Biogas innovation processes and innovation system: lessons from Davao del Sur, Philippines

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Biogas Innovation Processes and Innovation System: Lessons from Davao del Sur, Philippines

Joan Decenilla Gervacio [1 +], Chris J. Garforth [2]

[1] University of Southeastern Philippines, Apokon, Tagum City

[2] School of Agriculture, Policy and Development, University of Reading, PO Box 237, Reading RG6 6AR, UK

Abstract. This paper examines biogas innovation system and processes in two farming communities in Davao del Sur, Philippines. Innovation histories were traced through workshops, semi-structured interviews, observations and document analysis. The paper shows that there were diverse innovation actors both from public and private sectors. Restrictive attitudes and practices resulted in weak and limited interactions among actors. Multi-actor interaction was weak, signifying a lack of innovation actors that focus on creating, developing and strengthening linkages, networks and partnerships. The lack of support in the socio-organisational institutions that constitute the enabling environment within which innovation actors operate may lead to systemic failure.

Keywords: Innovation processes, Innovation system, Biogas technology

1. Introduction

Livestock production in urban settings faces problems and is being increasingly regulated, worldwide. The present bulk of swine production alone exacerbated by inadequate and ineffective waste management practices, has resulted in a burgeoning controversy surrounding environmental and public health effects [1-4].

In the Philippine setting, pig rearing is a very popular enterprise. The country's swine inventory during the decade 2000–2009 was estimated at 12.4 million heads, and accounted for 81% of the total value of livestock production and 10% of the gross value of agricultural output. Prevalently, 74% of these hogs are raised in backyard farms while 26% are in commercial farms [5]. The popularity of backyard pig production in the country implies how significant this enterprise is for the smallholders. However, 80% of the backyard and commercial farms dispose of their wastes in nearby creeks and rivers [6], resulting in severe environmental dilemmas such as river death and water contamination as well as health problems linked to exposure to malodours and emergence of more disease vectors.

One of the many technical options used to minimise pollution from swine wastes is the construction of biogas digesters to generate and capture methane gas. This technology appears to offer a win-win solution to producers, by not only improving if not totally eliminating malodour, while at the same time producing two useful products - the gas and the compost which could be used as fertilizer.

This papers deals with the questions on how biogas technology become available to suburban swine producers in Davao del Sur, Philippines. It identifies the key actors and their roles in biogas agricultural innovation processes and innovation system. It also examines their attitudes and practices, their patterns of interactions as well as the outcomes of their interactions. Lastly, it also examines the enabling or disabling institutional environments in biogas innovation systems. This paper hopes to bring a wider understanding on the communication and interaction which inform and support farmers' innovation processes.

2. Conceptual and Analytical Framework

The conceptual framework in this paper is anchored on the propositions of Leeuwis and van den Ban [7] that, to bring about change and innovation, there is a need to balance new technical and novel social organisational arrangements. In recent innovation thinking, it has been said that to gain deeper understanding

[+] Corresponding author. Tel.: +447976233622
E-mail address: joangervacio@gmail.com

about innovation entails looking at it as a system, describing and interpreting what happens around innovation processes and looking at them as multidimensional, complex and 'continuing' interactions between numerous actors/organisations. However, the literature on agricultural innovations in the Philippines suggests that the pressing problems facing the country's agricultural research-extension-development system could be due to the failure to look at these dilemmas as systemic failures. Therefore this paper attempts to understand whether the function (or dysfunction) of these components contribute to the success (or failure) of innovation processes.

To understand these components, this paper follows the analytical framework based on the lists of diagnostic assessment framework proposed by World Bank [8]. It examines four main components: (a) the main actors and their roles, (b) attitudes and practices of the main actors, (c) patterns of interaction, and (d) enabling environment for innovation and uptake.

3. Field Research

This paper relies on data collected from innovation histories traced through workshops, semi-structured interviews, observations and document analysis in two farming communities in Davao del Sur: Digos and Bansalan. RAAKS toolboxes (e.g. windows A2 used identifying relevant actors and A3 for tracing diversity in actor objectives) [9] and Actor Linkage Matrix or ALM developed by Biggs, Matsaert et al [10] were used to aid data gathering. A total of three workshops were conducted, attended by eight farmers from Digos and 13 farmers from Bansalan. Interviewees comprised 13 farmers in Digos, 12 farmers from Bansalan, 10 and 7 other potential innovation actors in Digos and Bansalan respectively. NVivo and UCINET's Netdraw were used to facilitate data management and analysis.

4. Discussion

The following discussions are laid out based on the analytical framework employed in this paper stipulated in section 2.

4.1. Main Actors and Their Roles

Contrary to what was traditionally believed, farmers in this case study were not just passive receivers of technologies. These farmers have become the agents of their own development, and therefore the existing scenario has denied the traditional thinking that they were objects of somebody else's development process.

Data from both research locations show that farmers were taking initiatives to seek solutions to their problems. It was a search for a solution to the problem that led farmers to contact people to help them, not as a result of a technology promotion by government or other agencies. This scenario shows that the initial conditions that shaped biogas innovation system in Davao del Sur reflects an 'opportunity-driven trajectory' [8]. The pivotal actors (the technology/sector champions) were the private sectors mainly the farmers, who were initially assisted by input suppliers. It was also observed that biogas use and adoption of each farmer vary in terms of layout, scale, and application. These farmers installed bio-digesters with modifications/adaptations to suit the layout and scale of their piggeries. Röling [11] calls this as 'farmer-driven innovation' in which farmers develop innovations and test whether or not these will work well in their environment.

The data further show that there is an interesting mix of individuals and organisations involved in biogas innovation processes. Communication networks and contacts are seen as significant in identifying sources of information and continuing support in terms of coordination and cooperation (e.g. initiatives in advocacy, mobilisation and lobbying), production inputs, and financial services.

4.2. Attitudes and Practices of the Main Actors

Farmers in this case study engaged themselves into various trial and error processes. These reveal that the process of innovation does not come to an end with the introduction of a new technology. It is very interesting to note that at the onset, these farmers were only originally interested in the technology because this provided a solution to a grave problem, that is, the malodour from their piggeries. They adapt the technology according to the setting of their farms and then they continue to innovate, on how best they could make use of the technology, depending on what they need. This supports the concept that innovation is a social process and that the local social context shapes the perception of the problem, the need for change and

the opportunities arising from the environment, which would then eventually shape the technology emerging from the process of innovation.

In terms of interaction: knowledge sharing and learning, patterns of trust, openness, mutual respect, reciprocity, confidence, proactive networking can be seen among farmers and government agencies, in between government agencies, between farmers and cooperatives, between farmers and input suppliers. Although these patterns of attitudes and practices between innovation actors vary in various degrees and intensities, they could be seen as a potential foundation for their evolving collaboration across the innovation system. However, it is glaring that there were restrictive attitudes and practices among actors. For example, some farmers exhibit mistrust with other innovation actors (e.g. with PVO).

4.3. Patterns of Interaction

While there were existing communication networks and contacts involved in biogas innovation processes, findings reveal fragmentation and gaps among actors. Sociograms (Figures 1, a and b) reveal weak linkages between the public and private sectors. There is also no alliance formed to collaborate in marketing surplus biogas and sludge. It is also very clear that there were no existing arrangements for the organisations involved in innovation processes to access credit and grants from local, national and international bodies. The sociograms also show how centralised the information network is as a whole, implying fragmentation and wide gaps among actors in the network. Information network in Digos has a graph centralisation of 46.77% and Bansalan with 32.42%. These figures imply that there is a considerable amount of concentration or centralisation in the whole network. This entails the need to identify which of those actors in the most concentrated part of the sociograms could assume the role of 'facilitating others' (especially those who are in the periphery). This may address the importance of facilitating others to become part of the system for putting knowledge and technology into use.

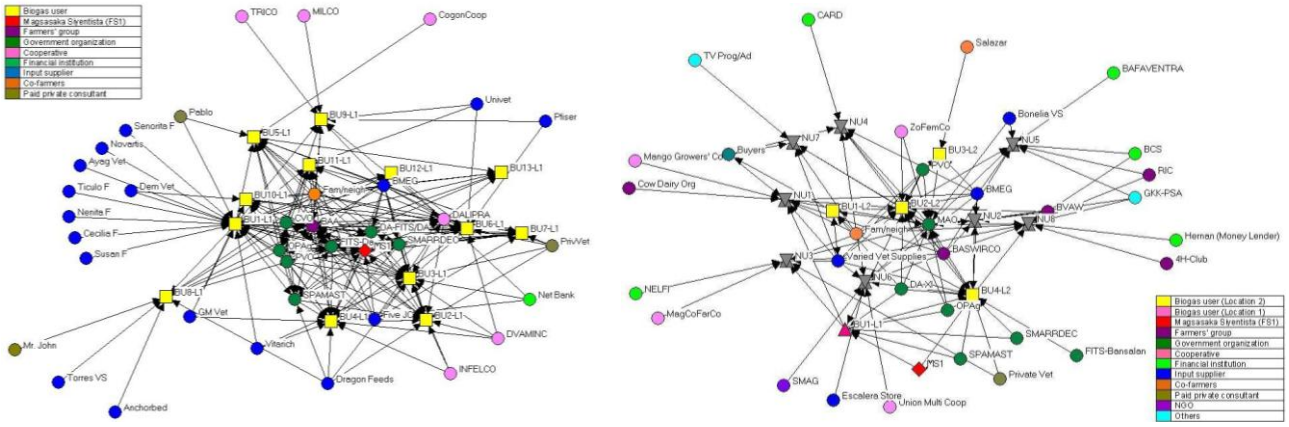

Fig. 1: (a) Network of actors linked with biogas users in Digos with a graph centralisation of 46.77%, (b) Network of actors linked with biogas users and non-users in Bansalan with a graph centralisation of 32.42%

4.4. Enabling Environment for Innovation and Uptake

The most pressing bottleneck (i.e. the high cost of the technology) could be addressed either by intensifying efforts by these identified multi-actors to manufacture and promote low-cost bio-digesters or by crafting micro-finance schemes for biogas installers. It is very evident in both locations that finance facility available to smallholders willing to invest on this technology does not exist. Therefore, micro-credit designs for small-scale farmers should be developed.

Moreover, the main actors providing extension services and lobbying should correspondingly formulate a series of cost-effective policies and best management practices. There is a need for legislative intervention of promoting the use of bio-digester as 'anti-pollution device'. In Digos, the local government is not the main actor in the conduct of the promotion and information campaign on this technology. Not that they should necessarily be seen as the main actor, but experiences in other countries [12-16] have shown that what catapulted biogas technology adoption is the strong presence and support of the government.

Moreover, the government agencies (e.g. Department of Agriculture, Office of Provincial Agriculture, Provincial Veterinary Office, City Veterinary Office and the Municipal Agriculture Office) should uphold the concept that production is abreast with waste management, and therefore must make a more comprehensive package of livestock production putting an emphasis on waste management. Appropriate training and education about technologies (e.g. application of sludge as organic fertiliser) is also necessary for stakeholders at all levels and their needs to be matched to the roles of those people in the implementation process. More trainings of local technicians and farmers should not be overlooked. This will help increase local capability to maintain bio-digester systems and thereby help promote its application. As what has happened in India, [12], trainings were provided to give the required local competence (technical skills) among suppliers and contractors.

4.5. Conclusion

The circumstances in this case study may seem unique and a singular case, but it offers myriad windows to draw insights on how best to understand agricultural innovation processes and innovation system. What this case study has made clear is that farmers were not just passive receivers of technologies but instead they develop innovations and test whether or not they will work well in their environment. Circumstances in this study also convey that innovation processes were likely to occur through participation of a mix of diverse actors who interactively learn, form linkages, partnerships and alliances and negotiate their roles in the system resulting in different innovation outcomes.

While it can be gleaned that there is indeed a platform for biogas innovations, there is still a need for more negotiation regarding roles among actors involved. The government agencies could take the lead in facilitating the interaction of, and negotiation among, these multiple actors. A challenge therefore to the government sector is to guide these actors for advocacy coalition. This study indeed could offer insights to inform innovation stakeholders, researchers, and policy makers in the management of agricultural innovation to address prevailing innovation system imperfections.

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