



Asia Pacific Regional Workshop on Biomass Energy Resource Assessment

6 – 8 July 2015, Bangkok, Thailand



BIOMASS RESOURCE ASSESSMENT in PAKISTAN

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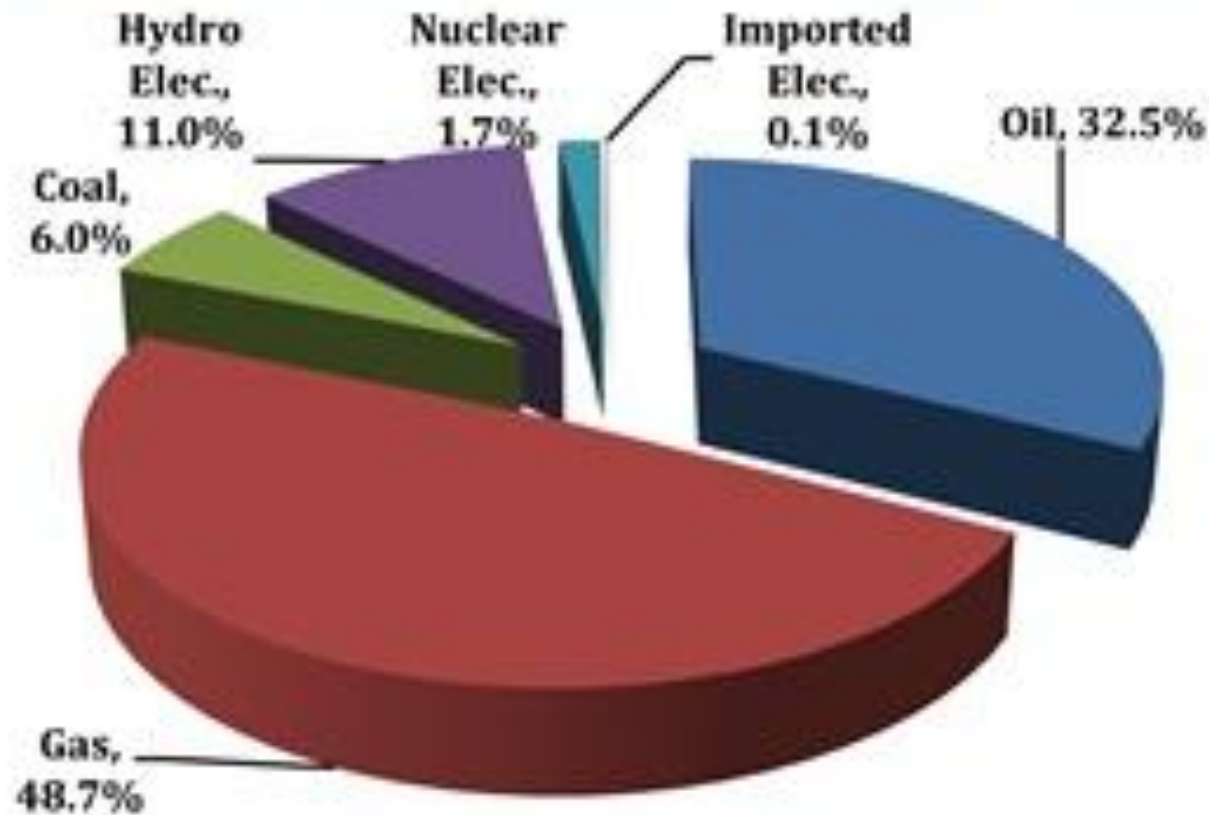
Center For Advanced Studies in Energy (CASEN)

To create an ecosystem for addressing energy requirements by identifying energy incentives and priorities guiding Policy Makers, developing Technologies and Human Resource and mobilizing Communities for energy conservation

The center incorporates existing institutes to this core mission

Existing scenario related to biomass renewable energy resource assessments at the national level

Exhibit 1.2 - Primary Energy Mix (FY 2013)



Data Source: HDIP Pakistan Energy Yearbook 2013

Existing scenario related to biomass renewable energy resource assessments at the national level

- Pakistan is Agricultural Country - Ample availability of biomass in Pakistan. .
- At the moment Farmers are unaware of new biomass to energy technologies, and biomass is being wasted in Pakistan
- People are using biomass/crop residue inefficiently for direct burning
- There is no definite/programmed estimation of biomass/crop residue yet completed in Pakistan but in progress.
- Energy departments and energy boards are engaged to introduce biomass to energy at provincial and national level
- Educational and Research Institutes have taken initiatives on biomass to energy including biomass assessment equipped with satellite imaging.

<http://www.thenews.com.pk/Todays-News-3-285436-Sugar-mills-apply-for-licences-to-generate-power>

<http://www.aedb.org/index.php/ae-technologies/biomass-waste-to-energy/current-status>

National initiatives for biomass renewable energy resource assessments

- Alternative Energy Development Board (AEDB) Pakistan is actively involved in promotion of Biomass/Bagasse to Energy. LOI has been issued to number of National and International Companies for biomass/bagasse to power generation
- Sugar Industries are producing electricity using bagasse and ethanol using molasses. In 2012, molasses production rose to 2.224 million tonnes in Pakistan. A number of Projects are in pipeline to utilize biomass/bagasse for energy.
- NEPRA has already approved Rs.10.50/unit as the upfront tariff for bagasse-based power generation to encourage sugar mills to produce around 1,500MW on fast-track basis.
- Pakistan has 545000 Tube wells on diesel and 84000 on electricity, Univ. of Agriculture-Punjab has started a project to run tube wells on Biogas from animal manure partially.

Alternative Energy Development Board (AEDB)

- **Implement** policies, programs and projects through private sector in the field of Alternative Energy
- Assist and **facilitate** development and generation of Alternative Energy to achieve sustainable economic growth
- **Encourage** transfer of technology and develop indigenous manufacturing base for AE Technology
- **Promote** provision of energy services that are based on Alternative energy resources
- **Undertake** RE projects on commercial scale (AEDB Act 2010)

ARE Policy 2006

Development of
Renewable Energy
for Power
Generation 2006

Presents Phased
program for the
development and
implementation of
Alternative and
Renewable Energy
(ARE) based projects
in the country

ARE Policy 2011

Based on relevant
international and
domestic

Comprehensive
framework
encompassing wider
scope for utilization of
all ARE sources and
encouraging utilization
of ARE technology
(ARET)

Incentives

Partial Resource Risk
Coverage

- Tariff on the Basis of a
Premium Rate of Return
for ARE Projects

- Mandatory Grid
Connection

- Mandatory Purchase
Requirements

Mandatory Use (biofuels)

- Credit Market Facility

- 100% Carbon Credits to
IPP

Following companies have been issued Letters of Intent (LoI) by AEDB in the present regime under ECC approved Policy Framework 2013 (Bagasse/Biomass)

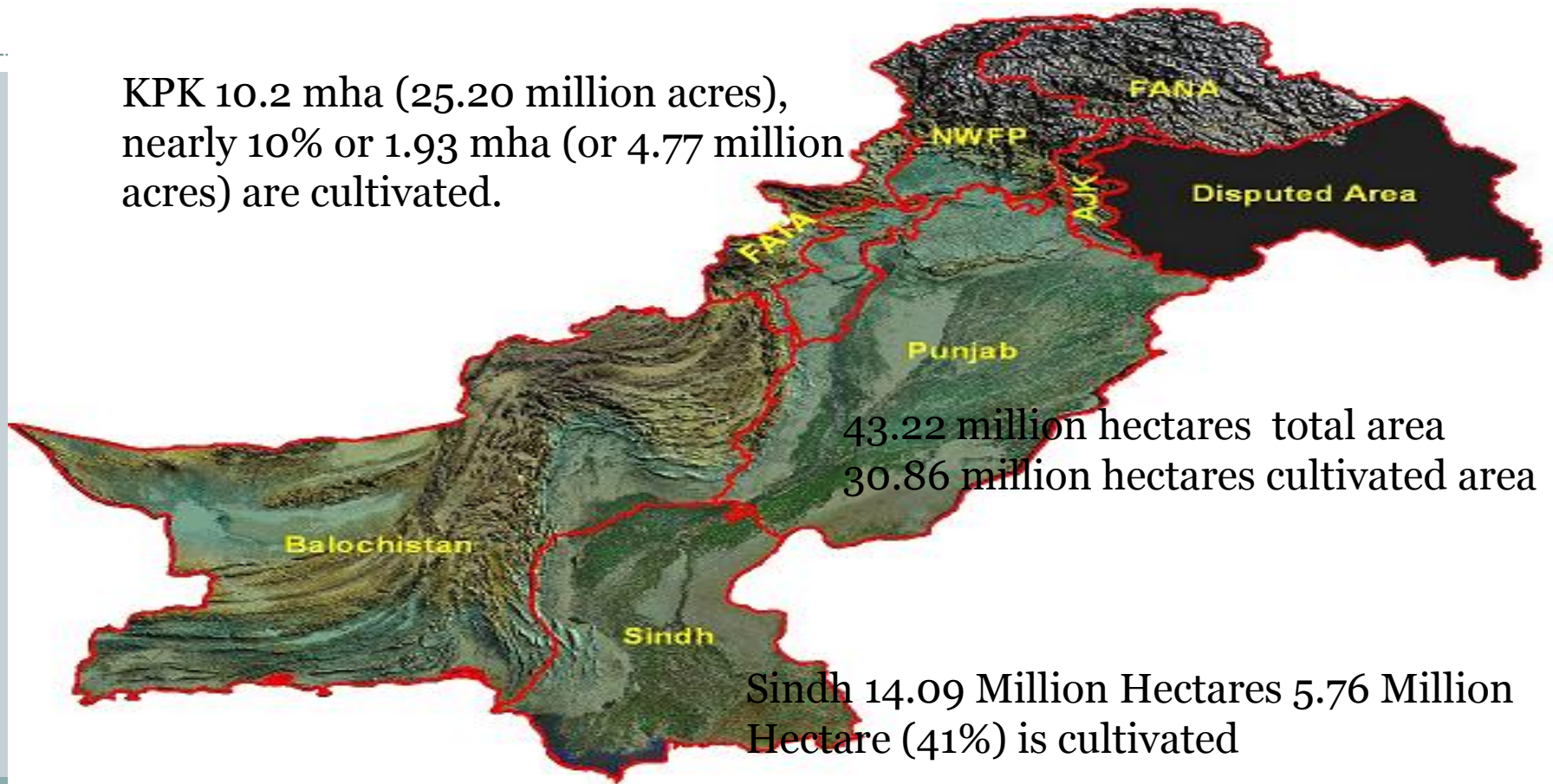
S.No	Project Company	Capacity (MW)	Current Status
1	JDW Sugar Mills Ltd (Unit-II) at Rahim Yar Khan	26.35 MW	In operation
2	JDW Sugar Mills Ltd (Unit-III) at Ghotiki	26.35 MW	In operation
3	M/s Chiniot Power Ltd at Chiniot, Punjab	62.40 MW	EPA & IA signed Financial close achieved COD to be achieved by CPPA
4	M/s RYK Mills Limited (RYKML) at Rahim Yar Khan, Punjab	30MW	LoS issued. EPA, IA and GoP Guarantee have been signed. Financial Closing declaration is at review stage.
5	M/s Hamza Sugar Mill Limited at Khanpur, District Rahim Yar Khan, Punjab	15 MW	Achieved Lol milestones. LoS issued.
6	M/s Alliance Sugar Mills Ltd at Rasheedabad, Ubauro, District Ghotki, Sindh	19 MW	Lol issued.

7	M/s Layyah Sugar Mills Ltd at Karoor Road, District Layyah, Punjab	41 MW	Lol issued.
8	M/s Safina Sugar Mills Ltd at 03-KM Chiniot 10– Sargodha Road, Lalian, District Chiniot, Punjab	20 MW	Lol issued.
9	M/s Almoiz Industries Ltd at Adda Hameed Kot, District Mianwali, Punjab	36 MW	Lol issued.
10	M/s Etihad Power Generation Limited at, Mouza Karamabad, District Rahim Yar Khan, Punjab	67 MW	Lol issued.
11	M/s Shahtaj Sugar Mills Ltd at, Mandi Bahauddin, Punjab	15 MW	Lol issued.
12	M/s Chanar Energy Limited, District Faisalabad	22MW	Lol Issued.

<http://www.aedb.org/index.php/ae-technologies/biomass-waste-to-energy/current-status>

Biomass Mapping Study of Punjab Pakistan
funded by IFC World Bank
July 2013-June 2014
Principal Investigator
Dr. Ehsan Ali

KPK 10.2 mha (25.20 million acres),
nearly 10% or 1.93 mha (or 4.77 million
acres) are cultivated.

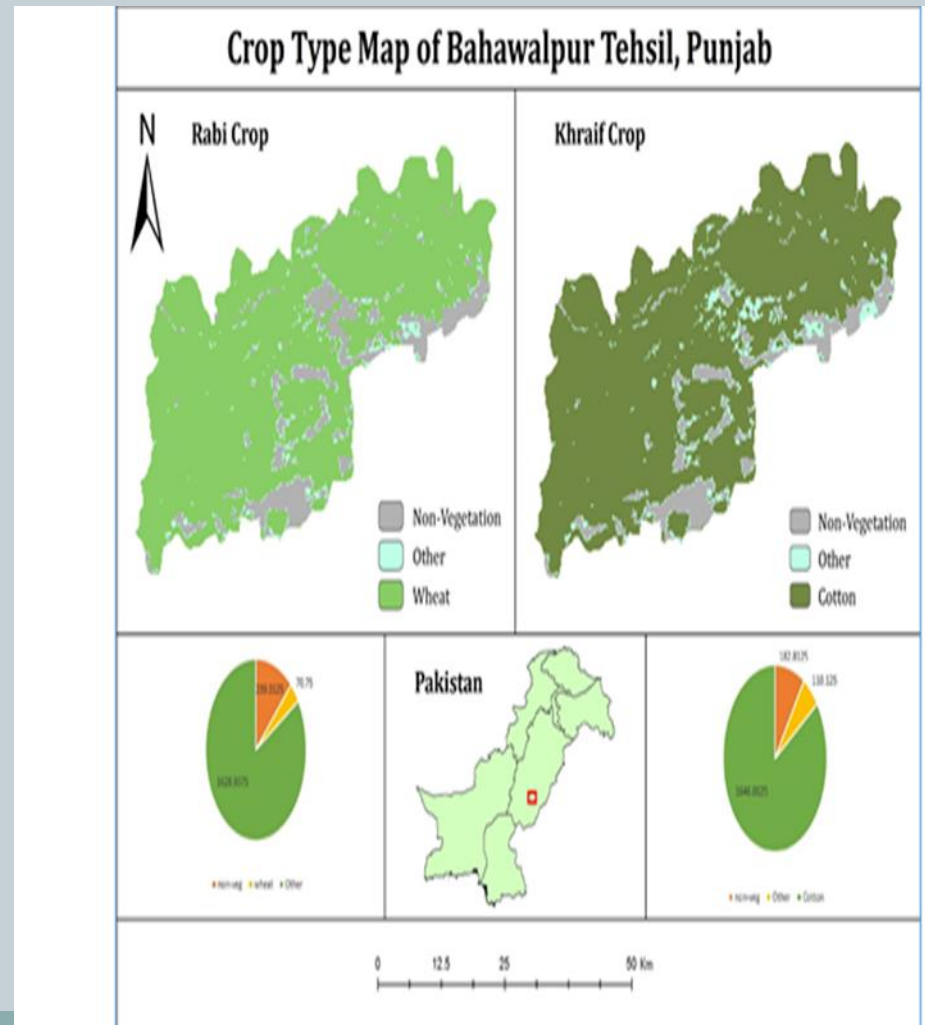


43.22 million hectares total area
30.86 million hectares cultivated area

Sindh 14.09 Million Hectares 5.76 Million
Hectare (41%) is cultivated

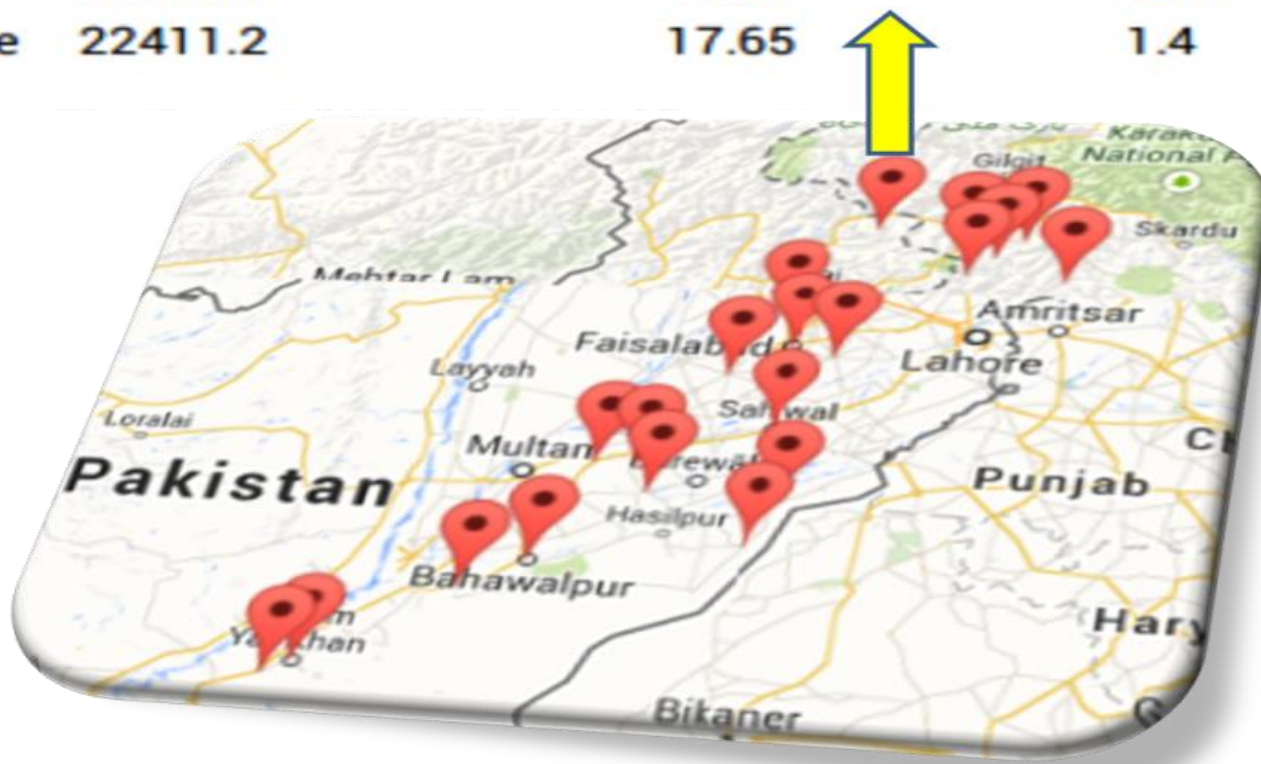
Result

- The result would be in the form of:
 - 1) Atlas of Punjab that will show Different type of Available residue
 - 2) Graphical Data showing current crop residue usage in the Areas.



MANDI BAHUDDIN

Crop Type	Amount of Residue(Tonnes)	Energy Value (MJ/Kg)	Power Generation Capacity(MW)
Wheat	125276.6	17.51	4.7
Cotton	7198.2	18.26	0.5=500KW
Rice	21276.8	16.28	12.2
Maize	22411.2	17.65	1.4



Biomass Resource Mapping-Pakistan

**Funded by ESMAP-World Bank through
Full Advantage Co. Thailand**

To design Biomass Atlas of Pakistan

April 2015-Aug 2015

Principal Investigator

Dr. Ehsan Ali

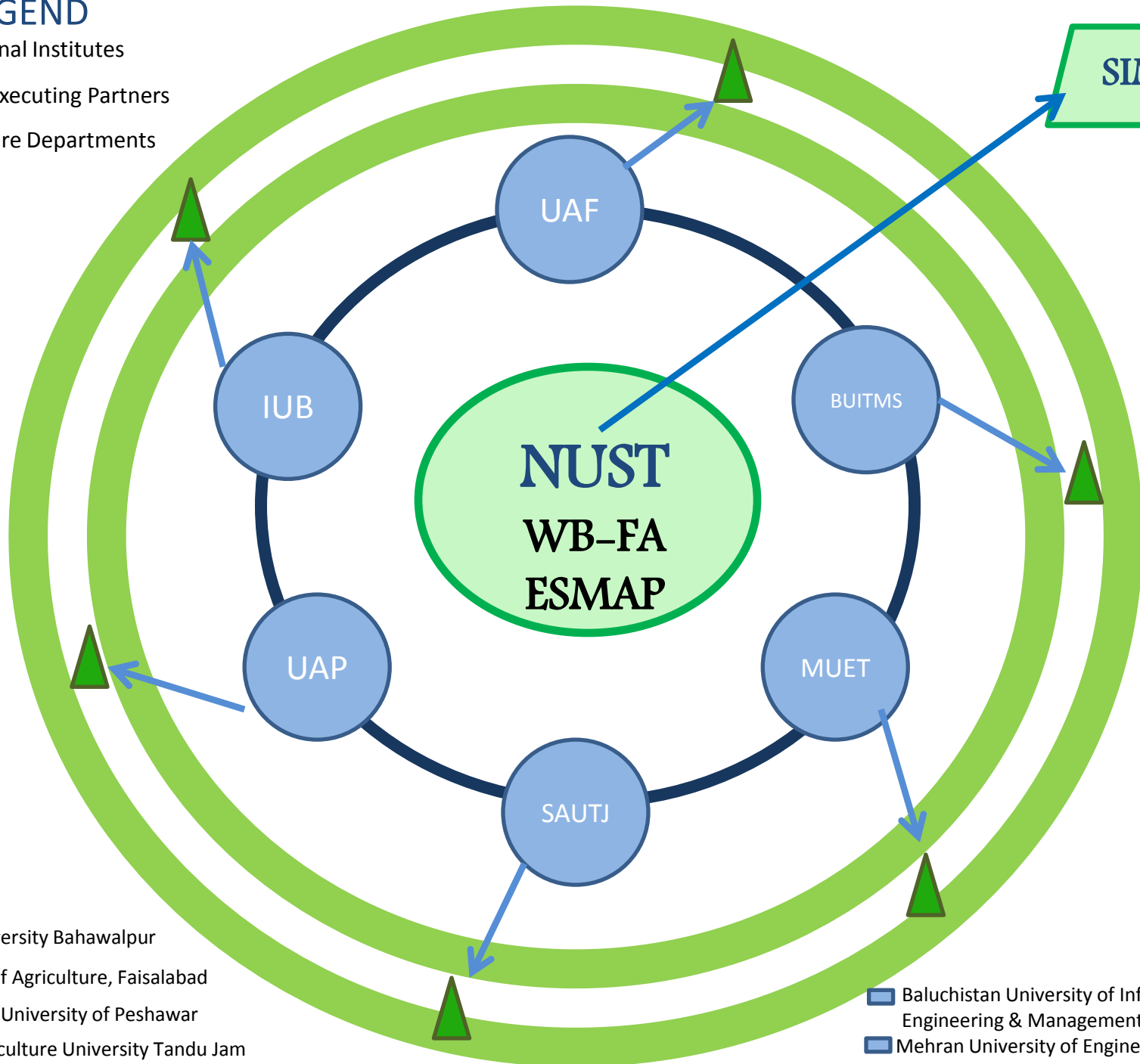
National University of Sciences and Technology

Islamabad Pakistan

We have completed 60% of the work

LEGEND

- Educational Institutes
- Project Executing Partners
- Agriculture Departments



SIMOSOL

- Islamia University Bahawalpur
- University of Agriculture, Faisalabad
- Agriculture University of Peshawar
- Sindh Agriculture University Tandu Jam

- Baluchistan University of Information Technology Engineering & Management Sciences
- Mehran University of Engineering & Technology

Biomass Resource Potential, Punjab

ITEMS		Focused Crops					
		S/Cane	Wheat	Rice	Cotton	Maize	TOTAL
Production	Million Tons	44.783	18.626	3.476	4.487	3.354	-
Residue		9.514	18.541	4.513	18.675	7.186	58.429
Local Consumption		3.526	12.273	2.880	8.723	3.169	30.571
Surplus Biomass		5.988	6.268	1.633	9.952	4.017	27.858

Pakistan's Total Biomass Production: 69 Million tons/year

Ali, M.A. 2013. Biomass Survey Report. Crop Biomass Cell Government of Punjab, Agriculture Department, Lahore, Pakistan

PROJECT Consortium Includes

- ESMAP WORLD BANK
- FULL ADVANTAGE COMPANY THAILAND
- SIMOSOL FINLAND
- PITCO PAKISTAN
- NUST PAKISTAN



“Capacity Building and Strengthening of Biomass Gasification Technology Support Systems”

Funded by GEF/UNIDO

July 2014-June 2016

Dr. Ehsan Ali (Principal Investigator)

NUST Islamabad

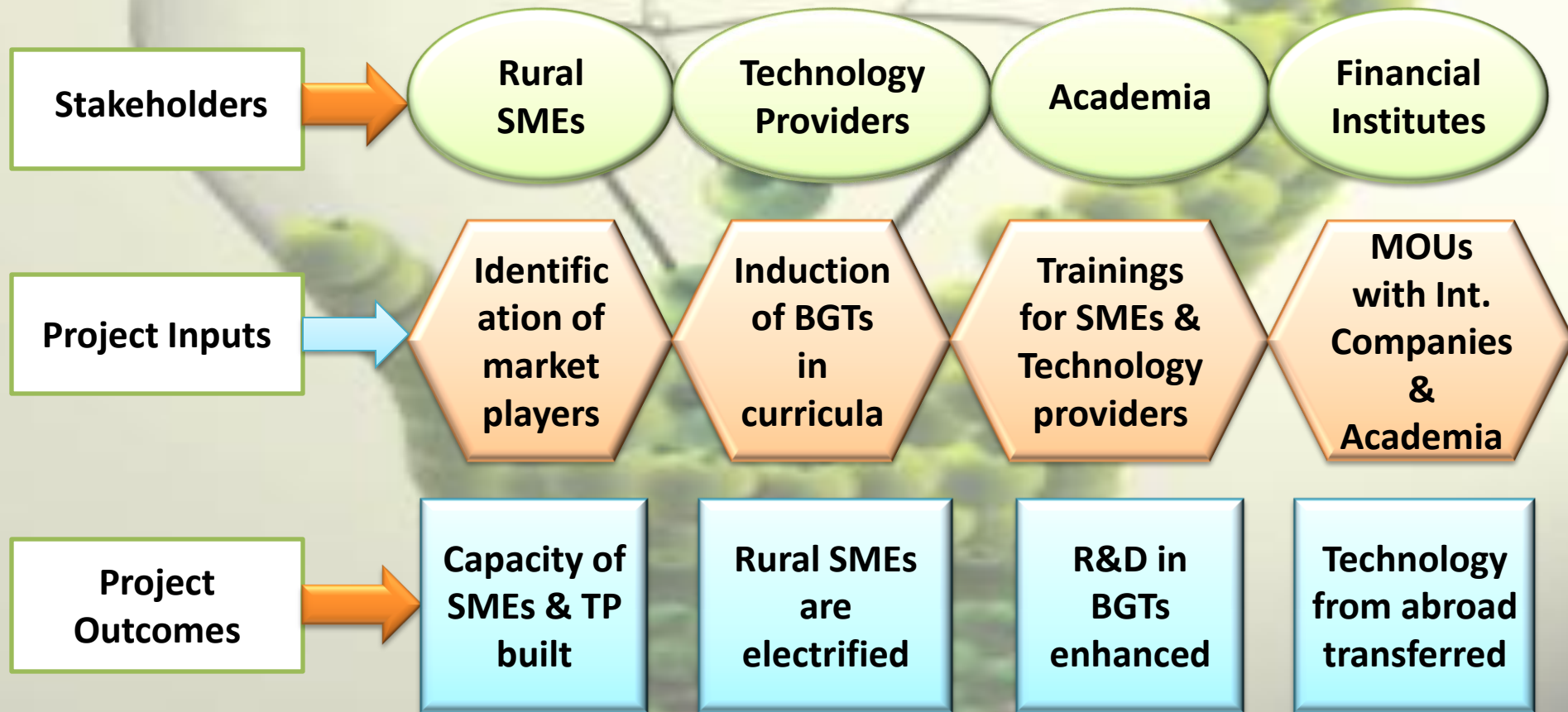




UNIDO-NUST Project
July 2014-June 2016

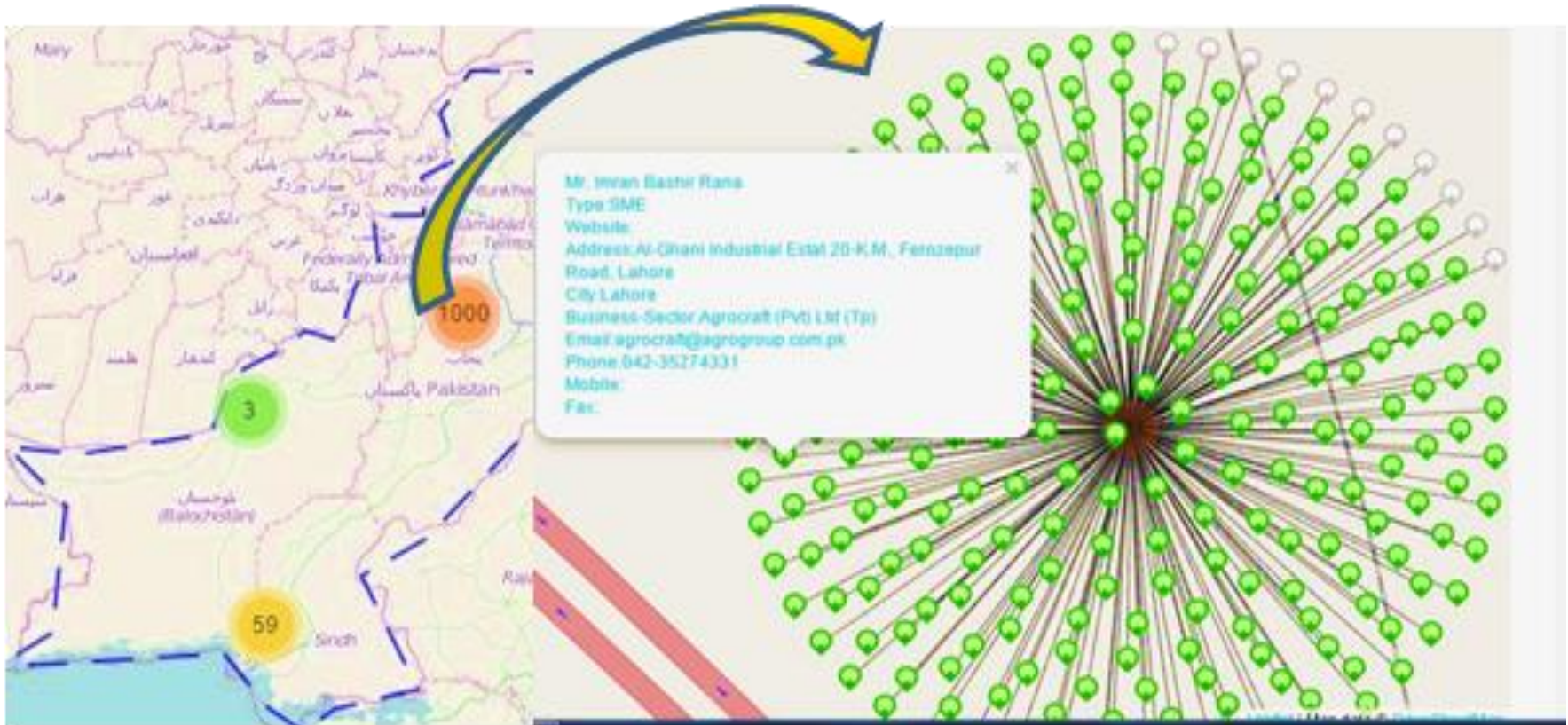


Capacity Building and Strengthening of Biomass Gasification Technology Support Systems
Our Vision: "To strengthen the rural SMEs in Pakistan through the use of biomass"



Funded by: GEF/UNIDO
Executed by: CAS-EN NUST

<http://biomass-unido-nust.com.pk/>



Atlas of SMEs, Educational /Technical Institutes, Financial Institutes, and Technology Providers in Pakistan.

CURRENT STATUS

Assessment of energy needs of SMEs completed

Training of Engineers from SMEs and Technology Providers is in progress

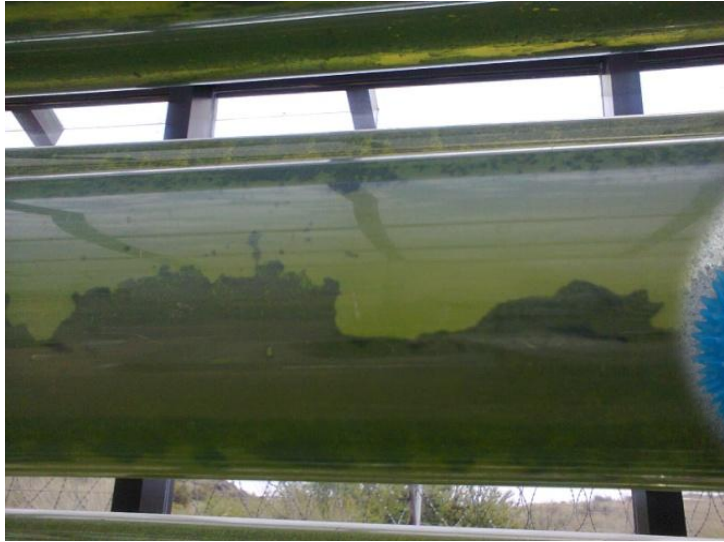
Curriculum on Biomass to Energy/Gasification will be introduced in Universities and Vocational Institutes.

Collaboration between Industries and Universities from advance countries will be established with Pakistani Universities and Industries.

Current Status

UNIDO has already completed feasibility study and design of following power plants:

- 1) *3 MW rice husk based gasification plant in Komonke*
- 2) *1MW wood residue biomass gasification plant in Jhelum.*
- 3) *6 mw biomass gasification plant in textile industry Sheikhupura road.*
- 4) *1 MW rice husk gasification plant in Bahawal Nagar*
- 5) *Rural electrification of 500 household in southern Punjab using biomass.*



Removing of Biofouling from Photobioreactors Using spike balls

Algae cultivation for biofuel and saline land reclamation

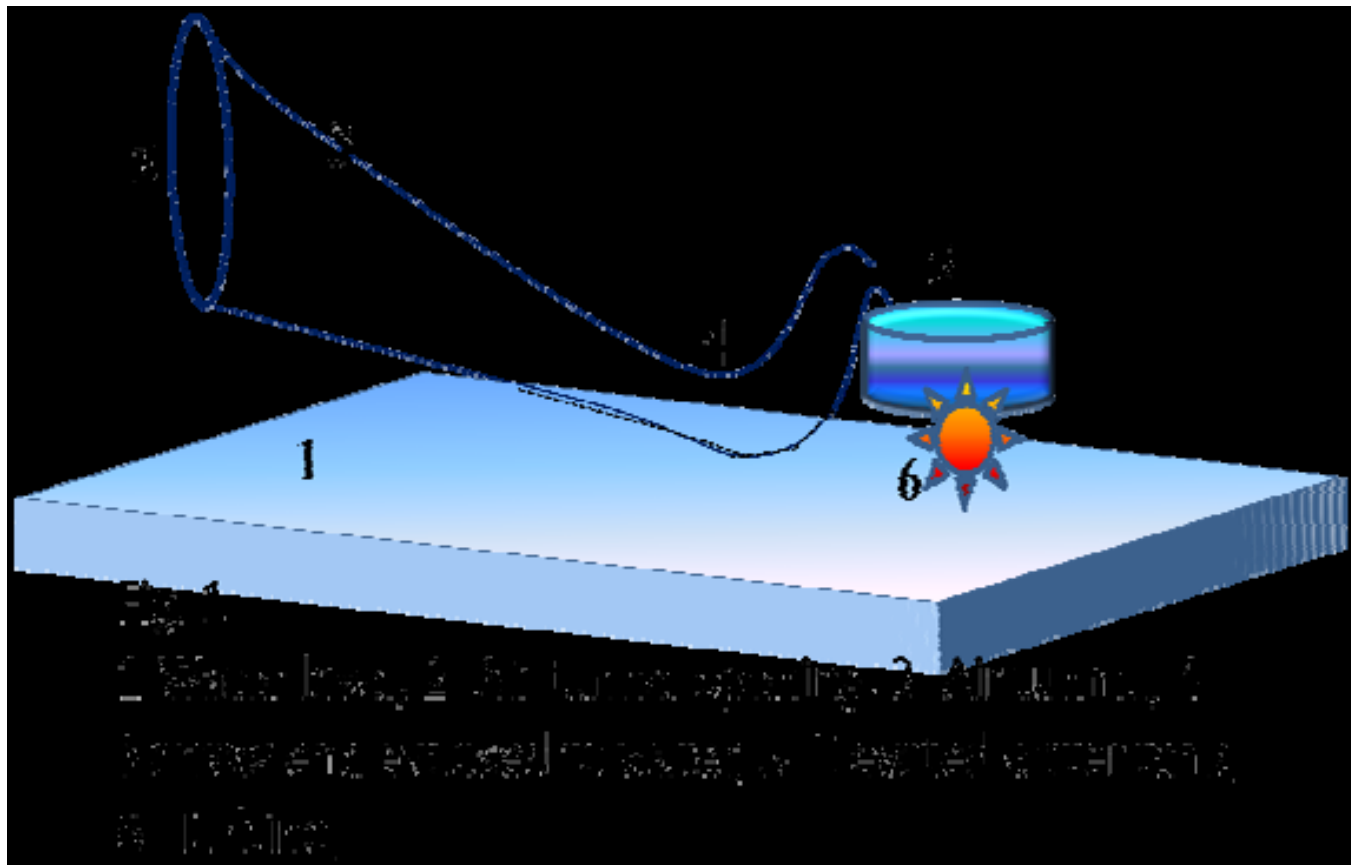


Wind–water hybrid system for power generation using still waters

Ehsan Ali,

Renewable and Sustainable Energy Reviews
Volume 44, April 2015, Pages 611–613

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New test proposed to determine origin of biodiesel feedstock

By Ehsan Ali | February 27,

Biodiesel Magazine

<http://biodieselmagazine.com/articles/320941/new-test-proposed-to-determine-origin-of-biodiesel-feedstock>

First International Conference and Expo on Biomass
Gasification Technologies
Sep 21-22, 2015 Islamabad NUST

In collaboration with
Global environmental Facility (GEF) and
United Nation's Industrial Development Organization (UNIDO)

**Promotion of
Environment friendly biomass to energy technologies.
Matchmaking between Universities and Technology Providers
for replication of this technology at Industrial level**

www.bgtconference.com

JOIN and HELP

to promote environment friendly biomass to energy

THANKS

Biomass Resource Potential, Punjab

ITEMS		Crops					
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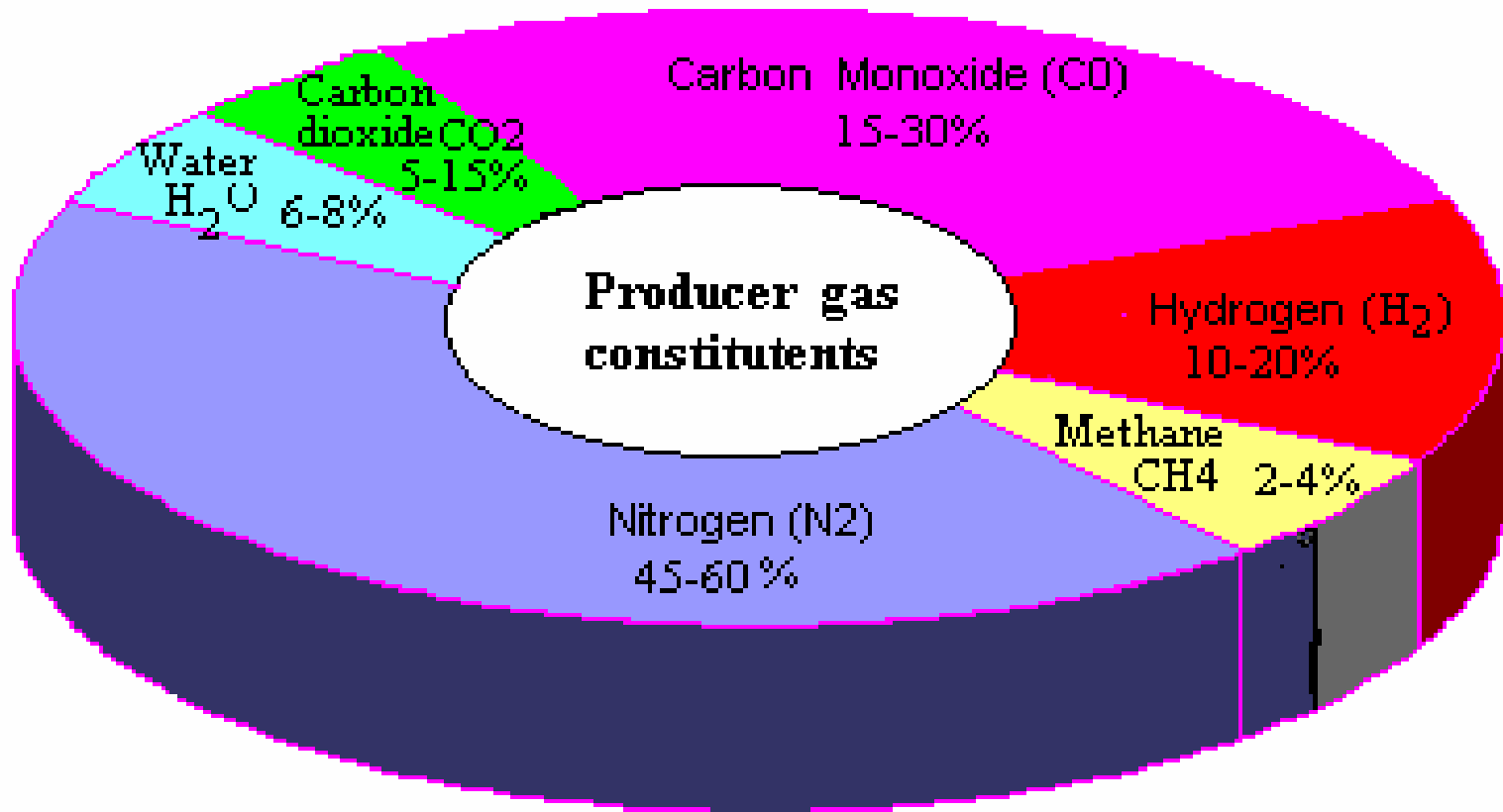
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Ali, M.A. 2013. Biomass Survey Report. Crop Biomass Cell Government of Punjab, Agriculture Department, Lahore, Pakistan

Energy content of biomass fuels

Biomass Fuel	Energy content (Kcal/kg)
Paddy straw	3469
Wheat straw	4100
Cotton Stalks	4252
Soya bean husk	4170
Wood chips	4785
Bagasse	7213
Sunflower stalk	4300
Rice husk	3881
Lignite (Brown coal)	500 - 2500
Carbons (Coal)	6440 - 8350
Oil	9500 - 10700
Natural Gas/Producer gas (Rice husk)	~ 12450/3410

Constituents of Producer Gas



Calorific Value Comparison

Fuel	Calorific Value (Kcal/kg)
Natural gas	10270
Furnace Oil	10180
Bituminous Coal	5550
Producer Gas (Gasification of Biomass)	1100
Diesel	10700
LPG	11010

Fuel Cost Saving in Power Generation

cost 0.04\$ to produce per Kwh of energy from Biomass

- A Liter of Diesel gives 3.5 unit of electricity
- To generate electricity in a producer gas system we need 2 kg of Rice husk
- Fuel Cost for per unit Electricity produce on Diesel Mode would be 20pkr
- Fuel Cost for per unit Electricity produce by rise husk would be 5.4pkr

Crops	Production in Punjab (000 Tonnes)	Total production by Pakistan(000 Tonnes)	Production by Punjab (%)
Rice	3277.0	4823.3	67.94
Wheat	19021.0	25213.8	75.44
Cotton	1335.88	1966.26	67.94
Sugarcane	37481.0	55308.5	67.76
Corn/Maize	2959.2	3707.0	79.82