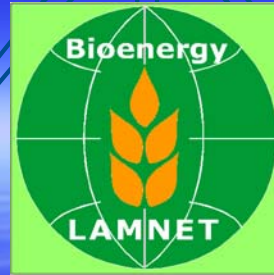


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LAMNET LIMITED WORKSHOP
CARACAS, VENEZUELA

LATIN AMERICA THEMATIC NETWORK ON BIOENERGY – LAMNET

VENEZUELA BIOMASS OPPORTUNITIES

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FUNDACION MOMENTO DE LA GENTE

22 October 2004



Venezuela Biomass Potential

- ❖ Biomass resources of Venezuela can not compete in price with fossil energy sources due to large subsidies received by government.
- ❖ Venezuela has 56,8 millions hectares of forests located in the Andes, Cordillera de la Costa, Guayana Shield, Lake Maracaibo Basin, Perija Mountains, Western Plains and the Amazons Region.
- ❖ The forest areas of the northern Orinoco are highly intervened, but undisturbed south of the Orinoco.





Venezuela Biomass Potential

- ❖ In Ticoporo and Caparo FR there are some 8,600 families which have caused an intervention of almost 80% of the natural species for the use of firewood.
- ❖ The industrial use of firewood in Venezuela is limited, except in steel and other metallurgical industries where is used to reduce iron ore.
- ❖ There are 600,000 Ha. of Caribbean pine planted by the public sector and 200,000 has by the private sector for pine forests and exotic plants like Theca, Melina and Eucalyptus planted in poor soils or barren land of Northern Orinoco





Venezuela Forest Areas 'ABRAES'

Category	Type	(ha)
Production	Forest Reserves	11,812,606
Forestral	Forest Reserves under Protection	3,387,889
Production	Special Areas for Farming	357,955
Agriculture [farming]	Rural Areas for Integral Development	1,082,314
	National Parks	13,559,578
Production Restricted	Natural Monuments	4,276,178
	Wild Life Refuges	53,474
	Biosphere Reserve	9,602,466
	Zones of Protection	12,859,531
	Hydro Reserves	1,740,783
	Wild Life Reserves	71,856
	Priority Critical Areas	3,599,146
	Protection Areas for Public Works	116,425
Protection Area	Reserve Zones for Dams and Reservoirs	7,043
	Protection Areas for Environmental Recovery	4,168
Under Strict Regulations	Deep Water Coastal Areas	26,336
	Historical Sites	1,209
	Tourism Areas	505,65
	National Security Zones	121,846
	Border Security Zones	294,315
	Total	63,480,774



Venezuela Forest Reserves

(Forest Reserve F.R)	Total Area in Decree (ha)	Area under Regulation and Forest Handling (ha)	Remaining Forest Area (*) (ha)
Imataca	3,640,899	1,497,561	1,320,000
El Caura	5,134,000	-	5,134,000
La Paragua	782,000	-	782,000
Guarapiche	370,000	27,240	-
Sipapo	1,215,500	-	1,215,500
Ticoporo	187,156	101,075	7,000
Caparo	181,143	180,511	26,000
San Camilo	97,100	-	12,000
Río Tocuyo	47,640	-	5,000
Turén	116,400	-	10.0

(*) Área que teóricamente conserva su característica de bosque natural





Venezuela Lotes Boscosos

	Total Area in Decree (ha)	Area under Regulation and Forest Handling (ha)	Remaining Forest Area (ha)
San Pedro	615,405	565,405	312,223
Caño Blanco	178,854	24,248	14,480
CVG El Frío	65,000	65,000	N.A.
Río Parguaza	65,700	-	65,700
Dorado Tumeremo	78,993	63,106	70,640
Fundo Paisolandia	8,101	-	8,101
Fundo Flamerich	19,196	7,000	N.A.
Hato Santa Marta	38,516	-	38,516
Altiplanicie del Nuria	171,720	171,720	143,100



Venezuela Firewood Consumption in the Forest Reserves*

Forest Reserve	Number of Families Thousands	Daily Consumption in Kg.	Annual Consumption in K MT
Tico poro	6.88	15	37.668
Caparo	3.5	15	19.162
Total Caparo & Tico poro	10.38		56.830
Other Reserves	5.0	15	27.375
Total			141.035

*Annual Consumption in Urban Areas is of 13 K MT and In Rural Areas is of 330 K MT





Venezuela Firewood Production [1995-2000]

Year	Firewood Kg.	Waste Kg.	Trimming Kg.	Total Kg.	Total MT	Total m3
1995	8,466,000	1,240,000	-	9,686,000	9,686	13,360
1996	2,917,602	-	4,512,950	7,430,552	7,430	10,249
1997	13,202,558	1,040,000	1,998,762	16,241,320	16,241	22,402
1998	10,111,465	1,308,125	10,466,366	21,885,956	21,886	30,188
1999	11,533,386	-	4,535,275	16,068,661	16,069	22,164
2000	12,146,535	1,322,193	14,557,968	28,026,514	28,027	38,657





Venezuela Firewood Consumption [m3]

YEAR	1996	1997	1998	1999	2000	2001
PRODUCTION	10,249	22,402	30,188	22,164	38,657	779,979
IMPORTS	--	--	--	--	--	--
EXPORTS	--	--	0.28	--	--	--
CONSUMPTION	10,249	22,402	30,188	22,164	38,657	779,979
Residencial		--	--	--	--	17,931
Urban						
Commercial		--	--	--	--	569,248
Rural						
Commercial	--	--	--	--	--	12,000
Industrial	--	--	--	--	--	180,080





Black Liquor from Paper Manufacture (K MT)

YEAR	1995	1996	1997	1998
PRODUCTION	135.78	175.2	186.15	186.15
IMPORT	--	--	--	--
EXPORT	--	--	--	--
CONSUMPTION	135.78	175.2	186.15	186.15
<i>Urban</i>	--	--	--	--
Comercial <i>Rural</i>	--	--	--	--
Comercial	--	--	--	--
Industrial	135.78	175.2	186.15	186.15
Electricity -Heating	--	--	--	--



Venezuela Energy Matrix



Proven Crude Oil Reserves in Million of Barrels

	2000	2001	2002
Proven Reserves	77,685	77,783	77,306
Annual Production	1,151	1,115	1,032
Reserves to Production Ratio (years)	67.5	69.8	74.9



Proven Natural Gas Reserves in Million of Cubic Meters

	2000	2001	2002
Proven Reserves	4,176,148	4,199,721	4,180,855
Annual Production	41,471	41,618	37,460
Reserves to Production Ratio (years)	100.7	100.9	111.6



Proven Coal Reserves in Million MT

	2000	2001	2002
Proven Reserves	1,342		
Annual Production	7.84		
Reserves to Production Ratio (years)	171.2		



Venezuela Energy Matrix [Prices]

NATURAL GAS (US\$/M3)	2000	2001	2002
Domestic Use	0.12		0.083
Industrial Use	0.027		0.025
Electricity Generation	0.037		0.028



GASOLINE (US\$/Lt)	2000	2001	2002	2003	2004
Regular of 87 Motor Octane	0.09	0.083	0.06	0.037	0.033
Leaded Gasoline 95 Motor Octane	0.11	0.104	0.076	0.046	0.04
Unleaded Gasoline 95 Motor Octane	0.14	0.134	0.097	0.06	0.049







Venezuela Energy Matrix [Prices]

ELECTRICITY (US\$/Kwh)	2000	2001	2002
Residential Electricity	0.06	0.07	0.06
Commercial Electricity	0.08	0.08	0.09
Industrial Electricity	0.06	0.05	0.05

FINAL CONSUMPTION BY SECTORS			
Million of Oil Equivalent [MMBOE]	2000	2001	2002
Industry	122	126	126
Transport	85	91	91
Residential	24	25	27
Services and Others	18	18	18
TOTAL	249	260	262





Potential of Biomass in Venezuela

BEPD

Firewood:

23 % from natural forests or 2 TM / Ha /yr

130,000

Cultivation: Vegetable Coal:

5 % of national area or 7 TM / Ha /yr

50,000

Agro-animal residues:

22 MM TM / yr

60,000

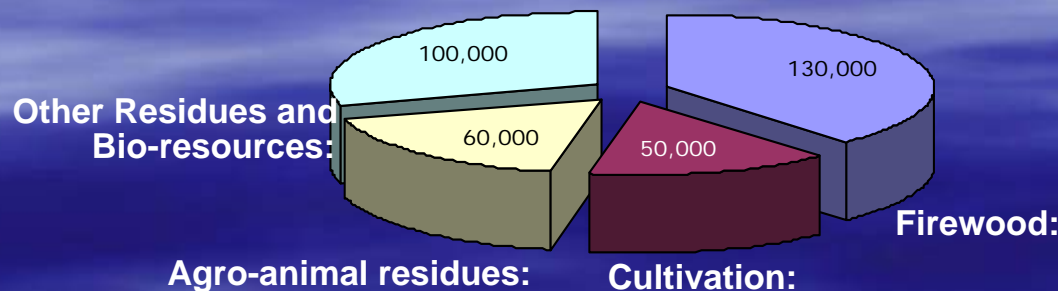
Other Residues and Bio-resources:

34 MM de TM / yr

100,000

TOTAL

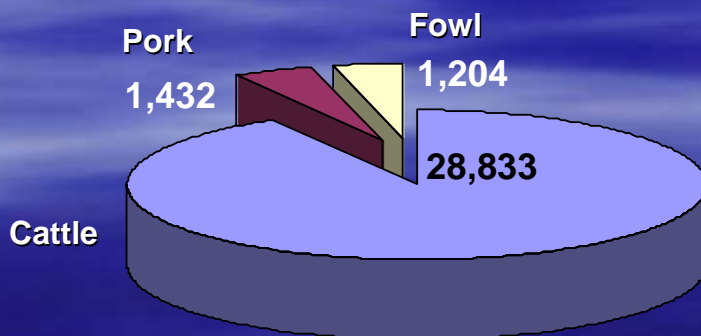
340,000





Animal Residues Per Year as of 2000

Animal Waste from:	Heads in10 ³	MT/head/yr	MT/yr	BEPD
Cattle	15,973	0.55	8,785	28,833
Pork	4,958	0.088	436	1,432
Fowl	33,337	0.011	367	1,204
Total				31,468





Vegetable Residues Year 2000

Vegetable Residues secos	Production. MT	Residues. MT	BEPD
Arroz	676,775	1,373,853	6,270
Otros Rubros	1,143,700	3,872,618	14,854
Maíz	1,689,551	3,379,102	12,961
Sorgo	581,526	157,012	602
Palma aceitera	372,658	111,798	429
Coco	111,076	59,982	230
Café	78,440	164,724	632
TOTAL	Vegetable Residues secos		20,123
Vegetable Residues húmedos	Production. MT	Residues. MT	BEPD
Rubros	3,411,842	1,251,778	
Cambur	788,332	236,500	378
Plátano	847,579	254,274	407
Papa	341,662	102,499	164
Piña	847,579	254,274	407
Cacao	16,126	4,838	8
Yuca	570,564	399,395	639
TOTAL	Vegetable Residues húmedos		2,003
Producción de Caña de Azúcar MT	8,831,523		BEPD
Bagazo de C. Azúcar MT		2,119,566	8,420
Vinaza de Caña MT		2,649,457	794
TOTAL	Bagazo y Vinaza de Caña		9,214
TOTAL	Vegetable Residues		31,340





Firewood. Vegetable Coal. Wood residues and Pulp of paper and paper residues. Year 2000

	MTM	BEPD
Firewood	28.0	175
Vegetable Coal	209.2	2,914
Artisan	9.2	128
Industrial	200.0	2,786
Wood residues	1,746.0	1,267
Madera in logs	1,482.0	934
Sawed Wood	265.0	334
Pulp of paper and paper residues	676.0	236
Pulp	128.0	75
Paper	548.0	161
TOTAL		4,592



Urban Solid Waste. Year 2000



Estimated Country Population: 25 million people	Net useful residue	BEPD
Solid Waste Gross Production per capita: 0.8 Kg/person/day		
Solid waste net biomass conversion for energy: 15	2.865 MTM / day or 1,045 MTM / yr	1,399



Potential of Biomass in Venezuela Year 2000 (BEPD)

Animal residues	31,468
Vegetable residues	31,340
Firewood. Vegetable Coal. Wood residues and Pulp of paper and paper residues	4,592
Urban Solid Waste	1,399
TOTAL	68,800

Firewood, vegetable
Coal, Wood residues
and Pulp

4,592

1,319

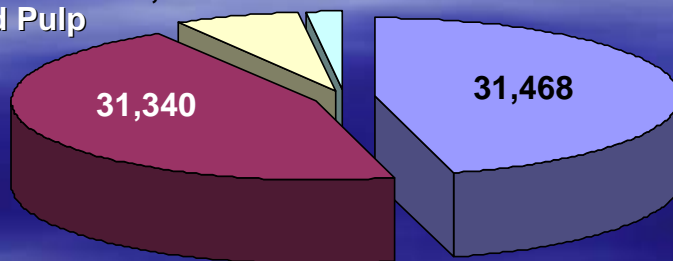
Urban Solid Waste

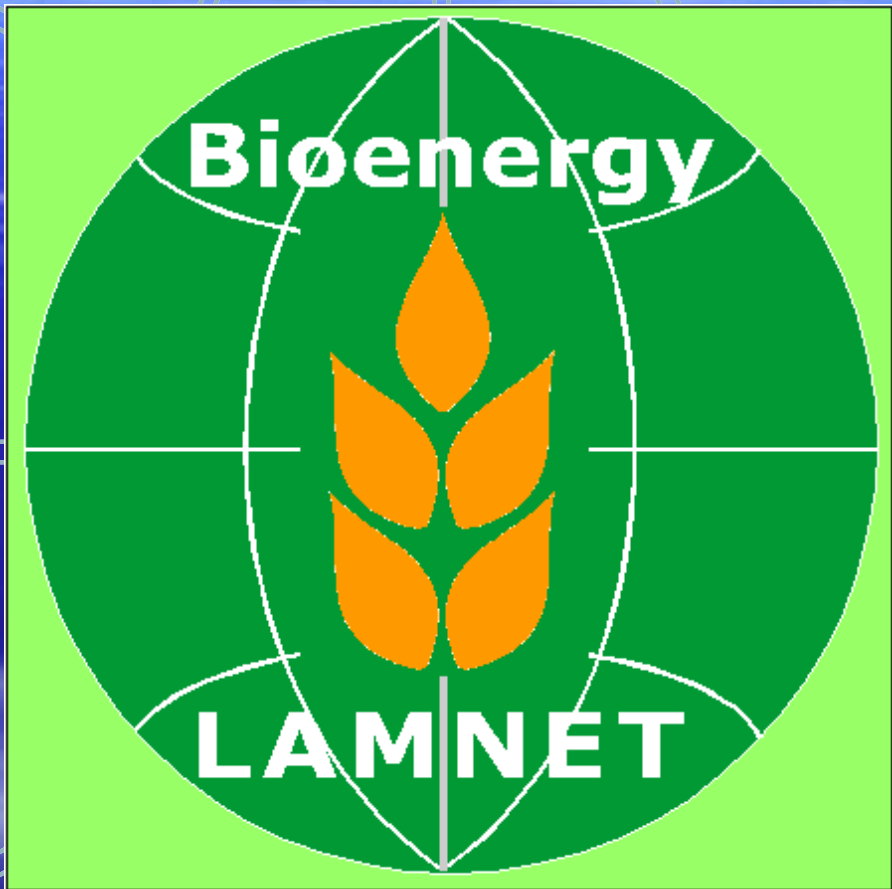
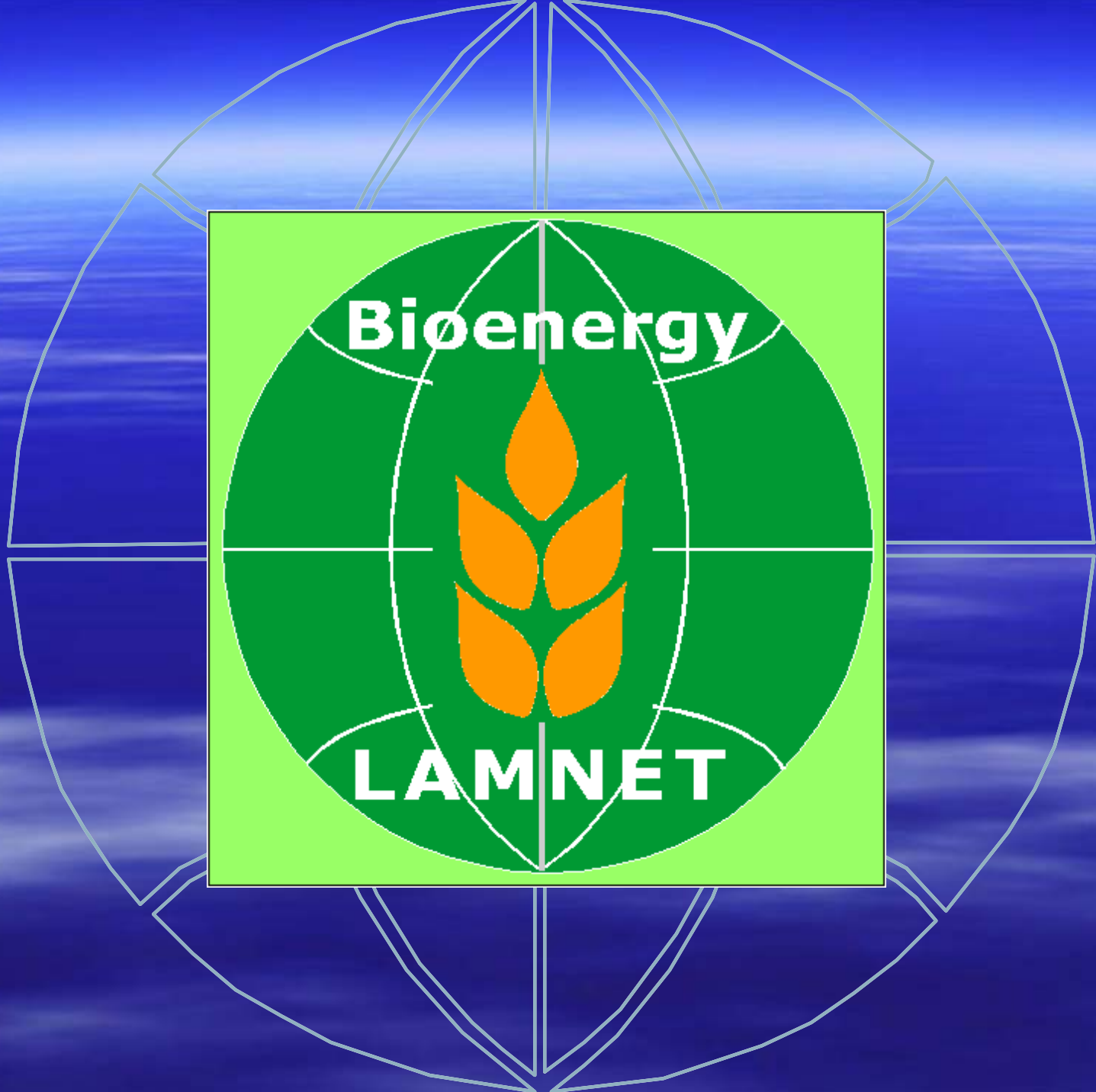
31,340

31,468

Animal

Vegetable





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