Construction of a biodigester in Ethiopia.

Cooking on a biogas-fuelled stove in Cambodia.

Global Status of Household Biodigesters

A status brief from SNV Netherlands Development Organisation on household biodigesters installed in Asia, Africa, and Latin America in 2018. This update was prepared in June 2019.

This brief provides data on the status of household biodigesters in Asia, Africa, and Latin America, for countries in which the SNV Netherlands Development Organisation implemented support.

In many of these countries, SNV's support was terminated while partners (i.e., private sector, government, and donors) have continued developing the sector. In this respect, the following data combines digesters installed with direct SNV support and with support of related follow-on projects.

Due to the absence of reliable data, most biodigesters sold in the free market or by NGOs or local governments through small projects could not be included. SNV expressed gratitude to all partners who provided information for this brief.

Installation rate in 2018

In 2018, over 38,000 household biodigesters were installed in 17 countries in Asia, Africa, and Latin America (see Table 1 on page 18). Almost all these digesters are fed by animal manure and provide two precious outputs: biogas (mainly used for clean cooking) and bio-slurry (a potent organic fertilizer to enhance agricultural production).

Asia delivered most digesters (over 27,000 units), particularly in Nepal, Vietnam, Bangladesh, and Indonesia. Africa surpassed 10,000 digesters, with most units installed in Ethiopia, Kenya, Zambia, and Burkina Faso. Numbers in Latin America are low. Up to 2018, over 868,000 households in 24 countries invested in a biodigester since the start of SNV's interventions in Nepal in the early 1990s. Of this number, about 315,000 units (36 per cent) have been established without SNV support, most of them in Nepal (over 154,000 units) and Vietnam (over 107,000 units).

Investment costs

The investment costs of biodigesters depend on the size of the unit, which is determined by several factors. Table 2 (on page 18) provides an overview of the most popular size of digesters in 14 countries, the investment cost of the most popular size (in local currency and USD), and the investment subsidy provided by the government and / or program, if any. The most popular size in most countries is four or six cubed-metres, comprising the total volume of the digester and gas storage. Niche markets for medium (up to 100 m^3) and large digesters (mostly up to 1,000 m^3) are emerging in countries like Ethiopia, Rwanda, Bangladesh, Nepal, and Vietnam, though numbers are still quite low. Most digesters are still constructed in-situ, using traditional materials, like sand, gravel, and cement, though companies are beginning to bring pre-manufactured digesters to the market in countries like Kenya, Vietnam, and Nicaragua.

Investment costs of the most popular sized biodigester in Asia and Africa range from US$500 to US$800. Exceptions include Nepal, Pakistan, and Nicaragua. In Pakistan, the greater investment cost is caused by the larger size. The higher cost of the

Asia:		
Country	2018	Up to 2018
Bangladesh	2.105	50.374
Bhutan	240	5.239
Cambodia	903	27.757
Indonesia	1.370	23.817
Lao PDR	-	2.888
Nepal	9.574	385.490
Pakistan	45	6.121
Vietnam	13.354	279.049
Total	**27.591**	**780.735**

Latin America:		
Country	2018	Up to 2018
Bolivia	-	50
Honduras	36	40
Nicaragua	317	1.466
Peru	-	26
Total	**353**	**1.582**

Africa:		
Country	2018	Up to 2018
Benin	25	132
Burkina Faso	1.699	11.986
Cameroon	-	355
Ethiopia	4.148	22.574
Ghana	13	17
Kenya	2.139	20.699
Rwanda	?	10.009
Senegal	-	2.287
Tanzania	28	6.570
Uganda	663	8.235
Zambia	1.738	3.394
Zimbabwe	-	97
Total	**10.453**	**86.355**

All regions:		
	2018	Up to 2018
Total	**38.397**	**868.672**

Table 1. The number of household biodigesters installed in 2018 and cumulatively by the end of 2018 in countries in Africa, Asia, and Latin America, where SNV provided support.

Region/country	Digesters installed (number)	Most popular size (m3)	Specification	Local currency (LCU)	Costs: Average investment cost for most popular size (LCU)	Exchange rate (LCU:USD)	Average investment cost (USD)
Africa:							
-Benin	25	4	in-situ	CFA	305.700	553,09	553
-Burkina Faso	1.699	4	in-situ	CFA	310.000	553,09	560
-Ethiopia	4.148	6	in-situ	ETB	15.661	27,43	571
-Kenya	2.139	6	pre-manufactured	KES	67.073	101,28	662
-Uganda	663	6	in-situ	UGX	1.876.040	3.744,01	501
-Zambia	1.738	6	in-situ	ZMW	9.000	11,16	806
Asia:							
-Bangladesh	2.105	6	in-situ	BDT	49.500	83,57	592
-Bhutan	240	6	in-situ	BTN	52.000	67,15	774
-Cambodia	903	4	in-situ	USD	550	1,00	550
-Indonesia	1.370	4	in-situ	IDR	10.749.000	14.500,35	741
-Nepal	9.574	6	in-situ	NPR	109.000	104,37	1.044
-Pakistan	45	15	in-situ	PKR	160.000	110,04	1.454
-Vietnam	13.354	6,5	pre-manufactured	VND	14.000.000	22.942,02	610
Latin America:							
-Nicaragua	317	6	pre-manufactured	NIO	37.646	31,55	1.193

Notes:
1) Exchange rates 2018 by IMF
2) Digester sizing in Bangladesh is based on gas production (2,4 m3/day)

Table 2. Investment costs in 2018 for the most popular size of household digesters in countries in Africa, Asia, and Latin America.

Region/country	2010: Most popular size (m3)	2010: Specification	2010: Average investment cost (USD)	2018: Most popular size (m3)	2018: Specification	2018: Average investment cost (USD)	2018 versus 2010: Cost difference (USD)	2018 versus 2010: Cost difference (%)	2018 versus 2010: Remarks
Africa:									
-Benin	6	in-situ	1211	4	in-situ	553	-658	-54%	size reduction
-Burkina Faso	6	in-situ	808	4	in-situ	560	-248	-31%	size reduction
-Ethiopia	6	in-situ	800	6	in-situ	571	-229	-29%	same size
-Kenya	6	in-situ	947	6	pre-manufactured	662	-285	-30%	pre-manufactured
-Uganda	6	in-situ	741	6	in-situ	501	-240	-32%	same size
Asia:									
-Bangladesh	5	in-situ	488	6	in-situ	592	104	21%	size increase
-Cambodia	4	in-situ	430	4	in-situ	550	120	28%	same size
-Indonesia	6	in-situ	660	4	in-situ	741	81	12%	size reduction
-Nepal	6	in-situ	663	6	in-situ	1044	381	58%	same size
-Pakistan	10	in-situ	505	15	in-situ	1454	949	188%	size increase
-Vietnam	12	in-situ	621	6,5	pre-manufactured	610	-11	-2%	size reduction and pre-manufactured

Note:
1) Digester sizing in Bangladesh is based on gas production (2,0 m3/day in 2010 and 2,4 m3/day in 2018)

Table 3. Investment costs in 2010 and 2018 for the most popular size of household digesters in countries in Africa, Asia, and Latin America.

Region/country	Most popular size (m3)	Specification	Local currency (LCU)	Exchange rate (LCU:USD)	Costs: Average investment cost for most popular size (LCU)	Costs: (USD)	Subsidy amount: (LCU)	Subsidy amount: (USD)	Financing: Net investment by household (USD)	Financing: Share of households financing: in cash (%)	Financing: Share of households financing: through loans (%)
Africa:											
-Benin	4	in-situ	CFA	553,09	305.700	553	257.700	466	87	100%	0%
-Burkina Faso	4	in-situ	CFA	553,09	310.000	560	160.000	289	271	98%	2%
-Ethiopia	6	in-situ	ETB	27,43	15.661	571	7.000	255	316	79%	21%
-Kenya	6	pre-manufactured	KES	101,28	67.073	662	0	0	662	54%	1%
-Uganda	6	in-situ	UGX	3.744,01	1.876.040	501	0	0	501	86%	14%
-Zambia	6	in-situ	ZMW	11,16	9.000	806	1.500	134	672	99%	1%
Asia:											
-Bangladesh	6	in-situ	BDT	83,57	49.500	592	13.500	162	431	62%	38%
-Bhutan	6	in-situ	BTN	67,15	52.000	774	11.700	174	600	59%	41%
-Cambodia	4	in-situ	USD	1,00	550	550	150	150	400	93%	7%
-Indonesia	4	in-situ	IDR	14.500,35	10.749.000	741	9.229.000	636	105	43%	11%
-Nepal	6	in-situ	NPR	104,37	109.000	1.044	24.400	234	811	90%	10%
-Pakistan	15	in-situ	PKR	110,04	160.000	1.454	0	0	1.454	100%	0%
-Vietnam	6,5	pre-manufactured	VND	22.942,02	14.000.000	610	0	0	610	100%	0%
Latin America:											
-Nicaragua	6	pre-manufactured	NIO	31,55	37.646	1.193	15.788	500	693	98%	2%

Notes:
1) Exchange rates 2018 by IMF
2) Digester sizing in Bangladesh is based on gas production (2,4 m3/day)

Table 4. Financing of household digesters in 2018 for the most popular size of household digesters in countries in Africa, Asia, and Latin America.

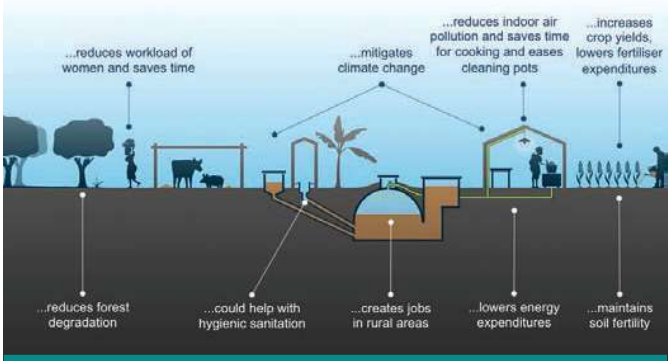

Figure 1. Multiple benefits of household biodigesters contribute to multiple Sustainable Development Goals.

(pre-manufactured) popular digester in Nicaragua may result from the small market (low economies of scale). Table 3 compares the investment costs of household digesters in 2010 and 2018 for 11 countries in Africa and Asia. Companies in Nepal appear to have increased margins to make operations sustainable. This may also be true, to a lesser extent, for other countries in Asia. The average investment of household digesters in Africa was reduced by about 35 per cent.

Financing

An investment of US$500 to US$800 is a major barrier for a rural household, even if the technical lifetime of the digester surpasses 20 years. It may be partially covered by the household through collection of traditional construction materials, like sand and gravel, and / or through the provision of unskilled labour. Some governments and / or programs, like those in Burkina Faso, Ethiopia, Nepal, and Indonesia, provide investment subsidies, lowering the net investment for farmers. See Table 4 for data on the most popular size.

In addition to subsidies, facilities for customer finance are key to market development. Credit facilities have made progress in countries like Ethiopia, Bangladesh, and Bhutan, but not in other countries, despite considerable efforts. In these countries, households are obliged to finance the (net) investment through cash and informal loans.

A new lease-to-own arrangement has been pushed by a limited number of companies in Kenya. Through this, no less than 45 per cent of the 2,139 Kenyan households that have installed a digester in 2018 financed their unit. In Indonesia, 46 per cent of biodigester households in 2018 received full subsidy from central or local government to provide better access to energy.

Multiple benefits

Operating biodigesters provide multiple benefits, as shown in Figure 1, by creating more income, increasing well-being, reducing vulnerability, improving food security, and offering more sustainable use of the natural resource base for small farmers. They potentially contribute to nine of the 17 United Nations Sustainable Development Goals (SDGs). Based on current UNFCCC methodologies, household digesters reduce greenhouse gas emission by three to four tonnes of carbon dioxide-equivalent each year.

Final remarks

Countries vary comparatively and within themselves, making it hard to compare data and information on household digesters. However, further analysis and sharing of results, challenges, and opportunities contribute to useful learning at the global level.

Please contact SNV Netherlands Development Organisation (wvannes@snv.org) for any questions or comments.