Perspectives of biofuels/biobased products for development

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Poverty: rural and urban

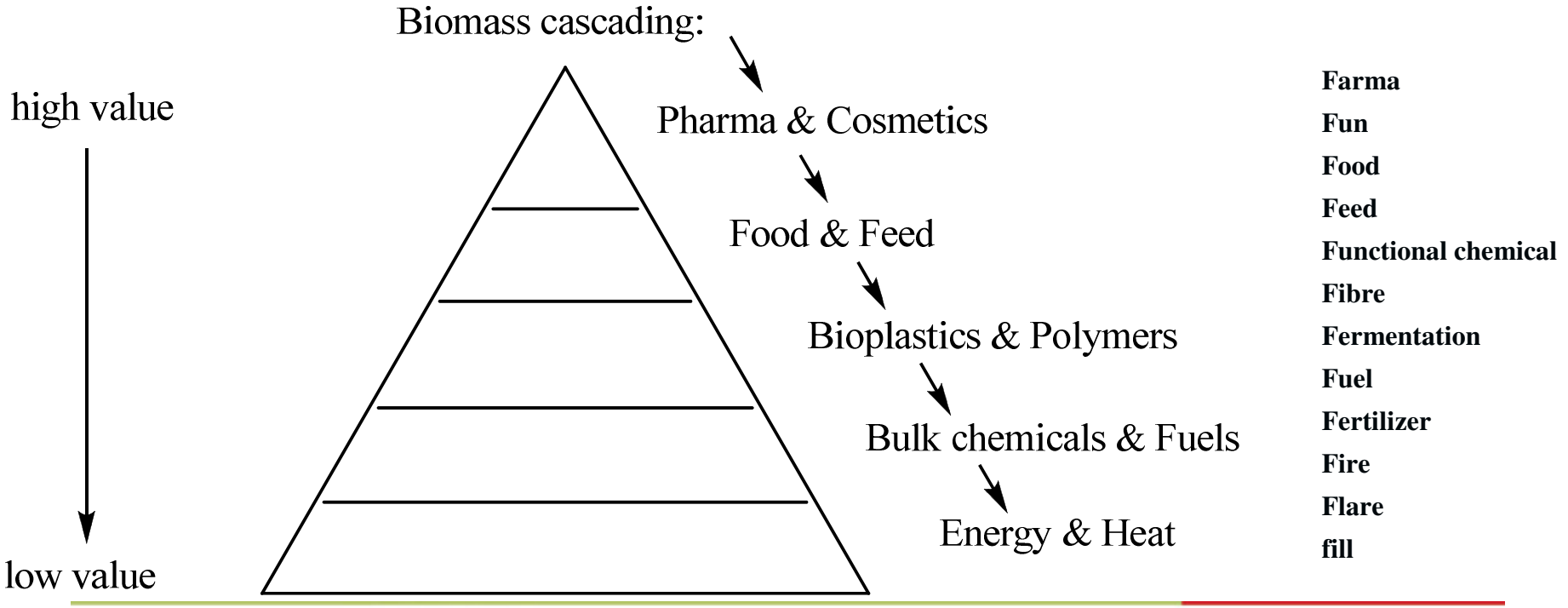
Distribution of poor (%)	Bolivia 2002	Ethiopia 2000	Bangladesh 2001	Zambia 1998	Cambodia 1999	Madagascar 2001	Vietnam 1998
Urban (buyers)	50.9	22.3	14.9	30.0	8.4	17.9	6.1
Rural landless (buyers)	7.2	-	53.3	7.4	11.5	14.8	5.8
Smallholders net buyers	29.1	30.1	18.8	28.8	25.8	18.9	35.1
Smallholders self-sufficient	7.1	39.5	4.6	20.8	18.0	27.3	19.4
Smallholders net sellers	5.6	8.0	8.4	13.0	36.3	21.1	33.6

Table 1. Net buyers and net sellers of food staples within a country
(Source: Word Development Report 2008, Box 4.7. Country selection follows World Bank)

Cited by Keyzer et al., 2008

Biobased development

Biobased products



Biobased development

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Pharmaceutials and specialty products

- High prices
- Special markets
- Solvents, surfactants
- Oil, starch crops

Biobased development

Chemicals

- 1,3 Propanediol
- Succinic acid
- 200-300, 000 tons
- Fermentation of maize, cane, potato

Biobased development

Oil products, polymers, fibers

- Hydraulic fluids, color inks
- Polylactic Acid (PLA)
- Polyhydroxyalkanoate (PHA)
- Starch based polymers
- Market sizes, prices

Biobased development

Table 1. Main development persp

Product	Feedstocks	Potential biobased production size	Potential impact for local producers	Potential local employment	Prospects for development
Pharmaceuticals	Selective crops	Very low	Very low	–	Very poor
Bulk chemicals	Starch, sugar crops, proteins	Very low	Very low	–	Poor to modest
Fine chemicals	Oil, starch, sugar crops, straw	Low	Modest	Very limited	Modest to good
Solvents	Oil, starch, sugar crops, straw	Very low	Very low	Very limited	Very poor
Surfactants	Various	Low	Low	Very limited	Poor
Lubricants	Oil crops	Low	Low	Good	Modest to good
Polymers	Mostly starch & sugar crops	Modest	Very low	Very limited	Very limited
Fibers	Lignocellulosic crops, residues, grasses	Modest	Low	Good	Modest to good

Biobased development

Discussion

- Rural versus urban development
- Crop prices and market volumes
- Labour is an issue
- Access to land and inputs
- Legal protection and law enforcement

Biobased development

Number underfed	1,000,000,000	(1 bln)
Additional food	1200 kcal pppd	(out of 1800 kcal total requirements)
Cereal requirements	350 g pppd	(wheat flour)
	128 kg pppy	(wheat flour)
Total	128 mln ton cereals	(wheat flour, 1 bln persons, 1200 kcal)
	192 mln ton cereals	(idem, 1800 kcal)

Cereal production (FAO, 2003)	1,885,611,618	(1.9 bln tonnes; not including beer)
Of which animal feed (idem)	720,267,840	(720 mln tonnes)
Of which waste (idem)	84,085,893	(84 mln tonnes)
75% of animal feed	540,200,880	(540 mln tonnes)
Equivalent of	4.22	(x 128 mln tonnes)
	2.81	(x 128 mln tonnes)
Waste ./. 128 mln ton	0.66	(x 128 mln tonnes)

Biobased development

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Conclusion

¬ Develoment requires economic opportunities

¬ Not just land use or biomass

¬ Select products with sufficient market volume and adequate production chains

¬ Labour and land security crucial importance

Biopolymer GHG

Table 2-6: Energy use and greenhouse gas (GHG) emissions of (Modified) Starch Polymer pellets and their petrochemical counterparts (Patel et al., 1999)

	Energy[1] in MJ/kg			GHG emissions[2] in kg CO_2 eq./kg		
	Pchem. Polymer[3]	Bio-based polymer	Energy savings	Pchem. Polymer[3]	Bio-based polymer	Emission savings
TPS	76	25	51	4.8	1.1	3.7
TPS + 15% PVOH	76	25	52	4.8	1.7	3.1
TPS + 52.5% PCL	76	48	28	4.8	3.4	1.4
TPS + 60% PCL	76	52	24	4.8	3.6	1.2
Starch polymer foam grade	76	34	42	4.8	1.2	3.6
Starch polymer film grade	76	54	23	4.8	1.2	3.6

TPS = thermoplastic starch

[1] Non-renewable energy

[2] Emissions refer to incineration in all cases. Exception: Composting has been assumed for starch polymer film grades.

[3] 50% LLDPE + 50% HDPE according to Boustead (1999).

Figure 1. Chain of actions following increased biofuel production