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ICID Task Force on Water for Bio-Energy and Food

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Purpose of Task Force

Requested to compile a position paper on the use of water for bio-energy and the possible impacts thereof on food production

Challenge:

To compile a position paper that will reflect the viewpoints of the members/majority/participating countries on the topic

Huge difference in viewpoints in terms of the agricultural situation, oil/gas reserves available/available water resources and the policies/objectives of the individual countries

Current situation

Task Force met during the recent ICID Conference in Adelaide Australia

Countries that attended the TF meeting:

Canada – Chair
India
Australia
Finland
China
Nepal
Uzbekistan
South Africa

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Meeting in Adelaide

- Four country presentations were made on experiences in biofuel in Nepal, India, South Africa and Canada:

- 1 Mr. Uttam Raj Timilsina from Nepal: The scope on production and usage of biofuels in Nepal
- 2 Mr. Amit Dutta from India: Country policies and developments of water for bio-energy and food
- 3 Mr. André Roux from South Africa: Crop production and water use for biofuels in South Africa
- 4 Mr. Laurie Tollefson from Canada: Biofuel production in Canada and opportunities under irrigated cropping systems

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Way Forward

- **Develop a position paper on 'Water for Bio-Energy and Food'**

- The TF agreed that a structured position paper would be very useful as an output of this TF.
- The position paper may outline the country experiences.
- Chairman, Mr. Tollefson and Director ICID, Dr. Vijay Labhsetwar , will develop a format for writing country papers and circulate to members and others for inviting their country experiences.
- In addition, invitations will be sent to Iran, Brazil, USA, Australia, China and Great Britain to make their country presentations during the next meeting of the TF in Turkey in 2013.
- The intent would be to use these in developing the position paper.

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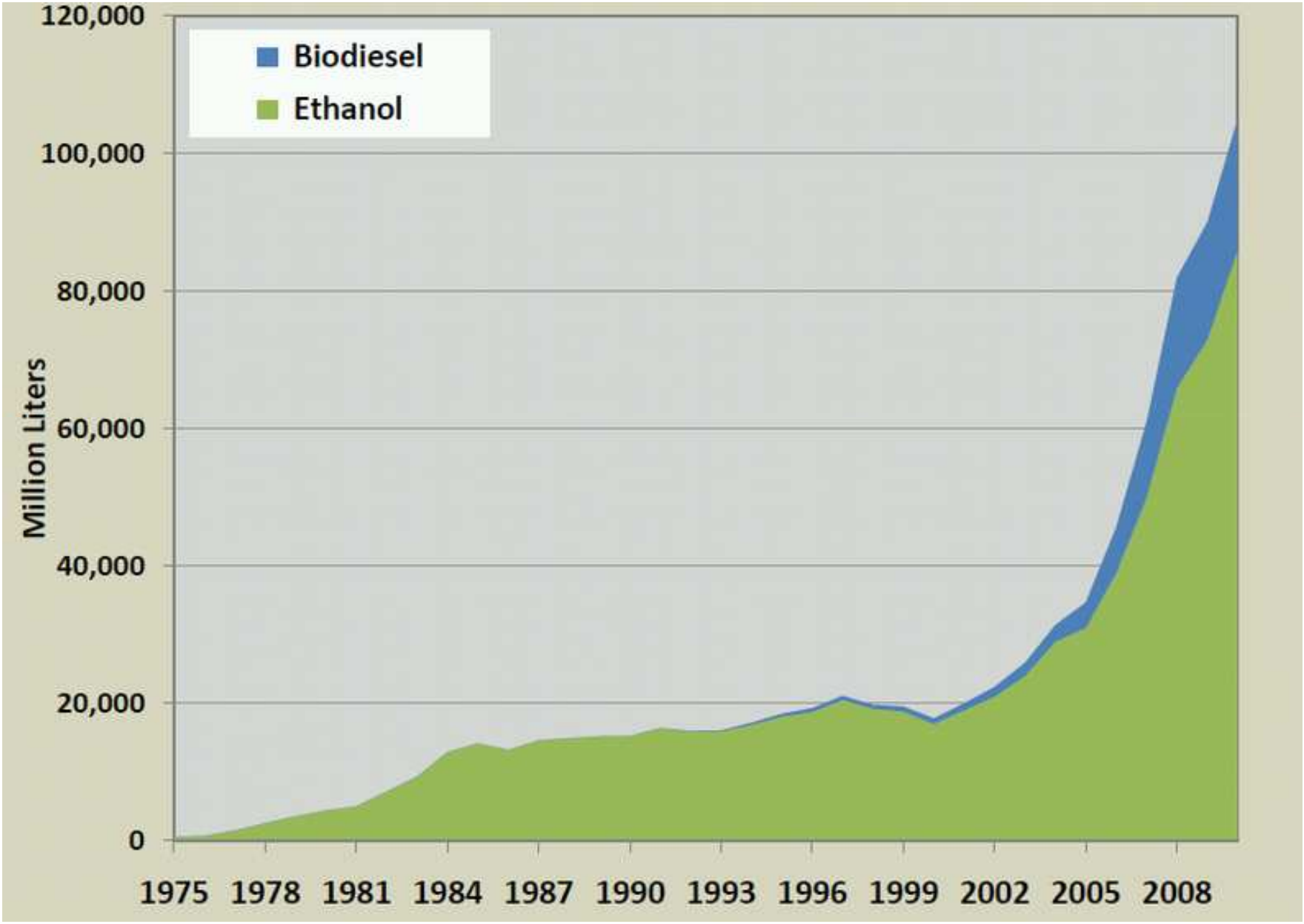
Global Bioethanol and Biodiesel Production 1975-2011



Global Biofuel Scenario :

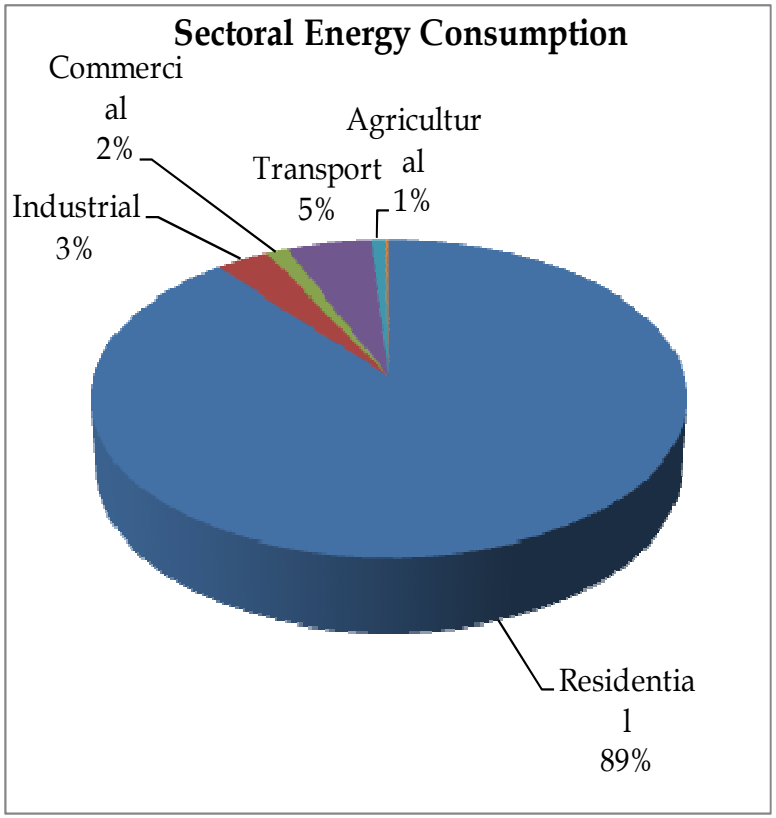
Words Biofuels Production : 62.2 billion tones

Table 1: Biofuel Feed Stocks and Blending Targets in the Selected Countries

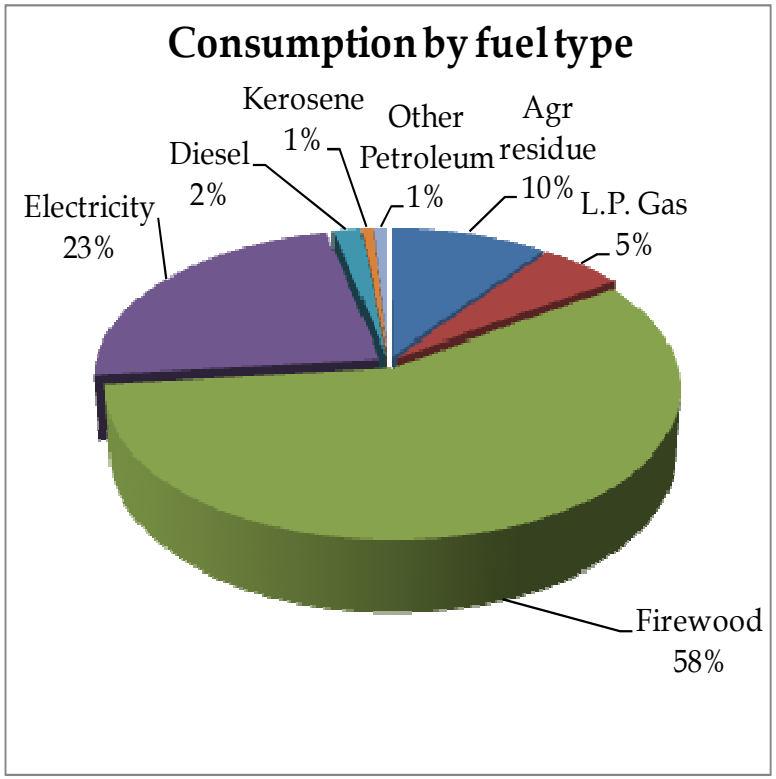
Country	Feed Stock		Production Forecast, 2009 (Million Litres)		Blending Targets (%)	
	Ethanol	Biodiesel	Ethanol	Biodiesel	Ethanol	Biodiesel
US	Corn	Soybean	38,600	2,415	3	1
Brazil	Sugar cane	Rapeseed, castor seed	25,200	1,825	25	2
EU	Wheat, corn, barley, sugar beet	Rapeseed, sunflower, soybean	3,830	5,304	5.75	5.75
Canada	Corn, wheat	Vegetable oils	1,100	–	5	2
China	Corn, wheat, cassava, sweet sorghum	Palm oil, jatropha	1,750	–	10	5
India	Sugar cane molasses, sweet sorghum	Jatropha, pongomia	494	45	20	20
Indonesia	Sugar cane, cassava	Palm oil, jatropha	405	–	10	10
Malaysia	none	Palm oil	–	140	–	5

Source: F O Licht (2009); FAO (2008); FAPRI (2008).

Nepal Energy Consumption Scenario



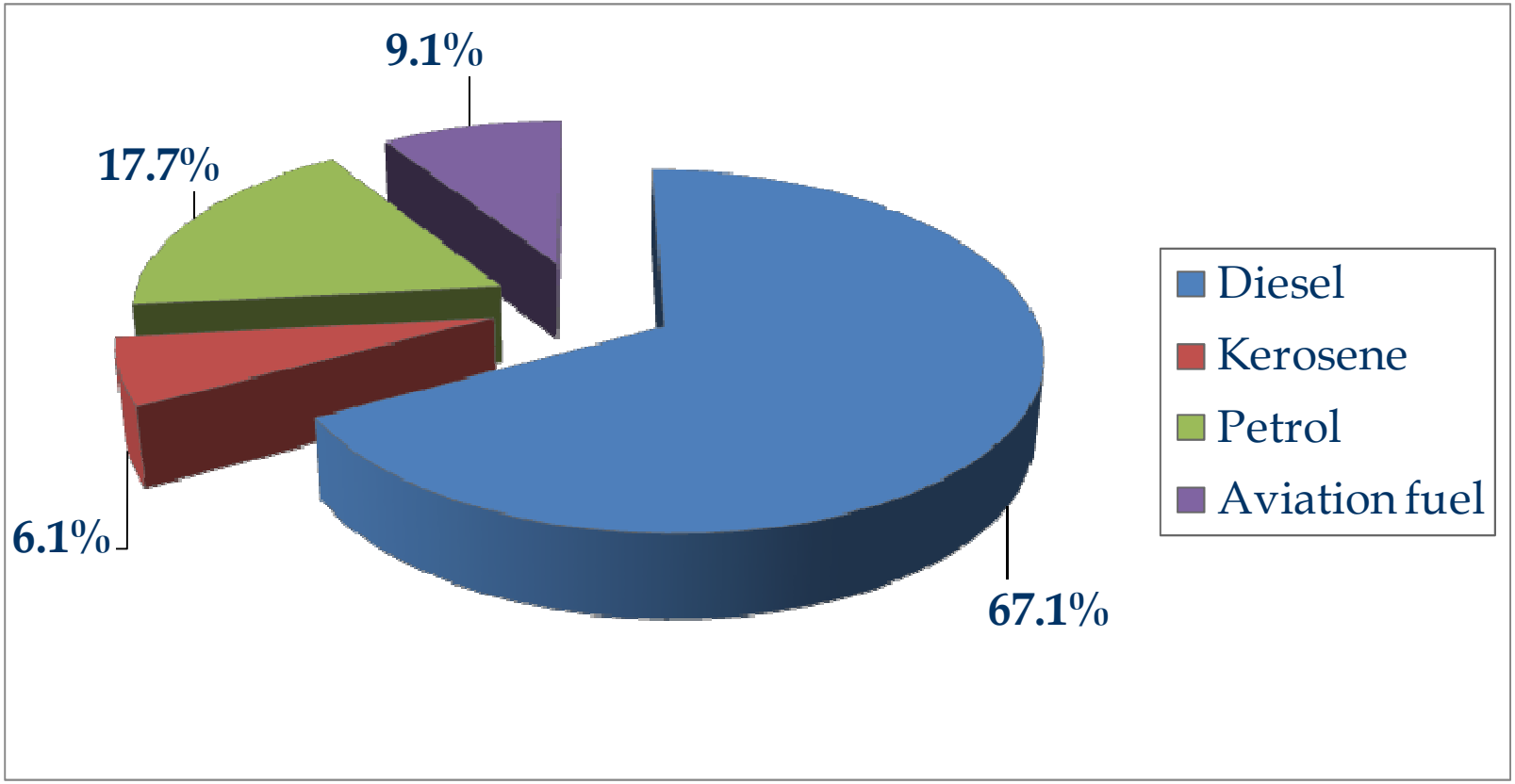
Total Energy Consumption



Industrial Energy Consumption

Source: Energy Sector Synopsis Report, 2010

Nepal Consumption Share of Petroleum Products



Nepal: Potential for Jatropha Biofuel Production

- Climate: Tropical and Sub-tropical
- Rainfall: 1500 mm -2500 mm
- Elevation of land: 60 m – 4000 m (Terai & hills)
- Farming system and available labor
- Technical manpower
- Market
- Resources

Biofuel Cultivation in Nepal

Jatropha plantation in various parts of Nepal

- Approximate Area : 12 000 ha
- Those areas are previously uncultivated land
- Promotion for Commercial cultivation : not started yet
- No irrigation facility in cultivated area

Potential Non edible plants for biofuels production in Nepal

S.N.	Local Name	Scientific Name	Type	Remarks
1	Sajiban	Jatropha cercus	Non edible	
2	Adir	Riccinus comunis	Non edible	
3	Sal	Shorea robusta	Non edible	
4	Chiuri	Bassia butyracea	Non edible	
5	Simal	Bombax ceiba	Non edible	
6	Khurpani	Prunus armenica	Non edible	
7	Simal	Bombax ceiba	Non edible	
8	Bakaino	Melia azedarach	Non edible	
9	Nim	Azadirachta indica	Non edible	
10	Dhaturo	Cannabis sativa	Non edible	

Biofuels Industrial Strategy of South Africa, 2007

The global debate on the potential negative impact of biofuels on food security informed the development of the Biofuels Industrial Strategy of South Africa in 2007

The goal of the 5 year strategy is a 2% biofuel penetration (400 million liters p.a. by 2013)

The strategy identified sugar cane and sugar beet for bio-ethanol production and soya beans, sunflower and canola (rape seed) for biodiesel production

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Biofuels Industrial Strategy of South Africa, 2007 (Cont.)

Recent studies indicate that grain sorghum, especially the faster growing sweet sorghum variety with a shorter growing season, is an alternative that can be used in combination with sugar beet, which can only be grown in winter due to our hot summers. Max temp tolerated is 25° C

Biofuel production as an agricultural crop can have significant job creation benefits e.g. Department of Trade and Industry's Industrial Policy Action Plan suggests 125 000 direct jobs could be created should a 10% blending target be set

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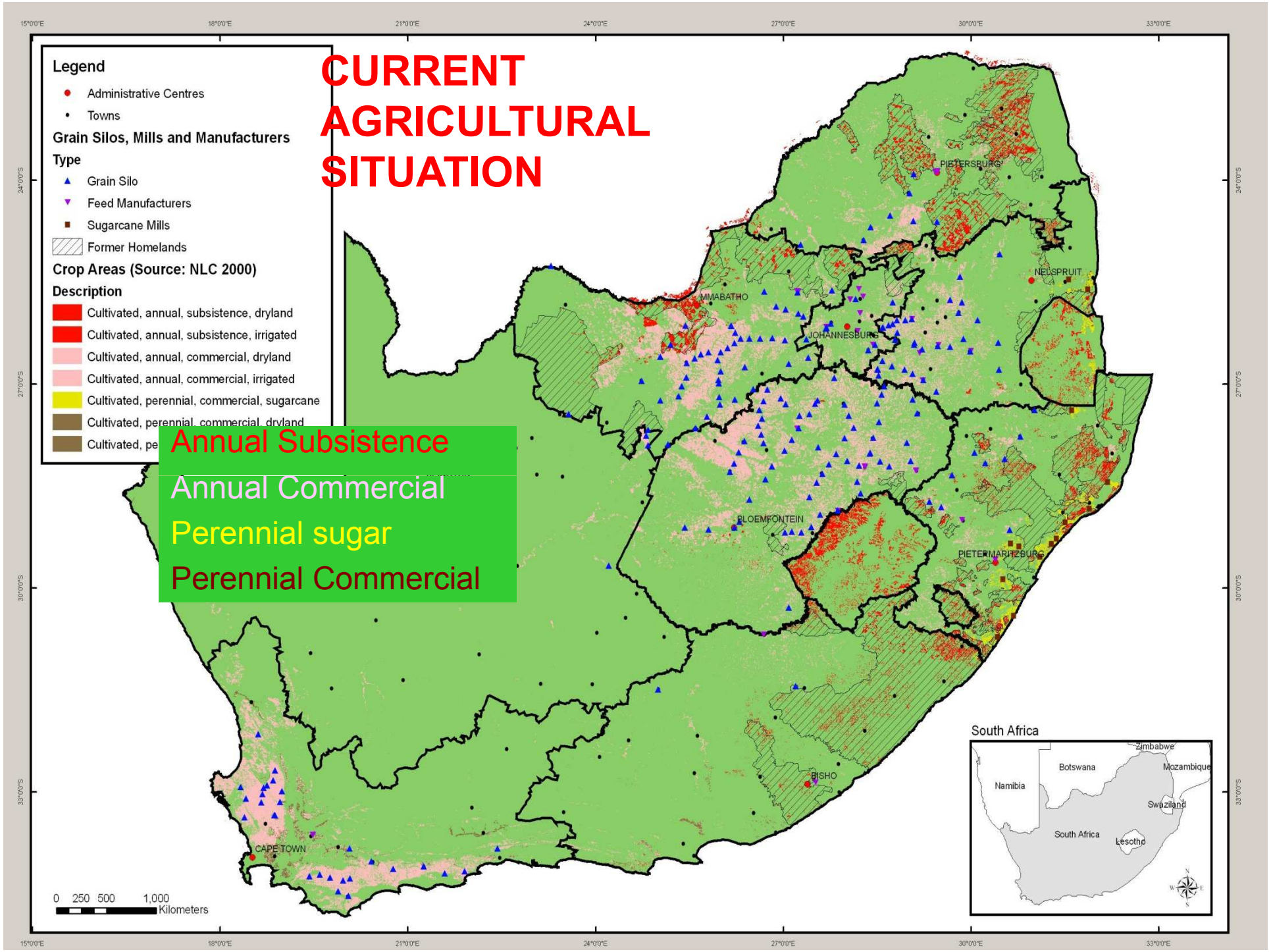
CURRENT AGRICULTURAL SITUATION
Legend
Administrative Centres
Towns
Grain Silos, Mills and Manufacturers
Type
Grain Silo
Feed Manufacturers
Sugarcane Mills
Former Homelands
Crop Areas (Source: NLC 2000)
Description
Cultivated, annual, subsistence, dryland
Cultivated, annual, subsistence, irrigated
Cultivated, annual, commercial, dryland
Cultivated, annual, commercial, irrigated
Cultivated, perennial, commercial, sugarcane
Cultivated, perennial, commercial, dryland
Annual Subsistence
Annual Commercial
Perennial sugar
Perennial Commercial
PIETERSBURG
NELSPRUIT
MMABATHO
JOHANNESBURG
BLOEMFONTEIN
PIETERMARITZBURG
BISHO
CAPE TOWN
0 250 500 1,000
Kilometers
South Africa
Zimbabwe
Botswana
Mozambique
Namibia
Swaziland
South Africa
Lesotho

The Biofuel Industrial Strategy (Cont.)

3 million ha of under utilised moderate to high potential land identified

Most of this land, situated in rural areas plagued by poverty, unemployment, poor infrastructure and reliance on social welfare grants, has not been cultivated in the last 20 years

The South African Government is of the view that almost all the previous productive land in the former homelands can be brought into full production once a firm market has been secured

Global debate on the potential negative impact of biofuels on food security resulted that specific crops i.e. soya beans, canola and sunflower for biodiesel and sugarcane and sugar beet for bio-ethanol production were chosen.

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Water footprint (water consumed to manufacture one litre of biofuel)

Biofuel	Feedstock	Litres
Bio-ethanol	Sugar beet	1 388
	Potato	2 399
	Sugar cane	2 516
	Cassava	2 926
	Wheat	4 946
	Sorghum	9 812
Biodiesel	Soybean	13 676
	Canola	14 201
	Jatropha	19 924

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Second generation biofuels

The conversion of lignin and cellulose, hemicellulose rich biomass into bioethanol using specific enzymes and/or microbial organisms is collectively referred to as second generation technologies.

Examples: alge or other non-food forms of biomass

Currently not considered by government as they are more capital than labour intensive

Technology still need refinement

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India: The Vision and Goals of National Biofuel Policy

- The Policy aims at mainstreaming of biofuel and therefore, envisions a central role for it in the energy and transportation sector of the country in coming decades.

- The Goal of the Policy is to ensure that a minimum level of biofuels become readily in the market to meet the demand at any given time.

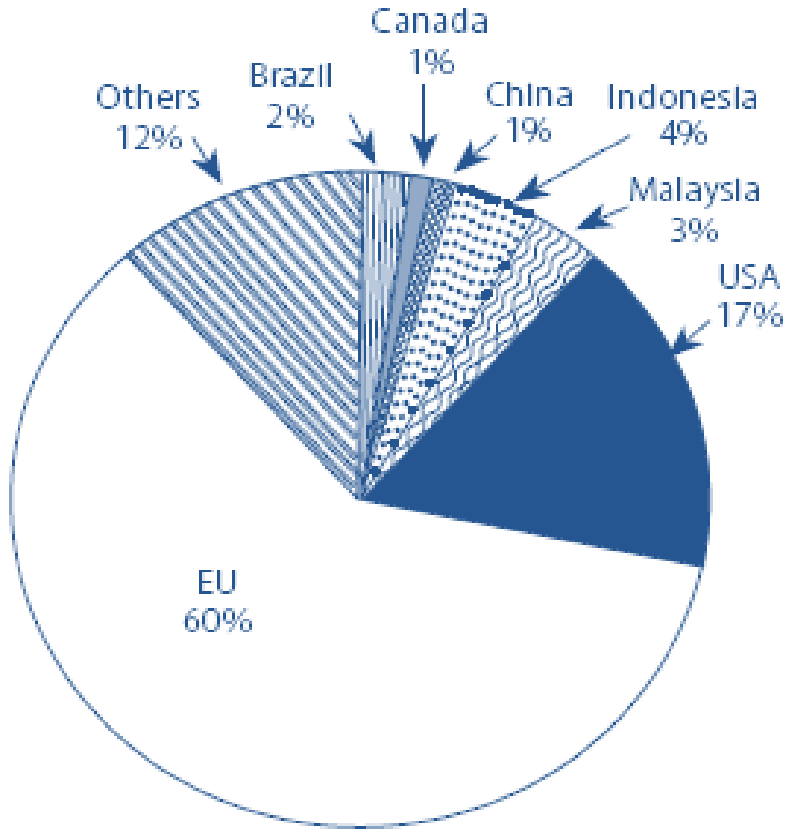
- An indicative target of 20% blending of biofules, both for bio-diesel and bio-ethanol by 2017 is proposed

- The blending level of bio-ethanol has already been made mandatory , effective from October 2008 , and will continue to be mandatory leading upto the indicative target.

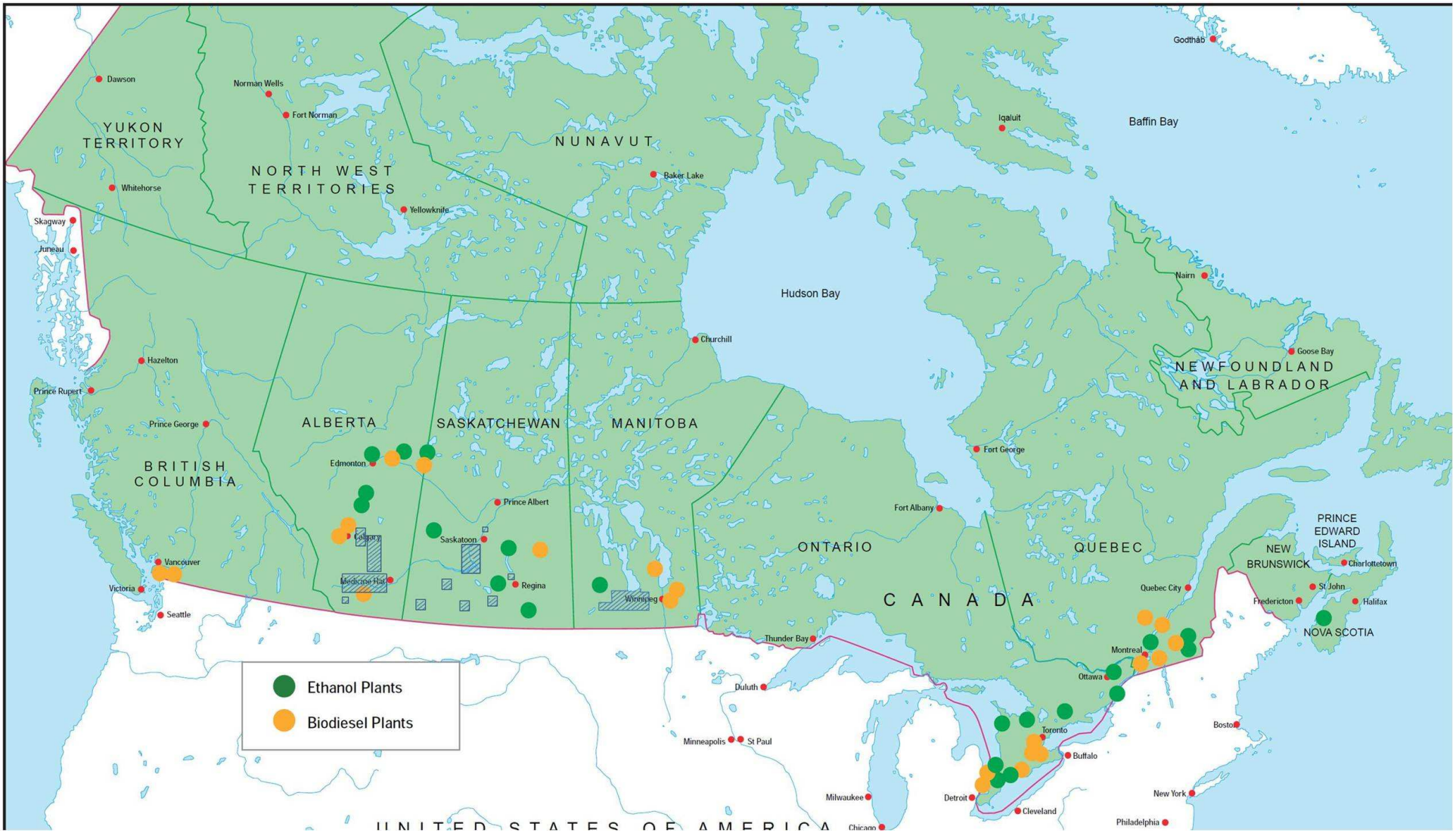
Indian Bio-ethanol Scenario

Currently India's Biofuel production accounts for only 1% of the global production. This translates to round 425 million liters, consisting of 380 million liters of fuel ethanol

Figure 2: Biodiesel Production by Country, 2008



Ethanol and Biodiesel Production Plants in Canada



Blue cross-hatch approximates irrigated areas.

Canadian Ethanol Production

- 1.83 billion litres per year
- 75% generated using corn as the feedstock and 24% using wheat.
- Most of Canada's ethanol capacity located in Ontario (63%) and Saskatchewan (18%)
- There are currently 15 operational ethanol production plants in Canada, 5 demonstration plants and 5 plants under construction or proposed
- Canada's Renewable Fuel Standard (RFS) of E5 (5% ethanol in gasoline) means that 2.14 billion litres of ethanol is currently required. Assuming that all plants are built, Canadian ethanol capacity will rise to 2.1 billion litres in the next few years. This indicates that ethanol imports or additional production capacity will be required to meet the RFS as gasoline demand in Canada grows.

Canadian Biodiesel Production

- 0.21 billion litres with Ontario and Quebec accounting for 37% and 29% of total capacity. British Columbia, Alberta and Manitoba share the remaining capacity.
- Currently 13 operational biodiesel plants, 5 proposed and 3 under construction. If all plants are built, biodiesel production capacity will increase to 1.2 billion litres. This is double the amount required to meet the RFS B2 (2% biodiesel) mandate.
- Biodiesel production from tallow (animal fats) is currently 60% but is expected to fall dramatically in 2012 (to 34 %) with the expected completion of a 225 million litre canola-oil feedstock based biodiesel plant in Alberta

Water and Biofuels

- Biofuels account for 1% water transpired worldwide and 2% water withdrawals
- Main concern irrigated sugar cane and maize

Crop	Annual obtainable fuel yield	Energy yield	Evapotranspiration equivalent	Potential crop evapotranspiration	Rainfed crop evapotranspiration	Irrigated crop water requirement	
	(Litres/ha)	(GJ/ha)	(Litres/litre fuel)	(mm/ha)	(mm/ha)	(mm/ha)[1]	(Litres/litre fuel)
Sugar Cane	6,000	120	2,000	1,400	1,000	800	1,333
Maize	3,500	70	1,357	550	400	300	857
Oil Palm	5,500	193	2,364	1,500	1,300	0	0
Rapeseed	1,200	42	3,333	500	400	0	0

[1] On the assumption of 50 percent irrigation efficiency.
Source FAO, 2008a

- Policies need to support development of biofuels that account for the production and processing of biofuel crops on water availability to meet local needs

Economics of Bio-fuels

Baseline for measuring the economics of biofuels is the price of gasoline and diesel.

Cost of ethanol production from sugarcane, currently the most economical biofuel feedstock to produce, was less than the price of gasoline only one year out of five between 2000 and 2010.

Biodiesel economics are more unfavorable than ethanol. Biodiesel feedstock costs alone have generally been higher than petroleum diesel prices.

Cellulosic feedstocks (switchgrass and corn stover) have low production costs and high initial investment costs. The latter value will decline over time as technology improves.

The amount of energy in ethanol is only 66% that of gasoline which means every litre of gasoline replaced requires 1.24 litres of ethanol to produce the same energy. Drivers who fill their tanks with E5 are getting slightly worse mileage than with pure gas. This makes the economics of ethanol less encouraging.

Thank you