

Advancing Modern Bioenergy: Poverty Alleviation, Land Use and Environmental Sustainability in Africa

“Working Session on Land Use and Bioenergy in the CDM”
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Presentation Outline

- 1.** The World Bank Framework: Poverty Alleviation
- 2.** Modern Bioenergy: PA, LULUC & Environmental Sustainability
- 3.** Towards a Sound ESSD Implementation Framework

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1. The World Bank Framework: Poverty Alleviation

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The Business We are In



Mission:

to fight poverty and to help people help themselves and their environment

by providing resources, sharing knowledge, building capacity, forging partnerships in the public and private sectors.

MOVING TO A RESULTS-BASED FRAMEWORK...

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The MDG Framework



Millennium Development Goals:

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria, and other diseases
7. Ensure environmental sustainability

Energy is NOT a Target but an **ESSENTIAL INPUT**

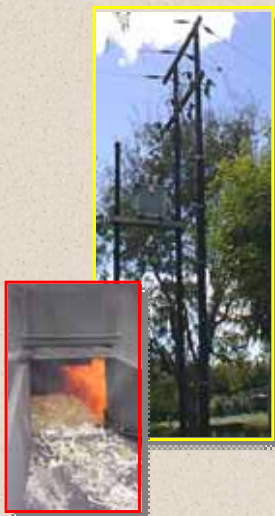
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World Bank on Modern Bioenergy

Status June 2005



1. Broad Consensus on “**Renewable Energy**” (20% Scale-up);
2. Support for “Green-Power” Development;
3. Support for Solid biofuels Development;
4. Ongoing Discussion on liquid biofuels (viability; Subsidies; PS Role; Level of EcoSoc & Env. Impacts; Policy Objectives; Country/Site Specificity); and,
5. AFR open to Clients requests on Policy Dialogue and Due Diligence on all modern bioenergy options.

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World Bank on Modern Bioenergy

Issues Under Discussion on Liquid Biofuels

- Valuation of Track Record; “Conditions of Success”;
- “State-of-the-Art” and Economics;
- Fuel/application/Technology “policy objectives”
- **Economic Analysis Methodology**: Accounting of economic externalities: Employment; Land use trade-off (i.e, “food vs. fuel”); Environmental impacts (including CDM issues); Energy security and independence, etc...

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2. Modern Bioenergy: PA, LULUC and Environmental Sustainability

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Can Modern Bioenergy Contribute to Poverty Alleviation in Africa ?

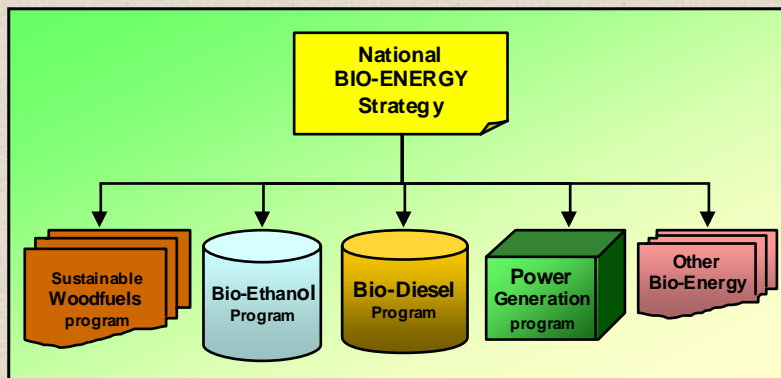
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
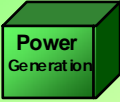
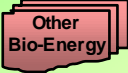
AFR: Moving Towards and Integrated "Biomass Energy" Agenda

Vision: Contribute to **Poverty Reduction** and **Sustainable Development** in the Africa Region through the development of Comprehensive, Sustainable and "Efficient" biomass energy sector policies, strategies and investment programs and projects.



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AFR/Bioenergy: Summary of Options and Applications

BIOENERGY	SHORT TERM	MEDIUM TERM	LONG TERM
 Sustainable Woodfuels	<ul style="list-style-type: none"> SF -> Households SF -> SME 	<ul style="list-style-type: none"> SF -> Households SF -> SME/Industry LF -> SME/Industry 	<ul style="list-style-type: none"> SF -> SME / Industry LF -> SME/ Industry LF -> Transport
 Bio-Ethanol	<ul style="list-style-type: none"> LF -> Hhlds (C/L/H) LF -> SME LF -> Transp. (Blend) 	<ul style="list-style-type: none"> LF -> Hhlds (C/L/H) LF -> SME/ Industry LF -> Transport (B/S) 	<ul style="list-style-type: none"> LF -> Hhlds (C/L/H) LF -> SME/ Industry LF -> SME/ Industry LF -> Transport
 Bio-Diesel	<ul style="list-style-type: none"> LF -> SME/Industry LF -> SME/Industry LF -> Transport 	<ul style="list-style-type: none"> LF -> SME/Industry LF -> SME/Industry LF -> Transport 	<ul style="list-style-type: none"> LF -> SME/ Industry LF -> SME/ Industry LF -> Transport
 Power Generation	<ul style="list-style-type: none"> Agro-Industry SME Rur. Electrification 	<ul style="list-style-type: none"> Agro-Industry SME Rur. Electrification Urban W2E 	<ul style="list-style-type: none"> Agro-Industry SME Rur. Electrification Urban W2E Grid Supply
 Other Bio-Energy	<ul style="list-style-type: none"> SF -> Hhlds/SME GF -> Hhlds/SME 	<ul style="list-style-type: none"> SF -> Hhlds/SME GF -> Hhlds.SME SE -> Power Gener. 	<ul style="list-style-type: none"> Multiple Fuels (Hydrogen, etc.) Multi. Applications

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Can Modern Bioenergy
Contribute to **Poverty**
Alleviation in Africa ?

The Example of
Ethanol for
Household
Applications

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AFR: Millennium Gelfuel Initiative



Development Marketplace 2000



"RPTES" MG Stove



"DM 2001 Stove"



"DM 2002 Stove"



"JIKO" MG Stove

World Bank + Private Sector + DM + RPES G.A.A.



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AFR: Millennium Gelfuel Initiative

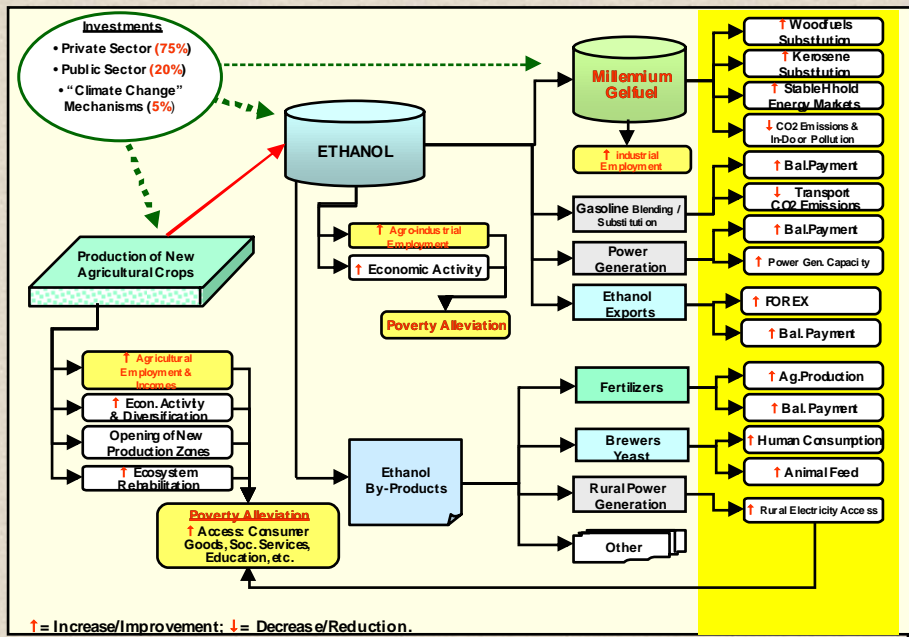
Comparison of Household Cooking Costs

FUEL/Stove Type	US \$ HOUSEHOLD COOKING COST PER MONTH (June 2004)					
	Ethiopia	Malawi	Mozambique	Senegal	South Africa	Zimbabwe
LPG Bumer	3021	1816	762	611	1256	13.02
Kerosene (W)	1042	1231	821	752	1154	19.23
Kerosene (P)	1032	1220	813	746	1144	19.06
Charcoal (T)	774	1126	533	602	1588	7.15
Charcoal (I)	529	769	364	411	1085	4.88
Fuelwood (T)	702	894	420	410	1681	2.52
Fuelwood (I)	486	619	291	284	1163	1.75
MGelfuel (CR)	881	1552	641	641	6.41	6.41
DEthand (CR)	330	551	240	240	2.40	2.40

Note: 75 Meals/month = 2.5 meals/day x 30 day/month.

World Bank + Private Sector + DM + RPES G.A.A.

Ethanol/Millennium Gelfuel: A Sustainable Engine for Poverty Alleviation



Ethanol/Millennium Gelfuel: Land Use and Land Use Change Impacts

TABLE 2 Land Requirements, Rural Employment and Millennium Gelfuel Production From 25% and 50% Increase in Agricultural Crops in Africa⁽¹⁾

25% Production Increase over Year 2000 Crop Levels	SUGARCROPS						STARCHCROPS						ALL CROPS					
	SUGARCANE		SWEET SORGHUM		CASSAVA		MAIZE		SWEET POTATOES		TOTALS							
	(2)	(3)	(4)	(2)	(3)	(4)	(2)	(3)	(4)	(2)	(3)	(4)	(2)	(3)	(4)			
REGION	Ha (10 ⁶)	Jobs (10 ⁵)	Gelfuel (10 ⁶ L)	Ha (10 ⁶)	Jobs (10 ⁵)	Gelfuel (10 ⁶ L)	Ha (10 ⁶)	Jobs (10 ⁵)	Gelfuel (10 ⁶ L)	Ha (10 ⁶)	Jobs (10 ⁵)	Gelfuel (10 ⁶ L)	Ha (10 ⁶)	Jobs (10 ⁵)	Gelfuel (10 ⁶ L)			
Central Africa	0.1	0.0	93.3	0.4	0.2	122.3	0.6	0.2	1,257.7	0.7	0.2	385.6	0.0	39.7	1.7	0.7	1,898.5	
Eastern Africa	0.1	0.1	437.1	0.8	0.4	301.7	0.8	0.4	1,250.7	2.7	0.9	1,989.6	0.3	0.1	275.5	4.8	1.8	4,254.6
Southern Africa	0.1	0.0	83.4	0.1	0.0	54.1	0.0	0.0	0.0	0.9	0.3	1,611.1	0.0	0.0	2.5	1.1	0.4	2,251.1
Western Africa	0.0	0.0	89.3	3.0	1.3	1,116.0	1.2	0.5	2,610.9	1.8	0.6	1,331.0	0.1	0.1	134.4	6.2	2.5	5,281.6
Total	0.3	0.1	1,203.1	4.3	1.8	1,594.1	2.6	1.1	5,119.3	6.1	2.1	5,317.2	0.5	0.2	457.2	13.8	5.4	13,685.9
50% Increase																		
Central Africa	0.1	0.1	186.5	0.8	0.3	244.5	1.1	0.5	2,515.4	1.4	0.5	771.2	0.1	0.0	62.6	3.4	1.4	3,780.1
Eastern Africa	0.2	0.1	874.2	1.7	0.7	603.3	1.6	0.7	2,501.4	5.4	1.9	3,979.2	0.7	0.3	551.0	9.6	3.7	8,509.2
Southern Africa	0.2	0.1	1,166.8	0.1	0.1	108.3	0.0	0.0	0.0	1.9	0.7	3,222.2	0.0	0.0	5.1	2.2	0.8	4,502.3
Western Africa	0.0	0.0	178.7	6.1	2.5	2,232.0	2.4	1.0	5,221.8	3.6	1.3	2,662.0	0.3	0.1	268.7	12.3	5.0	10,563.2
Total	0.5	0.3	2,406.1	8.7	3.6	3,188.1	5.1	2.3	10,238.6	12.2	4.3	10,634.5	1.0	0.4	887.4	27.5	10.8	27,354.8

Source: Phillips, T., "Agro-Economic Assessment of the Potential to Produce Fermentation Ethanol in Africa", RPTES Program, 2002.

Notes: (1) Projections based on 25 and 50 percent of 2001 and production of the specific crop. It is assumed that yields remain constant and that labor inputs will increase in proportion to production increases. Required land expansion was constrained by availability of suitable land. Sources:

(a) for Production data: FAO, Agricultural Production, FAOSTAT (<http://apps.fao.org/>); (b) for Suitability data: IASA and FAO, (2000); and,

(c) for Global Agro-Ecological Zones <http://www.wiao.org/ag/AGU/agl/gaez/index.htm>.

(2) Land requirements of production scenarios are stated in million Hectares (Ha).

(3) Employment Generation presented in millions and only reflect new jobs in the agricultural production phase. Actual number calculated on the basis of total number of days per person labour input divided by 250 workdays/year. Agro-industrial employment in ethanol distillation and gelfuel production is estimated to be of the order of 100,000 new permanent jobs not included.

(4) Millennium Gelfuel production calculated on the basis of 1.21 volume ratio with respect to ethanol alcohol production.

To Ethanol or not to Ethanol ? A Marginal Discussion of Central Proportions

IEA: 2000-30 Energy Investment Scenario (\$16 TIn)

Discussion Items	Coeff.	INVESTMENTS (2030)
Total Energy Investments:	1	16,000,000,000,000
Of which in Modern Biomass Energy:	15.0%	2,400,000,000,000
Of which in Ethanol:	5.0%	120,000,000,000
Of Which in Africa:	40.0%	48,000,000,000
Potential Ethanol Production:	Liters	96,000,000,000
Employment Generation (Low):	\$5,059/job	9,488,372
Employment Generation (High):	\$3,018/job	15,906,977

Africa: 9 – 15 Million New Jobs ... Marginal ?

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3. Towards a Sound ESSD Implementation Framework

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Towards a Sound Bioenergy ESSD Implementation Framework

- Environmental & Socially Sustainable Development Framework (ESSD)
- Economic Sustainability
- Multi-Purpose Programs/Projects
- “Win-Win” Investment/Trading Models

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Bioenergy: ESSD Framework (Essential)

- **Environmental Safeguards**
 - Soil/Water/Air Contamination (e.g., Stillage)
 - Soil Degradation
 - CO2 Route Emissions Reduction
 - Climate Change Benefits mobilization
- **Social Safeguards**
 - Volume of Employment
 - Quality/Conditions of Employment
 - Sustainability of Employment

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Bioenergy: Economic Sustainability

- **Minimization of LULUC Conflicts (Essential)**
 - Food vs Fuel Trade-Offs
 - Distortions of Agricultural Markets (L/R/I)
 - Forestry vs Fuel LU
 - Other Economic/Environmental Trade Offs
- **Pro-Active Spatial/Regional Planning**
 - Economic Diversification
 - Max. of Spatial Comparative Advantages
- **Min. of Distortionary “Eco. Instruments”**
 - Subsidies; Quotas; “Systems Rigidities”

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Bioenergy: Multi-Objective Vision

- **Multi-Markets Objective**
 - Domestic National/Sub-national Mkts.
 - Regional Exports Mkts.
 - Global Exports Mkts.
- **Multi-Sector Applications**
 - Industry
 - Transport (conventional & “mobility Solutions”)
 - Households (Modern Energy Service Delivery)
 - Agriculture
 - Other..

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Bioenergy: Multi-Objective Vision (Cont.)

- **Multi-Purpose Programs/Projects**

- Agro/Forestry Residues - Cogeneration
- Sugar – Cogeneration - Ethanol
- Biodiesel/DVO – Oils – Eco-Rehabilitation
- Hydro-Food-Biofuels-Other (Ethiopia, Nile Basin Example)

- **Multi-Scale Programs/Projects**

- Micro – Village Level (PA Focus)
- Medium – Local / Sub-national Focus
- Macro – Sub-national / National Focus

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Bioenergy: “W-W” Investment/Trade Models

- **Maximize Resource Mobilization and Technology Transfer through B.O.O. & B.O.O.T. Arrangements:**

- % Domestic / % Export Output Allocation;
- Provide Capacity Development
- Guarantee “Efficient Management”
- Secure Export Market Share

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Role of Development Cooperation Agencies for the Development of Bioenergy for Poverty Alleviation

- **“Unbiases” Information Dissemination** in Africa (Government, Private Sector, etc.)
- **Capacity Building on “Due Diligence”**
- **Technical Assistance**
 - Scientifical applications (GIS, Stats, etc.)
 - Evaluation Methodologies (EcoA, EIA, SIA, etc)
- **Policy Development Support**
 - **ESSD Safeguards**
 - Private Sector “Enabling Environment”
- **Program/Project Investment Financing**
 - PS Investment Guarantee Instruments
 - Donor/Concessional financing/co-financing
 - CDM and other PA Grant Sources

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Biomass Energy

- ✓ **Poverty Reduction**
- ✓ **Energy Access**
- ✓ **Rural/Agricultural Development**
- ✓ **Environmental Sustainability**



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Thanks for your attention.

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The End.