

GENDER CHARACTERIZATION OF BIOMASS ENERGY SYSTEMS IN NORTHERN PHILIPPINES

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ABSTRACT

This study sought to characterize the differentiated roles that men and women significantly play over time and space in the biomass energy systems (BES), particularly cookstove and biogas. This mapping endeavor proceeded from profiling the genders and concluded with constructing a spatio-temporal model to illustrate the gender map.

The two sectors are dominated by male, full-time waged employees but o are involved in farming and fishing as an alternative source of income, and have a long experience of involvement in the biomass energy. Socially, most family belong to the high class characterized by ownership of house and lot, permanent dwelling and many household appliances; are Catholic, and generally have positive attitude towards BES. Geographically, the role-players reside in the rural lowlands. They have easy access to roads, transport vehicles and service facilities.

Socio-politically, men are dominantly influenced by many members of the family and other influential persons outside the family in decision-making with regards to BES activities.

There is a contrast in the gender role profile between the cookstove and the biogas systems. The cookstove system is female-dominated, especially in the roles of marketing. In contrast, the biogas system is a male-dominated system, both on the roles of building and utilization. Only one from among the male respondents is a male builder and the rest are male users of the biogas systems. This is so because of the so-called masculine labor that is involved in building a biogas plant. In the cookstove sector, the fabricators and at the same time sellers of the cookstove are all females because their husbands have other jobs, thus, cookstove-making and selling are left to their wives. Children in the family help the mothers/women in the manufacture of cookstoves.

Key words: gender mapping, biomass, spatio-temporal

INTRODUCTION

Gender characterization is a methodology that seeks to understand the distinct culturally and socially defined roles and tasks that women and men assume both within the family and household system and in the community. The tasks that men and women are responsible for can vary in different cultures Gender analysis seeks to assist in planning development activities through improved understanding of these

different gender-specific roles and responsibilities.

Gender analysis seeks to answer questions such as: who does what, when and where in enterprise, off-farm, farm, and household maintenance? Who is most affected by lack of access to energy and why are women and children more vulnerable in cases where there are no energy technologies for cooking?

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Gender characterization is a term applied to what individual women and men experience and the strategies they choose in their daily lives regardless of the norms and policies of society and considering the time and space in which they are confined.

Space and time are two distinct approaches in measuring individual access to opportunities. This space and time acknowledge the importance of gender roles as a key social and spatial constraint for women, constraining their behavior, limiting their activities and confining them to a smaller geographic area than men.

The use of cookstove in the biomass energy sector is also a means to focus on gender issues because it is an intervention that encourages men to start cooking. As a gender specialist from Zambia noted, it is through improving interaction in the household that women's lives are improved. Thus, it is important to create an environment where sons and husbands are encouraged to cook. This way, men can learn to prepare meals, and their wives have more time to do other productive things (Leimbach, 2012).

According to traditional social and cultural norms, women's tasks in the household include cooking, and maintaining a clean environment inside and outside the house. While biogas is women friendly, it also reduces the workload of collecting fodder and fuelwood. Women's work is not valued the same as that of men, but biogas has played a role in changing the lives of women in rural areas. In Nepal, for instance, changes have been brought about by deliberate actions of the Biogas Program, which have benefited both men and women (Shakya, 2012).

However, the different implications of the wider use of renewable energy sources for women and for men have hardly been examined, as research and project reports on renewable energy rarely include gender disaggregated information. The interface of and between men and women's activities, often been overlooked in development and

energy policy generally, are being ignored as well by renewable energy programs. to the extent that the same supposedly gender-indifferent approaches and channels are involved. While the word energy often conjures gender-biased images, the reality is often the opposite of the image (Cecelski, 2000)..

Sustainable energy development should be seen in the light of equitable gender roles. Towards this end, gender characterization is a crucial task; Hence, this study.

The general objective of this research is to characterize the differentiated roles that men and women significantly play over time and space in the biomass energy (BES) systems in Northern Philippines

Specifically, the study sought to:

1. identify roles of key players, men and women in the biomass energy systems;
2. determine the extent of the roles being played in the biomass system processes of fabrication, construction, marketing and utilization;
3. come up with spatio-temporal model that could be structured to illustrate the gender characterization in the biomass energy systems.

Conceptual Framework

Gender is a phenomenon that provides a distinct complexion concerning the disaggregated role being played by individuals in the renewable energy systems. As a phenomenon, it is composed of a layer of sectoral role players made up of men and women doing tasks or involved in activities in particular time and space that are especially tailored according to gender. Like any other sector, the renewable energy sector, is a genderized area in which the characters are manifested in system processes within a layer of systems or subsystems. These system processes are established by the acts of the men and women, which in particular

time and places become comprehensible by their pattern and regularity.

METHODOLOGY

Locale of the Study

This study was conducted in the provinces of Ilocos Norte and Ilocos Sur, both located in Region I in Northern Philippines, where MMSU-Affiliated Renewable Energy Center (AREC) operates.

Ilocos Norte's economy is mostly agriculture-based. Aside from rice, the province is a major producer of fruits, vegetables specifically, garlic and tomato and legumes. Manufacturing has also become a thriving industry in the province where most of the establishments are focused on general contracting, furniture-making, handicrafts and metalcraft. Ilocos Norte also has a booming tourism industry due to its various scenic spots and the presence of an international airport in the provincial capital, Laoag City.

Ilocos Norte is also known for the presence of renewable energy sources, such as windmills in Bangui Bay, known as the first wind power plant in the country and in Southeast Asia. The windfarms are seen as a sustainable energy resource that could help minimize the cost of electricity consumption in favor of the customers.

Seven municipalities and two cities within Ilocos Norte were chosen as the locale of the study where the builders, fabricators, sellers and users of the cookstove and biogas systems came from. These were: Paoay, Pasuquin, Piddig, Pinili, San Nicolas, Solsona, Vintar, Batac and Laoag City.

Ilocos Sur is located south of Ilocos Norte. The people are engaged in farming, producing food crops, mostly rice, corn, vegetable, root crops, and fruits. Non-food crops include tobacco, cotton, and tiger grass. Cottage industries include loom

weaving, furniture making, jewelry-making, ceramics, blacksmithing, and food processing.

Ilocos Sur has their own programs to boost renewable energy in the province. One of these is the biomass power plant in Santa, Ilocos Sur. This project targets the area as a hub for renewable power and complements the wind power plants already in the region. The addition of biomass projects will spur further development of renewable energy sources in the area as it continues their march towards reducing their dependence on fossil fuels over time.

Three municipalities and one city were chosen as study sites: San Juan, San Vicente, Sinit and Vigan City.

The Research Design and Respondents

This study used a cross-sectional survey research design. Respondents of the study were of the 40 fabricators, contractors, sellers and users of cookstove and biogas systems in the areas covered by the DOE-MMSU-AREC.

Table 1. The distribution of the respondents by place of origin

MUNICIPALITY	POPULATION
<i>Ilocos Norte</i>	
Paoay	2
Pasuquin	2
Piddig	1
Pinili	1
San Nicolas	3
Solsona	1
Vintar	2
Batac City	22
Laoag City	1
<i>Ilocos Sur</i>	
San Juan	1
San Vicente	1
Sinit	2
Vigan City	1
TOTAL	40

An interview schedule was the primary instrument developed and used in gathering the primary data. A set of structured questionnaire was prepared to serve as a guide for interviewers or researchers in collecting information or data. The schedule was used to fill in the questions with the answers received during the actual interview. A focus group discussion with the respondents was also done in coordination with the Local Government Units, the village leaders in areas where AREC operates to discuss what the research in gender characterization in biomass energy sector was all about. This was done to gain an in-depth understanding of the program and was used to obtain data from a purposively selected group of individuals.

RESULTS AND DISCUSSION

This study tried to generate the gender characterization in the biomass energy sectors in northern Philippines. Along this characterization, the study attempted to profile sectors in terms of socio-cultural and economic characteristics, attitude towards gender role, physico-geographic environmental features and socio-political characteristics.

Socio-cultural Characteristics

Gender. There are more males (52%) than females (48%). The predominance of males, though not so

numerically great, suggests the derived implication above on the contrasting involvement of men and women in BES on the level of physical exertion and use of sophisticated materials and equipment required in system processes which is still a male attributed role in Philippine culture and society.

Age. Biomass users are concentrated to the middle (47%) and old-aged people (52%). Their mean age is 51.7 years – generally the age when a person is most active and therefore, should be more productive, as stated by Caluya (1994).

Educational attainment. The BES role-players, male and female, have high level of education, and either have gone to college, still pursuing a degree, or have graduated. The remaining 10% have either a secondary (7%) or primary (2%) education. These figures suggest that BES has a certain characteristic that encourages or motivates the educated people to invest, engage and use BES. This characteristic could be the rationalization to appreciate the significance and the process involved in BES, as explained by Caluya (1994).

Social class. In this study, social class was indicated by a 4-point criteria (type of house, ownership of house, lot ownership and ownership of appliances), and a graduated scale of 1-9 points. Based on this, majority of the respondents, male and female, were classified as belonging to the

Table 2. Frequency distribution of the respondents and their involvement or role in the biomass energy sectors

RESPONDENTS (N=40)	MALE		FEMALE	
	FREQUENCY	PERCENT	FREQUENCY	PERCENT
Biogas				
Contractor	1	2.50		5.00
User	7	17.50	2	
Cookstove				
Fabricator/seller			3	7.50
User	13	32.50	14	35.00
TOTAL	21	52.50	19	47.50

high social class. Almost all of the respondents have a permanent house, (92%), with the rest having temporary dwelling (7%). Moreover, thirty-eight (95%) own the house while two (5%) are renting. They also own the lot where their houses are built (95%) except for the two respondents (5%) who are still renting. For the household appliances owned, eighteen respondents (45%) have an average number of appliances while twenty-two (55%) have many. Twenty five (63%) own a vehicle while fifteen (37%) have low level of ownership.

Experience in biomass. Majority (55%) of the respondents, male and female have relatively long (means = 2.35 years) experience in biomass. A quarter (25%) of them have an average experience while the rest (20%) have short experience. Between them, the males have longer experience than their female counterparts.

Socio-economic Characteristics

Nature of work and source of income. Half (50%) of the gender role

players in the biomass energy sectors are full-time waged employees that have jobs outside of the BE sectors. Their engagement in the BES is only a case of part-time business. While most derive their income from wages, the rest have it from farming/fishing (9%), non-farm activities (6%) and pension (4%). Their mean annual gross family income is relatively high at P323,815.00.

Gross annual family income. Comparatively, the men and women do not have distinct differences in terms of these indicators. In terms of the nature of work, there are more men than women, although the difference is only small. Farming and fishing, though, is a men-dominated work.

Like in the nature of work, the same is observed with respect to amount of income. Men have a mean annual income, the amount of which does not vary much from the income of the women.

Attitude towards gender role. Both the men and women in the BES are sensitive

Table 3. Frequency distribution of respondents based on their personal characteristics

PERSONAL CHARACTERISTICS	MALE		FEMALE	
	FREQUENCY	PERCENT	FREQUENCY	PERCENT
Age				
Young (37-49 yrs old)	8	38	4	21
Middle (50-62 yrs old)	7	33	4	21
Old (63-73 yrs old and above)	6	29	11	58
Mean age = 51.7				
Educational Attainment				
Elementary	1	5	0	0
Secondary	7	33	0	0
College and above	13	62	19	100
Social class				
Low (1-3 points)	2	10	0	0
Middle (4-6 points)	14	66	15	80
High (7 points and above)	5	24	4	21
Experience in biomass				
Short (3-9 yrs)	5	24	5	27
Medium (10-16 yrs)	12	57	10	52
Long (17-23 yrs)	4	19	4	21
Mean experience = 2.35				

to the roles that gender plays in activities and concerns that are related to managing renewable energy systems. Being sensitive, not only scored negative on the negative comments but synchronically adaptive as well to the attitudes supportive of BES. Across the 25 attitude statement–measures both genders scored high and positive 17 out of the 25 with a grand mean score of 1.3. However, the female respondents had slightly more positive (Mean score = 1.2) attitudes than their male counterparts (Mean = 1.4). Synchronically, both men and women disagree that “women are only for the home” (85% and 90% disagreed respectively), and “just be followers” (76% and 84% respectively). “Women are less career-motivated” (77% and 90%, respectively), and “women tend to give-up more easily (57% and 73%, respectively). On the other hand, both agreed that: “men are more interested in high/modern technology and have greater mechanical aptitude” (76% and 66% respectively). Women (90%) disagree that they are “less career motivated” and disagree as well (73%) to “tend to give up more easily.

Physico-Geographic Characteristics.

The primary target of the DOE-MMSU-AREC program on BES are the rural areas,

thus most (63%) of the respondents, men and women, reside in rural locations. On the other hand, 37% of them reside in the urban area. Majority (85%) also reside in the lowlands/flatland with the rest in hilly (10%) and mountainous (5%) areas. Given their residential location, the residence of the majority of the respondents (75%) are easily accessible. Some (20%) consider their place as moderately accessible while only (5%) considered access to their place to be difficult.

Socio-Political Characteristics.

Both men and women respondents had a number of sources of authority influence both within the family and outside of it. Between them, the male respondents tended to have more family members who had influence on them. The same is the case with the influential persons outside of the family. In the case of the female respondents, the influence of other family members in terms of person-member is also noticed. However, outside of the family, the number of influencing persons is less. This observation, although indirect, points to the presence of persons within and outside of the family who may bear influence on the respondents in relation to activities in the BES.

Table 4. Physico-geographic environmental features of the place of the respondents

PHYSICO- GEOGRAPHICAL AND ENVIRONMEN- TAL FEATURES	MALE		FEMALE		TOTAL	
	FREQ	PERCENT	FREQ	PERCENT	FREQ	PERCENT
Geographical description of place of residence						
Category						
Rural	12	57	13	68	25	63.00
Urban	9	43	6	32	15	37.00
Classification						
Mountainous	2	10	1	5	3	7.50
Hilly	3	14	0	0	3	7.50
Flatland	16	76	18	95	34	85.00
Accessibility condition						
Easy	13	62	16	84	29	72.50
Moderate	5	24	3	16	8	20.00
Difficult	3	14	0	0	3	7.50

Involvement/Role of Men and Women in the Biomass Energy Sectors

There is a contrast in the gender role profile between the biogas and cookstove systems. The biogas system is a male-dominated system both in the role of building (2.5%) and utilization (17.5%). In contrast, the cookstove system is female-dominated in the roles of fabrication and marketing (7.5%) and utilizing (35%).

Only one (2.50%) from among the respondents is a male builder who is involved in biogas system. This is so because of the so-called masculine labor that is involved in building a biogas digester. While there were seven (17.5%) male users, there were only two (5%) female users, including members of an all-female sectarian organization who are assisted by males as utility workers and operators in the biogas system.

In the cookstove sector, there were three (7.50%) females who played the dual role of fabricators and being sellers. However, children in the family, males and females are helping their mothers in the manufacture of cookstove. The utilization of cookstoves is almost equally spread among men (32.5%) and women (35.0%).

The apparent contrast of the role played by men and women between the two sectors suggests physical exertion as well as the use of sophisticated materials and equipment in fabrication/construction of determinant factors.

Space (Distance). Space was measured by distance in kilometers where the respondents frequent everyday. Since majority of the respondents are very near the feeder roads (95%) and barangay roads (85%), also, they could be accessible to bus stations and terminals (42%) and markets (65%).

Moreover, the study attempted to map-out the places where the respondents go to when they associate with fellows. The purpose of this is to establish a link between

gender roles performed in the BES and the respondents' association with other men and/or women. Both men and women respondents go to office, church, market, farm, barangay hall, and their neighbor's house due to the inherent function of these places, i.e., worship in church, work in office, buy goods in the market, etc. The tendency was for the males to associate more with other males than with the opposite sex. Interestingly, the female respondents in terms associate equally with men or women. These trends suggest that a symmetric (male-to-male) association is seen among the male respondents, while it is liberal among the females.

Gender Characterization in the Cookstove Energy Sector

Gender characterization in the cookstove energy system can be done in two cookstove fabrication types, the oven clay and open area. Oven clay fabrication entails "firing" through an oven to harden the materials. Open area fabrication simply requires hardening of the fabrication materials in an open area with a minimum number of hour firing and partial sun-drying.

Cookstove Fabrication

Time and Space. The 16-process tasks in fabrication are: taking-out/preparing place/materials to be used, hauling measured materials, mixing all the materials, mold/form/design, carrying to the open area, checking/monitoring the area, hauling the molded clay to the cart, travelling to Nagrebcan for the clay oven fire, hauling from the cart to the oven/ikalso, (kill-dry) firing, monitoring the fire, guarding the clay/cooling-off, checking on the oven-formed clay, preparing/cleaning the display area (home), hauling the molded clay to the cart, then traveling back home for displaying the cookstove.

In the spatio-resource recovery analysis in cookstove fabrication, while there are two methods involved in cookstove fabrication, the oven clay and the open fire, they differ in the time spent, in cooking and

travel time. Majority of the activities involved both women and men except for transporting by cart to Nagrebcan (3km away) and firing to cook which are activities that involved men. However, while men travel to the area of destination to prepare the oven to fire and cook, women are left behind to prepare the foods and bring them to the field/area for their husband's meal..

It is really in the fabrication of cookstove where major roles for men was observed. This is so because of the physical activities that only men could do. *"Dagijay latta nokua annak mi a lallaki ti ag-pala ken agibukbok ti taep"* (It is our male children who will just carry and put the rice hull) said the respondents. *"isu da pay ket latta nokua ti mapan gumatang ken agpala ti taep ken para bagkat a mapan agi-bilag dita nga area"* (they are the ones who will just buy, shovel the hull from the stock and carry them to dry in the area) (.10km), says the others.

All the materials used in cookstove fabrication are ordered and delivered from suppliers to the mixing area, except for the rice hull which are being bought to the nearest milling station, with a distance of more or less one kilometer away from the field of activity and with twenty-minute travel by cart.

The male members of the family transport the molded clay to the oven clay area in Nagrebcan (3km away from their house). There, they arrange the cookstove at the pit ready for firing. As the firing goes on, they monitor every bit of the activity for ten hours, and let it cool down for two days to ensure the quality of the cookstove. They spend the night in the area to safeguard the products. While cooling down the cookstove, the time spent by the two genders in checking on the pit-cooked clay and in preparing the area for display has a big difference (Figure 6). On the fourth day, with a minimum assistance from females, the males do the majority of hauling the molded clay to the cart and travel back to the display area.

Cookstove Marketing

On the other hand, the five process tasks in marketing are: pricing, monitoring, contacting customers, disbursing, and, marketing/ selling.

Results of the study indicate that cookstove selling is a women's domain and all the activities in selling cookstove are women's. These sellers do the pricing, disbursing, promotion of products, and contacting customers. The three fabricators of cookstove are at the same time, the sellers of their own products. They monitor their product and command the price. Women do most of the major roles in selling.

Cookstove Utilization

The cookstove users' profile can be seen in Table 1. Of the respondents, 13 (32%) were males (32%) and 14 (35%) were females.. Majority, (67%) of the cookstove users are using firewood, while 24 (60%) use charcoal and 17 (42%) use twigs. Nine respondents (22%) use scratch paper.

Gender Role in Cookstove

Majority of the males use the cookstove for cooking. From purchasing (52%), operating (20%) to caring and maintaining (18%), the major activities for man could be observed. The study showed that men did the pre-activities in cookstove utilization like gathering of firewood and twigs, men do these activities. Charcoal is carried near the cookstove by men Reasons culled from the respondents during the interview include: the cookstove is too heavy

Table 5. Biomass being used in the utilization of cookstove

BIOMASS	FREQUENCY	PERCENT
Firewoods	27	67.50
Twigs	17	42.50
Charcoal	24	60.00
Scratch paper	9	22.50

for women to carry; the cookstove is too messy when cooking; and women cannot stand the smoke, among others. It is only during the time when the cookstove is already fired and is producing a steady heat when the women come in and assist in maintaining the supply of firewoods.

Gender Characterization in the Biogas Energy Sector

There are nine biogas users in the MMSU-AREC area: seven males (78%) and two (22%) females. All the biogas users (100%) are using waste from the swine. While this waste is the most common material in the biogas, one (11%) is also using poultry waste and one (11%) from large animal wastes.

Temporal element in the utilization of biogas

Building a biogas plant is a man’s domain, and they spend about more than 12 hours a day for a week until it is installed. Activities involved are pre-building arrangements, readying construction facility, operation, and caring and maintenance. Women are involved in decision and pre-planning activities which consume minimal time (less than 2 hours). When men are 100 percent involved in putting-up the biogas system , woman prepare food and snacks for the builders.

Biogas Fabricators/Contractors

Majority (77%) of the activities in biogas use involved males. While there are

two females (22%), the sectarian convent and the respondent whose husband is abroad, still, the operation of the biogas lies in the hands of the males. Most of the biogas owners are experts in building, analyzing and reviewing the situation and whose expertise are construction because of the nature of work and the education they obtained. During the interview, respondents claimed that their wives are the ones in cleaning the surroundings of the biogas system, and bathing the swine whose waste goes directly to the biogas tank/cubicle.

CONCLUSION

First, the research results show that biomass energy system is composed of gender role players dominated by people who are highly educated, waged earners in their prime or late prime ages with positive attitude towards characterized gender roles, belong to the upper social class and surrounded by persons with authority influence from within and outside of the family.

Second, the results convey the clear differentiated role of men and women in the BES where the relatively light, simpler and easier tasks are done by females while the physically taxing and more complicated process tasks are assumed by the men.

Thirdly, the differentiated role that men and women does in the BES are framed along time and space considerations. Women play their role along with and in direct consonance with the chores they perform at home. Men play their role without special consideration to time and space but the women do. Women tend to play more their roles in the BES when the required and needed time for this is adjacent or near from their performance of their household chores. Some tasks in the BES are done by women at particular hours and frequency during the day to complement the work-hours for domestic chores. However, when the women are busy with such chores at particular hours, BES tasks are scheduled for some other time distant from the time household jobs are

Table 6. Biomass being used in the biogas system.

BIOMASS	FREQ*	PERCENT
Swine	9	100.00
Poultry	1	11.00
Large animal	1	11.00

*-multiple response

performed. Combining together the differentiated roles that men and women play in the BES and the time and space contexts that roles are played can be framed through a conceptual model by way of a system of interconnected propositional statements, thus:

1. Gender roles played in the BES are differentiated by the type of system where men and women are actively involved.
2. The BES in themselves are constituted by processes and activities requiring varying levels of complexity and requirements for the physical indulgence of men and women.
3. Complexity requirements and degree of physical indulgence in a particular BES delineates the kind of processes and activities where either or both men and women are involved.
4. The less complex and less physically taxing process – tasks are performed by the women; men are more involved in the more complex and physically taxing process – tasks.
5. Besides complexity and physicality of tasks required, time and space also condition the role played by men and women along the many processes and activities in the BES.
6. Process – tasks that are less complex and less physically demanding, are done more by women when the time required to do such tasks is adjacent to or in time with the performance of household chores whereby doing the two type of tasks could be complementary.
7. Tasks complementarity is limited by the extent and volume of the household work done by women, whereby, if full and BES activity cannot be accommodated, process – tasks in the BES are undertaken in such other, usually, distant areas from the performance of household chores.
8. Space or location where process tasks are performed also conditions when women play their role in the BES. The nearer and more accessible the place

where the process – tasks are performed, the more that women tend to be involved.

RECOMMENDATION

The following are recommendations based on the findings and conclusions of the study:

A. For policy makers

It is recommended that policy makers underscore the need to adopt gender sensitive development programs and projects planned for biomass utilization. This should not only intend to increase cash income or production but will draw both gender in to meaningful and active participation. Both genders should be encouraged into meaningful and responsive development works in the cookstove and biogas sectors. Promotions for this sector should not be based on the stereo-typing on the gender roles but rather on the will of targeting a responsive development project goal for both genders.

There are indications that development works that fail to take into account the traditional gender structure cause more burden on both. Frameworks for development works should have a gender-sensitive plan – that is, both should not only be involved in development works but to become significant or meaningful partners – emancipated partners in project goal, specifically in the biomass sector.

B. For researchers and extensionists

Since this study was conducted in a short span of time, similar investigations need to be conducted in other areas, aside from MMSU-AREC areas, to explore on the generalization of the results of the study.

Inclusion of other variables that were not included in the present study, that may affect activities of gender roles, can also be considered.

Conduct of a comparative study on gender mapping is likewise recommended in other sectors like agriculture and fishing industry or gender mapping in the so-called men's or women's world.

Other recommendations based on observation:

1. With the number of respondents, it is assumed that there is a lack of awareness on biomass, especially on the biogas sector. There is a need to widen dissemination as regards biomass use and the benefits derived from it.
2. Users should be aware that the biogas system can also be used for some other energy-generated purposes like putting on the light and other direct heating application.
3. Swine raisers in the urban-compact communities should put up a biogas system for a healthy environment, and for cookstove users, as long as biomass resources are available in the locality and within the area, cookstove use is not only economical, it can also help in the cleanliness of the surroundings and environment.

For the biogas builders to encourage others to promote the industry in which way, biogas use will be advertised.

While building a biogas is also expensive, the result is worth the cost. It is environment-friendly because of the wastes that go directly to the cubicles for gaseous activity, it is safe and no expenses will be incurred in cooking and other energy-needed activities.

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