

Rural Electrification : the success story of Bangladesh



United Nations Practioner Network

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Presentation Overview

- Introduction : Bangladesh
- Rural Electrification in Bangladesh: At a Glance
- IDCOL: Success Performance till Date
- Schematic diagram of IDCOL SHS Program
- Cumulative Sales of SHS of Different POs of IDCOL
- Growth : SHS Installation in Rural Areas of Bangladesh
- Sample SHS Package, Product Features and Prices of SHS
- Financing Method
- Success Stories and Case Studies of Bangladesh
- Key Success Differential
- Zeroing the Subsidies
- Plans on Subsidies in Future
- Conclusion

Introduction: Bangladesh

Summary

Map

Location

Solar Energy

PV Program

□ Bangladesh is located between 20° 30' and 26° 45' north latitude and the climate is tropical with adequate solar radiation.

□ Nearly 75% of the population lives in rural areas and only about 30% of the rural households have access to grid electricity.

□ Solar PV dissemination was first started in 1998 by few govt. agencies in Bangladesh. Infrastructure Development Company Limited (IDCOL) entered the market in 2003-2004.

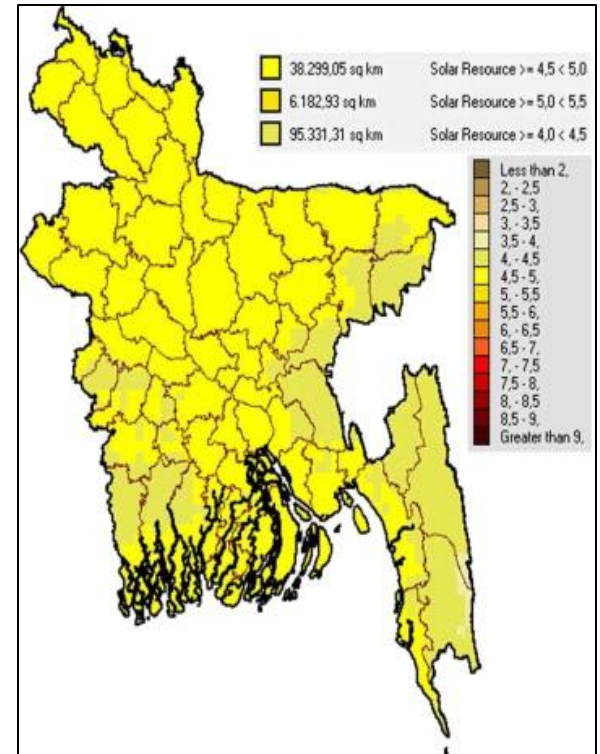
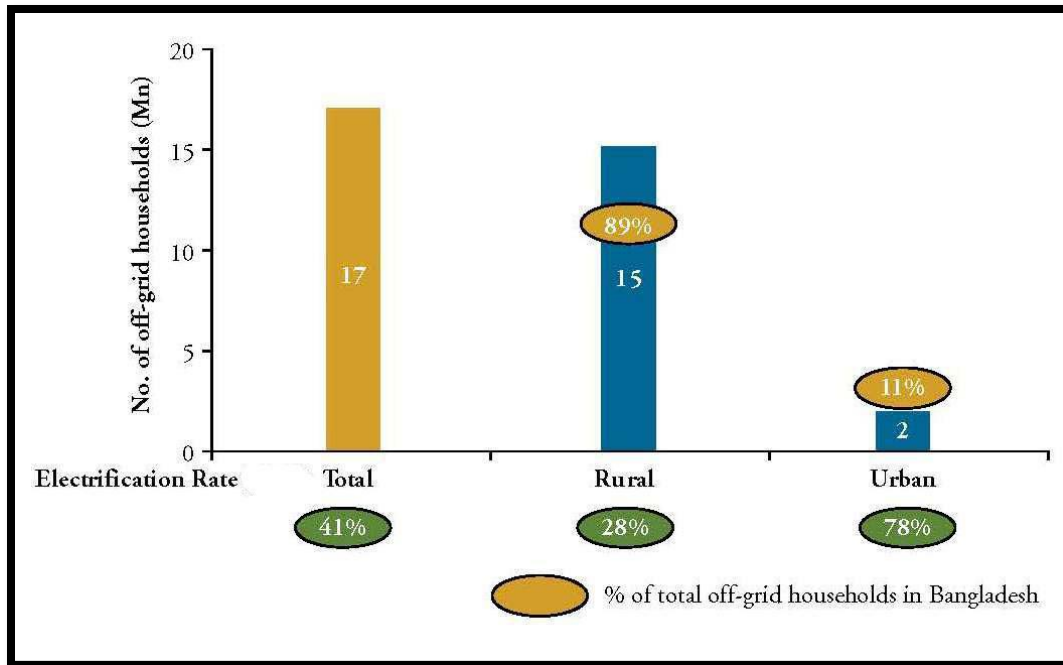


Fig. 1. Solar radiation and area of Bangladesh with highest potential for solar energy utilization.

Rural-urban Distribution of Off-grid households in Bangladesh



- Bangladesh has population of 163 million (or 29 million households)
- Low electrification rate of 41%
- 17 million households off-grid.
- Of the off-grid population, a vast majority (89% or 15 million households) is concentrated in rural Bangladesh

Source: International Finance Corporation (IFC) on February, 2012, published a report named 'Lighting Asia: Solar Off-Grid Lighting, Market analysis of: India, Bangladesh, Nepal, Pakistan, Indonesia, Cambodia and Philippines'.

Common PV Use in Bangladesh

☐ The commonly used solar PV:

- ✓ solar home systems (SHS)
- ✓ solar lanterns
- ✓ solar street lighting systems
- ✓ solar PV water pumping system
- ✓ solar mini grids etc.

☐ SHS Model : Solar Panel, Battery, Charge Controller, Inverter, Lights, Fans, TVs etc.

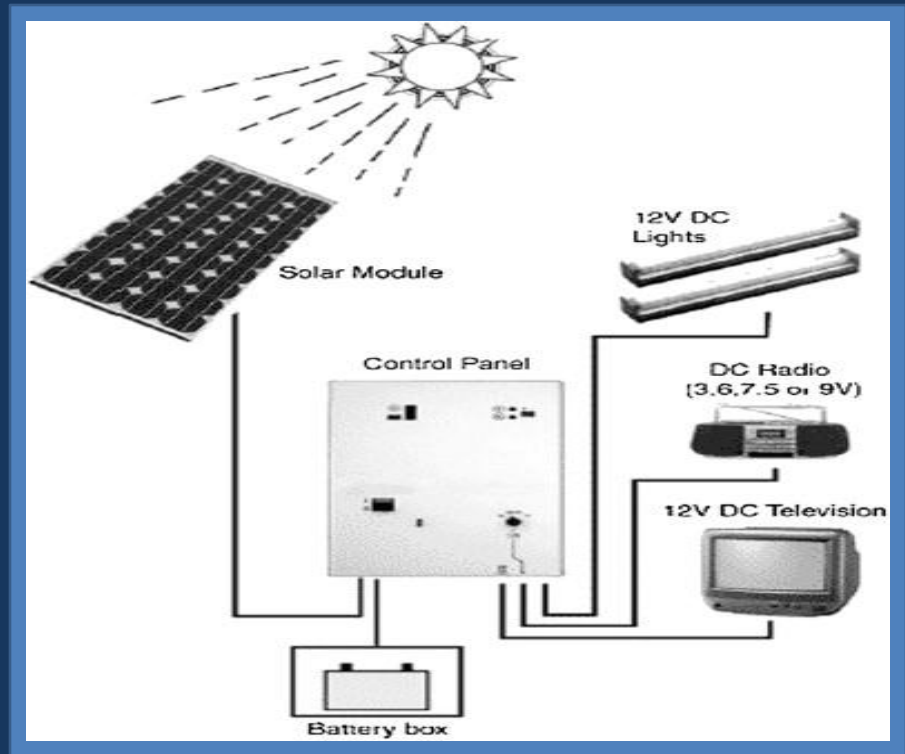


Fig 2: Typical solar home systems configuration.



Rural Electrification: At a Glance

LGED

1. Rural Electrification Board (REB)

Year of Installation : Started From 1993
Number of Beneficiaries: Solar electricity provided to 4220 rural households by June 2007

BPDB

2. Local Government Engineering Department (LGED)

Year of Installation : From 1998 to 2006
Number of Beneficiaries : 4500 direct and about 50,000 indirect beneficiaries.

REB

3. Bangladesh Power Development Board (BPDB)

Number of Beneficiaries : PV system provided to 2944 rural households

IDCOL

4. Infrastructure Development Company Limited (IDCOL)

Year of Installation : Started from 2003 till present
Number of systems installed: 2.4 Million a/o June 2013
Number of Beneficiaries: 12 Million (5 persons/ household on average)

5. Grameen Shakti (GS)

Year of Installation : Started from 1996 till date
Collaboration: GS is a partner organization of IDCOL.. SHSs installed , 1.4 million..

Grameen Shakti

Source: Renewable Energy Information Network, Bangladesh



Schematic diagram of IDCOL SHS Program

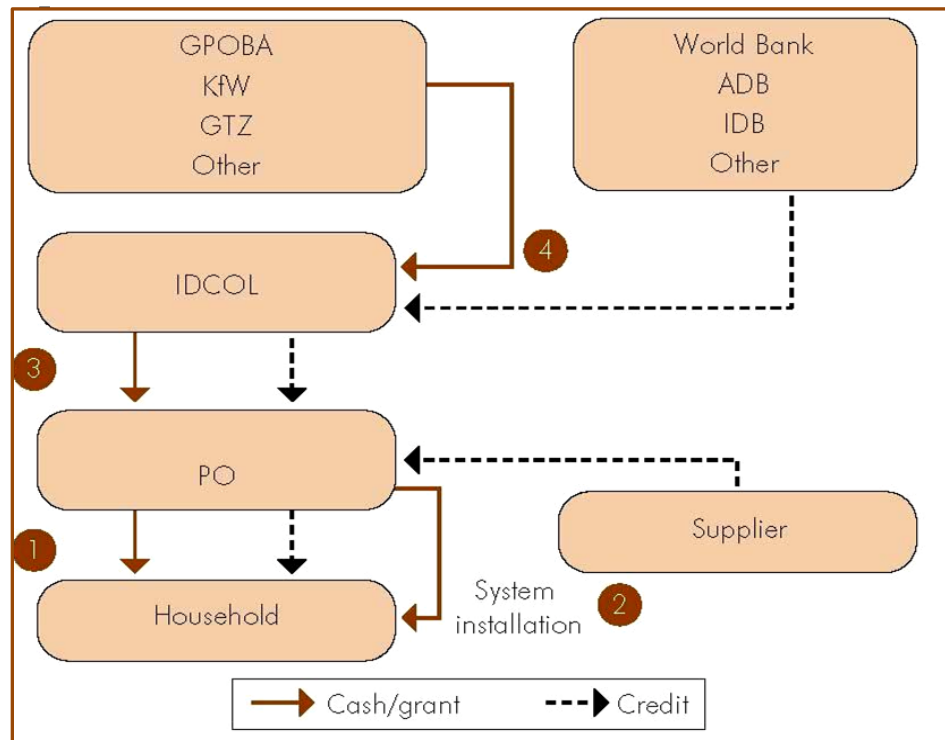


Figure: The Output based SHS Scheme. IDCOL program has been successfully driving the SHS market and accounts for nearly all SHS installations in Bangladesh.

Note: Most NGOs /companies procure components such as solar panels, batteries, charge controllers, lights and assemble SHS such as Grameen Shakti (GS) while few others procure complete systems

Source: OBA Approaches: Output-Based Aid in Bangladesh: Solar Home Systems for Rural Households, April 2012, World Bank. IDCOL presentation at DIREC 2010; Intellecap Estimation and Analysis.

IDCOL: Success till 2013...

- Infrastructure Development Company Limited (IDCOL):

- ✓ Government-owned financial institution
- ✓ mandated to promote private sector
- ✓ financing in infrastructure and RE sector.

- Objective of IDCOL SHS Program is to fulfill the basic electricity requirements in the rural areas of Bangladesh as well as supplement the Government's vision of ensuring access to electricity for all by 2021.

- As of June 2013, a total of 2.4 M (100 MW) SHSs have been installed all over Bangladesh under IDCOL's program. IDCOL has a target of financing 4 million SHS in off-grid rural areas of the country, with an estimated generation of 200 MW of electricity, by 2015.



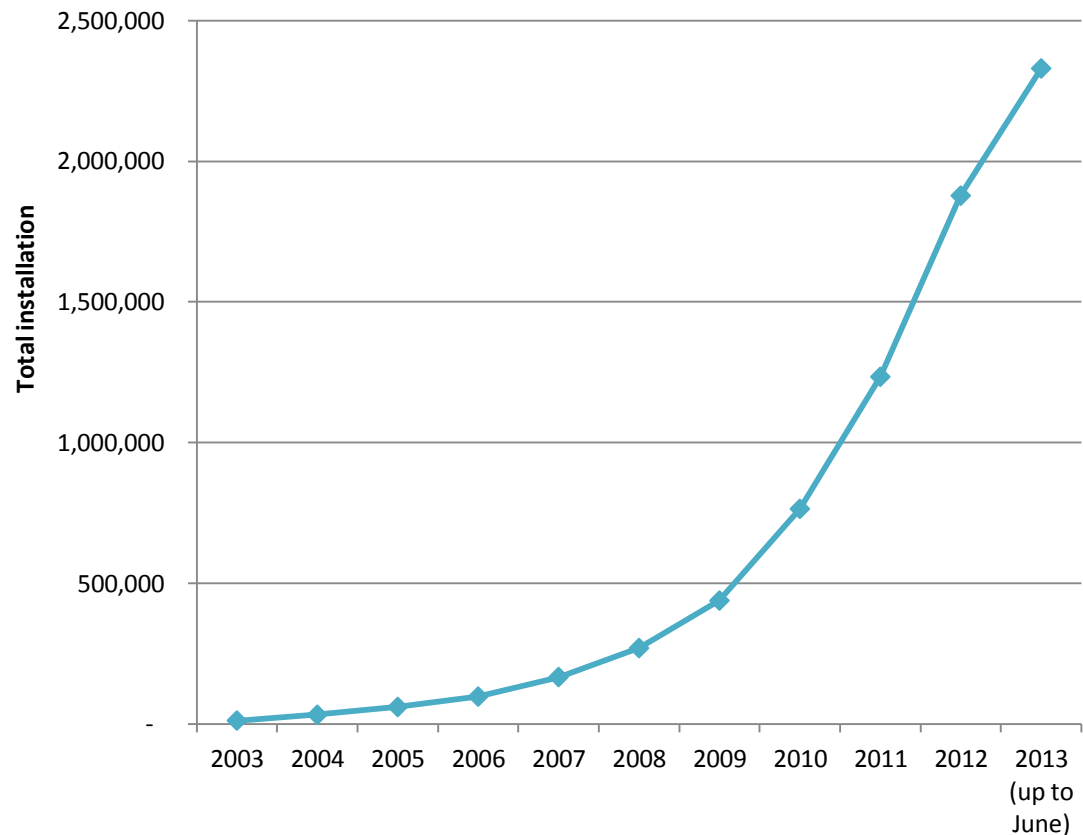
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Growth of Program: SHS Installation in Rural Areas of Bangladesh

1. Since IDCOL entry into the program, the number of SHSs installed stands at 2.2 Million
2. About 98% of the totals SHSs in the country were contributed by IDCOL.
3. The rate of SHS installation by IDCOL was only 12,000 units per month in April 2009 as compared rate of 80,000 a month currently..

Installation of SHS under IDCOL Solar Energy Program



SHS Program Current Status and Future Growth

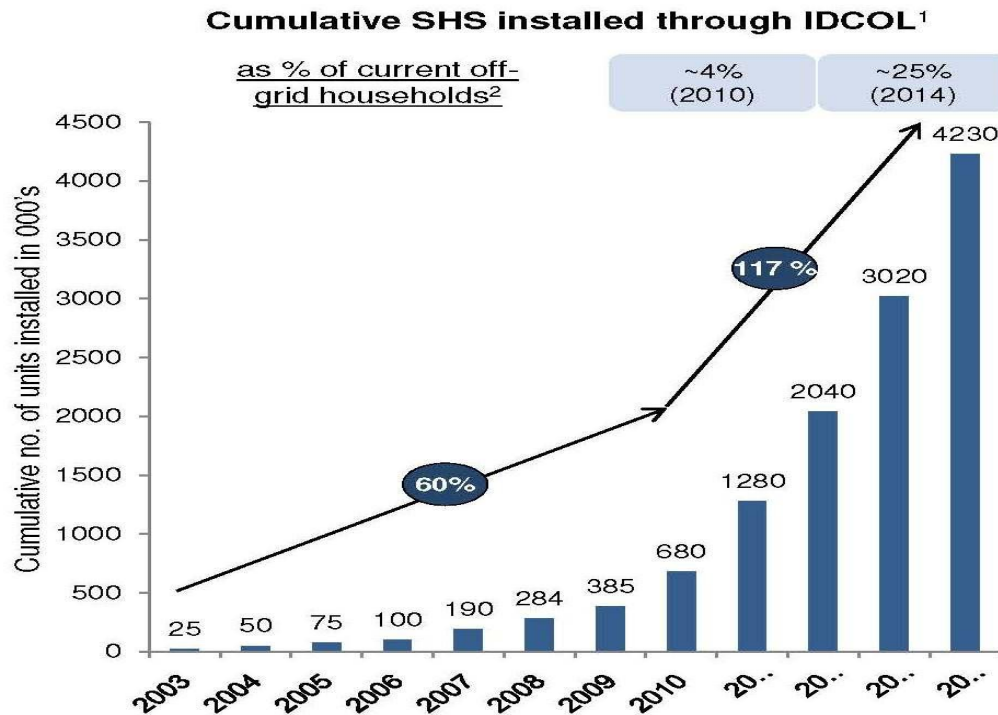


Figure: Cumulative number of targeted installations of SHS till 2014.

Source: Overview of the policies - Bangladesh (RENDEV), IDCOL solar home systems model, Financial model design - Bangladesh (RENDEV), Intellecap analysis.

Sample SHS Packages

Capacity	Total Load	Operating Hour	Cost (in USD)
20Wp	Lamp: 2 (5W each) Mobile Charger: 1	4-5 hours	140
50Wp	Lamp: 4 (7W each) Black & White TV: 1 Mobile Charger: 1	4-5 hours	380
85Wp	Lamp: 9 (7W each) Black & White TV: 1 Mobile Charger: 1	4-5 hours	580
130Wp	Lamp: 11 (7W each) Black & White TV: 1 Mobile Charger: 1	4-5 hours	940



Mapping of Product Features and Prices of SHS

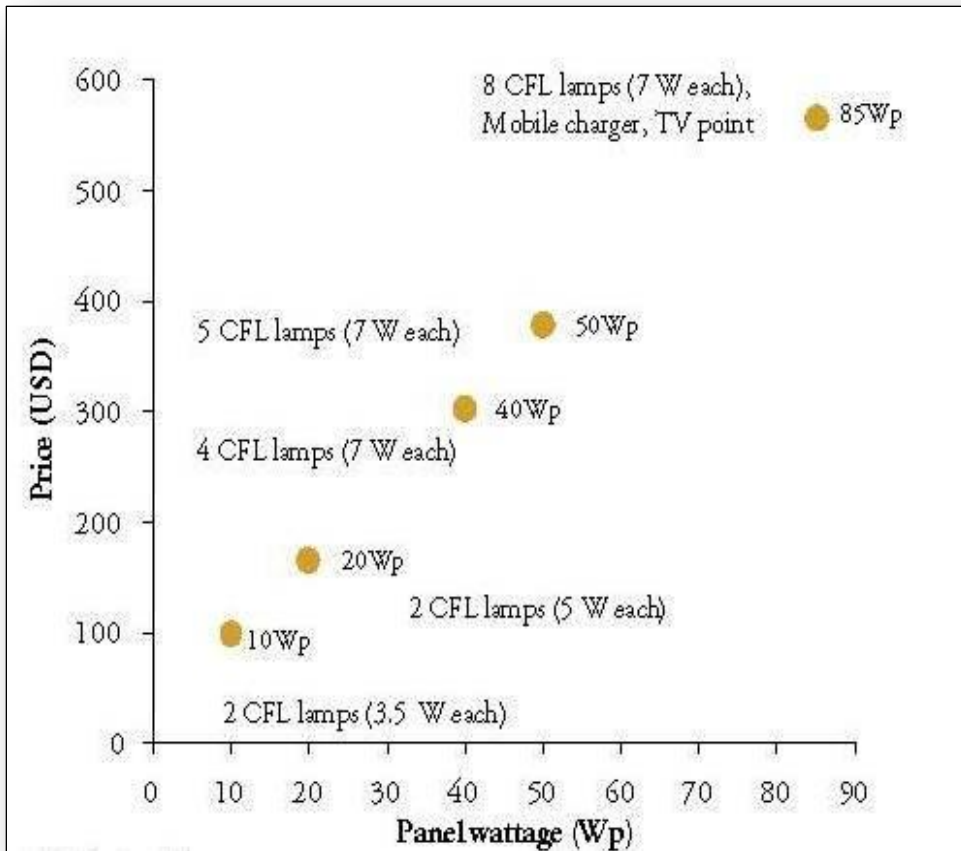


Figure: Mapping of Product Features and Prices of SHS in Bangladesh.

Source: Primary Research, Intellecap analysis.

- 80-85% of the overall sales of SHS are in the range of 20-85 Wp
- 50 Wp systems account for an estimated 35% of all sales.

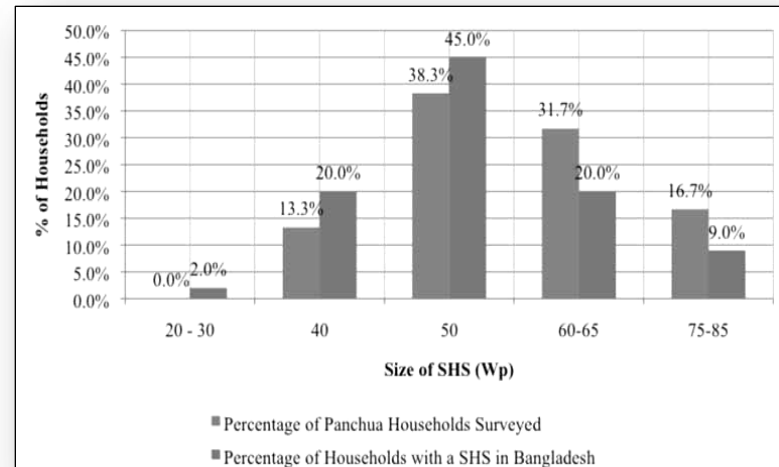
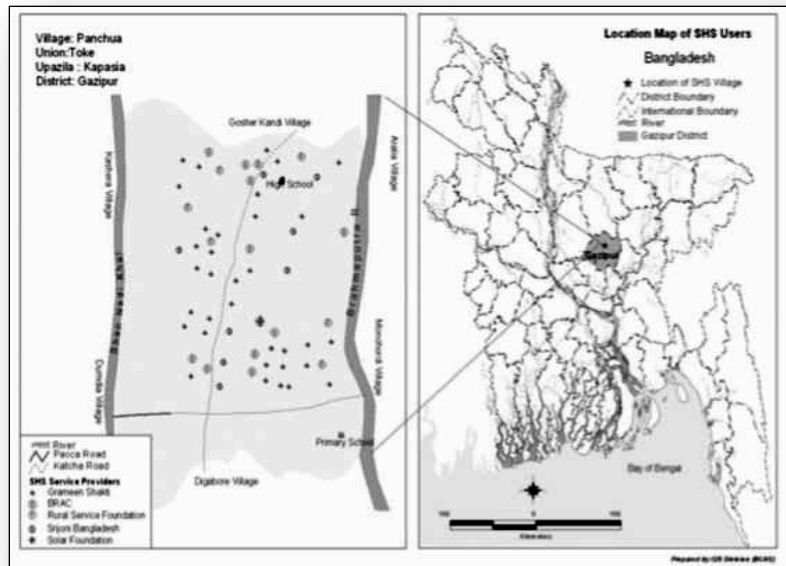


Importance of RERED Program for Rural Areas

- ✓The introduction of Rural Electrification and Renewable Energy Development Program (RERED) on December 31, 2002 was followed by an exponential increase in the number of SHS sold
- ✓RERED lowered the price of SHS by offering subsidies to POs for every system they sold.
- ✓The majority of industry experts believe that the subsidies lowered the price of SHS, thereby increasing the potential market size, boosting sales and causing explosive sectoral growth
- ✓Because of the prevalence of this view, please find the case studies using interview data from 'Panchua Village' in the following section.

Case Studies: Panchua Village, Gazipur, Bangladesh

Breakdown of SHS owners by organization and geographical location of Panchua Village



Comparative breakdown of SHS size in Panchua Village and across Bangladesh

1. Professional researchers from BCAS used these surveys to conduct in-depth interviews with 100 randomly selected households in Panchua Village, Kapasia Upazila, Gazipur District
2. Panchua Village Population: 4,959, Households: 1,042, Land: 1,267 acres , 60 of the households interviewed owned a SHS out of 100.
3. The size of the SHS owned by households is similar to the breakdown of the 320,000 SHS sold under the RERED Program.
4. This study suggests that the similarities between the households surveyed in Panchua Village with national averages to study the SHS sector in Bangladesh.

Case Studies of Rural Electrification in Bangladesh

Three Case Studies: How SHS Has Improved Quality of Life for Project Beneficiaries

- A. Mujib, a 32 year-old shopkeeper,** has seen his income increase by 1,000 Tk/month and his evening business grow since his system was installed 2 years ago. Customers enjoy the TV and the music from the CD player powered by the SHS. Previously, he used candles and kerosene for lighting. The price of kerosene kept rising, he suffered from bouts of bronchitis because of the fumes. The SHS eliminated those problems for him.
- B. Since Hajra, a mother of four,** received the SHS two years ago, she has been able to power five lights, a TV, and a mobile phone charger. Previously, she used kerosene, and still remembers the fumes that filled her house. Now her children can study in the evenings and she can charge her mobile phone to keep in touch with her husband, a laborer in southwest Asia.
- C. Mustafa, who owns a barber shop,** used to borrow power from his neighbor's side connection. He paid 200 taka/month but had no control over it. The SHS installed 13 months ago, has changed his quality of life and his business for the better. His hours are flexible, and he can close the shop as late as 9 pm.



Source: OBA Approaches (April 2012) Geeta K. and Zubair S., World Bank, A Report named 'Output-Based Aid in Bangladesh: Solar Home Systems for Rural Households'.

Financing Method

Cash Sale: Buy-down grant only

Credit Sale: Buy down grant and Refinance

Example: 50 Wp System

SHS cost	USD 380	Financing terms of loans from PO to household	
System buy-down Grant A:EU 30	USD 38.40	Loan (BDT)	USD 290.36
Remaining Cost	USD 341.6	Loan duration	3 years
Household Down payment (15%)	USD 51.24	Total Interest charge (12% p.a. flat)	USD 104.53
Credit to customer (BDT)	USD 290.36	Total household payment	USD 394.89
IDCOL refinance (80%)	USD 232.29	Monthly household Installment	USD 10.97
PO Contribution (20% of loan amount)	USD 58.07		
Institutional Development Grant B : EU 8	USD 10.24		

Sources of Fund for Rural Electrification

Source	Grant		Credit	
	SHS	Amount	SHS	Amount
IDA & GEF	75,000	USD 7 m	566,000	USD 145 m
KfW	372,000	EUR 15 m	-	-
GTZ	158,000	EUR 7 m	-	-
ADB	-	-	100,000	USD 28 m
IDB	-	-	50,000	USD 16 m
Sub-total	605,000	USD 7 m & EUR 22 m	716,000	USD 189 m
Probable sources				
GPOBA	140,000	USD 7 m	-	-
JICA	40,000	USD 2 m	-	-
Swedish CIDA	140,000	USD 7 m	-	-
Sub-total	320,000	USD 14 m	-	-
Total	925,000	USD 21m & EUR 22m	716,000	USD 194 m

Success Stories of Bangladesh

SHS in villages



Many children in the rural areas do odd jobs to help out their parents during day time. Electricity has allowed them to study at night



Women engaged in income generation activity , i.e. sewing



An NGO worker demonstrates how the solar home system works to a group of curious spectators.



Many children in the rural areas do odd jobs to help out their parents during day time. Electricity has allowed them to study at night

Women income

Creating Jobs

Reaching Remote areas

Success Stories of Rural Electrification

Better environment for Study



Work continues till night

Work and shops open at night



Starting New Business



Family entertainment

Starting of new business like mini Cinema Hall



It's time for entertainment. Family members and sometimes neighbors sit together in the evening and enjoy television programs, thanks to the solar home systems.

Family Entertainment

Key Success Differential

Challenges	IDCOL Solar Program
Lack of capacity of the government, private sector and financial sector	<ul style="list-style-type: none">✓ equipped to develop private sector i.e. MFI, NGOs✓ grass-root level network of NGOs as implementation partners (POs)✓ Adequate financial supports provided by donor agencies
Lack of tailored financing package	<ul style="list-style-type: none">✓ Capital Buy-down Grant channeled to reduce system price✓ Institutional development Grant and long-term refinancing are channeled to POs;
High initial cost of solar equipment	<ul style="list-style-type: none">✓ Capital Buy-down Grant reduces system price;✓ Systems are also sold on credit to households to ensure affordability;
Lack of business model	<ul style="list-style-type: none">✓ A social enterprise model is used for implementation✓ Presence of multiple POs in the program✓ A phase-reduction nature of grant is used



Reducing Dependence on IDCOL Subsidies

The need for subsidies to build market volume on the premise that costs will decline as volume increases, due to economies of scale and learning. Subsidies can undermine private investments and business in new markets and should be applied with attention to private-sector conditions in a particular market .

- IDCOL has already reduced the subsidy from US\$ 90 per unit of SHS to US\$ 25. It has plans to eliminate it in next two years. This is not expected to hurt the market growth as it will be offset by a corresponding reduction in the cost of the systems due to the decreasing trend in component prices.

Primary research with POs suggests that a complete phase out of subsidy will not affect growth, it would only increase the payment \$1 in monthly repayments. However, the soft loan facility that has driven consumer financing would be required.

- The policy allows vendors to sell one unit of the system at USD 268 Vs USD 304.
- PV market size of Bangladesh is around US\$ 200 million annually.

Case of Subsidy on the following section.....



Subsidy Plans in Future

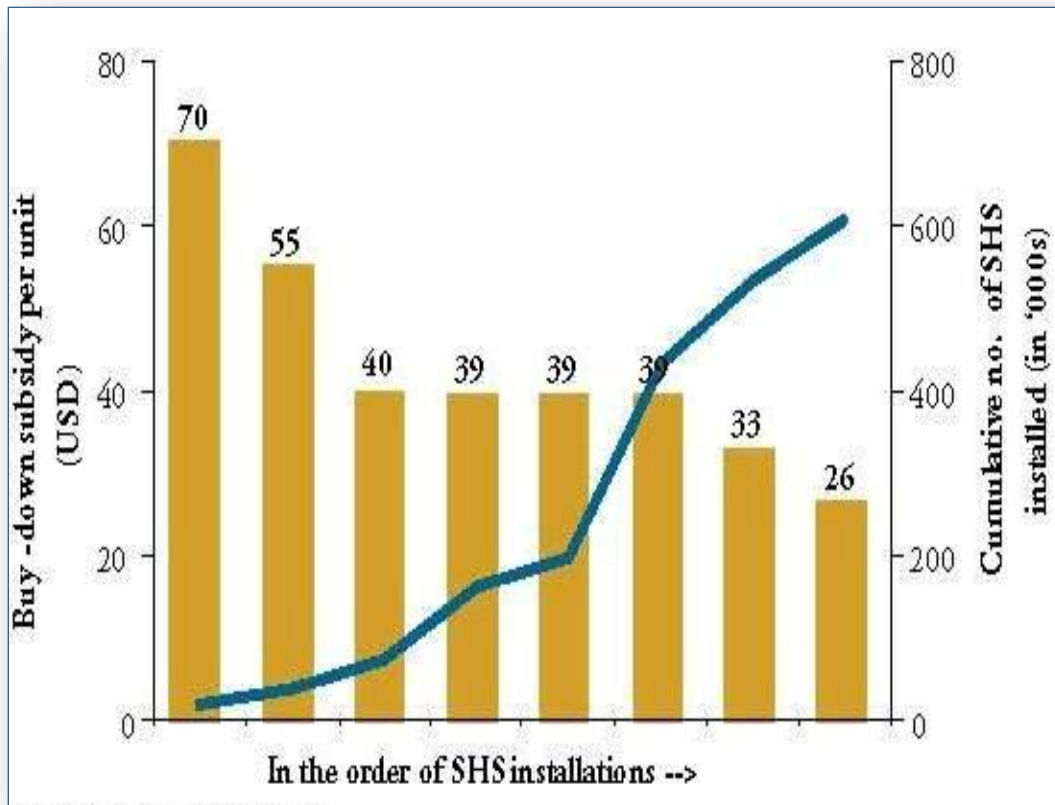


Figure: subsidies provided and the cumulative growth of SHS installed

Source: Primary research, IDCOL, Intelcap analysis

Lesson learnt about reducing subsidies from SHS Program in Bangladesh:

- Subsidies are unlikely to lead to sustainable markets unless they explicitly create the conditions whereby they are no longer needed (i.e., smart subsidies)
- subsidies can be used effectively to build up initial market volume, local expertise, user awareness, appropriate technology adaptation, quality standards, and entrepreneurial activities
- Subsidies are more effective when tied to operating performance rather than investment
- continuing subsidies may always be needed for poorer segments of the population.



Conclusion

The purpose of the presentation is to present the case study and success story of Bangladesh where Solar Home Systems installations has experienced explosive growth and created a \$200 million PV market.

The case of Bangladesh could be replicated and launched in other parts of the world ..

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