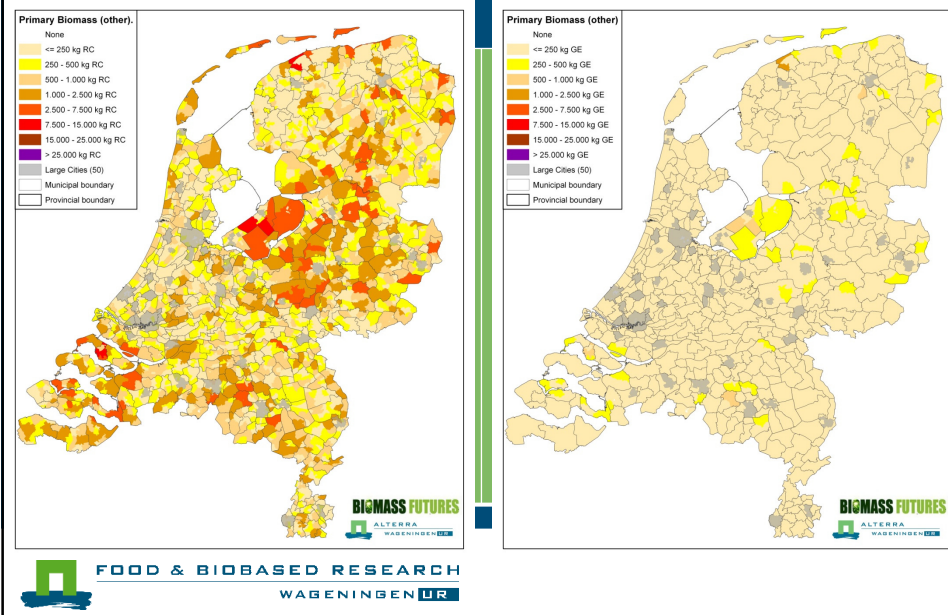


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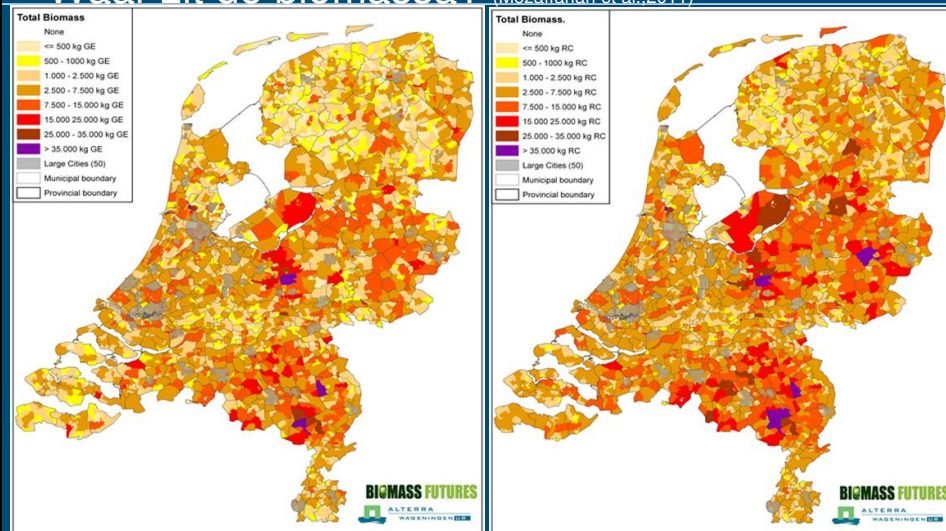
Primair Agroresiduen



Primair: grasachtig



Waar zit de biomassa? (Mozaffarian et al., 2011)



	2010	2020	2020	2030
		NREAP	GE - RC	GE - RC
Biomass demand (PJ final energy)				
BIO-Electricity	21	60	35 - 72	75 - 128
BIO-Heat	30	63	29 - 70	56 - 114
BIO-transport (total (2 nd gen.))	13	35	45 (6)- 49 (12)	66 (17) - 70(35)
BIO-Chemicals	?	?	14	36 - 113
Total	64	158	123 - 227	233 - 425
Biomass supply				
BIO-E & BIO-H, (Koppejan et al., 2009, PJ final energy)	44	-	54 - 94	64 - 144*
BIO-E & BIO-H, BIO-F, BIO-CHEM, (Sanders et al., 2006, PJ primary energy)	-	-	125- 250	250- 500

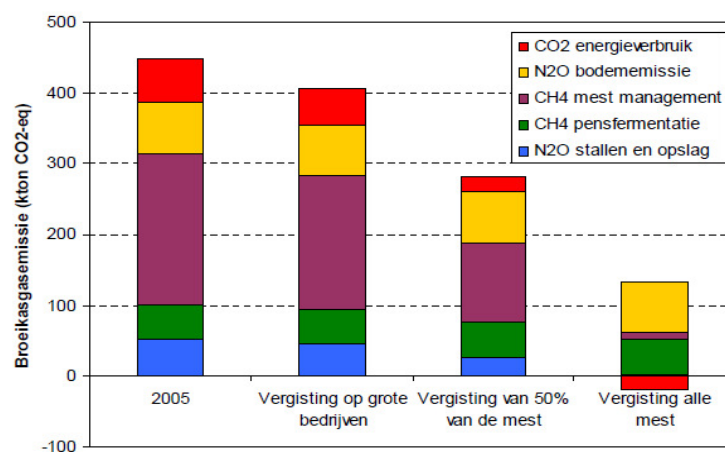
Trends

- Nederland heeft heel veel verschillende stromen!
- Onbenutte biomassa potenties zijn mest, primaire biomassa (bermgrass, gewasresten, biomassa uit natuur, etc.)
- Meer biomassa benutten is belangrijk maar beter benutten is nog belangrijker
- Biomassagebruik wordt ook gestuurd door andere zaken: Broeikasgas uitstootvermindering, nutriënten benutten, etc
- Integraal beleid: energie + nutriënten + broeikasuitstoot + ?
- Biomassa beweegt de ladder op: van onbenut naar verbranden/vergisten naar transportbrandstof naar chemicaliën
- Biomassaketens hebben heel veel interacties



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Avoided GHG emission when using manure for AD



Figuur 5.4. Broeikasgasemissie van de Gelderse varkenshouderij in 2020 voor verschillende scenario's van mestvergisting.



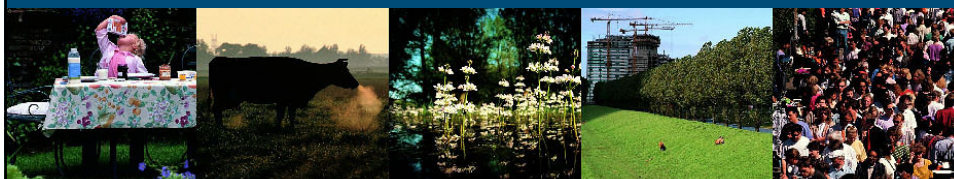
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Lesschen et al., 2009.

Einde

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Beschikbaarheid biomassa elektriciteit/warmte

	2009	1 Global Economy	2 Transatl Market	3 Strong Europe	4 Regional Comm.
Mton dm	10.5 (48.6)	13.8 (50.4)	13.4 (47.1)	16.4 (47.9)	15.5 (46.3)
PJ LHV	125 (558)	173 (515)	167 (491)	179 (494)	173 (485)
PJ HHV	180 (881)	231 (910)	226 (855)	281 (868)	268 (841)
PJ Electricity	30	38	38	51	49
PJ Heat	13	15	15	28	35
PJ Fuels	-	1	1	13	10
PJ Final	44	54	53	91	94
PJ av. fossil	83	101	102	155	157
bio eff (% _{HHV})	24%	23%	24%	32%	35%
fossil eff (% _{HHV})	53%	54%	54%	59%	60%



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