HOUSEHOLD BIOGAS PLANT (BGP) WITH CLIMATE MITIGATION

CARBON CREDIT UNDER VER FOR BGP BUILT BY INSEDA MEMBERS AND PARTNERS IN INDIA

INFORSE - ASIA

By

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COOKING RELATED DRUDGERY TO RURAL WOMEN, GIRL CHILD AND BURNING OF CHILDREN & INFANTS DURING COOKING






* Biogas Plant (BGP) is one of the appropriate renewable energy technologies for effectively solving domestic rural cooking problems while promoting Sustainable Agriculture as well as effectively addressing the rural livelihood , through employment and self-employment

- BGP also provides solutions for de-forestation, desertification and environmental degradation is taking place as a result of over logging of wood, unsustainable use of biomass & burning of cattle dung for cooking fuel

UTILIZATION OF BOVINE (CATTLE & BUFFALO) DUNG IN RURAL INDIA AT PRESENT

OPTION-1: Used as Domestic Cooking Fuel

DUNG CAKE AS COOKING FUEL

(Manural value of dung is lost)

DUNG CAKES ARE USED IN BIOMASS COOK STOVES FOR COOKING IN INDIA

(Only 11 to 24% efficient when dung cake burnt as fuel in stoves)

UTILIZATION OF BOVINE DUNG IN RURAL INDIA AT PRESENT

OPTION-2: Making Organic Manure

(Either traditional Manure in Heaps or Scientifically produced Manure)

Dumping in Heaps fin backyard for making Manure in a traditional manner

(Releases Methane a GHG in to Atmosphere)

(CH4 is 19 to 21 times potent GHG , as compared to CO2)

Scientifically produced Organic manure

(NADEP Composting)

(Fuel value of dung is lost)

UTILIZATION OF BOVINE DUNG IN RURAL INDIA AT PRESENT

OPTION-3: Making Vermi-Compost

(A) Vermi-Composting at Farmers Place

(Better and faster recycling of dung to produce enriched organic manure)

(Opportunity for extraction of energy is lost)

(B) Vermi-Composting at Farmers Place

(Better & cheaper method of recycling dung to produce good organic manure)

(Fuel value of dung is lost)

UTILIZATION OF BOVINE DUNG IN RURAL INDIA AT PRESENT

OPTION-4: Recycling of dung through biogas plant

(Better and most efficient method for processing & utilization of dung)

RECYCLING OF DUNG THROUGH BIOGAS PLANT FOR GETTING TWIN BENEFITS:

(1) Clean and convenient fuel and (2) Enriched organic manure

RECYCLING DUNG FROM DOMESTIC FARM ANIMALS THROUGH BIOGAS PLANT GIVES:

(Biogas as clean & convenient energy and enriched Organic Manure)

Domestic cooking fuel

(60% efficient fuel using appropriate burner)

Organic manure for eco-farming

(improves soil health while giving good yield)

BIOGAS

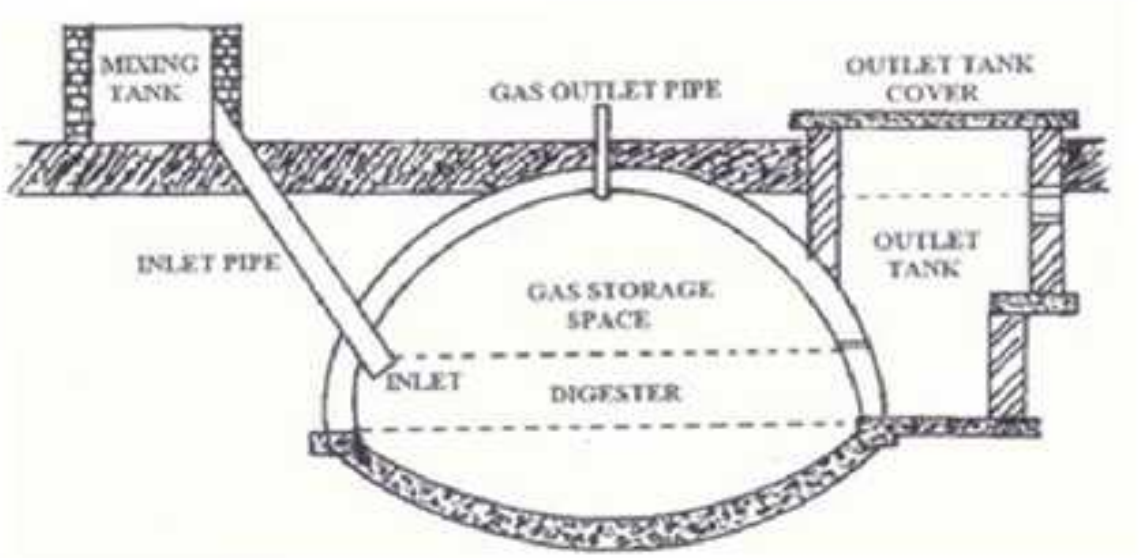
- **Biogas is a clean, environmentally benign and eco-friendly fuel, that can be generated by recycling dung (manure) from domestic farm animal, farm and kitchen waste, agricultural residues, available in plenty in rural areas.**
- **Thus, biogas can be an important source of renewable energy for rural India, produced from locally available organic (biodegradable) waste.**
- **Biogas comprise of 55-65% Methane, 35-45% Carbon dioxide 0.5-1.0% Hydrogen Sulfide, traces of other gases & water vapors.**
- **Average calorific value of biogas (60% methane plus 40% and carbon dioxide) is 4713 Kilo calories/m3 or 20 MJ/m3.**

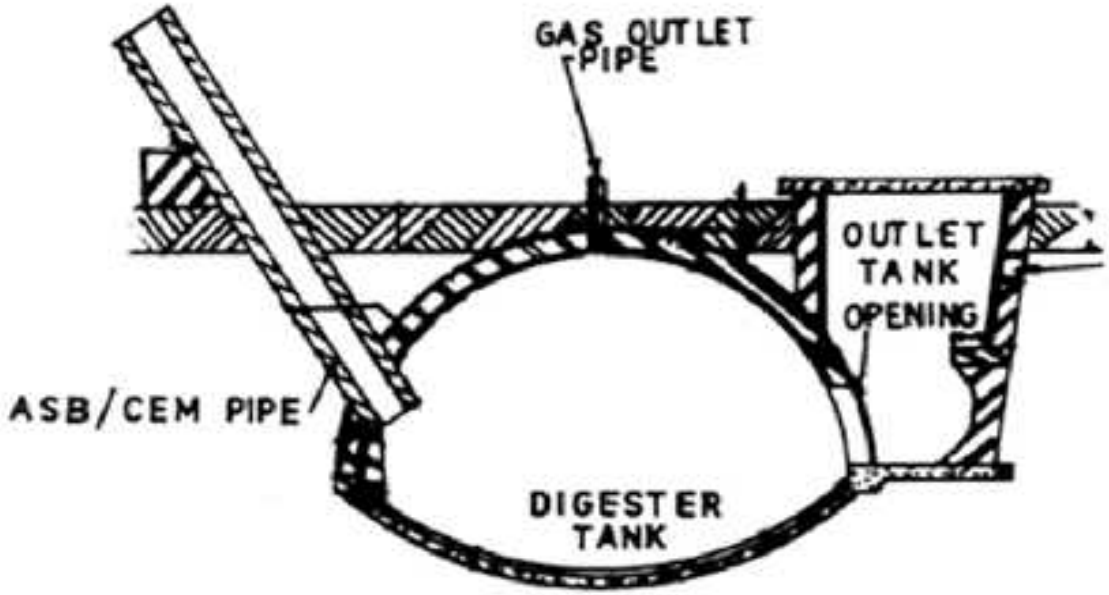
POTENTIAL OF BIOGAS PLANT IN INDIA AND DAILY REPLACEMENT OF OTHER TRADITIONAL FUEL IF THE ENTIRE ESTIMATED POTENTIAL OF GENERATION OF BIOGAS FROM CATTLE MANURE IS ACHIEVED

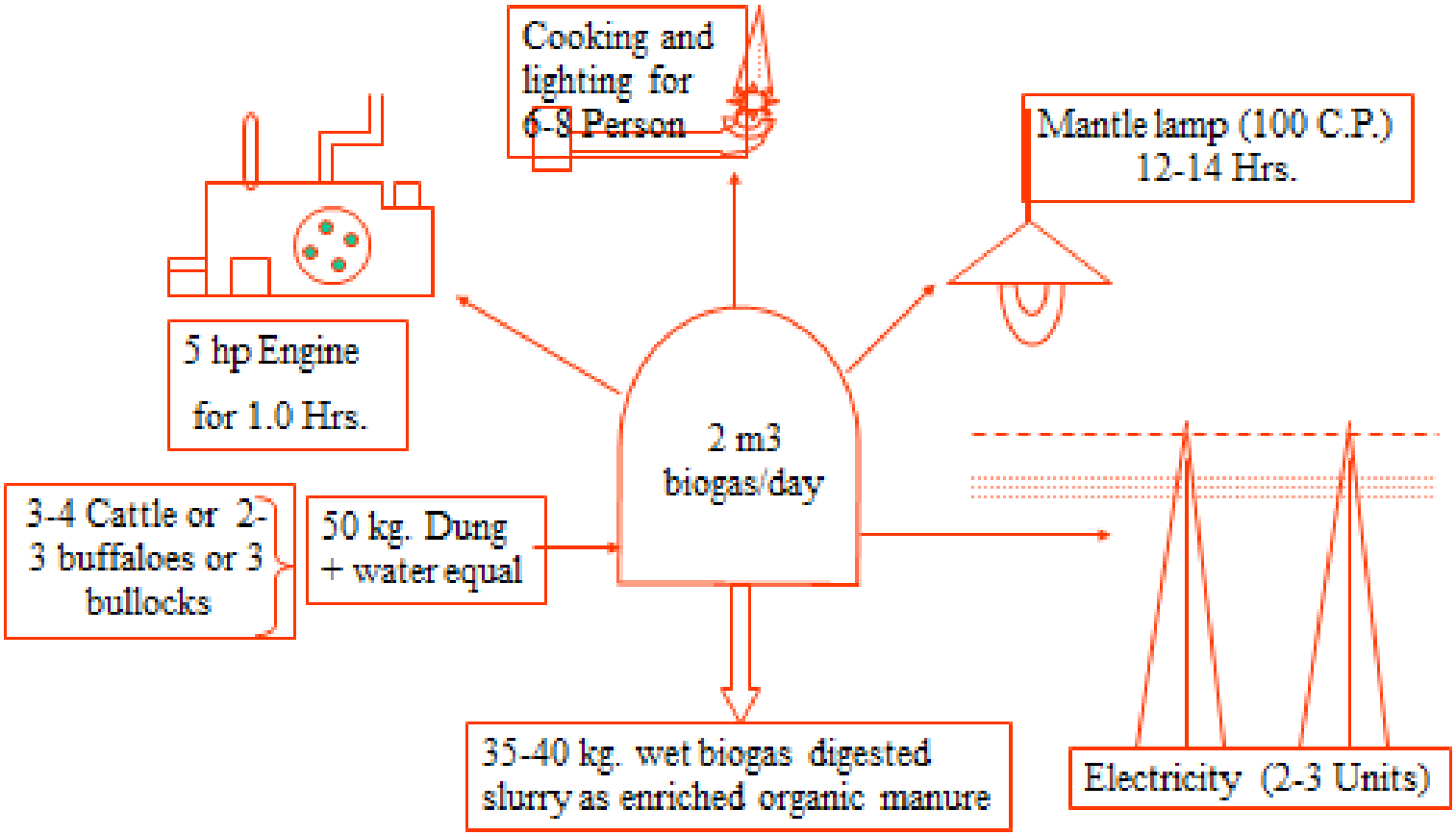
- Cattle population : 300 million
- No. of Rural families : 75 million
- Families owning 3 or more Cattles : 50 million
- Potential of building BGPs of 1, 2 & 3 m3 size
  (Ave 2 m3 @ 50 kg dung/day INSEDA's Estm) : 20 million
- Biogas generation potential (2 m3 x 20 mil) : 40 million m3/day
- Taking 60% (40 mill m3 BG x 4713 Kcal/m3) : 113112 million Kcal/day
- Equivalent Kerosene (113112 mil/9110 Kcal/lit) : 12.41 million liter/day
- Equi to Elect (40 mill m3 x 1.25 kWh/m3 x 60%) : 30 million kWh/day
- Equivalent to Crude oil (113112mil/7750 Kcal/lit) : 14.59 million liter/day
- Equivalent to Coal (113113 mil/6930 Kcal/kg) : 16.32 million kg/day
- Equivalent to firewood (113112 mil/4707/Kcal/kg): 24.03 million kg/day
- BGP built till June 30,11 (MNRE) : 4.4 million

UTILIZATION OF BIOGAS

- **Cooking:** Biogas can be used in a specially designed burner for cooking purpose. A biogas plant of 2 cubic metres capacity is sufficient for providing cooking fuel needs of a family of about five persons.
- **Lighting:** Biogas is used in silk mantle lamps for lighting purpose. The requirement of gas for powering a 100 candle lamp (60 W) is 0.13 cubic metre per hour.
- **Power Generation:** Biogas can be used to operate a dual fuel engine to replace up to 80 % of diesel-oil. Diesel engines have been modified to run 100 per cent on biogas. Petrol and CNG engines can also be modified easily to use biogas.
- **Transport Fuel:** After removal of CO_2, H_2S and water vapor, biogas can be converted to natural gas quality for use in vehicles.


MIXING TANK
GAS OUTLET PIPE
OUTLET TANK COVER
INLET PIPE
OUTLET TANK
GAS STORAGE SPACE
INLET
DIGESTER


GAS OUTLET PIPE
OUTLET TANK OPENING
ASB/CEM PIPE
DIGESTER TANK



POSSIBLE APPLICATIONS OF BIOGAS AND BG PLANT DIGESTED EFFLUENT (SLURRY)

Manure for agriculture and aquaculture-

Table :- comparison of NPK contents -

Plant Nutrient	DS (%)	FYM (%)
NITOGEN (N)	1.5-2.0	0.5-1.0
PHOSPHOROUS	1.0	0.5-0.8
POTASH	1.0	0.5-0.8

About 70-75% of original wt. Of dung is conserved on BG plant while in compost 50% is lost.

Slurry as manure improves soil fertility & increases crop yield by 10-20%

COMMON BIOGAS MODELS PRESENTLY BEING BUILT IN INDIA

(Three of the biogas model presently being implemented by NGOs in India are KVIC, Deenbandhu and Grameen Bandhu)

DEENBANDHU BG MODEL
(Main building material used is brick with cement mortar)

KVIC BG MODEL
(Main building material used is brick with cement mortar and mild steel for gas holder)

GRAMEEN BANDHU BG MODEL
(Main building material used is bamboo with cement mortar)

DEENBANDHU BIOGAS PLANT

(Fixed Dome Model with Fixed Gas Storage Chamber)

Designed, developed & improved by a team of engineers and specialists in 1980's.of a National NGO

DEENBANDHU BIOGAS PLANT (DBP)

(Fixed Dome Model with fixed Gas Storage Chamber)

Different stages of construction of DBP

- Construction of Deenbandhu BGP-IX

- Construction of Deenbandhu BGP-XI

- Construction of Deenbandhu BGP-X

- Construction of Deenbandhu BGP-XII

GRAMEEN BANDHU BIOGAS PLANT

(Fixed Dome Model with fixed Gas Storage chamber, built using bamboo reinforced cement mortar-BRCM)

Designed & developed by the Secretary General INSEDA in 1990's.

Grameen Bandhu Biogas Plant (GBP)

(Built using bamboo reinforced cement mortar-BRCM)

Different stages of fabrication and Construction of GBP








Grameen Bandhu Biogas Plant (GBP)

(Built using bamboo reinforced cement mortar-BRCM)

Different stages of fabrication and Construction of GBP

Grameen Bandhu Biogas Plant (GBP)

(Built using bamboo reinforced cement mortar-BRCM)

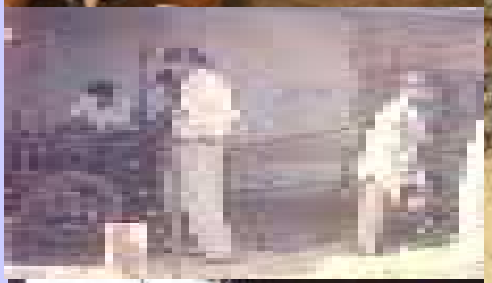
Different stages of fabrication and Construction of GBP

Grameen Bandhu Biogas Plant

(Built using bamboo reinforced cement mortar-BRCM)

Completed Grameen Bandhu Plant (GBP) in operation at farmers house

(Used for Cooking, operating Duel Fuel Gen-set, Mechanical Power for operating agricultural machines & irrigation pump and digested slurry for organic farming)




BENEFIT AND IMPACT OF THE PROGRAMME IN RURAL INDIA

Socio-economic impact & local employment generation in rural India

- *Social Impact*

- Removing drudgery of rural women in the collection of firewood,
- Provision of clean & convenient cooking fuel to women at their door-step,
- Saving in time of cooking,
- Saving in time for cleaning cooking vessels as no soot is formed,
- Fetching less quantity of water for cleaning of utensils & washing kitchen,
- Smoke-free kitchen and soot-free walls of the kitchen and the areas surrounding the cooking area,
- More time available to rural women to take rest during the day as the time spent in collecting the firewood & cooking would be substantially reduced.
- Adolescent girls who normally required to stay at home and help their mothers to assist in the domestic chores including cooking, could have time to be sent to schools, and
- Availability of more time with the rural women is utilized by them for carrying out other more productive (socially and economically) activities.

SOCIO-ECONOMIC IMPACT & LOCAL EMPLOYMENT GENERATION IN RURAL INDIA-CONTD.

Economic Impact

- **Construction of the fixed models, about 30% of their cost goes towards providing wages to the local labour, in the form of skilled semi-skilled and unskilled labourers,**
- **Generates employment and self-employment for trained local people in providing post-plant implementation services to owners.**
- **Biogas digested manure saves money for the farmer which is other wise, spent for the purchase of costly inorganic fertilizers.**
- **Biogas digested manure Improves crop yield with reduced cash outflow increasing their net economic benefits,**
- **Biogas digested manure improves micro-flora of the soil and building the soil structure and texture, conserves natural resources, which would gradually lead**

SOCIO-ECONOMIC IMPACT & LOCAL EMPLOYMENT GENERATION IN RURAL INDIA-CONTD.

Generation of local rural employment by building/ constructing fixed dome household BGP

- ONE 2 M^3 FIXED DOME BGP, GENERATES EMPLOYMENT IN RURAL AREAS AS FOLLOWS:
  - Skilled person (Masons) 22 man days
  - Semi-skilled person 11 man days
  - Un-skilled person 10 man days
- 20 MILLION FIXED DOME (2 M^3 CAPACITY) BGP, WOULD GENERATE EMPLOYMENT AS FOLLOWS:
  - Skilled (Masons) 440 million man days
  - Semi-skilled 220 million man days
  - Un-skilled 200 million man days

IMPACT OF PROGRAMME ON CHECKING HEALTH AND MIGRATION

Impact on Health and Migration:

- Positive impact on the public health as it prevents flies and mosquitoes and kills pathogens during recycling of excreta
- Positive impact on the health of the women, (adolescent girl, children and infant her family due to smokeless kitchen and checking of indoor pollution; and
- Checking migration from rural to urban areas in search of employment

IMPACT OF IMPLEMENTING OF HH BIOGAS PROGRAMME ON THE MICRO-ENVIRONMENT IN RURAL INDIA

- Installing BG plants, would save burning of biomass (trees, shrubs & harvested crop residues) as fuel for cooking, and prevent release of greenhouse gases (GHGs).
- Converting major part of the biomass available form the harvested agricultural crops to enriched compost (scientifically produced organic manure), would be returned to the farmers field for crop production. This would create positive environmental impact at the micro level.
- Offsetting of carbon dioxide (CO_2) and methane (CH_4) emission from bovine dung, by recycling it through biogas plant would provide substantial gain in terms of abating greenhouse gas (GHG), as compared to either burning of dung cake as fuel or the decomposition of manure in a traditional way in Indian villages. Thus, creating very positive environmental impact in rural areas.
- Household biogas plants would also become instrumental in promoting ecological agriculture, using enriched organic manure from BGPs, contributing to overall positive environmental impact, promoting empowerment of rural people as well as facilitating people centered, sustainable development.

Formation of INSEDA from informal network to registered body, achievement till date and initiation of carbon credit BG project under the Gold Standard

- Informal network of 50 Indian grassroots NGOs, building household biogas plants since 1980 decided to form INSEDA national association in early 90's, which was formally registered as a socio-technical NGO in December 1995 to promote RE and ecological development.
- INSEDA member and partner NGOs have built around 200,000 household plants till date
- Based on dialogue with GTZ-Carbon Procurement Unit (CPU)-India, in 2007, INSEDA decided to initially undertake as a pilot project on biogas for carbon credit VER under the Gold Standard

CARBON CREDIT OF INSEDA MEMBER AND PARTNERS HOUSEHOLD PLANTS UNDER VER

- INSEDA started the process by having dialogue with its members/partners/in Nov 2007
- Based on collection of preliminary data on 10,000 household biogas built by members/ partner NGOs in a few states
- After screening of data/information, finally selected 4,000 household plant in two states (Kerala and Madhya Pradesh) of India in May 2008
- Engaged GTZ-CPU-I as the consultant to develop PDD as well as to assist INSEDA in the process to get it registered under as Gold Standard project

CARBON CREDIT OF INSEDA MEMBER AND PARTNERS HH BIOGAS PLANTS UNDER VER

- The compliance of entire process for registration as Gold Standard project took very long time, creating frustration of all the key stakeholders and financial pressure and danger of loosing credibility of INSEDA, and at each stage uncertainty
- INSEDA member/partner NGOs intern loosing credibility with the end users, because of organizing stakeholders meetings and various studies for collection of data from them, with only verbal promise that funds will eventually come
- Finally the project was registered by Gold Standard in the middle of September 2011
- Now the last stage, which is varification to allot VER is to be done by the validator to allocate allot VER to INSEDA

SUGGESTIONS FOR IMPROVEMENT IN CARBON CREDIT FOR DECENTRALIZED RE PROJECTS OF NGOS

- At present the entire process involved in the certification of project either CDM or Gold standard is:
- Very cumbersome and time consuming.
- Heavily dependent on high cost external consultants.
- If project doesn't come through , the project holder and other NGO stakeholder get in to heavy financial loss.
- The procedure should be revised and made much simpler
- Process time should be cut down to max of 9-12 month
- Bridge funds should be provided by donor agencies for assisting/and supporting NGOs in developing socially relevant RE project, which could be recovered when the project is registered and buyer pay the money to NGO.

Household BGP meets the following UN's - Millennium Development Goals

Goals 7 and 8: Environment and Partnership

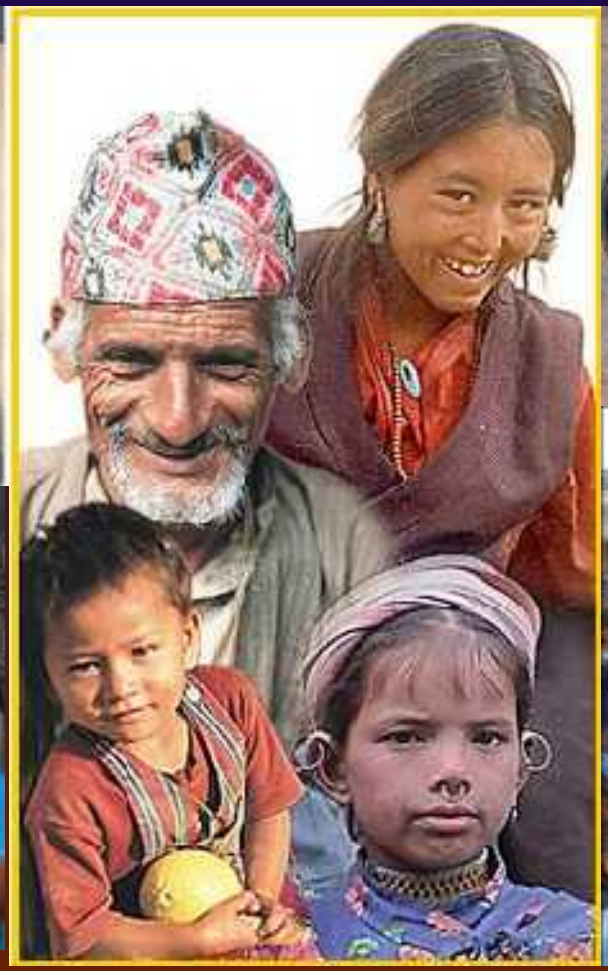
- Avoiding unsustainable logging, erosion and desertification
- Avoiding GHG-emissions
- Protection of biodiversity
- Protection of soil fertility
- Reducing rural-urban migration by improving living conditions in rural areas
- Cooperating worldwide for climate protection & for fulfilling the Millennium Development Goals

SUM-UP

- At present only 150,000 household plants are being built in rural India
- There are 600,00 villages in India, so on an average 1 plants per village is being built under the National Programme of MNRE
- In order to accelerate the number, carbon credit is an excellent mechanism, as it will not only support the building of plants but also improve the post-installation services for efficient maintenance for emission trading

- Household biogas plant is an excellent technology but if we have to realize the potential of 20 million BGPs in a foreseeable future to cover over 600,000 villages in India we will need a friendly Carbon Credit mechanism

Let us promote Biogas plants as one of the Sustainable Energy (SE) solutions for environment protection, Livelihood, Happy Family, Food for All, and for Brighter Future of our Children



Biogas as Sustainable Energy for Better Future for All

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