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Coconut Industry in the Philippines: Actors, Interactions and Innovation

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Abstract
Coconut trees can grow in nearly all parts of tropical countries, because it does not require any special requirements for growth. In particular, value-added products by processing coconut, among others: coco chemical, coco fibre, coconut oil, desiccated coconut, Nata de coco, activated charcoal, etc. In the Philippines, the significant coconut squanders incorporate coconut shell (12%), coconut husks (35%) and coconut coir dust. This study aims to understand the productivity condition and innovation system in coconut industrial cluster as part of sectoral innovation system. Study is carried out by identifying and analysing interaction between coconut industry actors and landscape of coconut industry policies and provide recommendation for better improvement on interaction model for the coconut industry in the Philippines. This research outputs are identification of actors and its interaction in the Philippines coconut industry, its constraints and challenges, conclusion to the case and proposed model for better off coconut productivity and innovation and further recommendation. This research identified the Philippines coconut industry actors, from the Government actors (PCA) and its program, strategies and policies, Business actors (Davao based firms) and Civil society and Academia actors, analyse its interactions and proposed better model in helices of interaction of actors (Academic, Business, Government, and Civil Society) of the Philippines coconut industry.

Keywords: coconut industry, triple helix, interaction, actors, innovation

Introduction
Philippines has large Coconut Area in about 3.502 million ha. About 28.56% of the Agricultural Lands. The area bears coconut trees for 330 million trees with coconut production 14.70 billion nuts/year. In terms of provinces, it has 68 out of 81 provinces are coconut areas. Best areas that produces coconut products are listed to 10 most productive provinces from Northern Areas
Industrial clusters provide innovative products such as coconut processed products. Innovative products such as coconut oil, coconut charcoal briquettes, husks and are mainly based on research and development based in a competitive manner to commercialisation. It is supported by system and complex socioeconomic and political environment in the specific regions. Firms in the region are challenged to innovate and enter the global marketplace, by designing, producing and commercialising new products based on coconut resources. PCA and is leading regional and sectoral implementation of Davao industrial cluster. Modes of interactions of the coconut industry, emphasize on the triple helix interaction model of Etzkowitz and Leydesdorff (Etzkowitz & Leydesdorff, 1995, 2000); (Leydesdorff, 2013) is necessary to rejuvenate. Therefore, as initial research on the Philippines coconut industry, it is important to understand actors and interactions and propose better model of its interaction to enhance productivity and innovation of coconut industry by using framework of triple helix and industrial cluster in sectoral and regional innovation system.

Literature Review
Concept of Innovation system/system of innovation since the idea of “creative destruction” (Schumpeter, 1912) is put forward by scholars such as Freeman (1987); Lundvall (1992); Nelson & Rosenberg (1993); Edquist (1997, 2001) as an integrated view on nation’s competitiveness in modern praxis to explain the success and the failure of nations in developing its economic performance. Freeman explained Innovation System (IS) as “the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies” (Freeman, 1987). Edquist (2001) further explain that the innovation system is where all factors relating to the economic, social, political, organizational, and other factors that influence the development, diffusion and use of innovation.

System (RIS) and Sectoral Innovation System (SIS). NIS therefore can be viewed through a variety of innovations in the regional implementation and in the sectoral level implementation.

Implementation of innovation system is depending on the presence of stakeholder’s activities. The literature in innovation system suggests emergence of the triple helix model unanimously states the need for university–industry–government interactions is “key” to innovation in knowledge-based societies (Etzkowitz & Leydesdorff, 2000). The triple helix postulates that the triple helix interrelations between academia-industry-government provide the optimum conditions for fostering innovation (Etzkowitz & Leydesdorff, 2000; Leydesdorff and Etzkowitz, 1998). The triple helix model of innovation has been considered as integral policy tools and attracted the strengthening of the collaborative interaction between government, industry and academics to improve innovation. While Schutz, Heidingsfelder & Schraudner (2019) stressed on the civil society role as main actor in innovation, triple helix concept has been common strategy of many governments in developing national and regional innovation systems.

The Triple Helix interactive relationships between the three institutional spheres referred to by various authors (Etzkowitz & Leydesdorff, 1995, 2000; Leydesdorff, 2012) and more recent improvement to holistic barriers and enablers (Abd Razak & White, 2015), quadruple helix (Carayannis & Campbell, 2010, 2017; Cavallini, et.al., 2016) quintuple helix (Carayannis & Campbell, 2010, 2017) and open innovation (Chesbrough, 2003, Leydesdorff & Ivanova, 2013) and its critics for developing countries implementation of triple helix (Saad & Zawdie, 2011). Nevertheless, in the studies of innovation systems, research policy and higher education, the Triple Helix model has been commonly used as a normative framework for understanding interactions between actors in innovation arena. The study of actors, interactions, and system of innovation therefore remain vital in understanding the coconut industry in the Philippines, especially Davao cluster.

**Research Method**

This study descriptive analytics using qualitative data approach. Method of collecting data are through Focus Group Discussion (FGD), In-depth Interview and desk study. The discussants and interviewees are as follows. (1) Government: PCA Representatives (5 Discussants FGD) and Department of Trade and Industry (1 Interviewee). (2) Business: Coconut Firms Representatives (3 Interviewees each of from Regmill Industry, BF Industry and Freyvonne Industry). (3) Academia: University Representative (1 Interviewee from Ateneo de Davao University). Civil Society: Coconut issues NGO representative (1 Interviewee from COIR).

**Results and Discussion**

**Actors and Interactions**

Government actors in the coconut industry are PCA, DTI and DENR. The coconut industry in the Philippines policy authority is the Philippines Coconut Authority (PCA). PCA is the government agency directly under the president. PCA under supervision and reported directly to office of the presidential assistant for food security and agricultural modernization. PCA headquarter is based in Diliman, Quezon City. PCA mandate as stated in Article 1, Section 2, .D. 1468 of the Revised Coconut Industry Code is “To promote the rapid integrated development and growth of the coconut and other palm oil industry in all its aspects and to ensure that the coconut farmers become direct participants in, and beneficiaries of, such growth and development”. Department of Trade and Industry (DTI) and Department of Environment and Natural Resources (DENR) also part of government supportive actor in the...
coconut policy, besides the Parliament and the President. The PCA has the responsibility and resources in carrying the development of coconut industries in the Philippines. It has programs and projects in enhancing the productivity of coconut farmers in the Philippines, especially Davao cluster. Research & Development (R&D) Centres established by PCA are focus on research on varietal improvements (continuing research on breeding, genetics, tissue culture), agronomy and farming system, integrated pests and disease management, product development and biotechnology.

Business actors in the coconut industry are firms and corporations, coconut farmers, coconut farmers association whereas they production of coconut innovative products are solely by their own R&D in the case of several firms in Davao, and also by optimizing support from Society and Community such as coconut based NGOs to develop the capacity of community of coconut farmers to innovate and/or to produce the optimum coconut products. The traditional products come to brokers as their hub to the firms, and firms processed it into value-added products and comply with PCA for the purpose of domestic’s consumptions and foreign exports. Academic actors not involved in the industry intensively. However, PCA conduct projects with academia in science-based research in the coconut R&D branches in the country. The R&D human resources from academia are hired as staffs, engineers and researchers in PCA owned programs. Universities in Davao’s connection to the development of coconut cluster in the region is not significant to the process. Moreover, civil society and media recently plays important role to mainstream issues of coconut farmers economic development.

Roles and Strategies
Philippines Coconut Authority (PCA) is the government agency directly under the president. PCA under supervision and reported directly to office of the presidential assistant for food security and agricultural modernization. PCA develop midterm and long-term under Coconut Productivity Enhancement Program, consists of three main activities: Accelerated Coconut Planting and Replanting Project (ACPRP), Coconut Fertilization Project (CFP), and KAANIB Intercropping/Livestock Raising and Coco-Based Enterprise Development Project. However, those strategy challenged by business and civil society. Firms such as BF Industries, Freyvone Mills, and Green Asia Agri (Regwill) signalled that they did business as usuals and gain not much attention and support from government (PCA) for years (interview). While PCA concern on products R&D inline with their midterm and long-term plan, the lack of marketing coordination to business sectors and universities are remains the main problem. The existence of brokers acting as middle man between farmers and firms/business owners is still major problems for coconut farmers economic development.

Civil society and media, however, as stated by Joey Faustino from COIR, that “PCA is part of cronies of big companies” (interview). From the perspectives of NGO and coconut activists, PCA role is not enough to overcome problems all these years. While business sectors, from three firms that we had interviewed with, also not experienced any special change on their daily business. Moreover, firms feel that coconut business is declining because of the land conversion, and many of their suppliers are brokers. While exports are declining, the government should do something to save the industry. Nena from Regwill also stated that trust is none because PCA only based on projects (interview). After one project finished, the infrastructure for example, machinery for coconut production is not monitored, workers not trained, and the continuity of the projects is still in questionable. That is why many farmers back to the old ways, become a coconut worker, without owning land and has no wages, only
payment for what they produced in a timely manner. However, all agreed that there is hope for PCA because recently, PCA pay attention to the farmers and association by creating forums for communications to all stakeholders.

**Challenges in Productivity & Innovation**

There are 5 (five) challenges in coconut industry productivity. First, low coconut farm productivity and income because of the prevalence of old and unproductive trees, limited access to credit and marketing support, lack of value-adding enterprises, low domestic utilization of coconut, and land conversion to housing. Currently, low productivity and income affect to the coconut traditional farmers and partially affect the coconut firms (interview). Therefore, second issue is how to access the credit and marketing support for coconut farmers and workers of firms (such as levy tax, insurance, pension, wage) should be addressed. Third, farmers education and advocacy in effort to utilisation of coconut product to value-added products is needed. Fourth, PCA is a government agency should operate their Key Performance Indicator (KPI) related to transparency, governance and participation of multi-stakeholders. Fifth, to overcome the barriers in productivity, PCA has three national programs by replanting the coconut tree, and fertilize the trees in certain area, and implement intercropping for example coconut and coffee in one area. These programs basically a good program, however in reality there is room for improvement, especially on dealing with brokers issues. Brokers playing significant role setting up prices between Firms and Farmers, therefore PCA have to implement regulations on the framework of relationship between coconut farmers and firms’ associations.

There are 5 (five) challenges in coconut industry innovation. First, low R&D collaboration between actors in coconut industry. Low participation of university and society in coconut industry (sectoral system of innovation) because the PCA rely on their own resources and hired academia as merely staffs in R&D of coconut products and innovation. R&D centre, including Davao Research Centre (DRC) established by PC focus on research on Integrated Crop Protection Division and Agronomy, Soils and Farming Systems Division is operated on the mission of PCA without sufficient coordination and planning from stakeholders. University and society in this interaction is limited. A new framework of interaction in innovation should be develop. Second, lack of social trust between actors in coconut industry. This constrained the further effort to create collaboration and information whenever actors in coconut industry are not operating the helices of collaboration. Third, misuse of PCA personnel’s in the coconut industry. There have been report that the PCA as authoritative agency which supposed to be coconut policy regulator, also plays as operator of the coconut trade industry. Nevertheless, this corruptive behaviour as the result of lack of governance in their programs and projects because lack of transparency and openness in planning and implementation the program. The fourth issue related to public governance in multi-stakeholder approach in policy making. The Fifth challenge is lack of incubation of firm’s innovative production. While coconut firms rely on their capacity in production and development innovation, such as Freyvonne, Regwill and BF which have their own research centre and human resources, they are doing business “as usual”, without prior focus on the novelty of the research centres. Firms pay taxes and attend forums initiated by PCA and/or other related government organisations.

**Remodelling Triple Helix Interactions in the Philippines Coconut Industry**

Form the challenges discussed above, interaction of actors in the coconut industry should be refine and develop to a multi-stakeholder’s model. PCA as single-authoritative agency has
powerful resources and capacity to coercively implement all policies, strategies and programs and projects. However, to make it effective and efficient, this institution should collaborate more to the external entities such as universities. Helices of interaction in solely silo confinement should be rearrange to collaboration in multi-stakeholders. This collaboration involving more than three helices actors is viable to build a science parks where all stakeholders can participate without hesitate and barrier to entry. Business sector which have their own engineers and scientist will be productive to boost innovative products to overcome the declining of the business in competitive global world. Helices between collaborating actors will contribute to development of trust between actors. Transparent information and flow of information available will eradicate the problems of brokers and choked distributions. Innovative products from communities and from firms R&D will be balanced and have the same standard as competitive coconut-based products for global market exports. Collaboration of actors creates “science park” to accommodate all stakeholders to participate on innovation. Innovative products from incubation program in science park are able to meet national standard by PCA. Firms and civil society involved in “Coconut Reform Movement” to alleviate coconut farmers poverty.

Table 1. Model of Helices Interaction of Coconut Industry in the Philippines (Sagena, 2016)

<table>
<thead>
<tr>
<th>Model</th>
<th>Actors Interaction</th>
<th>Arena</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Model</td>
<td>Government-Business</td>
<td>Forums, Association, Conference, Gath</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Academic-Business</td>
<td>Incubation</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Government-Business</td>
<td>Innovation Collaboration</td>
<td>3</td>
</tr>
<tr>
<td>Proposed Model</td>
<td>Government-Society</td>
<td>Information Sharing, Product Commercialisation</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Academic-Business-Government-Community/Society</td>
<td>Science Park</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Academic-Community/Society</td>
<td>Training, Education</td>
<td>6</td>
</tr>
</tbody>
</table>

From the current model, proposed model of helix interaction will enhance productivity and innovation in framework of regional innovation of Davao cluster industry. Convergence of R&D in a science park incubation activities and media engagement in Davao as industrial cluster for coconut industry in the Philippines. Forums and gathering event should be develop to output-based arena of interactions. Interactive complexity of relations from collaboration of R&D to commercialisation of innovative, value-added coconut product.

Current interactions mode among actors in Coconut Industry is only PCA (Government) and Coconut Firms (Industry) with the university (Academic) which connected by projects by R&D centre division of PCA. The interaction between Government (PCA) and Business (industry) are via forums, Association, Gath, Networking (1). Proposed interaction is: A-B-G Incubation (2), B-G Innovation Collaboration (3), G-S Information, Commercialisation (4) A-B-G-C Science Park (5) A-C Training, Education (6). Through this model, Davao-based coconut industrial cluster would be efficient to fulfil its economic goals.
Conclusion
There is gap of implementation between successful of PCA’s Coconut Productivity Enhancement program and campaign from perspectives of business and civil society. Lacks of transparency, connectivity, asymmetric information and narrow collaboration between government through PCA with other stakeholders in coconut industry is the reasons of the failure to achieve desire goals. Absence of intensive multistakeholders collaboration between actors in coconut industry, firms are doing business as usual and society advocate desperately for the poor coconut farmer are pieces to unite. Government program is only successful as project by hiring university-based researcher but none contribute to the economic development. Forums of coconut industrial landscape recently inviting new perspective for collaborations of actors in the coconut industry. Firms capabilities to innovate will be enhanced by the collaborating process of PCA’s programmatic agenda.

Recommendations from the study suggests that government trough involvement of authoritative agency, PCA to collaborate and access opening to university and business/industry to participate in planning, organising and implementation of their program. Other government institutions also support PCA policy such as Environmental department (DENR), Agricultural department, Trade department, and also the parliament. Business firms specifically coconut firms and enterprises should be able to enhanced their productivity and innovation by collaboration and networking between actors/stakeholders. Academics sector presented by research university can play significant role in leading the science park for coconut research and development. Community represented by civil society such as NGOs, mass media, and association/community related to the coconut business is significant to create informational agenda to other stakeholders such as coconut farmers, international and domestic buyers as well as the environmental effect of the coconut industry. Those actors, interactions and innovation remodelled in helix perspective beyond the “triple helix” but consecutively, “quadruple”, “quintuple”, “multiple-helix” scenario to foster the creation of significance and balance role of multistakeholders in the Philippines coconut industry.

Limitation of the Study
The findings of the study have some limitations that could be addressed in future research. Limited access to data only disclosed by PCA and other related government agencies organizations, time constraints where development of the study is time-limited, and more insights would have been gathered with the extension of the study period in the Philippines.
Conflicts arising from cultural bias and personal issues on the interviewee and different organizational perspectives would have been incurred the findings.

Declaration of conflicting interest
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