



27-28 March 2008

GLOBAL FORUM VII

ON International Investment

POLICIES FOR PROMOTING INVESTMENT IN ENERGY SUSTAINABILITY A CASE OF BIOGAS SECTOR OF NEPAL

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**Session 2.3.: The policy challenges
of involving private investment in key primary sectors:
the water and energy sectors in focus**

This paper was submitted in response to a call for papers conducted by the organisers of the OECD Global Forum on International Investment. It is distributed as part of the official conference documentation and serves as background material for the relevant session in the programme. The views expressed in this paper do not necessarily represent those of the OECD or its member governments.

Policies for Promoting Investment in Energy Sustainability A Case of Biogas Sector of Nepal

**A Paper prepared for
OECD Global Forum on International Investment VII
Best practices in promoting investment for development
27-28 March 2008, OECD Conference Centre, Paris, France
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Energy is the basic factor contributing to development. And sustainable development is not possible without making energy systems more sustainable. Rising oil prices, growing energy security concerns and the human and environmental devastation caused climate change are increasing the attractiveness of alternatives to conventional fossil-fuel based energy sources. Investment is at the core of the transition to a sustainable energy future, as massive amounts of new capital will be required to cover the world's growing energy demand with clean energy and increased energy efficiency. Despite the increased awareness about the importance sustainable energy, the investment has not reached the desirable scale. A number of barriers are impeding scaled-up investment in the sustainable energy sector, an area that includes both renewable energy and energy efficiency technologies and systems:

- Financiers regard the cost and long-term performance risks of clean energy technologies as being higher than with conventional systems – a perception which often results from a lack of access to timely and accurate information.
- The typically small size of sustainable energy projects makes transaction costs disproportionately high.
- The market distortion caused by the pricing of high-carbon fuels, which does not reflect the environmental and social costs they impose, puts most sustainable energy technologies at a competitive disadvantage and makes them dependent on supportive policy and regulatory frameworks to be financially viable.

These barriers have caused imperfections in the energy markets, which constitute a hindrance for the socially optimal penetration of sustainable energy technologies. These have slowed down the progress in investment.

Nevertheless, investment in sustainable energy has been increasing both in developed and developing countries. However, current rate of growth and outreach does not match with the current need for reducing causes of climate change and at the same time maintaining energy security for the growth and economic stability. In this backdrop, the current paper begins with highlighting the importance of energy sustainability, global investment trend and global policy focus on promoting investment in sustainable energy. The main body of the paper presents the case study of biogas sector of Nepal based on the lessons learnt from various studies.

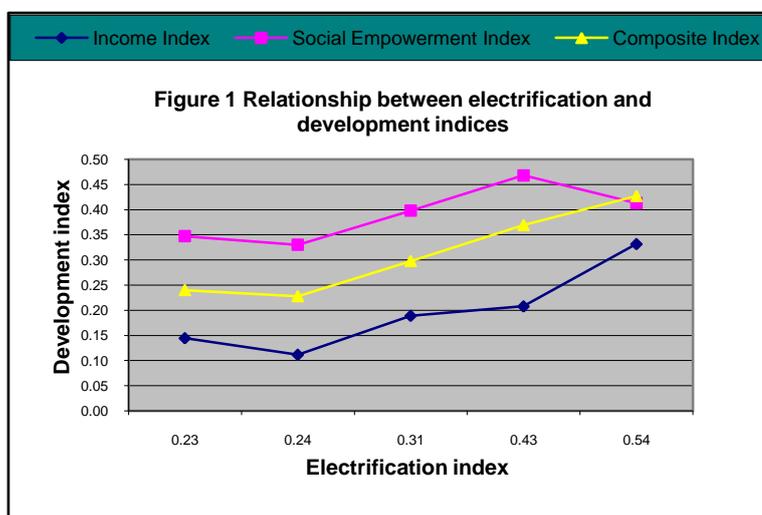
1. Importance of energy sustainability

1.1 Energy and development

The UN Commission on Sustainable Development (CSD) identified access to sustainable energy services as an essential element of sustainable development. The Commission stated that, “to implement the goal accepted by the international community to halve the proportion of people living on less than USD 1 per day by 2015, access to affordable energy services is a prerequisite” (Green Peace/ITDG, 2002). Poor people spend up to a third of their income on energy, mostly to cook food. Women, in particular, devote a considerable amount of time collecting, processing and using traditional fuel for cooking. In India, two to seven hours each day has been devoted to the collection

of fuel for cooking, whereas in rural sub-Saharan Africa, many women carry 20 kilograms of fuel wood an average of five kilometers every day. This is time that could be spent on childcare, education, socializing or income generation. The World Health Organization (WHO) estimates that 2.5 million women and young children in developing countries die prematurely each year from breathing the fumes from indoor biomass stoves (UNDP/UNDESA/World Energy Council, 2002). Therefore, the sustainable energy is an important source for sustainable development of the world.

There is also a two way relationship between the energy and development. While consumption of modern energy services depends on the level of development, the level of development in its turn also depends on the availability of modern energy services. In fact, they reinforce each other. This is evident from the Fig. 1 which is drawn on the data of Nepal. The Fig. 1 demonstrates a positive relationship existing between the electrification index (measured as percentage of electrified households) and development index (Nepal, 2005).



1.2 Access to energy and poverty reduction

The UN-Energy Paper has explicitly stated that although there is no specific Millennium development Goals (MDGs) relating to energy, the MDGs cannot be met without affordable, accessible and reliable energy services (UN-Energy, 2005). The pathways of meeting MDGs through the use of modern energy services have been demonstrated by various documents (DFID, 2002; Nepal, 2005, UNDP, 2004) in the following ways (Table 1):

Table 1: Poverty Reduction Impact Indicator and Rural Energy

Poverty Reduction Impact Indicator	Intermediate Poverty Reduction Impact Indicator (Effect)	Linkage of Rural Energy to Intermediate Poverty Reduction Impact Indicator
Reduced Vulnerability	<ul style="list-style-type: none"> Increased income Increased productivity of labour Increased social capital 	<ul style="list-style-type: none"> RE opens up the possibility of new economic opportunities Community energy generation brings individual families into a cohesive group RE enhances labor productivity in industry, agriculture, commerce and household sectors.
Increased Income	<ul style="list-style-type: none"> Increased economic activities Increased investment opportunities Market access Reduced Drudgery Skill development 	<ul style="list-style-type: none"> RE enables enterprise development Lighting permits income generation beyond daylight hours Energy program generally contains skill development packages

Poverty Reduction Impact Indicator	Intermediate Poverty Reduction Impact Indicator (Effect)	Linkage of Rural Energy to Intermediate Poverty Reduction Impact Indicator
Increased Employment	<ul style="list-style-type: none"> • Employment opportunity in energy system • Increased industrial activity • Increased commercial activities • Increased agricultural activities 	<ul style="list-style-type: none"> • Employment in local energy service provision and maintenance • Energy based entrepreneurship. • Pump irrigation increases cropping intensity or extensive cultivation
Better Health and Longevity	<ul style="list-style-type: none"> • Reduced indoor pollution • Increased health care expenditure • Increased leisure • Nutritious food • Less stress • Well-being 	<ul style="list-style-type: none"> • RE provides access to better medical facilities with refrigeration, equipment sterilization and operating theatres. • Clean energy technologies reduce indoor air pollution. • Hauling, grinding and oil expelling facilities reduces drudgery of women • Reduction in firewood consumption saves considerable time
Knowledge and Awareness	<ul style="list-style-type: none"> • Adult literacy • Better Education • Access to knowledge and information 	<ul style="list-style-type: none"> • RE extends study hours and induces literacy classes. • RE widens the use of IEC materials. • RE increase access to ICT
Access to Basic Infrastructure	<ul style="list-style-type: none"> • Availability of telephone • Availability of irrigation • FM station • Ropeways • Computer/Internet/photocopy 	<ul style="list-style-type: none"> • Energy is a basic input to run systems for basic services.
Environmental Sustainability	<ul style="list-style-type: none"> • Controlling global warming • Conservation of forest • Controlling environmental pollution 	<ul style="list-style-type: none"> • Renewable energy reduces firewood consumption and contributes to environmental sustainability. • Renewable energy programmes may have component about the awareness on environmental sustainability.
Gender Balance and Women's Empowerment	<ul style="list-style-type: none"> • Participation in social organization • Participation in decision making • Education • Income and saving opportunities • Drudgery reduction • Low exposure to indoor pollution • Good working environment 	<ul style="list-style-type: none"> • Availability of modern energy services frees girls and young women's time from survival activities (gathering firewood, fetching water, cooking inefficiently, food processing manually etc.). • Renewable energy helps to engage in income generation activities in free time and earn extra income. • Participation in community organization may be necessary in institutional arrangements on renewable energy.

Source: Adapted with some modifications from the author's "A Study on Analysis of Rural Energy Programmes with Respect to their Linkages with Poverty Reduction" AEPC/ESAP, 2005. .

1.3 Clean energy and climate change

In order to tackle climate change at the requisite scale, clean energy technologies should be made available and utilized by all countries. Of critical importance for renewable energy development is a long-term goal for reducing global greenhouse gas emissions. The more ambitious and robust the long-term objectives, the more the climate will benefit. All developing countries, especially rapidly industrializing countries, should have access to clean energy technologies on preferential terms. The infrastructure created in coal-fired power plants and energy-intensive industries is long-lived (about 40-50 years). However, the costs of cleaner and more efficient technologies are much higher (as much as \$100 million or more for an average 1 GW coal-fired power plant). In addition, issues of competitiveness and intellectual property rights (IPR) have impeded the dissemination of clean technologies in developing countries, and the full utilization of knowledge, which is a global public good. The barriers that hamper the dissemination of such technologies in developing countries, such as higher cost of development, intellectual property rights and competitive rules, should be overcome with technological and non-technological solutions. Innovation targets to bring new technologies to market, as well as incentives for meeting them, should also be considered

2. Policies for promoting Energy sustainability

Supportive regulatory/fiscal frameworks and financial support mechanisms are needed for those SE enterprises experiencing capital constraints and difficulties in making it from the early business-planning stages through to operations and commercial sustainability. Financing mechanisms that provide grant support or provision of debt or equity at the seed, start-up and growth stages are crucial to develop the small-scale niche of the SE market (UNEP, 2005)

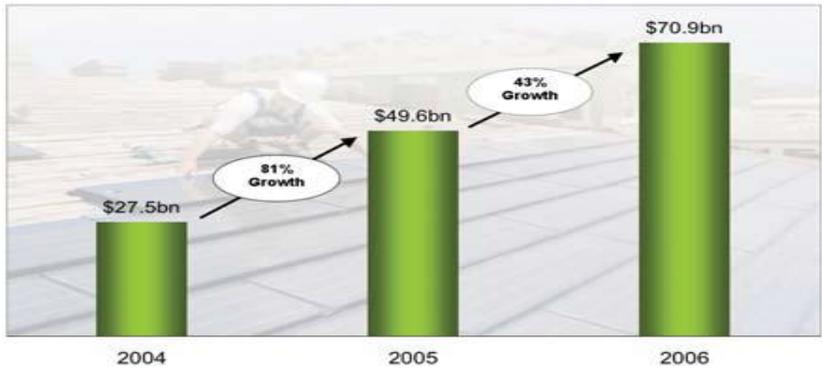
Given the high capital costs of most sustainable energy technologies, the availability of affordable end-user financing is critical for accelerating market uptake, particularly in the developing world. For household scale sustainable systems, end-user financing comes in various forms, ranging from retailer financing to consumer credit, leasing or fee for service. Helping shift cash-based sustainable energy markets to credit and other financing options can significantly increase the market for clean energy technologies. To ensure the success of such instruments, carefully designed public support initiatives are needed that support new markets without overly distorting them (UNEP, 2005).

Both the developing and developed countries of the globe are making efforts to develop clean energy market through market mechanism. State interventions in terms of subsidy or other policy incentives are agreed just for short terms. They view that effective financing mechanisms should fill an existing investment gap through the increase in private sector involvement. It is generally expected that the most effective finance mechanisms do not distort the market, but rather help to build it into a financially viable alternative to conventional energy. There is a global consensus that policies are needed to create markets, reduce risk, provide acceptable rates of return for investments and create conditions for a sustainable and profitable sustainable energy industry (UNEP, 2005).

2.1 Global policy focus

There is a strong focus on investment on renewable energy and achieving energy efficiency. Sustainable energy investment was \$70.9 billion in 2006 (Figure 2), an increase of 43% over 2005. The sectors with the highest levels of investment are wind, solar and bio-fuels, which reflects technology maturity, policy incentives and investor appetite. During the first quarter of 2007, the overall upward trend continued. A total of \$2.2 billion of venture capital and private equity flowed into the sustainable energy sector, an increase of 58% over the same quarter in 2006. Investment in sustainable energy is still very much driven by policy, which today includes a broadening array of tariff and fiscal support regimes in many countries that together create a stable environment globally for continued sector growth (SEFI 2007). During the first quarter of 2007, \$2.2 billion of venture capital and private equity flowed into the clean energy industry worldwide, an increase of 58% over the same quarter in 2006 and 60% over the fourth quarter of 2006.

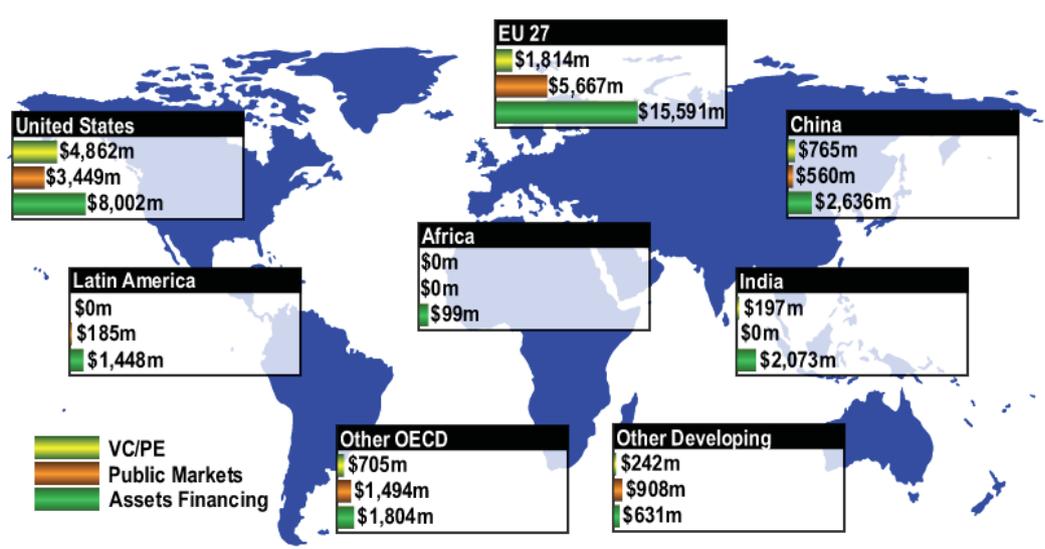
Figure 2: Global Investment in Sustainable Energy, 2004 – 2006



Source: SEFI

The fig.3 presents the scenario of global investment by type of financing and the regions of investment. The figure depicts that the asset financing is more popular all over the countries including China and India.

Figure 3: Global Investment in Sustainable Energy, by Type and Region, 2006



Source: SEFI

Note: VC denotes venture capital and PE denotes private equity

Over the coming decades, estimates of investment requirements in the energy sector are huge - USD 20 trillion over the next 25 years and likely to be considerably greater by 2050. This investment is required across the value chain and for all energy carriers, although it is expected that slightly more than half is required in electricity generation. The private sector, multilateral agencies, and governments are all in agreement that while the scale of the challenge is enormous, there are sufficient funds available

2.2 Renewable energy investment trend

There is a positive trend in investment in renewable energy sector. Generally, a look at renewable energy finance and investment reveals following trends:

Analysis of the investment figures reveals that the global investment is growing in all regions, but emerging markets are expected to become the core.

- Sector preferences reflect the maturity and potential of the technology.
- Private investors are becoming more bullish due to favorable policies and supportive political factors.
- Investment banking firms are showing interest.
- Venture capital favors clean energy.
- The bond market is starting to finance wind farms;
- Market growth looks set to remain sturdy.

2.3 Nepal's policy for promoting investment in energy sector

In Nepal pioneering works in renewable energy sector started with private initiatives. Intermediate Technology Development Group (now Practical Action) helped to transfer micro-hydro technology in Nepal and provided technical assistance to private entrepreneurs. The biogas technology also started with private initiatives. The government and donors came at a later stage. But their involvement in the sector helped to standardise the technology and scale up the dissemination. Currently Nepal's policy for promoting investment in energy sector can be summarised as follows:

- Nepal has made honest efforts to attract private to invest in renewable energy sector.
- In micro-hydro, the subsidy provide by the Nepal government with own and donor money covers around 50 percent of the investment cost. The other 50 percent is invested by beneficiary community or private sector entrepreneur.
- In Biogas sector too about 40 percent cost is covered by the subsidy and the rest by beneficiary households.
- In case of solar energy, government subsidy covers less than one third of the market cost of the solar panel and the two third cost is born by the subscribing household.
- The overall policy of the government is to develop and implement innovative financing mechanism and reduce the subsidy and promote private sector financing.
- In recent period government of Nepal has entered into the carbon trading and the money so earned is planned to invest in financing renewable energy sector.

3. Introduction to Biogas sector of Nepal

3.1 General background

Biogas technology has become very popular in this region especially in China, India and Nepal. China reported 17 million existing biogas users in 2005, up from previous reports of 12 million. Biogas remains a priority in India, with about 3.8 million household-scale biogas plants now reported installed, up from prior reports of 3.7 million, and 66,000 new plants were expected to be installed from early April 2005 to April 2006(Renewable Global Status Report 2006). Similarly, the number of biogas users in Nepal has reached to 172,500 as of July, 2007.

The Biogas Support Program (BSP) started in July 1992 with funding from the Directorate General for International Cooperation of the Netherlands (DGIS) of the Netherlands government through the Netherlands Development Organization in Nepal (SNV/N). Government of Nepal (GoN) and the Kreditanstalt fuer Wiederaufbau of Germany (KfW) also started funding the BSP from Phase–III, which started in March 1997 and lasted in June 2003. Until Phase–III, BSP was directly implemented by SNV/N. The BSP Phase–IV, which covers the period July 2003 to June 2009, is being

implemented by the Biogas Sector Partnership - Nepal (BSP-Nepal), a Non-Governmental Organization (NGO), with financial and technical support from Alternative Energy Promotion Centre (AEPC) and SNV/N. The subsidy component for BSP-IV has been co-funded by KfW, DGIS (through SNV) and GoN (through AEPC). The overall objective of BSP-IV is to further develop and disseminate biogas plants as a mainstream renewable energy solution in rural Nepal, while better addressing poverty, social inclusion and regional balance issues

3.2 Development potential

The technical potential for biogas production in Nepal is based upon the number of cattle buffalo in the country, especially on the quantity of dung that could be available for biogas, and the micro-climate pockets in different parts of the country. The potential of biogas in Nepal is presented in the Table 2 below:

Table 2: Potential of biogas generation in Nepal

Type of Animal	Number of animal (in Million)	Dung available (Per animal per day in kg)	Total dung available	Biogas yield per Kg. of dung (m ³)	Gas Volume (m ³ /day)
Cattle	7.0	10	70000	0.036	2520000
Buffalo	3.4	15	51000	0.36	1836000
Total	10.4		121000		4356000

Karki Amrit, Shrestha J. N. and Bajgai S. (2005)

The daily dung production from cattle and buffalo alone is about 121000 tons, which has theoretical potential to produce 4356000m³. However it is estimated that only the 75 percent of the theoretical potential, i.e., 3282000 m³ would be practically available since the number of animals also include the households with only one cattle or buffalo and hence do not have enough dung volume even to feed the smallest size biogas plant (4 m³) which requires 24 kg. of dung per day.

It has been further estimated that the potential number of technically feasible biogas plants in Nepal are 1.9 million. The geographical distribution of the potential is given in Table 3. Table 3 depicts that out of the total 1.93 million potential plants, 56. 24 percent fall in Terai, 37.36 percent in Hills and the rest in Remote Hills. Until 2006, only 8.08 percent of the total potential has been materialised. In case of remote hills, the achievement is only 0.57 percent of the potential.

Table 3: Geographical distribution of biogas potential and installed plants in Nepal

Geographical region	Total no. of potential plant	% distribution	Total plants installed	As % of potential plant
Remote Hill	123962	6.40	706	0.57
Hill	723599	37.36	80436	11.12
Terai	1089445	56.24	75437	6.92
Total	1937006	100.00	156579	8.08

Source: NBPG (2007) Biogas Sector in Nepal: Highlighting Historical Heights and Present Status

3.3 Present status

The biogas program reached 67 districts and 2,665 Village Development Committees (VDCs) till July 16, 2007, out of 3,913 VDCs in Nepal. The total number of plants constructed under the program is 172,505. The Phase-wise breakdown is as given in Table 4 below:

Table 4: Number of biogas plant constructed in different Phases of BSP

	Phase I (‘92 to ‘94)	Phase II (‘94 to Feb ‘97)	Phase III (Mar ‘97 to Jun ‘03)	Phase IV (Jul ‘03 to Jul 16, ‘07)	Total
No. of Plants Constructed	6,824	13,375	91,196	61,110	172,505

Source: BSP Nepal

3.4 Investment requirement

The investment requirement of biogas sector has been calculated on the basis of the quotation price received from the Nepal Biogas Promotion Group (A national association of private sector biogas companies) and approved by the Biogas Support Program for 2006/07. The popular plant size is 6 m³ capacities as its share in the total plants is 56 percent. Therefore, the cost of this plant size has been used to derive the figure for investment requirement. The final figure calculated on the basis of above mentioned method comes to be as depicted by the Table 5 below:

Table 5: Investment requirement for biogas sector of Nepal

Geographical region	Total no. of potential plants	Cost per plant (in US\$)	Total investment requirement (in Million US\$)	Net investment requirement (in Million US\$)
Remote Hill	123962	574.095	71.17	70.76
Hill	723599	510.095	369.10	328.06
Terai	1089445	468.159	510.03	474.74
Total	1937006	517.450	1002.30	921.31

The Table 5 depicts that at 2007 price, the total investment requirement for the development of biogas in the country is US \$ 1002.30. In order to come to a figure for future investment requirement, an adjustment of 8.08 percent reduction from the total is necessary to deduct the cost for already constructed plants. In that case, the total investment requirement for the future comes to be US \$ 921.32 million.

4. Government policies for promoting investment in Biogas sector

Government has taken multiple measures to promote the investment in biogas sector. The major financing mechanism so far in practice are: subsidy to biogas users, bulk loans at low interest rates to those financial intermediaries who provide loan to biogas users, and performance based advance subsidy to the biogas entrepreneurs who provide the equipment and the technical services to the biogas users.

4.1 Investment subsidy

Subsidy policy of Government of Nepal has been revised periodically to respond to new issues and challenges. The provisions contained in the following two tables are the latest policy of the government. According to the new subsidy policy, the following arrangements have been made:

The table 6 shows that for all categories, for Terai, hill and remote hill the subsidy is NRP 6,000, 9000 and 12,000 respectively. Furthermore, the government provided additional subsidy to poor at the rate of NRP 1500, 2500 and 3500 for Terai, hill and remote hill respectively. Furthermore, the additional subsidy for 4 and 6 m³ at the rate of NRP 500 the subsidy for low penetration districts at the rate of NRP 500 also continued. The Table 6 also shows the share of contribution to the subsidy fund of the government and donors. Initially government contributed only 10 percent of the fund but in 2007/08 it contributes 25 percent. The rest is contributed by KfW (67 %) and SNV (8 %).

Table 6: Year wise subsidy rate by sources of financing

Year	Fiscal Year	Terai	Hill	Remote Hill	4 & 6m ³	LPD	Subsidy for poor			Donor		
		Subsidy Rate						Terai	Hill	Remote Hill	Govt. Nepal	KFW
2007/08	2064/65	6,000	9,000	12,000	500	500	1,500	2,500	3,500	25%	67%	8%

Source: BSP-Nepal

LPD denotes low penetration area

The Table 6 indicates that the subsidy has remained an important component of financing biogas in Nepal. Subsidy has been made pro poor recently to expand the coverage among relatively poorer people. Subsidy has taken into consideration of remoteness and connectivity too in terms of differentials in rates.

4.2 Credit financing

Credit financing plays a vital role in market expansion and in reaching poorer households in more sustainable manner compared to over-dependence on direct investment subsidy and technical assistance. However, availability of credit or micro credit for biogas has been limited to socio-economically better off areas and the conflict in the country actually adversely affected it by forcing government owned or promoted banks with large rural networks to scale down their micro credit portfolios by closing down or relocating branches located in rural areas.

Biogas Credit Fund

KfW provided a grant of German Mark 5 million (roughly Euro 2.5 million or Rs. 220 million) in November 2000 to be used as a Biogas Credit Fund to provide credit to biogas users. The fund management responsibility has been given to AEPC (it is a loan from the government to AEPC at 3% interest rate) for wholesale lending to Micro Finance Institutions (MFIs) at 6% interest rate and eventual retail loan to individual biogas users at interest rate up to 16%. The Biogas Credit Unit at AEPC, thus became operational in early 2002.

BSP has been undertaking a number of activities to promote biogas with micro credit in general and to help the Biogas Credit Unit in particular to improve the wholesale lending. This situation has remained far from satisfactory. At the end of December 2006, the progress of the AEPC's Biogas Credit Unit was as presented in the Table 7 below.

Table 7: Progress of AEPC's Biogas Credit Unit as on mid-July 2007

S. No.	Particulars	Amount
1	Cumulative Loan Sanctioned, NPR	16,498,0000
2	Cumulative Loan Paid Out, NPR	93,942,712
3	Cumulative Loan Re-Paid, NPR	41,603,907
4	Cumulative Loan Outstanding, NPR	53,238,805
5	Cumulative Loan Overdue, NPR	35,35,892
6	Cumulative Repayment Rate (%)	92.17
7	Cumulative No. of loan accounts	204
8	Number of active partner MFIs	94
9	Cumulative Plant Construction (No.)	5391
10	Cumulative Districts Covered (No.)	32

Source: AEPC's Biogas Credit Unit
Exchange rate: US\$ 1: NPR 63

Wholesale credit financing for MFIs serving in rural communities

The formal and semiformal sector has been trying to provide financial services in the rural areas where formal sector is absent; they are facing constraint in financial resources. Though Rural Microfinance Development Centre, Rural Self Reliance Fund, Sana Kisan Bikas Bank, National Co-operative Bank and commercial banks are trying to expand outreach of bulk finance to such intermediaries, a large number is still out of reach for financial resources. The main wholesale financiers and their performance is given below:

- **Rural Microfinance Development Centre (RMDC)**

Rural Micro-finance Development Centre Ltd. (RMDC) was promoted by the NRB, 13 commercial banks, 5 state-owned regional rural development banks, Deposit and Credit Guarantee Corporation and Nirdhan, an NGO. As of mid-July 2007, the total loan disbursed by RMDC to 45 MFIs operating in 47 districts is Rs.19, 409,741 thousand. RMDC charges 6 % interest rate on its bulk loans to partner MFIs. It also provides bulk loans to partner organisations involved in Community Livestock Development Project at 5% per year.

- **Sana Kisan Bikash Bank Ltd. (SKBB)**

Sana Kisan Bikas Bank Ltd was established in 2001 as a development bank to provide wholesale loans to Small Farmers Cooperatives Ltd. (SFCL). SKBB is exclusively supplying bulk loans to the Small Farmers Cooperatives Ltd. The Bank has recently developed a policy and procedure to supply bulk loans to other MFIs as well. As of mid-July 2007, the total loan disbursed by SKBB to 219 SFCLs is Rs.204,37,11 thousand.. SKBB charges 9.5 % interest rate on its bulk loans to partner SFCLs.

- **National Cooperative Development Bank Ltd.**

National Co-operative Bank Ltd. was established in 2003 to provide financial services (mainly loan and deposits) to the member co-operative societies scattered all over the country. Their lending rate is 10% per annum. The Bank is mainly serving business oriented cooperative societies situated in the urban centres. As a result of tight lending policy and procedures, the bank is not able to cater the needs of the co-operative societies situated in the rural areas. The bank has disbursed Rs.

17,06,46,917 for 56 borrower accounts and recovered Rs. 5,41,82,935. So far recovery is not a problem for the bank.

Revolving fund

For companies that cannot submit bank guarantees, working capital support has been designed in the form of credit which they get through NBPG at the time of purchase of various appliances and components for the plants. This has been made possible through a working capital revolving fund made available to NBPG by BSP-Nepal. The NBPG credit scheme was conceived to make outright payment to workshops by NBPG on the purchase of different appliances by individual companies. For this service rendered to the companies, NBPG would levy a 5% service charge to cover its administrative costs. However, so far, the working capital credit through NBPG has not been utilized as conceived, and the fund has virtually been lying idle.

4.3 Equity participation

With the decrease in the rate of subsidy and increase in the prices of equipments and materials over the years, the share of equity participation has been increased. The equity participation also has increased as the construction of plants has been expanded in the remote areas, which lack road connectivity. In the past too, the increase in the share of equity participation has been observed. For instance, during the first year of the BSP (1992/1993), the number of equities-financed plants was reported at 6 percent, which increased to 30 percent during 1995/1996 and to 42 percent during 1997/1998 (.Silwal, 1999)

4.4 Promotion of private sector investment

Implementation of a sensible and consistent subsidy policy combined with the development of a liberalized policy and procedures for private sector participation triggered the entry of the private sector in the construction biogas plants. This has had a significant impact on the progress of the number of plants. With a mere 1 percent share in the total constructed plants during FY 1990/1991, the private sector continued to record higher share, which reached 80 percent during 1998/1999 (.Silwal, 1999)

. A total of 17,663 plants were constructed in 2006/07 by 66 companies ranging from the highest of 2,236 plants to a lowest of only 1 plant. The top 10 companies alone have constructed 54% of the total plants, and 75% by the top 20 companies. The average plant per company is 267.5.

The private sector was constrained by following two problems:

- i. Working capital shortage has been identified as a prominent problem faced by the companies resulting in low plant number and poor financial efficiency. This has in turn led companies to lose on benefits of bulk purchase, credit, discount etc in the purchase of raw materials and components.
- ii. Companies also face shortage of capital due to late reimbursement of subsidy which is attributed to a number of factors like long processing time taken at BSP-Nepal and AEPC for release of subsidy due to delay in report submission by companies or submission of incomplete documents, and also due to delay in entering into annual agreement with companies etc.

To address the problems:

- i. BSP initiated the advance subsidy payment scheme for biogas companies against a bank guarantee since 2005/06. The advance subsidy payment is given in the beginning of fiscal year at a rate of Rs. 2,000 per plant for plants constructed by individual companies in the

previous fiscal year. One of the conditions of BSP in providing the advance subsidy payment is that companies increase their plant production by 20%.

- ii. For companies that cannot submit bank guarantees, working capital support has been designed in the form of credit which they get through NBPG at the time of purchase of various appliances and components for the plants. This has been made possible through a working capital revolving fund made available to NBPG by BSP-Nepal.
- iii. The NBPG credit scheme has also been designed for outright payment to workshops by NBPG on the purchase of different appliances by individual companies. For this service rendered to the companies, NBPG would levy a 5% service charge to cover its administrative costs. However, so far, the working capital credit through NBPG has not been utilized as conceived, and the fund has virtually been lying idle.

5. Sources of investment fund and Funding Mechanism

There are several types of funds and mechanisms in operation to support the expansion of biogas technology in the rural areas Nepal. Funds generally comprise of government budget, bilateral aids, and dedicated fund of commercial banks to invest in deprived sectors. The mechanisms and vehicles of support are also multiple.

Sources of investment fund

5.1 Bilateral grant and national fund

The largest component of the RESS Programme is the fourth phase of the Biogas Support Programme (BSP) comprised of subsidy, credit and programme management. The subsidy component for BSP-IV is co-funded by Kreditanstalt für Wiederaufbau of Germany (KfW) complemented with subsidies from DGIS and His Majesty Government of Nepal (HMG/N) implemented by the Biogas Sector Partnership, Nepal (BSP/N). BSP-IV covers sixty seven Terai, hill and mountain districts.

The programme runs from July 1, 2003 to June 30, 2009 and has a total funding of € 15.83 million. It is supported by a grant from the Government of the Netherlands (GoN) of € 4.03 million. The funds flow is:

€ 2,468,000 from GoN for technical assistance to BSP/N via SNV/N.

€ 1,562,000 from GoN for subsidy to AEPC.

€ 4,602,312 from HMG/N for subsidy to AEPC.

€ 7,500,000 from KfW for subsidy.

5.2 NRB's Rural Self-Reliance Fund (RSRF)

Rural Self-Reliance Fund is created in 1991 by Nepal Rastra Bank to supply funds to micro-finance institutions. Loan tenures are 3 three years, and institutions are only eligible for three loans – the first for NRs. 1.0 million, the second for NRs. 1.5 million, and the third for NRs. 2.5 million. The Government and the Nepal Rastra Bank has given grant capital to this fund which has grown to nearly NRs. 343.4 million by mid-July 2007. In mid-July 2007, outstanding loans to 137 financial cooperatives was Rs. 47892 thousand and 19 FINGOs Rs. 3478 thousand. The total outstanding loans were NR 51370 thousand. The Rural Self-Reliance Fund reports that its repayment rate is 91.6 percent.

5.3 Credit from organised financial sector

Savings and Credit Co-operatives

The Savings and Credit Co-operatives (SCCs) are legally established under the Co-operative Act of 1992 and 34 of them were subsequently licensed by NRB. The first group of 228 SCCs were established in 1994/95 and the total number of SCCs registered stands at 3500 of which 19 licensed from NRB to perform limited banking transactions.

Financial Intermediary NGOs (FINGOs)

The FINGOs are normally registered under the Society Registration Act of 1978 and licensed under the Financial Intermediaries Act. These FINGOs offer financial services to people below the poverty line based on group guarantees. Forty-seven FINGOs have licensed so far by NRB.

5.4 Semi formal and Informal Financial Sector

In addition to the licensed institutions, there are numerous institutions operating without a licence from the NRB in semi formal and informal sector. These include some 3500 primary savings and credit co-operatives, informal savings and credit groups, a variety of NGOs, traditional micro-finance schemes.

Semi-formal Savings and Credit Groups

Community based Savings and Credit Groups (SCGs) exist across the country and are generally promoted by International NGOs, various micro-credit programmes and initiatives etc. Such projects have promoted Forest User Groups, Water User Groups, and Ama Samuha (Mothers' Group) etc. All of these have formed self-help groups in fairly a large size. Based on expert consultations it is estimated that more than 50,000 such informal self-help groups exist in the country.

Non Governmental Organisations (NGOs)

There are over 25,000 NGOs active in Nepal and several of them engage in micro-finance activities directly or through SCGs. Only 47 of these NGOs have become FINGOs. In additions to micro finance activities many of these FINGOs are also active in different sector of socio-economic development of the community.

Co-operatives

Several of the co-operatives who do not possess licence engage themselves in savings and credit schemes which are normally restricted to their members. Over 3500 co-operatives have been registered as Savings and Credit Co-operatives but only 19 have been licensed by NRB. The typical number of members of these SCCs are in the range of 25 –200 per society.

Money Lenders

Moneylenders have been in existence for ages and provide loans to poor people without collateral and generally at significantly higher rates. Most often the poor who avail such credit are at a disadvantage.

Family and Friends

Family and friends are by far the largest providers of informal loans, followed by moneylenders. Money lenders are more active in rural areas and among poor households – though not for the poorest, who borrow more from family and friends

6. Critical assessment of investment policy

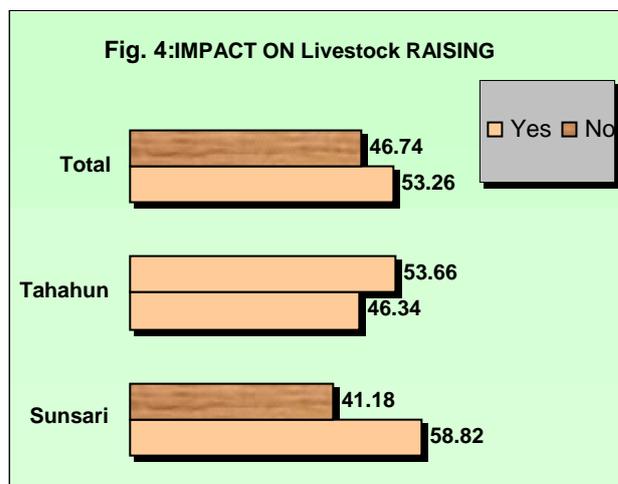
It can be safely said that the investment policies have become sustainable energy friendly, as the volume of investment in sustainable energy sector in the developed country and developing countries have increased. In relation to Nepal, Government investment policy are generally supporting for the better functioning of the market as well as targeting services to the weaker section of the people and low penetration areas. Generally modern and clean energy are used by richer section of the people if they are available. But the poor people, due to lack of affordability and awareness, are bound to depend on the traditional sources of energy which are not health and climate friendly. In evaluating the investment policy on sustainable energy, both the effects and impacts of the policy has been analysed. But this will evaluate from the perspective of access to remote areas and poor people. This assessment is based on the 2007¹ study of the author in two districts (Tanahu and Sunsari) of Nepal.

6.1 On expanding program among poor households

Armed conflicts and its hangovers has to some extent impacted the rapid expansion of the biogas technologies Compared with the total biogas plants constructed during the financial year 2005/06, the program expansion achieved during the period Sept.1 2006 - 15 July 2007 is just around three percent. However, viewed from the perspective of access of the poor to biogas technology is very encouraging. This was due to the extra financial support from the government and at the same time availability of credit at doorstep. All the Biogas companies and Grameen Bikas Banks interviewed during the field survey shared the view that it would not have been possible to reach out to poor households had there not been the arrangement of additional subsidy for them.

6.2 On reducing the purchase of chemical fertilizer, livestock raising, and time saving

The biogas has impacted positively on reducing the purchase of chemical fertilizers for some households in Terai as it has replaced the consumption of traditional manure in terms of dung cakes. Likewise more than 53 percent of the respondents reported that biogas plants have induced livestock rising. The impact of biogas on livestock rising is greater in Sunsari district than in Tanahu district. The other impact experienced by the respondent households was the time saving as consequence of the reduction in the use of firewood. This has positively contributed to the drudgery reduction particularly of women and girl children.



¹ Assessment of Effectiveness of Additional Subsidy for the Poor and Increased Subsidy in 2006/07

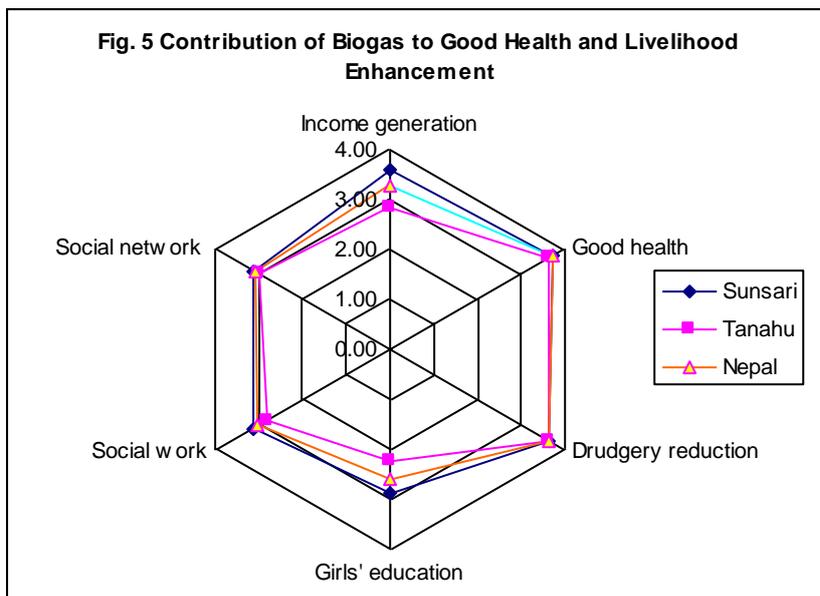
6.3 On promoting good health and enhancing livelihood

On the basis of these indicators the livelihood impact of biogas plant was evaluated through perception survey. The indicators were measured using a standard scoring method related to a four-point ordinal scale between the most desirable (4 point) and least desirable outcome (1 point). The perception survey of the respondents indicated that the biogas plants contributed more to promote good health followed by to drudgery reduction and income generation. At district level income generation impact is much larger in Sunsari district compared to that in Tanahu district (Table 8 and Fig. 5.)

Table 8: Dimensions of livelihood indicators (Four Point Scale)

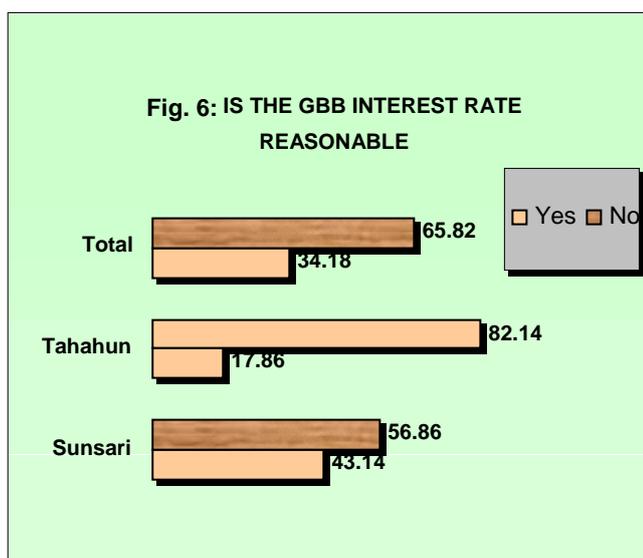
Indicators	Sunsari	Tanahu	Nepal
Income generation	3.59	2.85	3.26
Good health	3.76	3.66	3.72
Drudgery reduction	3.65	3.66	3.65
Girls' education	2.88	2.24	2.60
Social work	3.18	2.83	3.02
Social network	3.14	3.00	3.08

Source: Field survey



6.5 Interest rate concerns of participating financial institutions

The terms of the credit affects the ability of the farmers to take loan. Currently, the Grameen Bank takes 20 % interest on loan and there are 50 equal installments. Each installment has to be paid on weekly basis. During the survey, about 97 percent respondents reported that they have been repaying their installments on time (Fig.5). The GBB also reported no repayment problems, while lending to poor people for the construction of biogas plants on group collateral. However, the term and conditions of loan from GBB seem to be strict. During the survey, about two third of the respondents opined that the 20 percent interest rate charged by GBB on their loan is unreasonable (Fig. 5) and demanded reduction in it.



Considering the credibility of borrowers reflected by the good repayment situation, Grameen Bank and other MFIs should reconsider the lending rate and other terms and condition.

6.6 Capacity and resource gap of private sector

Many of the biogas companies are financially weak and they do not have enough financial capital. They also require management and training support to become "significant player" capable of producing more than 500 plants a year. Most of the companies do not have long term business plan (Bajgai and Kellner, 2005). Working capital shortage is a major financial problem faced perennially by most of the biogas companies, and this has led the companies into a vicious cycle of poor profitability, resource crunch, management deficiencies and limitations in capacity, and to further poor profitability. The ultimate results of the working capital problem are poor management, unhealthy competition, unmet quantitative targets of the companies themselves, and the overall qualitative expectations of the BSP. The operational and investment capacity of the companies have been constrained by the following factors like a) Little training to the staff and trained mason leaving country for better jobs, b) Dearth of trained mason during peak construction period, c) Problem of material transportation to remote areas, d) Weak management within the company (GGC), e) Unavailability of materials and appliances on time, f) Financial problem of the company (GGC), g) Unhealthy competition among companies, e) Subsidy amount not released on time.

6.7 Affordability and issues of access

Income inequality in Nepal is the highest in the South Asia region and the Gini coefficient stands at 0.47. Worse still, the Gini coefficient for Nepal increased by slightly over nine percent during 1990 to 2000 (Lohani, 2007). According to the Nepal Living Standards Survey, 2003/04, absolute poverty has decreased 11 percent from 42 to 31 during 1996 to 2003. However, in this same period, the Gini coefficient has increased from 0.34 to 0.41, in other words the difference between the rich and poor is seen to have increased (CBS, 2004). The results of the living standard survey conducted by Central Bureau of Statistics in 2003 also confirm that the trend of increasing Gini coefficient is continuing even after 2000. The highest Gini coefficient and its increasing trend demand some effective affirmative action in favor of the poor

7. Input to policy makers

The investment in sustainable energy sector should promote not only the expansion of technology in absolute term but also enhancement of its impact by making it affordable to a large section of the population. In the biogas sector of Nepal, the technology is fairly mature but it needs more research in developing technical models suitable for relatively high hills. Furthermore, how the technology becomes affordable to poor people with little but targeted support from the government. . In making investments, the critical factors like a) Economic and political stability in the country of investment, b) Stable regulation of the business environment, c) Institutional climate (e.g., contract law), Labor availability, d) Efficient financial system, e) Personal security, f) Environmental regulation stability must be actively considered, with some requiring attention so that they do not become barriers (World Energy Council, 2007):

7.1 For investment in sustainable energy sector

In general, if the problems of energy sustainability are to be met, then much more, and much better integrated (government and industry) funding for research, development, and demonstration of sustainable energy technologies are needed, and now. Because research and development process takes both time and consistent investment, global society cannot wait until the problem becomes acute. Investments should be made on a technology's / project's ability to reduce GHG emissions against a defined financial projection. Since the sustainable energy technologies are capital intensive and require huge capital, innovative mechanism and a better coordination among various parties are needed to raise funds and use these in a proper way for a right cause. One of the important sources of fund for developing country Nepal is the fund generated from carbon trading.

7.2 For promoting private sector investment

An integrated and focused approach to sustainable energy investment is needed to fill financing gaps across the various spectrums. In the developing countries Funds and sub-funds can often be more effectively managed through established, experienced public private partnership. Therefore it is necessary to match the donor's money with the money of private sectors in order to provide services to larger areas in relatively quick time duration. Government's role here is to facilitate the matching and creating an environment in which the private sector can perform its developmental activities in consistent with national and sectoral objectives of Nepal. Increased and better quality communication between government and the business sector is needed to engage private sector time and capital. Implementing agencies should be able to mediate efficiently between government policy makers and private sector decision makers.

7.3 For enhancing involvement of banking/cooperative sector

Banks lack information and know very poorly about the project itself. Many banks find it very small investment opportunity with high transaction costs. Even in big sustainable energy project like large hydro, the long gestation period may provide them disincentive. Therefore, the banks may need extensive financial knowledge about the project and some innovative mechanism, like wholesale lending, to reduce their transaction cost. Furthermore, they need technical manpower to conduct project appraisal for funding purpose. Furthermore, there should be some operational researches to find out whether there are other business incentives/opportunities for the banks, when they invest in sustainable energy projects.

7.4 For making biogas plant accessible and affordable to poor people

For the scaling up of the biogas program among poor, AEPC and BSP/N should be able to make following arrangements:

- Get support from the donors to continue present rate and types of subsidy
- Consider eligible for additional subsidy to all those currently taking credit on group guarantee from any legal financial institutions/organisations.
- Enter into agreement with other micro finance institutions/cooperatives/NGOs in addition Grameen Bikas Bank's for the provision of credit to poor households.
- Reduce the interest rate of biogas credit fund at least at the level of other big commercial banks (3 – 4%) to enhance bulk lending to micro finance institutions/cooperatives/NGOs.
- While negotiating with micro finance institutions, attempt to reduce the interest rate on credit without collateral to biogas companies.

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