

## **The Energy & Poverty Thematic Group (EPTG) of the World Bank Group**

**BBL: “ Maximizing the MDG Impacts of Rural Energy Projects: experiences in the micro-hydropower and biogas sectors in Nepal and Pakistan”**

**Date : Wednesday, March 12, 2008**

**Time : 12:30 pm - 2:00 pm**

**Venue : MC2- 800**

### ***Speaker***

#### **Bikash Pandey**

Director of Winrock's South Asia Clean Energy Program, Pakistan

**Brief Bio of the Speaker** **Bikash Pandey's** work experience encompasses twenty (20) years in policy review, design, and implementation of a range of clean/renewable energy projects in Asia, Africa and Latin America. A technical specialist in micro- and mini-hydropower systems, he has designed and implemented numerous community-based electrification, small-scale mini-grids, and home biogas energy systems. Mr. Pandey is one of the pioneers of the micro-hydropower sector in Nepal and recently carried out an MDG impact analysis of the REDP/UNDP program. He is currently developing the Project Design Document for the World Bank Community Development Carbon Fund for mini-hydropower projects in Northern Pakistan. Mr. Pandey has established and assessed the feasibility of household biogas plants in several countries, including East Africa, Pakistan and Nepal. Mr. Pandey is currently based in Pakistan and serves as the Director of Winrock's South Asia Clean Energy Program. He holds an M.S. in Energy and Environment, with emphases in renewable energy, sustainable development, resource economics, and climate change from the University of California at Berkeley and was trained as an Electrical Engineer at MIT.

# Maximizing the MDG Impacts of Rural Energy Projects:

(experiences in the micro-hydropower and biogas sectors in  
Nepal and Pakistan)

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# MDG Evaluation of REDP

- ❖ Assessment of contribution of Rural Energy Development Programme (REDP) activities in achieving MDGs
  - ❖ To compare changes before and after REDP intervention.
  - ❖ To analyze the overall contribution of the program activities to MDGs.

# Overview of REDP

- REDP is a joint program of Government of Nepal (GON) & The United Nations Development Programme (UNDP), started in 1996.
- Currently working in 25 hilly districts of the country (out of 75)
- Main objectives of the program:
  - enhance livelihood of rural people by promoting rural energy systems (RES), especially using Micro Hydro as an entry point,
  - preserve environment.

# REDP Basic Principles

## 1. Organization Development

- **Formation of community organizations (COs)**
  - Male CO
  - Female CO
  - Representation of male and female from each HH
- **Formation of Microhydro and other Functional Groups**
  - Representation from user COs
  - For Specific Purpose (Micro hydro, forest, peltic set, biogas etc.)

## 2. Capital Mobilization

- **Saving & Investment**
  - Weekly meeting of COs
  - Collection of money from each CO member as savings
  - Invest the collected money to the CO members as loans

# Basic Principles

## **3. Skill Enhancement**

- Provide different trainings
  - Technical Training
  - IG Training
  - Leadership Training

## **5. Environment Conservation**

- Preservation of Natural resources
  - Plantations, sanitation & health education
  - Promotion of improved cooking stoves

## **4. Technology Promotion**

Promotion of different rural technologies

- Pico and Micro Hydro
- Biomass/Biogas
- Solar PV

## **6. Vulnerable Community's Empowerment**

- encourage women for equal participation
- Provide different training
- Gender sensitive energy planning

# REDP Initiatives and MDGs

- REDP (started in 1996) came before the MDGs (in 2000).
- REDP has adopted a Holistic Approach
- The REDP's six basic principles have linkages to more than one MDG.
- Establishment of linkage to MDGs is challenging
  - Direct/indirect link
  - Strong/weak link
  - Screening for impacts of other development programs.

# IMPACT OF REDP INITIATIVES on MDGs

Major areas of REDP contribution	Corresponding MDGs
1.HH Income	MDG1
2.Education	MDG2/3/7
3.Health & Sanitation (incl. awareness)	MDG4/5/6
4.Gender	MDG2/3/5
5.Energy & Environment	MDG 7

# Data Collection Tools

## ❖ STRUCTURED QUESTIONNAIRE

- ❖ Building on the Baseline survey questionnaire:

## ❖ CHECKLISTS

- ❖ Schools
- ❖ Health Posts
- ❖ Enterprises

## ❖ FOCUS GROUP (FG) DISCUSSIONS

- ❖ Districts Level (3 FGs, one in each region)
- ❖ Community Based (6 FGs, two in each region)
- ❖ VDC and DDC leaders were also consulted.

# Findings

# Education

- People of age group between 6 to 14 years without primary level education dropped from 25% to 7%.
- Average Boys/Girls ratio of school enrolment changed from 1.20 to 1.13.
- FGDs view was that boys and girls are equally sent to School.
- About 90% of the respondents agree that the educational status of the villages has improved because of REDP activities.

# Health and Sanitation

- Mortality rates of Child and Mother are considerably decreased.
- More diseases were reported after REDP program
  - According to FGD, diseases have not increased, people report more than before.
- Toilet users increased from 40% to 70%.
- Access to tap water supply increased from 58% to 82%.The average distance to be traveled decreased from nearly 400 M to 175 M.
- 70% of the villagers agree that REDP impact is vital to improve health and sanitation aspects of the societies. Remaining villagers did not acknowledge strong REDP contribution into this sector.

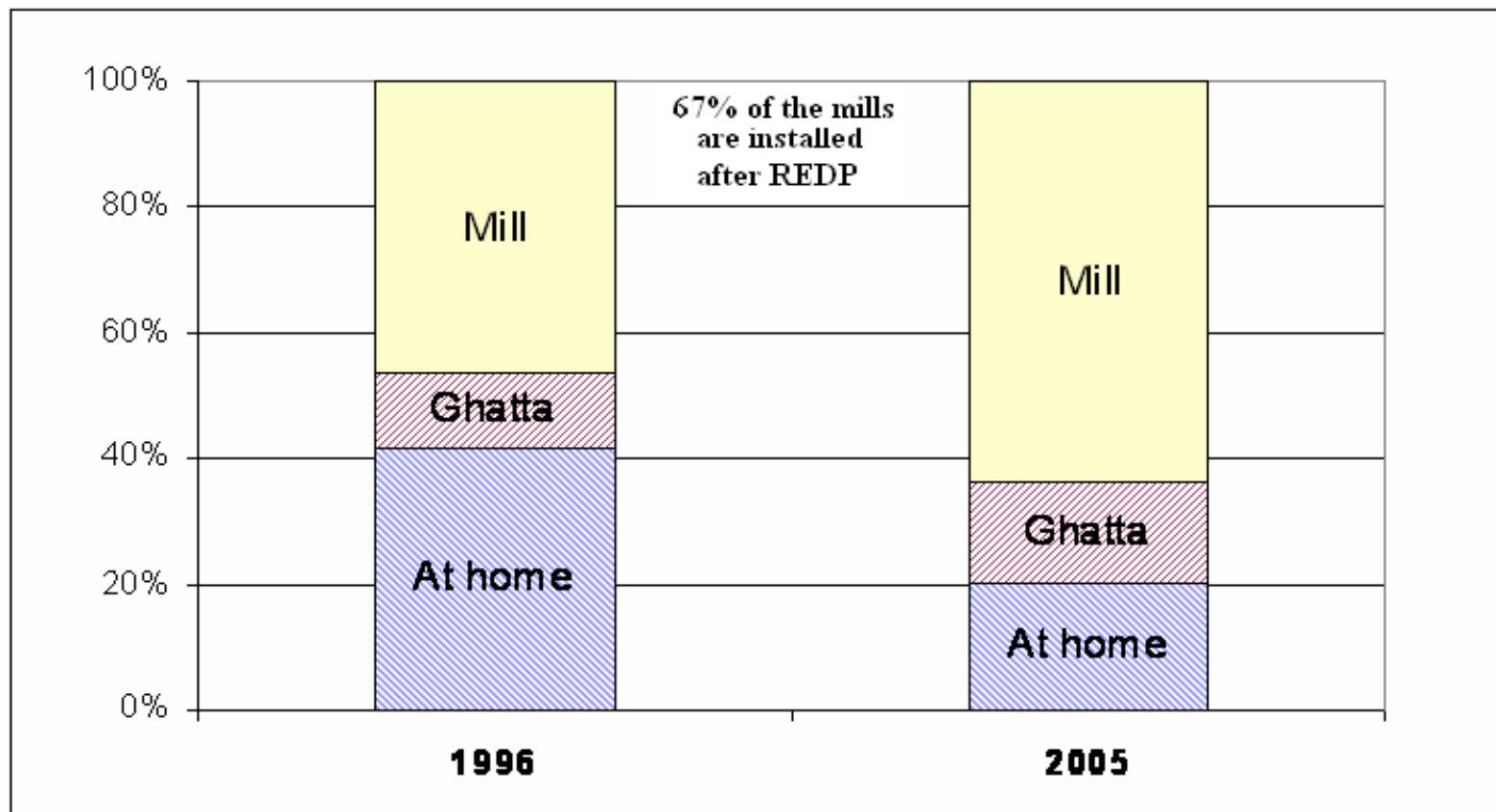
# GENDER

- Overall, men and women are almost equally involved in household work.
- In indoor work, women are more involved than men.
- In agricultural work, men are found slightly more engaged.
- There is reduction in working hours for work such as 'Firewood collection' and agro-processing' for both men and women.
- Men's participation has significantly increased in: 'Cleaning' and 'Agro-processing', and even in 'Cooking'.
- Social involvement of both men and women significantly increased (almost doubled).
- Active participation of women covers 48% of total participants.
- Women play the dominant role in economic decision of 47% of HHs.
- Majority of the respondents (70%) agree that REDP role is vital in gender empowerment. About 24% of the respondents are unsure about it and rest do not see any role of REDP.

# Energy & Environment

- MHP activities have very significantly reduced the use of kerosene.
- Firewood consumption has reduced.
- FGD responds that REDP activities have helped to increase biogas and ICS installation. REDP has contributed to installation of 932 biogas plants and about 1,300 ICS in 20 project sites.
- 64% of villagers said that REDP played significant role in reducing firewood demand.
- Trend of firewood collection from Private forest (7% to 11%) has increased.
- Villagers have experienced more greenery in their localities (according to FGD).
- Almost 90% respondents said that REDP impact helped to improve the environment of the villages. Rest are unsure whether it is because of REDP or not.

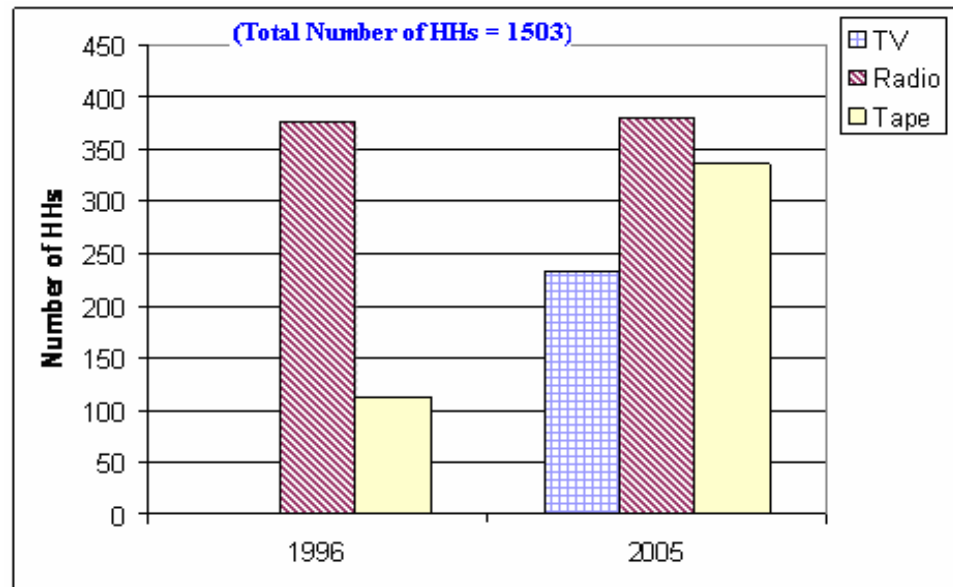
# Others



Methods for Agro-processing

# Others

- People are more aware



- About 16% HHs have TV.
- Radio and TV played significant role in awareness creation.
- Over 85% of the respondents have pointed that REDP activities made people aware.

# MDG I - Income

- Average HH's annual income increased from Rs 48,000 to Rs 73,000.
- Percentage of HHs below Rs 50,000 annual income decreased from 59% to 54%.
- People below Rs 10,000 annual income reduced from 15% to 12%.
- 65% of the respondents agree that REDP impact has increased HH income in the community.
- Qualitative discussions held in district offices and FGD said that REDP activities have supported increased income.
- **HOWEVER THESE CHANGES WERE NOT SUBSTANTIALLY DIFFERENT FROM OVERALL TRENDS IN THE COUNTRY!**

# Summary

**REDP's activities and its holistic approach have played significant role in contributing to MDG targets.**

- **Community-based energy projects reach the poor and have multiple MDG impacts! (e.g. AKRSP in Pakistan).**
- **Impacts for MDG 1 are more difficult to achieve than for other MDGs.**

# Commercialization Approach vs MDG Impact

- Biogas Support Program (BSP) in Nepal has achieved:
  - 190,000 domestic biogas plants have been constructed, 97% functioning well,
  - 2 to 3 hours of time saved per household in collecting firewood for women and children,
  - Around 3 tons of firewood consumption per household reduced per year,
  - Farmers pay 75% of the cost of the digester,
  - Carbon financing providing sustainability strategy.
- Achieved through a private-sector oriented RE commercialization approach.

# Commercialization Approach vs MDG Impact

Program assessment so far:

- Excellent in terms of scale-up and private sector participation;

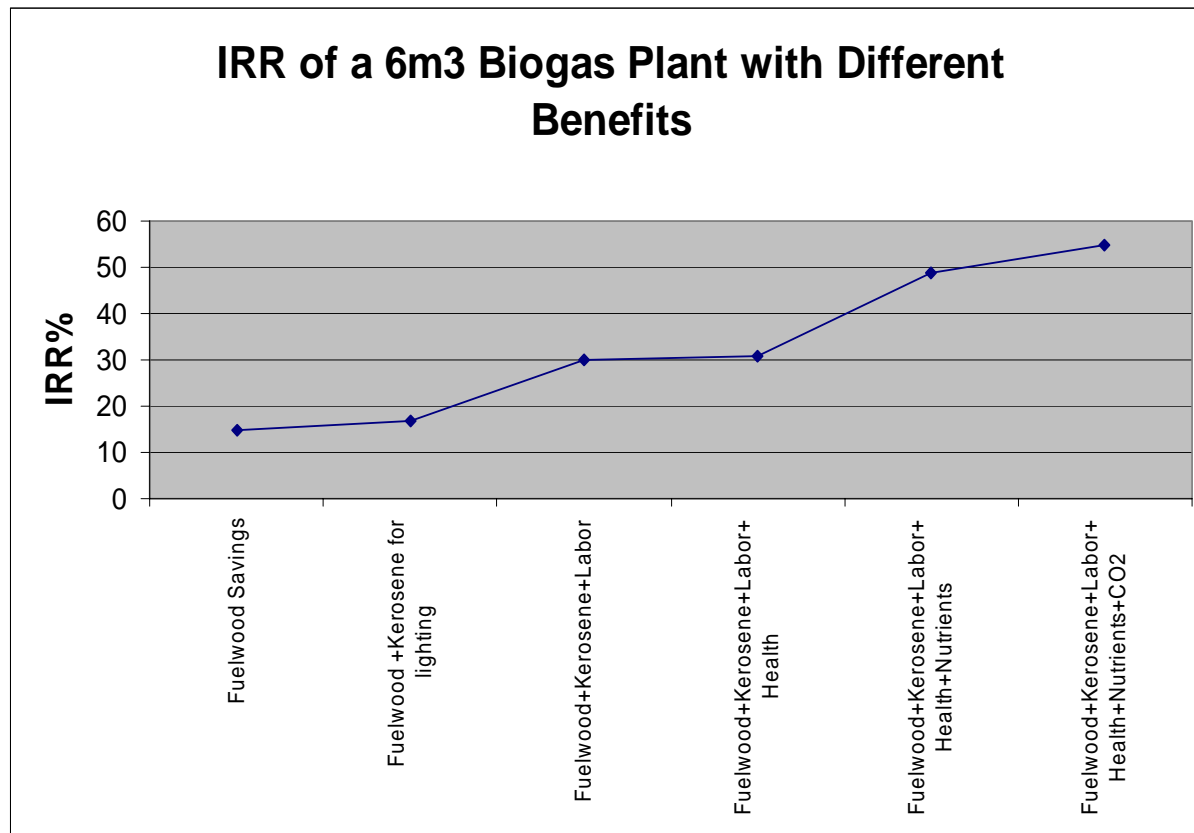
*However:*

- Poor have not been reached;
- Non-energy benefits have not been strongly realized.

# Potential MDG Benefits from Household Biogas

- MDG 1: Eradicate extreme poverty and hunger
  - Reduce fuel expenses to the household and make money more available for food and other essentials
  - Improve agriculture production by using slurry as fertilizer
  - Enhance economic opportunity by creating jobs in the biogas sector
- MDG 2: Achieve universal primary education
  - Provide lighting for school children to read at home after dark in areas not served by grid power
- MDG 3: Promote gender equality and empower women
  - Reduce the drudgery on women of firewood collection and making dung cakes
  - Reduce women's workload (fuel collection, cooking and cleaning) and empower them through alternative economic and social activities
- MDG 4: Reduce child mortality
  - Reduce indoor air pollution and associated respiratory diseases such as ARI
- MDG 7: Ensure environmental sustainability
  - Reduce pressure on local forests and biodiversity including in protected areas and national parks
  - Restore nutrients to soil
  - Reduce GHG emission

# High IRR with Full Benefits Captured



Only 20% IRR (out of possible 55%) is likely to be captured at household level through a commercialization based RE project.

# Proposal in Pakistan

- Commercialization approach on the supply side
  - Private micro-enterprises to supply 30,000 high quality systems to households,
  - Users themselves pay 80% cost of household digester,
  - Quality control by PBDE through a carbon rebate mechanism,
  - Finance project sustainably using carbon revenue.
- Extensive demand side activities
  - Organizing demand among poor households,
  - Micro-finance to increase affordability to poor,
  - Training for slurry benefits maximization and income generation in saved time.

# Impact areas & expected results

<b>Agriculture &amp; livestock</b>	<b>Family health, Sanitation</b>
<b>Environment</b>	<b>Energy</b>

<b>Pakistan Biogas Programme</b>	
<i>expected results (provisional)</i>	
Biogas plant construction	<b>30.000</b> [plants]
<b>Energy</b>	
Energy production	<b>17.786</b> [toe / yr]
Power installed	<b>60.084</b> [kW]
<b>Environment</b>	
GHG emission reduction	<b>214.557</b> [t CO <sub>2</sub> eq / yr]
Deforestation reduction	<b>8.218</b> [ha of forest / yr]
Soil nutrification	<b>70.350</b> [t(DM) bio-slurry / yr]
<b>Fuel substitution</b>	
Biomass	<b>164.660</b> [t biomass / yr]
Fossil fuel	<b>2.392</b> [t / yr]
<b>Socio-economic</b>	
Persons reached	<b>300.000</b> [persons]
Workload reduction (women & children)	<b>4.690</b> [pers years]
Exposure to indoor air pollution reduced	<b>150.000</b> [women & children]
Toilets attached	<b>6.000</b> [toilets]
Productive slurry use	<b>24.000</b> [households]
Employment generation (direct)	<b>2.100</b> [person years]
<b>Training</b>	
User training	<b>42.000</b> [person days]
Professional training	<b>12.855</b> [person days]

# Supply and demand

Provide “off the shelf” high quality domestic biogas plant

Ensure continued operation of constructed biogas plants

Commercially viable sector

Organize potential target group

Promote domestic biogas

Integrate in rural development

Stimulate optimal utilization

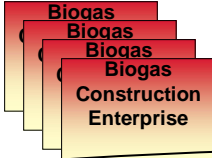
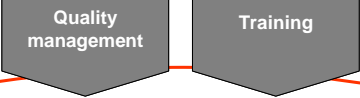
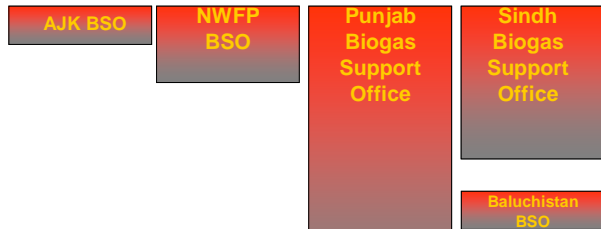
100,000 COs

Demand Side actors

Dairy ind: 300,000 hh

- R&D
- Training development
- M&E

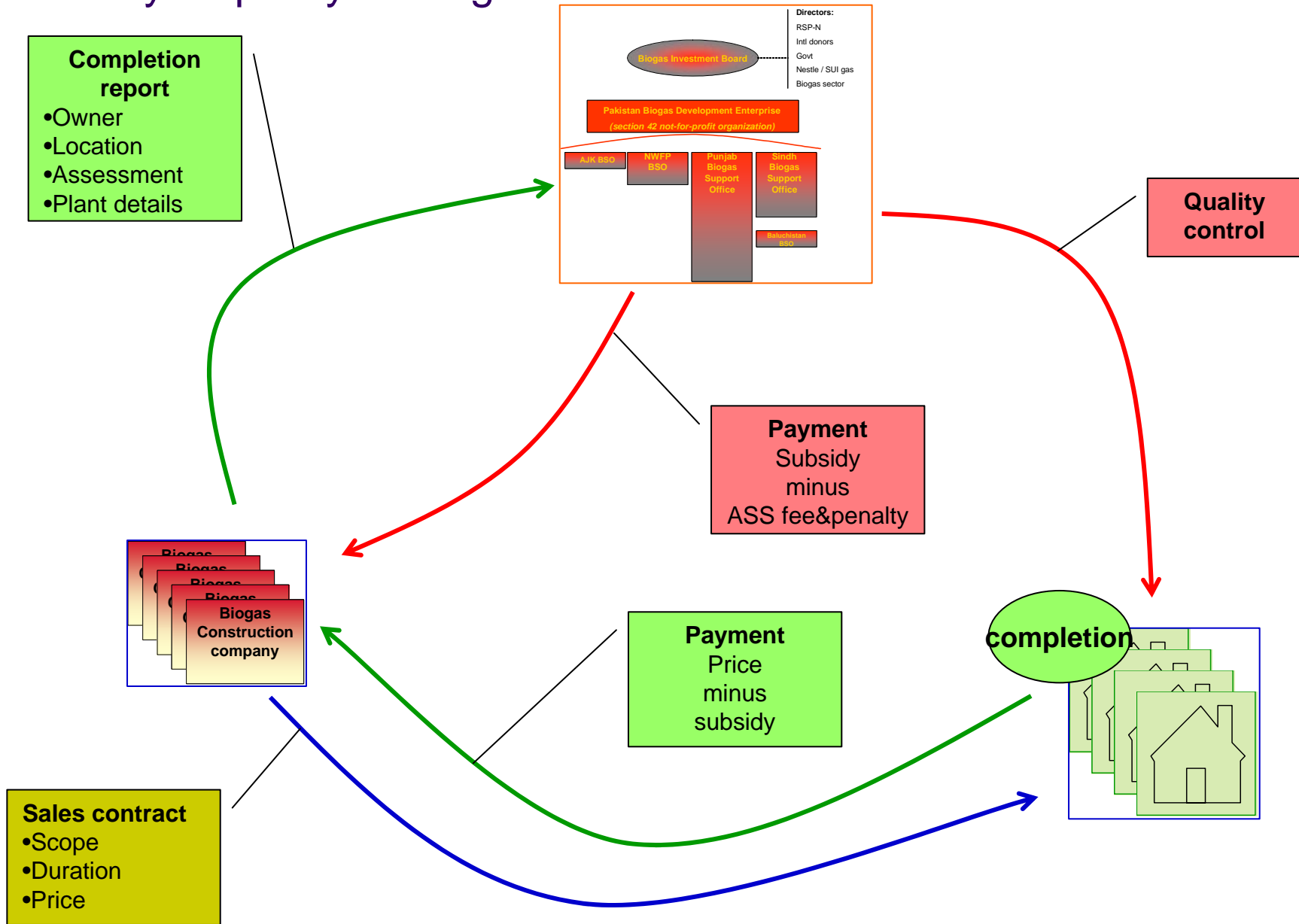
Pakistan Biogas Development Enterprise  
(section 42 not-for-profit organization)



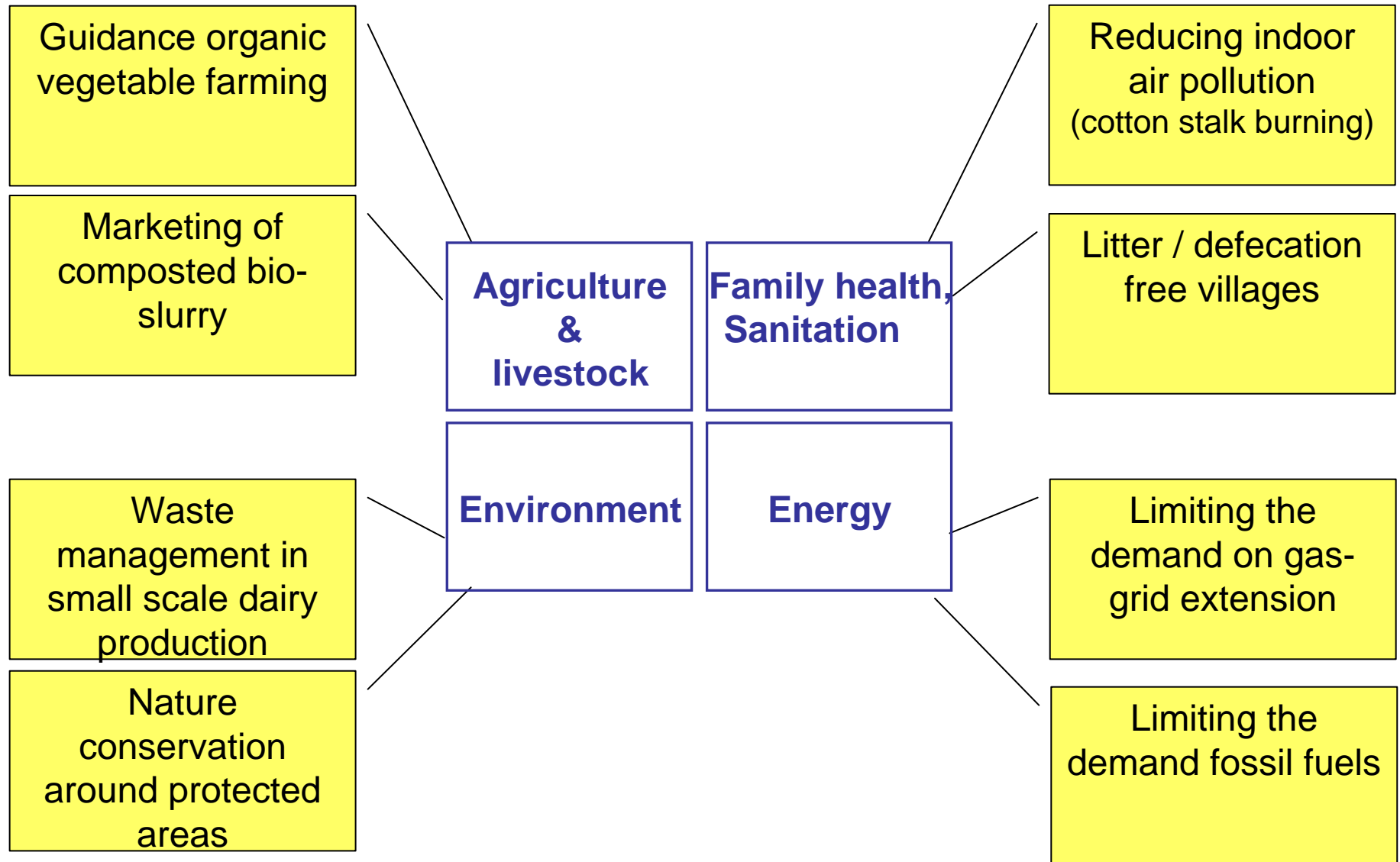
Micro finance institutions  PPAF/KPF	Rural Support Programmes	Dairy Processing Industry	Agriculture & Rur Dev NGO and GO	Min of Env UNDP IUCN WWF
Micro finance	Community Organizations	Milk collection centres	Extension Network	Clean production policies
Revolving fund	Micro finance	Technology Improvement		Organic production facilitation
Credit & CDF	Integrator			CDM facilitation

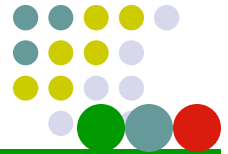


# Subsidy & quality management



# Multi-sectoral demand-side





# Conclusions

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- Where opportunities exist for community-based renewable energy systems, well designed social mobilization methodologies and holistic approaches can reach the poor and contribute to a number of MDG targets. e.g. REDP, AKRSP.
  - Commercialization approaches for household energy systems (biogas, solar PV, white LED based systems) can expand sectors rapidly and be made sustainable through a combination of good design, one time grants and carbon finance.
  - MDG impacts of these market-based approaches might be enhanced by separating the “demand side” activities and allocating resources and finding partners to strongly integrate these technologies into “poverty reduction”, “income generation”, “gender”, “education”, and “environment” sectors.
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**THANK YOU FOR YOUR ATTENTION!**