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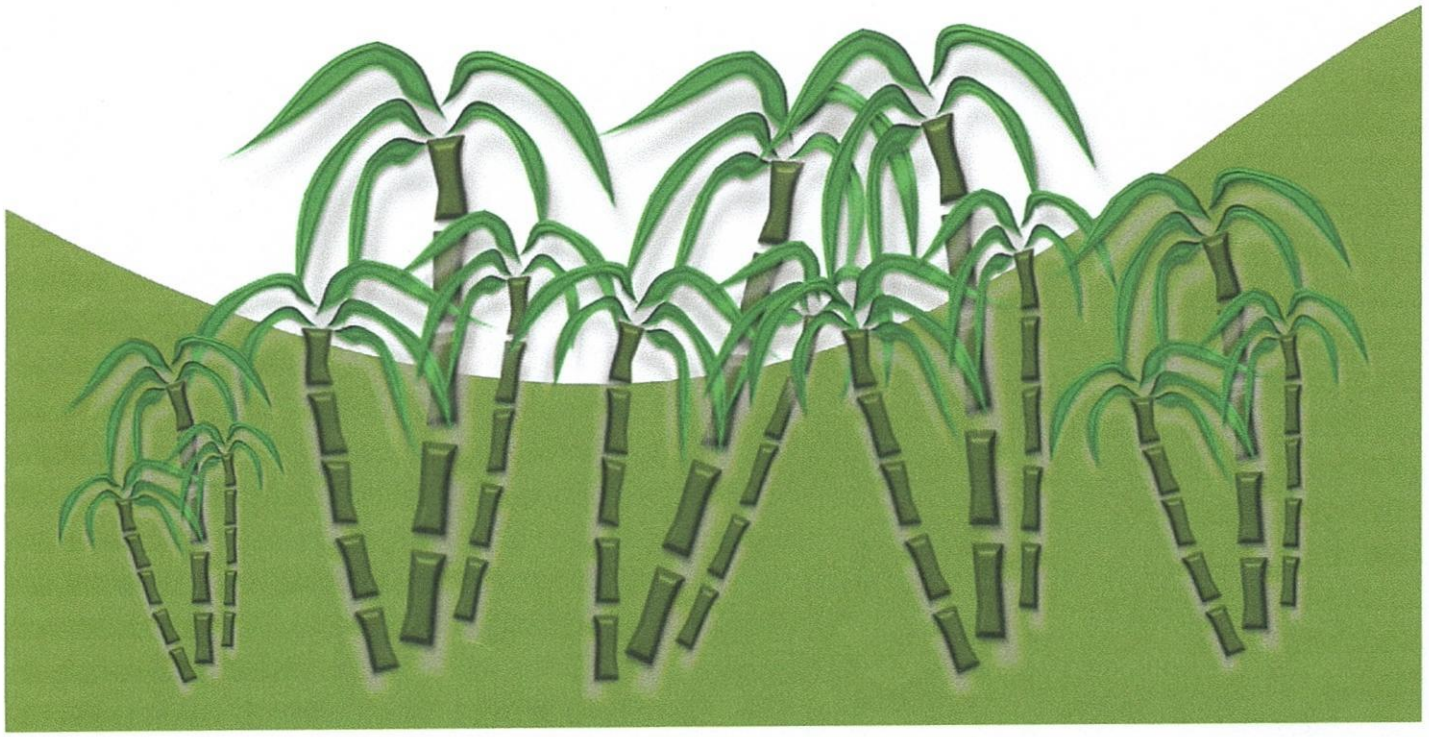
FINAL REPORT: Analysis of Sugarcane Supply/Value Chain in Some Major Sugarcane Producing Provinces in the Philippines



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A food-secure Philippines with prosperous farmers and fisherfolk

ANALYSIS OF SUGARCANE SUPPLY/ VALUE CHAIN IN SOME MAJOR SUGARCANE PRODUCING PROVINCES IN THE PHILIPPINES

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Executive Summary

The sugarcane industry is one of the major pillars of the Philippine economy. A multi-product industry, it produces cane sugar, bioethanol as green energy and power. Sugar is a mainstay of the country's export products, thus, the industry has significant contribution to the country's foreign earnings and Gross Value Added to the agriculture sector from the sale of sugar and molasses. The industry has more than 80,000 sugarcane farmers, majority of them are small farmers and there are also about 5 million people who are directly and indirectly dependents of the industry.

At present, the industry undertakes major programs and projects to improve its global competitiveness. The best way to strengthen and rehabilitate the industry is to make the entire sugarcane supply chain work well, eliminate the bottlenecks and sources of inefficiencies in all nodes of the supply chain from input suppliers to end users.

Hence, this project of sugarcane supply value chain analysis is being implemented to identify and institute measures to make the sugarcane industry achive global competitiveness competitive and to improve the income of stakeholders involved in the supply chain.

Our Objectives

Development. Making significant improvements in the efficiency and competitiveness of the sugarcane subsector, as well as improvement in the income of people involved in the sugarcane supply chain.

Immediate

- To identify the major strengths and weaknesses of the key players in the sugarcane supply chain, as well as the opportunities and threats in the sugarcane supply chain;
- To identify the best (technically and economically) production, postharvest, processing, and marketing practices;
- To identify problems, constraints, and opportunities in the provision of business development services relating to technology, transportation, financing, and information; and
- To formulate upgrading strategies for the selected value chains to make the sugarcane subsector efficient and competitive.

The Project Team

- Funding Agency - Sugar Regulatory Administration (SRA)
- Implementing Agency - College of Economics and Management, Department of Agricultural and Applied Economics, University of the Philippines at Los Baños (UPLB)

The Funding Source. Sugarcane Industry Development Act (SIDA)

The Project Location. Five major sugar producing provinces were represented in the project.

- Batangas Province

  Don Pedro Mill District – Municipalities of Nasugbu, Calatagan, Lian, Tuy
  Balayan Mill District – Municipalities of Calaca, Balayan, Tanauan, Alitagtag, Ibaan

- Negros Occidental Province
  La Carlota Mill District – Municipalities of La Carlota, Pontevedra, La Castellana
  Victorias Mill District – Municipalities of Cadiz City, Victorias City, Manapla

- Tarlac Province

  Tarlac Mill District – Municipaties of Bamban, Capas, Concepcion, Gerona, Moncada, Paniqui, Pura, San Miguel, Tarlac City, Victoria

- Negros Oriental Province

  Bais-Ursumco Mill District – Municipalities of Bais City, Pamplona, Tanjay City
  Tolong Mill District – Municipalities of Bayawan City, Sta. Catalina, Siaton

- Bukidnon Province

  Bukidnon Mill District – Municipalities of Maramag, Kalilangan, Don Carlos, Valencia City, Pangantucan, Quezon

The Methodology

- Value Chain Analysis
- Productivity, Efficiency, and Profitability

Result

Sugarcane was used to be the 4th major traditional crop in the country after rice, corn and coconut. But recently, based on its contribution to GVA, the subsector has declining importance.

- Increasing in current prices, but declining in real terms.
- Declining share in total GVA in griculture, fishery and forestry.

Plantation area decreased overtime which may be attributed to the conversion of sugarcane plantations to plantations for other crops.

Farm productivity or yield measured by tons cane per hectare (TC/Hectare) in CY 2017-2018 dropped to 51.99 TC/hectare from a good performance in CY 2016-2017 which averaged to 66.46 TC/Hectare.

Likewise, raw sugar production in CY 2017-2018 dipped to 2,083,641 metric tons from 2,500,509 metric tons in CY 2016-2017. This can be explained by the trend in plantation area and farm productivity which both recorded a decreasing trend.

Lack or high cost of labor is the eminent reason in improving productivity of the respondents. Due to the growth of the construction sector, there is a migration of laborers from the farm to the construction projects anywhere in the cities and even in the provinces. This problem is true especially during harvest season. The farmers were competing on the available supply of laborers and this cause delays in harvesting and loading of canes. This problem is common in Batangas, Negros Regions and Bukidnon.

Recommended Strategies To Restore The Profitability Of The Sugarcane Industry

1. Process upgrading

- Mechanization
- Improvement of fertility management
- Investment on irrigation facilities climate change adaptation
- Continuous varietal improvement and planting material propagation and distribution
- Aggressive control of sugarcane pest
- More effective extension system
- Strengthen and capacitate the research centers particularly in terms of staff complement

2. Product Upgrading

- Improvement of cane quality

3. Intra-sectoral upgrading

- Promotion of trading transparency
- Improvement in market information system

I. PROJECT DETAILS

Project Title	: **ANALYSIS OF SUGARCANE SUPPLY VALUE CHAIN IN MAJOR SUGARCANE-PRODUCING PROVINCES IN THE PHILIPPINES**
Funding Agency	: Sugar Regulatory Administration
Implementing Agency	: College of Economics and Management, Department of Agricultural and Applied Economics, University of the Philippines at Los Baños (UPLB)
Project Duration	: 28 months (March 22, 2017 to July 2019)
Project Location	: Batangas, Tarlac, Bukidnon, Negros Occidental, Negros Oriental
Project Cost	: P 4,565,000.00

II. RATIONALE OF THE PROJECT

The sugarcane industry is one of the principal drivers of the Philippine economy. Sugarcane is a major traditional export crop and a principal source of foreign exchange earnings. It is the lifeblood of the economies of the major sugarcane-producing provinces in the country. About 700,000 people in the farms and more than 25,000 people in the sugar mills and refineries are directly dependent on the industry for their income and employment. There are also about five million people who are indirectly employed in the industry.

The sugarcane industry currently faces a number of problems that need to be addressed immediately. Foremost of which is the lack of competitiveness especially now that the real threat to the industry is at hand given the ongoing market globalization and ASEAN economic integration.

The industry needs to be strengthened and rehabilitated if it is to survive the stiffer market competitions. The best way to strengthen and rehabilitate the industry is to make the entire sugarcane supply chain work well, eliminating the bottlenecks and the sources of inefficiencies in all nodes of the supply chain from input suppliers to end users. Hence, this project of sugarcane supply value chain analysis is proposed with the end in view of identifying possible measures that can be instituted to make the sugarcane industry competitive and to improve the income of those people involved in the supply chain.

III. OBJECTIVES OF THE PROJECT

The major development objective related to the project is that of making significant improvements in the efficiency and competitiveness of the sugarcane subsector, as well as improvement in the income of people involved in the sugarcane supply chain.

IMMEDIATE OBJECTIVES

The immediate objectives of the project are:

1. To identify the major strengths and weaknesses of the key players in the sugarcane supply chain, as well as the opportunities and threats in the sugarcane supply chain;

2. To identify the best (technically and economically) production, postharvest, processing, and marketing practices;

3. To identify problems, constraints, and opportunities in the provision of business development services relating to technology, transportation, financing, and information; and

4. To formulate upgrading strategies for the selected value chains to make the sugarcane subsector efficient and competitive.

IV. REVIEW OF RELATED LITERATURE

The Sugar Regulatory Administration (SRA), an agency under the Department of Agriculture (DA) receives its mandate from the Executive Order No.18 or Creating of Sugar Regulatory Administration on May 28, 1986. It states that the policy of the state is to promote the growth & development of the sugar industry through greater participation of the private sector and to improve the working conditions of the laborers. This leads the SRA as a member of National Biofuel Board (NBB) to develop and implement policies supporting the Philippine Biofuels Programs and ensure security of domestic sugar supply known as Republic Act 9367 s. 2006 (Biofuels Act of 2006).

This section focuses on sugarcane, its products, by-products and the sectors involved in the sugarcane industry. Considering the significance of sugarcane, the SRA have authorized the Department of Agricultural and Applied Economics (DAAE) in University of the Philippines Los Baños (UPLB) in conducting a Supply/Value Chain Analysis on sugarcane. Supply/Value Chain Analysis is used in identifying key players and intermediaries as well as their corresponding functions involved in the chain. This involves the flow and the value added as the product moves along the chain. Furthermore, this study also incorporates benchmarking, productivity, efficiency and profitability analyses.

Supply/Value Chain. Supply value chain captures the complex interactions of processes and firms needed to create and deliver products to end users. It is a concept formed from combining the supply chain and value chain. However, these two are not synonymous with each other.

Supply chain is the physical flow of raw materials to be transformed to finished products for the end consumers. It refers to a network of independent organizations working together to control, manage, and improve the flow of inputs or materials, products and transformation from suppliers to consumers (Lantican, 2010). The supply chain not only includes the manufacturer and suppliers but also transporters, warehouses, retailers, and customers themselves.

On the other hand, Kaplinsky and Morris (2001) defined value chain as —the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use.‖ Value chain analysis is essential for a successful business operation and in doing such an

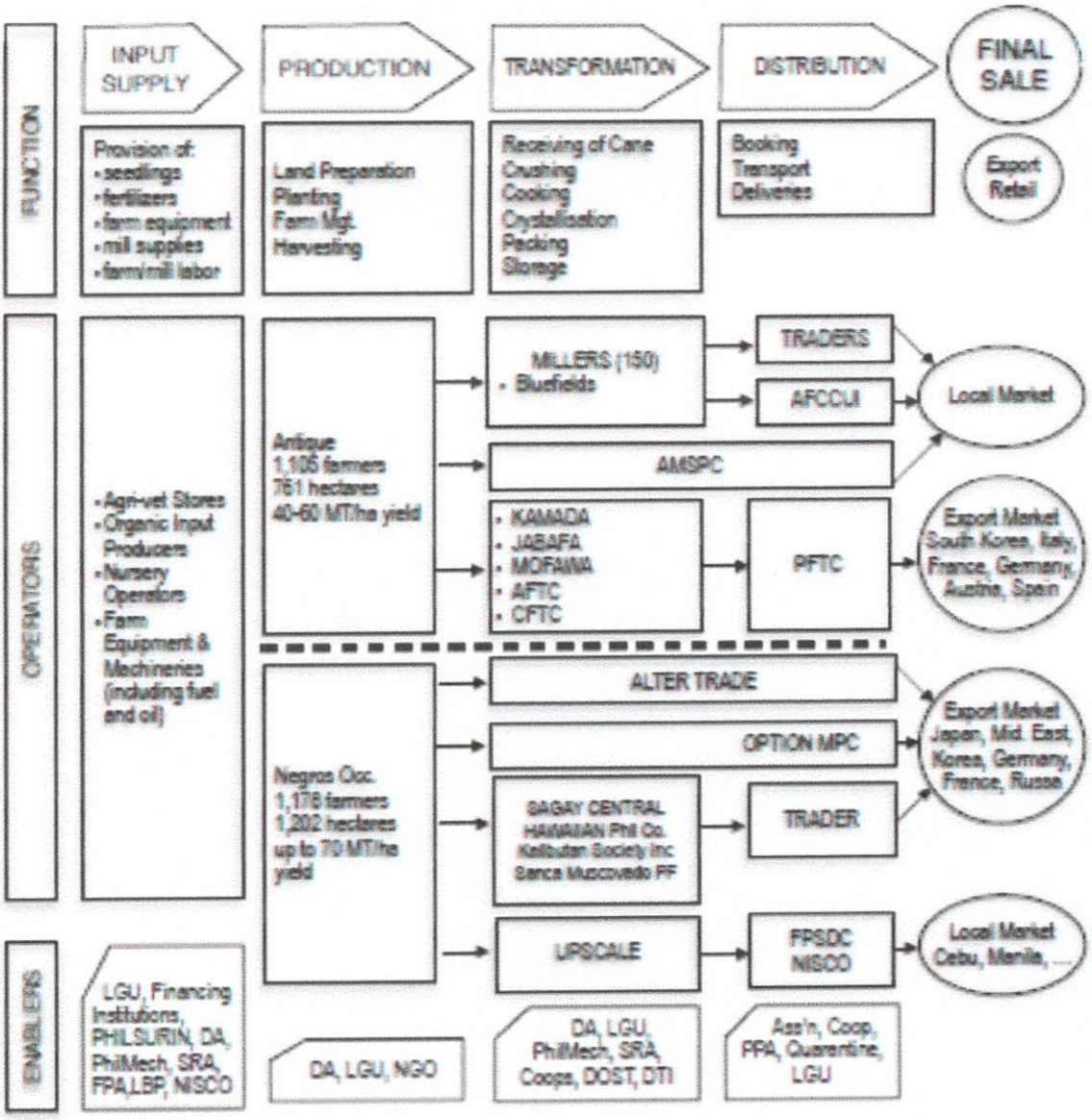
analysis. Porter (1985) claimed that it will be helpful to model the firm as a chain of value-creating activities that when carefully assessed and addressed can create a competitive advantage. Two general categories of activities can be named: primary and support activities. Primary activities include inbound logistics (transportation, input material handling, storage/warehousing); operations (include value-creating activities that transform the inputs into the final product); outbound logistics (activities required to get the finished product to the customer); marketing and sales (channel selection, advertising, pricing); and service activities (activities that maintain and enhance the product's value) that add value to the production of the product. In contrast, support activities indirectly affect the final value of the product and these can be linked to the primary activities to achieve competitive advantage.

In terms of structure, Kaplinsky and Morris (2001) said that value chain includes all the firms in the chain that fall under any of the following: end markets, business and enabling environment, vertical linkages, horizontal linkages and supporting markets. End markets are people who determine the characteristics which include the price, quality, quantity and timing of a successful product or service. The business and enabling environment at the local, national and international levels includes norms and customs, laws, regulations, policies, international trade agreements and public infrastructure that either facilitate or hinder the movement of a product or service along the value chain. Vertical linkages facilitate the delivery of benefits and embedded services and the transfer of skills and information between firms up and down the chain. Horizontal linkages, on the other hand, involve ties with firms that perform similar functions in a value chain which can help small firms to generate economies of scale. Supporting markets, considered to be the key to firm-level upgrading, include financial services, cross-cutting services such as business consulting, legal advice and telecommunications, and some sector-specific services.
Generally, the supply value chain analysis is done to determine the different strengths, weaknesses, opportunities and constraints in the production and marketing process to further improve the efficiency, profitability and competitiveness of an industry.

Literatures available on supply value chain of sugarcane focused mainly on muscovado. One of these studies was conducted by the Department of Agriculture Philippine Rural Development Project (DA-PRDP) in Antique, Iloilo and Negros Occidental. The result consists of value chain mapping, key players and functions, nature of interfirm relations, and price and cost structure. For the value chain mapping, generally, farmer-producers bring their harvests to the small or big millers and get their shares of muscovado based on the quedan system. These shares are sold to the local market or processors through traders or directly by the farmers. Some muscovado millers in Negros Occidental and Iloilo are selling muscovado in the export and domestic markets.

Figure 1 shows the supply chain segments and players involved in muscovado sugar in Antique and Negros Occidental. The chain starts with the input provision. Sugarcane seedlings, fertilizers, farm equipment and machineries, fuel and oil, mill supplies, credit, and farm and mill labor services are the inputs needed in the production of sugarcane. The farmers require good farm practices in land preparation, planting, farm management and harvesting to have a better yield with the help of the different enablers such as DA, LGU and NGO. Most of the millers also serve as traders with established contract buyers both in the local and international markets. Millers like Alter Trade sell directly to retailers. The final sale leads to the various outlets from supermarkets to the local stores in the province and nationwide.

Figure 1. Value Chain Map of Muscovado Sugar in Antique and Negros Occidental.



Source: Department of Agriculture Philippine Rural Development Program (DA-PRDP)

In Antique, horizontal relations of millers can be noticed with the formation of Antique Muscovado Sugar Producers' Marketing Cooperative (AMSPMC) while millers in Iloilo and Negros Occidental do not collaborate with each other. In terms of vertical relationship, the interfirm relations is characterized by a relational or network-type of value chain governance where there is transfer of information and services between PFTC suppliers and buyers.

The selling price of sugarcane farmers to muscovado millers range between P1,100-P1,200 per ton (Lkg/TC) while sugar centrals pay P1,196.85. For every hectare, sugarcane farmers can earn a net income of P28,800. However, farmers who employed ratooning can only earn a net income of P17,150 per hectare.

The study recommended expanding the area planted of sugarcane and implementing of GAP for sugarcane farming to increase the production of sugarcane. Establishing of community-based service providers is also a necessary.

Lizada and Tan (2015) analyzed the supply chain of muscovado sugar in Antique, Philippines. The study identified key processes, actors, flow of the product, payment, market information, external influences along the chain, and issues and concerns as perceived by respondents. Core processes in muscovado industry include input acquisition from distributors and dealers of farm inputs, sugarcane production, primary processing for the conversion of sugarcane to muscovado sugar, secondary processing for producing modified food products, distribution to the institutional or household buyers and consumption. The study reported that traders or millers were the only ones who have the knowledge of the market information such as prices, volume and supply and demand, among others. Furthermore, almost 95% of the respondents agreed that national government agencies, local government units and non-government organizations had not given any assistance for Antique muscovado program. Majority of the problems encountered by the farmers were pests and diseases, low price of muscovado, and high cost of farm inputs. On the other hand, opportunities identified were export quality characteristics of the muscovado and its high demand in local market. Therefore, the study recommended that government should establish intervention programs to improve productivity in sugarcane production for continuous supply of muscovado in the market. Value adding processes should also be further explored.

Moreover, as reported by the SRA (2015) on supply value chain analysis of sugarcane, value addition in the Philippines is higher than in Thailand because it uses more labor even for weeding and harvesting. Small farms of sugarcane in the Philippines have varying amount of production costs with Negros being the highest at P583.13 per Lkg. It is slightly higher than large farms with P577.92 per Lkg. During the processing of sugarcane, Batangas sugar mills have the highest cost at P288.71 per Lkg which comprised the cost of cane, cane transport and milling. Using cost and return analysis, the study reported that large farms have higher profits compared to small farms due to higher average yield by large farms.

Productivity, Efficiency, and Profitability. Productivity, efficiency and profitability are interrelated concepts whereas a farm that efficiently utilized inputs can lead to improvement in productivity resulting to increase in profit.

Productivity is defined as an output per unit of input‖. It is generally considered to be the results of a more efficient use of the factors of production in terms of physical, socioeconomic, institutional and technological (Dharmasiri, 2009).

Efficiency refers to the ability of a system to achieve maximum level of output using the least amount of resources (Quilloy, 2015). In production, it may be measured in terms of technical, allocative and economic efficiency. Technical efficiency refers to the use of productive resources in the most efficient manner. It implies that the maximum possible output can be produced from a given set of inputs or technology (Worthington, 2010). Allocative efficiency, on the other hand, is concerned with attaining the proper combination of inputs for production. It is influenced by the prices of input and output since the two dictates the marginal cost and marginal benefit of production. These concepts will be useful in determining whether the inputs are under or over utilized. The proper combination of inputs is necessary to achieve optimum profit. By achieving allocative efficiency we are able to optimize our inputs making it more efficient in terms of costs in production. If the efficiencies mentioned are achieved by a farmer then he is said to be economically efficient, obtaining both optimal production and optimal profit (Carambas, 2013).

Profitability is defined as positive return to working capital and capital invested in various productive assets including landǁ (Srinivasan, 2007). It should ensure that the rate of return to capital is equal to or greater than the prevailing interest rate in the market. The main driver of productivity is profitability therefore if the farm is able to produce the same or more output using less or same input hence will result to increase in profit.

The productivity and efficiency of the individual farms can be analyzed using stochastic frontier analysis (SFA) and data envelopment analysis (DEA). Stochastic frontier analysis is a parametric model developed by Aigner, Lovell, and Schmidt (1977). It can be used in —modeling functional relationships where you have theoretical bounds: estimation of cost functions and the study of cost efficiency, estimation of revenue functions and revenue efficiency and multi-output and multi-input distance functions.ǁ (Rao, n.d.). The advantage of using SFA is that it accounts for the random effect and inefficiency component specific to every producer (Ali & Jan, 2017). On the other hand, data envelopment analysis is a non-parametric technique developed by Chanes. One of the advantages of using DEA is that it specifies shape of production frontier from observed data that does not impose any kind of restriction on the structure of production frontier (Mishra, 2015). Instead it can simply use data of inputs and outputs used by the decision making unit (Lestari et al, 2016). According to Fernandez and Nuthall (2009), the results from DEA on the sources and level of inefficiency are obtained for individual farms, which can be used in giving advice to individual farmers in improving their efficiency.
Several studies have used stochastic frontier analysis to determine the technical efficiency in the agricultural farming. One was done by Khai and Yabe (2011) on rice production in Vietnam. Using the Cobb-Douglas Production Function, the study measured the average technical efficiency level to be 81.6% which indicates that an increase in output and decrease in cost could be gained using available technology. The tobit model was used to analyze the factors affecting rice technical efficiency. It was concluded that intensive labor on rice land is the most important factor in increasing the efficiency of rice production followed by the irrigation. Higher education level characteristic of a farmer could also lead to a higher technical efficiency level. The recommendations mainly focused on encouraging the rice farms to be more labor intensive to attain technical efficiency.

The study conducted by Khanna (2006) used Stochastic Production Function Analysis to estimate technical efficiency of sugarcane farmers in Uttar Pradesh (one of the major sugarcane producers of India). Results showed that education, land area and distance of water source from farm contributes to technical inefficiency. The author recommended that different institutions provide more training to farmers on best practice techniques and how inputs should be handled properly to make up for the low educational attainment of some farmers. Land area specifically land fragmentation was also seen as a contributing factor in technical inefficiency because farmers are unable to effectively utilize investments made to increase farm efficiency through economies of scale. The study also made an emphasis on the importance of water application as a contributor to technical inefficiency. Farms far from water source depend on water pumps generated by electricity to irrigate their fields. In times of power shortage, they are unable to provide water for their sugarcane and this becomes a problem especially in times of drought. To compensate, farmers in the area over apply water to make up for the times when water application was not done. It was recommended that a partnership between owners of tube wells (common water source) as well as buyers of tube wells be formed to come up with an efficient way to distribute water for the farmers. Sugarcane farmers in the area have average technical efficiency of 85%. This means that they are still able to increase their production by 15%.

Data envelopment analysis (DEA) is also being used to investigate sugarcane farm's efficiency. Fernandez and Nuthall (2009) used DEA in assessing the production of sugarcane in Central Negros Area in the Philippines wherein there were 127 farmers

included in the analysis. Only 24 farms were considered as DEA-efficient. These efficient farms were using lesser inputs and achieved higher yield than inefficient ones. The mean efficiency level was 0.777 which indicates almost 22% of the production is being lost due to technical inefficiency. Additionally, the pure technical, scale and overall technical efficiency indices were 0.7580, 0.9884 and 0.7298, respectively. Tobit model was also used to determine what influences inefficiency by regressing the DEA scores with farm specific characteristics. It was found out that farmer's experience, access to credit and farm size have significant positive relationship with farmer's technical efficiency while coefficients of farmer's age, soil type and N-fertilizer showed negative signs. With the result of efficiency, the study concluded that the production could increase through the proper application of N-fertilizer and seed inputs. Credit assistance should also be given focus given that it is necessary to induce production efficiency. Since soil type and N-fertilizer have negative relationships with the efficiency, soil analysis programs and information dissemination on proper application of fertilizers should be extended to the farmers.

For profitability, costs and returns analysis is usually used. It is an analytical tool which involves estimating all costs (cash or non-cash costs) entailed from performing farm activities and revenues derived from sales of farm harvests. Doloriel (2014) evaluated the productivity and profitability of sugarcane farming by farm size and by a number of ratoon crops. Sugarcane farmers were stratified into first, second, and third ratoon crop farmers with a total of 90 respondent. Cobb-Douglas production function and cost and returns analysis were used in the analysis. The results showed that the average productivity of inputs in sugarcane farms were 51.949, 125.693 and 135.945 piculs/input for small, medium and large farms, respectively. It implies that large sugarcane farms were the most productive compared to other farm sizes. Additionally, the first ratoon was the most productive with 618.67/piculs/unit of input compared to second and third ratoons, significantly for cane points and man-labor inputs. First ratoon is considered as secondary tillers which are desirable since these were closer to the soil and could absorb more nutrients and thus achieving more productivity in the farm. After comparing the net return above all costs per picul by farm size and by a number of ratoon crops, it was concluded that large sugarcane farms and first ratoon were significantly the highest and most profitable. The result is also evident in the study of SRA (2015) where large farms have higher profits compared to small farms due to higher average yield by large farms. According to Fernandez and Nuthall (2012), the higher input usage by the large farms tends to increase the quantity produce and, with the low price of inputs, generates a larger profit per hectare.

V. METHODOLOGY

A. Value Chain Analysis

The value chain is the entire range of activities required to bring a product from the initial input-supply stage, through various phases of production, to its final market destination (UNIDO, 2009). It categorizes the generic value-adding activities involved in production and marketing. This component of the study will identify: (1) the key actors/participants/stakeholders in the value chain, their roles/functions, and interrelationships; (2) the enabling environment for business development, the services required, and the adequacy and accessibility of these services; and (3) the prices, costs, and value-addition along the chain. Benchmarking competitiveness and economic performance analysis will be done in each segment of the chain using costs and returns, value addition, and cost shares. Based on the results of these, recommendations on how to increase product competitiveness will be formulated.

B. Productivity, Efficiency, and Profitability Analyses

These will be done mainly at the sugarcane farm production level. Detailed information on individual farm production inputs and output, prices paid for inputs, price received for outputs, investment cost on fixed assets, varieties planted, farm practices, biophysical characteristics of the farm, socio-economic characteristics of the farm operator/manager, support services availed, and problems and constraints faced by the farm operator/manager will be collected from 120 to 150 sample farms in each of the provinces. Stratified random sampling will be applied in drawing the sample farms in each mill district. The farm size (small, medium, and large) will be the basis for stratification.

The productivity and efficiency of the individual farms will be analyzed using stochastic frontier analysis (SFA) and data envelopment analysis (DEA). The sources of productivity and causes of technical inefficiency will be identified. The best practice farms, which will serve as benchmark farms, will be identified, too, in the process. As previously mentioned, they will be the ones operating on the production frontier. The input use, output level, and profitability of small, medium, and large farms will be compared statistically, and the economically optimal farm size will be determined. An analysis of whether the rates of input use by the sample farmers are economically optimal given the current input and output price levels will be done.

Based on the results of above component studies, the strengths and weaknesses of the industry as well as the threats and opportunities available in the industry will be identified. They will also serve as the bases for coming up with upgrading strategies in order to develop the competitiveness of the industry and improve the income or welfare of the key actors in the supply chain.

VI. PRELIMINARY RESULTS OF METHODOLOGY

A. VALUE CHAIN ANALYSIS: PRELIMINARY FINDINGS

BATANGAS PROVINCE

Sampling Procedure. In CY 2016-17, there are 9,440 sugarcane farms in Batangas with a total area of 28,323.34 has. There are only two mills that serve the whole area. About 60% (5,652) of the farms are in the municipalities within the vicinity of Don Pedro Mill District, namely: Nasugbu, Tuy, Lian, and Calatagan. The remaining 40% (3,788) of the farms are located in Balayan Mill District. Although there is greater number of farms in Don Pedro, the total sugarcane area in Balayan is larger (16,219 has) than Don Pedro (12,104.2 has) as the farm sizes in Balayan (Eastern side) are larger. While nearly 55% of the total sugarcane area in Balayan is accounted for by medium and large farms, in Don Pedro medium and large farms only account for about 22% of the total sugarcane area. The average farm size in Don Pedro and Balayan are 2.1 has and 4.3 hectares, respectively.

For the farm survey, ***stratified random sampling*** was adopted. All the four municipalities in Don Pedro were included, while in Balayan only the top five municipalities in terms of total sugarcane farm area were selected, namely: Balayan (4,447.3 hectares), Calaca (1,756.3 hectares), Ibaan (1,409 hectares), Tanauan (1,301.7 hectares), and Alitagtag (1,146.6 hectares). The farms in the selected municipalities were classified by size (Table 1). The industry classification by size was adopted, i.e. small (≤ 10 has), medium (10.1 – 50 has) and large (> 50 has). A minor modification in the classification was done by subdividing the small farms into Small-A (≤ 2.5 has) and Small-B (2.6 – 10 has). This was done since it is deemed that 2.6 to 10 has of farm size is not ordinarily small by Philippine standard as the

average farm size in the Philippines as of 2012 was 1.29 hectare. Moreover, a planter with more than two hectares can already be considered as relatively progressive planter.

Socio-Economic Characteristics of the Sample Planters. Planters holding larger farms were generally younger and more educated, but with fewer number of years of experience in sugarcane farming planters with smaller land holding. Most of them are part-owners of the land they till with one or more parcels of land.

Characteristics of the Sample Farms. Sample farms belonging to Small-A and Small-B subgroups have average farm areas of 1 hectare and 5 hectares, respectively, while those belonging to medium and large groups have average farm areas of 23 hectares and 97 hectares, respectively. Majority of the sample farms under different size groups has the ideal flat topography and clay loam to sandy loam soils. Small-A farms mostly plant Phil 7544 sugarcane variety while larger farms mostly planted VMC 84524. Very few sample farms in Batangas mill districts adopted newly introduced varieties, e.g. 1999 and 2000 series.

Farm Production and Land Productivity. Average total cane production of sample farms were 75 tons among Small-A, 302 tons among Small B farms, 1,408 tons among medium farms, and 6,990 tons among large farms. In terms of land productivity or yield per hectare, the overall average for all samples was 58 tons of cane. Larger farms generally obtained greater yields than small ones—Small-A and Small-B have an average of 56 tons and 57 tons per hectare, respectively, while the medium-and large-sized farms obtained an average of 60 tons and 70 tons per hectare, respectively.

Constraints on Sugarcane Production and Land Productivity. The first and most commonly cited constraints on sugarcane production and land productivity across different farm sizes was the prevalence of pests, e.g. white grubs, termites, beetles, rats, locusts, tungro, and army worms. More than half (52%) of sugarcane planter-respondents have experienced the prevalence of one or more of these pests. The second most commonly cited constraint is the lack or high cost of labor (38%) especially during harvesting. Some planters rely on migrant labors from Negros who usually migrate to Batangas after the harvesting in Negros. Hence, sometimes these planters experience delay in harvesting because they have to wait until harvesting in Negros is finished. Other common constraints cited by planters were high cost of inputs (17%), lack of capital (13%), low price of sugar (10%), and weeds (12%). There is a myriad of other constraints which were cited by planters, e.g. soil type, low sugar yield, absence of irrigation, drought, fertilizer usage, lack of equipment and machinery, climate, trucking, unavailability of cane points, same variety all throughout, wilting of sugarcane crop, low soil fertility, and a host of other minor factors.

Reasons for Not Expanding Sugarcane Farm Areas. Sugarcane planter-respondents mentioned lack of capital (49%), unavailability of land (25%), cannot manage larger farm (14%), lack/shortage of labor (6%), and a host of other minor factors.

Access to New Technology and Adoption. Majority (87%) of the sample planters, especially those with small- to medium-sized farms, were not aware of new sugarcane production technologies, or have not kept abreast with technological development. Nonetheless, majority (78%) of the large planters were aware of, and even claimed they have adopted, new technologies.

As far as access to extension services is concerned, majority of the sample planters has not accessed extension services provided by government institutions (83%) and non-government institutions (99%).

Credit Access. Majority of the sugarcane planter-respondents are not aware of the existence of banks (66%) and non-banks (57%) financial institutions in the area. In terms of

borrowing incidence, majority (58%) of them are borrowers while the rest are not. Sugarcane planters belonging to the Small-A and Small-B groups has an average credit amount of around PhP36,000.00 and PhP 91,000.00, respectively. While, the medium and large planters has an average credit amount of PhP266,000.00 and PhP46,000.00, respectively. Out of the 83% who availed credit, majority (51%) of them did not encounter any problem. On the other hand, 41% of them encountered problems which include inadequate amount of loan, high interest, timeliness, schedule of payments, expenses for guarantors, payments of loans are being deducted right after milling, schedule of release of loan is not known, limited sources of credit.

Moreover, 42% of them have a credit-market tie up arrangement. In this type of arrangement, planters are oblige to sell their output to their respective creditors. Some of the sampled respondents claimed this arrangement has advantages including immediate source of credit, assurance of market/buyer, quick transactions, and less cost of access.

Membership in Organizations. Fifty one percent of the samples-respondents are members of the organizations such as Batangas Sugar Planters Cooperative Marketing Association, Inc. (BSPCMA), Batangas Integrated Sugar Planters Multi-Purpose Cooperative, Inc. (BISPMPC) Saprocom Multipurpose Cooperative (SAPROCOM-MPC) and *Kapisanan ng mga Magsasaka ng* Hacienda Roxas Inc. (KAMAHARI). According to them, there is an advantage of being a member of an organization when it comes to marketing, credit availment and provision of inputs and machineries. These organizations are the member associations of the LUZONFED, Inc.

Marketing. The study is now on its stage of completing the first level of the market chain. So far, a total of eight traders were already traced from the 37 sugarcane planter respondents. The other marketing participants identified were the assembler-wholesalers, agents and brokers. Noted is the change of ownership of the quedan as it moves along the chain. The usual practice of the sugarcane planters is to bring their harvest to the millers (Mill A and Mill B) wherein the miller will issue them a warehouse receipt indicating the volume and the date of withdrawal of quedans. At the time the quedans are released, this is also the time where sugarcane planters and traders meet for transactions. Only the registered traders are allowed to withdraw these quedans from the mill.

Marketing Problems. Majority (65%) of the sugarcane planter-respondents did not encounter problems in marketing their quedans. On the otherhand, 51% of them experienced marketing problems such as: low price of sugar (67%), low bargaining power (11%) and limited market options (5%). Other problems include poor farm-to-mill roads (3%), low PSTC (3%), limited number of millers (2%), competition with HFCS (2%), smuggling (2%), wrong information (2%), delayed payment (2%), and priority of traders are large planters (2%).

Distribution and Marketing of Sugar Quedan. Sugar millers and planters' associations do not market or sell physical sugar collectively. They only trade their sugar *quedan,* a proof of ownership of sugar as deposited in registered warehouses of the mill. The quedan system secures credit, simplifies trading, and monitors the withdrawal of raw sugar from the warehouses. As soon as the sugar is processed, the planter is being issued a *quedan* or warehouse receipt by the mill representing his share of the sugar and stating its classification or market destinations depending on the SRA policies. The sugar *quedan* then becomes a negotiable instrument and the sugar can now be easily bought and sold without physical movement prior to delivery.

Annexes A and B show the flow of sugar *quedan* in the two mill districts in Batangas province, wherein a total of 13 market intermediaries were traced from the 50 sugarcane planter-respondents. A total of 8,022 Lkg and 40, 680 Lkg of raw sugar were sold from Don

Pedro Mill district and Balayan mill district, respectively. In Don Pedro MD, the commission agents has the majority of raw sugar bought about 3, 573 Lkg, while in Balayan MD, the assembler wholesalers got the bulk of the sugar from the planters with a total of 20, 617 Lkg. These assembler wholesalers are actually the associations and cooperatives in the province. Most of the planter-respondents from Balayan MD are members of the associations/ cooperatives who consolidate their output, initially buy their sugar *quedan* and eventually sell to the big trader. In CY 2016-2017, the sugarcane planters sold their sugar at an average price of PhP1,300 per bag. On the other hand, majority of their sugar *quedan* buyer has a mark-up price that ranged from PhP5.00 to PhP10.00 per bag, while some cooperatives, has a mark-up price of PhP2.00 per bag of sugar.

Planters Associations/Cooperatives. There are a number of associations and cooperatives who provide services to the sugarcane planters in Batangas. Such services include production/ crop loans, fertilizer trading, distribution of planting materials, pre and post harvest facilities rental and marketing of sugar *quedan.* Among the large planters associations/cooperatives are Batangas Integrated Sugar Planters Multipurpose cooperative (BISPMPC) located in Lipa City and Batangas Sugar Planters Cooperative Marketing Association (BSPCMA) in Balayan, Batangas.

Input Suppliers. There were 11 input suppliers interviewed in Batangas who provide access to inputs such as planting materials, machineries and equipment, herbicides and fertilizers. The input supplier-respondents include 9 multi-purpose cooperatives (MPCs) and 2 market outlets. The MPCs commonly provide access to fertilizers which they sell to their members and sometimes offers it as credit in a form of cash or in kind. Their mark-up price for fertilizer irrespective of grades usually ranges from PhP5.00 to PhP10.00 per bag. In the case of herbicides, they just put a mark-up price of PhP5.00 on the average. Meanwhile, the mark-up price of the other input suppliers in the area is relatively higher that ranges from PhP10.00 to PhP15.00. Most of the costumers of the available stores in the area are small sugarcane planters who cannot afford to order in bulk in some associations. Other planters are unaffiliated.

Financial Service Providers. Access to credit institutions is one of the main concerns of the sugarcane planters given the capital intensiveness of the industry. There are formal banking and non-bank institutions that serve the sugarcane planters in Batangas. Landbank and Philippine National Bank (PNB) are the banks which the planters can access credit, while other planters can
directly access their credit to their respective associations/cooperatives. There were 3 associations/ cooperatives which provide financing services to the sugarcane planters exclusive for their members in Batangas. These associations/ cooperatives usually offer credit in a form of cash or in kind. The type of loans which planters could get are agricultural/ production/crop loans, chattel mortgage, fertilizer loan, real estate and educational loans. The interest rates ranges from 11 to 24 percent per annum. Their planter-members could pay their loans during harvest season, wherein others have an option to pay them in cash. Other associations/ cooperatives automatically deducts their loans from their sugar *quedan* proceedings. Meanwhile, aside from the bank and non-bank institutions, some of the sugarcane planter-respondents avail credit directly from their sugar *quedan* buyers, known as agents and brokers. Usually, they can have cash advances from these *quedan* buyers and just pay during the milling season. These planter-borrowers chose to get credit from them due to accessibility and less hassle of availment. They have basically a credit-market tie up arrangement with the agents and brokers.

Research Development & Extension Service Providers. In Batangas, there is an assigned mill district officer in each mill district. These MDOs usually conduct farm visits and attend to the sugarcane farming concerns of the planters. Each mill district has also Mill District Development Council. Like in Don Pedro Mill District, it has Mill District Development

Foundation Inc. (MDDFI), which acts as a focal point of the development in the district. MDDFI helps in the implementation of plans and programs to help the sugarcane planters, like farm mechanization and variety improvement program. Other projects like mudpress utilization; road rehabilitation and extension, education and training were also being undertaken by the MDDFI for assistance to the planter clientele. Don Pedro MDDFI has a representative from the seven planters association in Batangas, Sugar Regulatory Administration (SRA) and Philsurin.

Sugar Mills. There are two sugar mills in Batangas, namely, Mill A and Mill B. The former is the largest milling and the second largest refining operations in the country with a capacity of 12,000 TC per day and 18,000 bags of refined sugar per day. Mill B has a daily milling capacity of 4,500 TC.

For crop year 2016-17, about 71% of canes in Batangas were milled in Mill A while the remaining 29% where brought to Mill B. Both mills also provide trucking services with corresponding rates depending on the distance. Mill B offers trucking rates ranging from PhP100 to PhP200 per ton, while in Mill A they offer free hauling within the 50 km radius and about PhP40 to PhP200 per ton for the Eastern part of Batangas. Aside from trucking services, millers also give incentives such as volume, fresh cane and early milling incentives. Incentives usually range from PhP10 to PhP50 per ton. The planters share in Mill A is 67% which is relatively higher than Mill B with 65%.

NEGROS OCCIDENTAL PROVINCE

Sampling Procedure. In CY 2016-17, there are 10, 093 sugarcane farms in Negros Occidental with a total area of 230, 789 hectares. There are 9 milling companies that serve the whole area, namely La Carlota, Victorias, Lopez, URC-SONEDCO, BISCOM, Hawaiian-Philippines, First Farmers, Sagay and OPTIONS.

For the farm survey, ***stratified random sampling*** was adopted. All the three municipalities in La Carlota Mill District were included , while in Victorias only the top three municipalities in terms of total sugarcane farm area were selected, namely: Cadiz City (58,297 has), Victorias City (28,029 has), and Manapla (6,304 has). The farms in the selected municipalities were classified by size. The industry classification by size was adopted, i.e. small (≤ 10 has), medium (10.1 – 50 has) and large (> 50 has). A minor modification in the classification was done by subdividing the small farms into Small-A (≤ 2.5 has) and Small-B (2.6 – 10 has). This was done since it is deemed that 2.6 to 10 has of farm size is not ordinarily small by Philippine standard as the average farm size in the Philippines as of 2012 was 1.29 hectares. Moreover, a planter with more than two hectares can already be considered a relatively progressive planter.

It was initially targeted to cover in the survey a total of 156 sample farms (i.e, small-A (37), small-B (39), medium and large (40 each)). Nonetheless, the actual number of small planters interviewed exceeded the planned number while the number of medium and large planters actually interviewed somewhat fell short of the target numbers for some reasons. Some of the large planters identified in the sampling frame were found not actually medium/ large while others were simply hesitant to be interviewed.

Socio-Economic Characteristics of the Sample Planters. Planters who have different farm sizes generally have almost the same age and are male dominated. Planters holding larger farms are generally more educated and more experienced, with large farm holders being the most experienced. Large farm holders also started farming at an early age, averaging to 28 years old, relative to the others. Generally, the planters' household size are almost the same ranging from four to five members per household. As the farm size

increases, their total yearly household income together with the household income from sugarcane also increases. This can be supported by the gathered data on planters' primary occupation; 95% of them has farming as their primary occupation. Even as secondary occupation, almost half of them do farming. Most of the planters are owner operator of the land they till with one to five parcels of land.

Characteristics of the Sample Farms. Sample farms belonging to Small-A and Small-B subgroups have average farm areas of 1 hectare and 5 hectares, respectively, while those belonging to medium and large groups have farm areas of 28 hectares and 126 hectares, respectively. Majority of the sample farms of each size group has the ideal flat topography, except for farms belonging to large group with majority of them being flat-slightly rolling. Furthermore, mostly have clay loam soil. Majority of the farms from different size groups are rainfed, with 98% and 91% rainfed farms in Small-A and Small-B subgroups, respectively. The new plant variety that is being used by majority of planters from different farm sizes is the VMC 84-524 sugarcane variety. Likewise, majority of the farms from different size groups have ratoon with VMC 84-524 sugarcane variety.

Farm Production and Land Productivity. The average ton cane production of sample farms were 84 tons among Small-A farms, 286 tons among Small-B farms, 2000 tons among medium farms, and 10,257 tons among Large farms. In terms of land productivity or yield per hectare, the overall average for all samples was 66 tons of cane. Larger farms generally obtained greater yields than small ones—Small-A and Small-B have an average production of 63 and 62 tons per hectare, respectively, while medium and large-sized farms obtained an average of 66 and 76 tons per hectare, respectively.

Farm Area, Farm Production, and Land Productivity with New Plant. Larger farms generally cover more area with new plant and has greater average total cane production compared to small ones. Small-A, Small-B, Medium, and Large farms produced 54 tons, 576 tons, 1,053 tons, and 6,422 tons, respectively. Moreover, larger farms generally obtained greater new plant yields than small ones. The average new plant yield is 62 tons per ha among Small-A farms, 63 tons per ha among Small-B farms, 72 tons per ha among Medium farms, and 80 tons per ha among Large farms.

Farm Area, Farm Production, and Land Productivity with Ratoon. Larger farms generally cover more area with ratoon and had greater average total cane production compared to small ones—Small-A, Small-B, Medium, and Large farms produced 79 tons, 209 tons, 1,113 tons, and 4,012 tons, respectively. Moreover, larger farms generally obtained greater ratoon yields than small ones. The average new plant yield is 63 tons per hectare among Small-A farms, 60 tons per hectare among Small-B farms, 62 tons per hectare among Medium farms, and 73 tons per hectare among large farms.

Constraints on Sugarcane Production and Land Productivity. The most commonly cited constraint on sugarcane production and land productivity across different farm sizes is the lack or high cost of labor especially during harvesting season while some of the large planter-respondents are also having manpower shortage during weeding season. Due to high cost and shortage of labor, they have the tendency to experience delayed harvesting operations and therefore might lose the chance to have their output sold at a high price.

The second most commonly cited constraint is the changing weather patterns (42%). For instance, their application of fertilizer tend to be delayed and too much heat might cause the sugarcane to wilt while excessive rainfall could reduce its sugar content.

Prevalence of pests (29%) is also a problem and just like in Batangas province, pests such as white grubs and termites and are also found in Negros Occidental.

Other common constraints cited by the planter-respondents were lack of capital (23%), high cost of inputs (16%), lack/ high cost of machineries and equipment (16%), and soil type/ topography (12%). There were also numerous other constraints but were cited sparingly, e.g. low sugar yield, absence of new technologies/ varieties, drought, fertilizer usage, lack of equipment and machinery, inefficient farming systems, management capability, number of ratoons, cane quality, weeds, rice volatility, weeds, CARP, and taxes.

Reasons for Non-Expansion. Majority (82%) of the sugarcane planter-respondents did not expand for the last five years mainly due to the unavailability of land (53%). Some of the areas are now being converted to residential and recreational purposes. The next most commonly cited reason was the lack/ no capital (35%) while some of them are being constrained by the lack/ expensive labor (23%). Other commonly cited constraints were low/ fluctuating sugar prices (12%) and having fixed land area (10%).

Input Sourcing/Procurement. Majority (52%) of the sugarcane planter-respondents did not encounter problems in acquiring inputs. However, 48% of them had a problem in terms of availability (24%), accessibility (23%), and lack of capital (20%). Most of them complained about having shortage of cheaper and high quality fertilizer. Hence, they tend to buy what is readily available in the market. Other commonly encountered problems include high cost of procurement/transportation (14%), price fluctuations (11%), high costs (9%) and delayed delivery (7%). Majority (81%) of them picked-up the inputs they purchase, while the rest (19%) preferred their inputs to be delivered and pay on a per sack basis, e.g. PhP 10/sack (See Tables 32 & 33).

Awareness of the Presence of Banks and Non-Banks Financial Institutions. Majority (65%) of the planter-respondents are aware of the existence of banks in their areas which offers financial services for sugarcane planters, like Landbank, Marayo Bank, UCPB, etc. On the other hand, 63% of them are also aware of the existence of non-bank financial institutions like Neptune, Boston, MACARBEN, etc.

Credit information. Majority (68%) of the sugarcane planter-respondents did not borrow capital for the last five years while the rest (32%) availed credit mostly from their respective associations, mills and traders (50%), relatives (43%) and cooperatives (33%) while only few of them availed credit from the bank (22%). Most of them availed cash (72%) and a few of them had an in kind credit (9%) while some of them availed both cash and in kind (20%). Usually cooperatives and associations provide credit in kind, i.e., a farmer can avail 10 sacks of fertilizer and their payment will be automatically deducted from their output during harvest season. On the average, the sugarcane planter-respondents had a total loan amount of PhP68,864 (Small-A), PhP100,000 (Small-B), PhP152,000 (Medium) and PhP232,857 (Large). Results showed that most of the planter-respondents acquired credit in order to pay for their farm laborers (78%) and to purchase fertilizers (67%). It can also be inferred that part of their credit acquisition are being devoted for household expenditure (37%), purchase/ payment for machineries/ equipment (30%), purchase of material inputs (20%) and purchase of herbicides and other chemicals (9%). Among the 46 sugarcane planter-borrowers, 87% of them encountered problems such as high interest rates (61%), inadequacy of loan amount (57%) and untimely release (13%). In addition, the respondents were also asked regarding the organization that can best facilitate credit services and results showed that most of them still preferred banks (37%).

Access to Extension Supports. Out of the 145 sample sugarcane planter-respondents, only 20% of them were able to have access to extension support from the government while 24% of them had an access to non-government extension supports for the last five years. Some of the private institutions like, Philsurin and Alter Trade Philippines, provide the sugarcane planters access to material inputs (e.g., provision of new HYVs), machineries/ equipment (e.g, ram pump irrigation facilities) and soil analysis. However only 34% of the

sugarcane planter-respondents are aware of the existence of the private technology providers, nonetheless majority (68%) of them are still willing to pay for additional services in order to improve sugarcane farming/ production. Based 13% of them adopted new technologies.

There are seminars and trainings being organized by the different government institutions including Department of Agriculture and Sugar Regulatory Administration for the past five years, however, only few (27%) of them were able to participate for some reasons. Some of them couldnot afford going to the seminar sites while some are not just interested. According to them, the concerned institutions should hold seminars and trainings not just on the technical aspect of production but also into management (farm record keeping), financial literacy and marketing.

Planters Associations & Cooperatives. In Negros Occidental, sugarcane planters are required to become a member of an association/cooperative in order for them to bring their canes to the respective millers and to be able to market their sugar. Each of the association maintains a workforce in the sugar mill premises that monitors data and equipment to protect the integrity of the cane weights and analysis of cane deliveries. Normally, they have personnel in the scale house and core sampling laboratory. Also, they have personnel who monitor periodically the calibration of the weighing equipment in the factory, compute the balance of stocks in the warehouses and molasses volume in the tanks. The associations also offer services related to Social Amelioration Program (SAP) like maternity and death benefits of sugarcane farm workers of planter-members through the Department of Labor and Employment (DOLE). Other services being offered by the associations also include mudpress and mill ash withdrawal, trip tickets to the mills, road repair and crop inspection, soil analysis, double-coring/LkgTC and trash appraisal monitoring.

In La Carlota Mill District, there are two planters' associations that serve the entire mill district. Apart from negotiation and monitoring, the association also provides scholarship programs through Sugar Industry Foundation, Inc. (SIFI), offers patronage refund of around PhP10 per Lkg and sells fertilizer to their planter members.

In the case of Victorias Mill District, there are 5 district and 12 non-district or extended associations. District associations are from the areas such as Victorias City, Cadiz and Manapla, while outside these areas are considered to be non-district who deliver canes to VMC. On the average, cooperatives charge between PhP5.00 to PhP10.00 per Lkg as service fee. Aside from negotiation, monitoring and marketing, the associations/ cooperatives also provide services including input supplies, financing, transloading and access to machineries and equipment.

Input Suppliers. There are numerous input suppliers in Negros Occidental, hence planters have options on where to purchase. A total of 10 input supplier-respondents were interviewed in the study, 7 of which are the regular stores and dealers found in the area while 3 of them are planters' association/cooperatives. The dealer's mark-up price for fertilizer ranges from PhP10.00 to PhP30.00, while associations/cooperatives put a mark-up price between PhP10.00 to PhP20.00 per bag. Some associations (e.g. VICMICO) assist the planters in purchasing tractors, trucks, tires, diesel fuel and cane knives.

Financing Service Providers. Aside from the formal banking institutions like Landbank, PNB and DBP, other prominent banks that provide access to financing for sugarcane planters in Negros Occidental also include Marayo Bank and Dungganon Bank Inc. The type of loans vary from agricultural/ production/crop loans, truck loans, educational and real estate loans. Normally, aside from the usual paper requirements, these banks also require the submission of the previous three consecutive volume of production of the planter borrower. The interest rates range from 11 to 22 percent per annum.

The small planters usually access credit from their respective associations/ cooperatives. They can actually avail loans and services like molasses advances, fertilizer loans, and *quedan* financing. *Quedan* financing allows the planter members to continue operations by having their quedans financed by banking institutions (e.g., LBP, Bank of Commerce, BDO) and not sold at cheaper prices. With this kind of financing, the planter member can avail funds from the banks to help them in their cash flow. Loans from associations/cooperatives are being paid during milling season and automatically deducted from the planter's *quedan* proceedings.

Sugar Mills. There are 9 operating sugar mills in Negros Occidental. The study covered only two mill districts, which are La Carlota and Victorias mill districts. The planters-millers sharing scheme is based on the capacity of mills and it usually ranges to 30-35 percent (millers' share) and 65-70 percent (planters' share). However, the net planter's share may vary depending on their respective association charges. Mill A and Mill B are the two largest mills in the Negros Occidental with milling capacity of 16,000 TC per day. Since there is a stiff competition among the mills, they have different styles and services. Milling companies have transloading stations to aid the hauling of canes. Also, trucking subsidies are being offered which vary depending on the distance, usually it ranges from PhP30.00 to PhP280 per ton. There also incentives in volume and fresh canes.

Research Development & Extension Service Providers. Just like in Batangas, there are Mill Ditrict Officers and Mill District Development Councils (MDDCs) in every mill district. MDDC in La Carlota provides assistance/ services such as custom plowing (PhP9500/ha), canepoints dispersal (PhP2700/lacsa), soil analysis, and mudpress loading (PhP400/ truck load). Currently, the institution is launching the use of VMC 84-524, Phil 86-550, PSR 07-195, PSR 07-66, Phil 07-45, Phil 02-272, Phil 03-171, Phil 06-2289, and Phil 00-0791. MDDC serves a total of 60 municipalities, including La Carlota, La Castellana and Pontevedra.

Interfirm Relationships. Inter-firm relationships refer to the type of coordination or cooperation in the value chain. Strong coordination between and among players through horizontal (e.g. farmer to farmer or farmers' coop to other farmers' coop) or vertical integration (e.g., farmer to mill or farmer to traders) is important to take advantage of market opportunities. Support services enable the different functions or vertical linkages in a value chain (e.g., financing, RDE, technology, logistics, advisory services, product design, and other services). For horizontal relationship analysis, six parameters were used which include, price and technological information sharing, input bulk buying, collaboration in marketing, trust and their competition level. Results revealed that, there is a strong relationship among the farmers in terms of price information sharing. Majority of them are members of the cooperatives/ associations. Pricing and marketing of their output are not a major concern as majority of them rely on their cooperatives/associations in determining the prices and in seeking buyers. On the other hand, there is a weak relationship among them in terms of technological information sharing. They do not often discuss and exchange information about the newly available technologies. Majority of them still rely on their traditional way of farm practices. In terms of buying farm inputs, there is a weak relationship among them, since majority of them prefer to buy on their own. Although, it will be cheaper for them to buy in bulk, the availability of their capital for inputs are not always readily available. Meanwhile, their degree of trust to each other is strong in general, thereby making their competition level, weak in general.

On the other hand, for vertical relationship analysis, parameters such as supply contract, price and technological information sharing, value added services, quality control and trust were used.

Farmer to Input suppliers. In terms of procurement/ supply contract, farmers and input suppliers have a strong relationship. Some of them can actually avail credit in kind and pay in cash within a month or in *quedan* form during harvesting season. Also, there is a strong relationship that exists between them in sharing price information. Farmers are always being updated to the existing prices as well as price changes. However, results showed that there is a weak relationship in general between them in terms of technological information. There are few who were offered new brands of fertilizers and herbicides by their suppliers. Most of the planter-respondents do not also often check the quality of inputs they buy, hence they have a weak relationship in terms of quality control. They often buy what is readily available at a cheaper price. This also implies their strong trust to their suppliers.

Farmer to Miller. Out of the 9 milling companies that serve the area, 7 of them were identified by the sample planter-respondents to whom they brought their cane for milling for the crop year 2016-17. Results showed that Victorias (40%). La Carlota (29%) and Lopez (16%) were the top milling destinations. There is a strong relationship between planters and the miller in general. Factors such as its proximity, sharing arrangement, subsidy, benefits, incentives and price offered are being considered by the planters in choosing where to mill. In terms of price and technological information, value added services and trust there is a weak relationship in general between them. Planter-respondents demand for transparency in each aspect. On the other hand, in terms of quality control, strong relationship exists. Mills offer incentives to green canes and penalties to burnt canes. They also have standard trash deductions schedules, which serve as their guide in measuring the percentage of purity and sugar that can be obtain from the cane.

Farmer to Traders. Their sugar quedan is being bought by their respective associations/ cooperatives. Their associations/ cooperatives are the ones who take charge in marketing their output. Their associations/ cooperatives will just deduct marketing fees, e.g, PhP2/ LkG. Some of the associations/ cooperatives also function as domestic/ international traders as well as the milling companies. In general, results showed that there is a weak relationship between planters and sugar traders. Basically, planters do not know specifically to whom their sugar is being sold.

NEGROS ORIENTAL PROVINCE

Sampling procedure. In CY 2016-2017, a total of 275,055 hectares are planted with sugarcane in Visayas, wherein, Negros Oriental has approximately 35% or about 94,882 hectares of total area planted with sugarcane. There are three milling companies which are located and serve the province of Negros Oriental. There are about two mill districts in the province which includes, Tolong (11,549 hectares) and Bais-Ursumco (28,596 hectares). The former covers the municipalities of Siaton to Basay City, while the latter covers the town of La Libertad down to Zamboangita area. ***Stratified random sampling*** was employed in the selection of the planter-respondents. The top municipalities covered were chosen in terms of farm area and number of planters. The municipalities included from Bais Mill District are Bais City, Pamplona, Tanjay City, while Bayawan City, Sta. Catalina and Siaton represented the Tolong Mill District. A total of 122 planter-respondents from Bais Mill District and Tolong Mill District were interviewed and were classified as small (subdivided into three groups; 3 hectares and below, 5 hectares and below and 10 hectares and below), medium (10.01 to 50 hectares) and large (above 50 hectares).

Socio-economic Characteristics of the Planter-Respondents. Planters having different farm sizes generally have almost the same age and are male dominated. Planters holding larger farms are generally more educated and more experienced, with large farm holders being the most experienced. Large farm holders also started farming at an early age, averaging to 30 years old, relative to the others. Generally, the average planters' household

size are almost the same ranging from four to five members per household. As the farm size increases, their total yearly household income together with the household income from sugarcane also increases. This can be supported by the gathered data on planters' primary occupation; 95% of them have farming as their primary occupation. Even as secondary occupation, almost half of them do farming. Most of the planters are owner operator of the land they till with one to seven parcels of land.

Characteristics of the Sample Farms. Sample farms belonging to small group have an average farm area of 3.53 hectare, while those belonging to medium and large groups have farm areas of 22.41 hectares and 136.28 hectares, respectively. Majority of the sample farms of each size group has a slightly rolling topography, that is why some of the farms could not fully mechanized their farm operations. Furthermore, mostly have clay loam and sandy loam soil, which are considered to be good quality of soil for sugarcane. Majority of the farms from different size groups are rain-fed (71%), while 29% of them have irrigation system. Majority of the irrigated farms are owned by the large planter-respondents, thus, they use different irrigation system like, overhead sprinkler, drip and water pump irrigation system. Apparently, only one planter-respondent belonging to medium-sized group has only irrigated farm, mainly because some of them complained about the water source, hence they do not invest to irrigation facilities.

In terms of cane planted, only 9% of them has a new plant, while most of them (48%) are planted with ratoon and about 43% of them have both new plant and ratoon planted. The average number of ratoons noted was about 4 to 5. With regards to the sugarcane varieties planted, still VMC 84-524 dominates, while only some, especially the medium and large planters were able to access to new varieties like 2000 series launched by Philsurin. Meanwhile, among the sugarcane varieties, Phil 99-1793, has a positive feedback from the planter-respondents. This variety, according to them has a yield potential of up to 170 TC/hectare and approximately 2.1 LkG/TC. Also, aside from its good tonnage and LkG/TC characteristics, agronomic traits include self detrashing, drought tolerance, good germinator and fast grower.

Farm Production and Land Productivity. The average ton cane production of sample farms were 109 tons among Small (3 hectare and below) farms, 150 tons among Small (5 hectare and below), 203 tons among Small (10 hectare and below) farms, 1,255 tons among Medium farms and 9,783 tons among Large farms. On the average, Negros Oriental has an average production of 2,660 tons. In terms of land productivity or yield per hectare, the overall average for all samples was 57.6 tons of cane which is lower compared to Negros Occidental with 66 tons per hectare. Larger farms generally obtained greater yields than small ones. Small farms had an average of 56 tons per hectare, while large-sized farms obtained an average of 65 tons per hectare. Noticeably, yield per hectare of the medium-sized farm seemed to be lower than the small-sized farms. Medium-sized farms had an average yield of 54 tons per hectare. This might be due to the farm protocols of the planter-respondents interviewed. In terms of the number of bags of sugar produced for the crop year 2016-17, sampled respondents in Negros Oriental has an average of 100 Lkg per hectare. Small farms had an average of 91 Lkg per hectare, while the medium-sized and large-sized farms obtained an average of 97 and 127 Lkg per ha respectively. Meanwhile, their average sugar factor or LKG/TC received ranges from 0.6 to 4.2.

Reasons for Non-expansion. Out of the 122 planter-respondents, 78% of them did not expand their area devoted to sugarcane farming for the last five years. Among the top reasons for non-expansion were lack/ no capital (41%), lack/ no available land (39%), lack/ expensive labor (37%) and inconsistencies of LKG/TC (17%). Other commonly cited reasons were low/ fluctuating prices (12%), some couldn't manage activities (6%), low sugarcane yield (4%), crop diversification (3%), and CARP (3%).

On the other hand, 22% of them expanded their farm area for some reasons like source of additional income, while some of the large farms has a capital for expansion.

Constraints on Sugarcane Production and Land Productivity. The most commonly cited constraint on sugarcane production and land productivity across different farm sizes was still the lack or high cost of labor especially during harvesting season while some of the large planter-respondents are also having manpower shortage during weeding season. Due to high cost and shortage of labor, they have the tendency to experience delayed harvesting operations and therefore might lose the chance to have their output sold at a high price. Also, other planters were not able to deliver their canes right before the mills within their reach close their milling schedules.

The second most commonly cited constraint is the changing weather patterns (34%). For instance, their application of fertilizer tends to be delayed and too much heat might cause the sugarcane to wilt, while excessive rainfall could reduce its sugar content. Prevalence of pests (33%) is also a problem and just like in Batangas and Negros Occidental provinces, pests such as white grubs and termites and can also be found in Negros Oriental.

Furthermore, millers/ milling inefficiencies is also seen as a constraint by the planter-respondents. They complain about the LKG/TC results which seems to be inconsistent. Other common constraints cited by the planter-respondents were: high cost of inputs (26%), price volatility (23%) and CARP (12%). There were also numerous other constraints but were cited sparingly, e.g. low sugar yield, absence of new technologies/ varieties, drought, fertilizer usage, lack of equipment and machinery, inefficient farming systems, management capability, number of ratoons, cane quality, weeds, price volatility, weeds, high cost of hauling, lack/no irrigation facilities, poor farm to mill roads and taxes.

Farm Production and Land Productivity Planted with New Plant. Large-sized farms cover more farm areas planted with new plant compared to the small ones. Some planters were hesitant to buy cane points for planting which are relatively costly. On the average, cane points cost about PhP2000 per lacsa, while the 2000 series varieties costs up to PhP2700 on per lacsa basis. Moreover, as the farm size increases yield per hectare also increases. On the average, yield per hectare with new plant is 58 TC for large-sized farms, while 46 TC, 48 TC and 53 TC, for small farms with 3 ha and below, 5 ha and below and 10 ha and below, respectively. Medium-sized farms have an average yield of 55 TC.

Farm Production and Land Productivity planted with Ratoon. Most of the planters-respondents have their farm planted with ratoon. Majority of them (51%) belong to the small-sized farms.

Meanwhile, most of these large farms planted first up to second ratoon only, because they believe that more than two ratoons will yield to lower output. Moreover, large-sized farms still had the highest yield, with 63 TC, among the farm sizes. Noticeably, the yield per hectare of medium-sized farm (52 TC) is relatively lower compared to the 59 TC yield of the small-sized farms.

Constraints to Inputs Sourcing. Forty eight percent of the planter-respondents encountered problems in acquiring inputs. Majority of them are actually the planter-respondents belonging to the small-sized farms. Among the top cited problems were price (52%), availability (42%), accessibility (42%) and shortage (22%). Large planters do not have problems when it comes to inputs access in general, since they have their own procurement system, wherein they usually have an advance or pre-order of inputs they need (material inputs, fertilizers and other machineries and equipment). In Negros Oriental, access to material inputs is not a major problem, however prices of new high yielding varieties are relatively higher (e.g, PhP2700/ lacsa), hence most of the planter-respondents,

especially the small ones are hesitant of purchasing these varieties. When it comes to fertilizers, Viking Ship, Amigo Planters and Harvesters are the most patronize brands when it comes to quality. However, these brands are costly, depending on grades.

Credit Information. In Negros Oriental, there is a relatively fewer credit institutions compared to Negros Occidental. Out of the 122 planter-respondents, only 35% of them availed credit for the past five years mainly for capitalization, purchase of inputs and payment for laborers. Most of them availed credit from the non-bank institutions such as associations and cooperatives. Their payment will be automatically deducted from their sugar proceedings. However, some problems were cited by the planter-respondents in credit availment including, inadequacy (84%), high interest rates offered (67%) and tedious requirements (7%). On the average, planter-borrowers belonging to the large-sized farms had an average loan amount of PhP4,991,818 which is higher compared to the average loan amount of the small ones.

Extension support services received by the Planter-respondents. Only few of the planter-respondents received extension support from both government and non-government agencies. Forty percent of them received assistance from the government and most of them are from Bayawan City covered by Tolong mill district. Its local government has an active involvement to the sugarcane industry in their area. Part of their program is the provision of free plowing and harrowing services and dissemination of maximum of four bags of Diammonium phosphate (18-46-0) fertilizer per hectare. The planter-beneficiary is allowed up to a maximum of 4 hectares only to be assisted by the program.

On the other hand, majority of the planter-respondents are not aware of the availability of newly developed technologies, hence majority of them did not also adopt any of the technologies. Newly launched technologies like high yielding varieties and high-end equipment like cane loaders and mechanical harvesters can only be accessed by the large planters themselves.

TARLAC PROVINCE

Sampling Procedure. Seven municipalities in the province of Tarlac were initially selected for research. These are Bamban, Capas, Concepcion, Gerona, Paniqui, Tarlac City, and Victoria. ***Stratified random sampling*** was used, resulting to different number of target planters to be interviewed from each municipality. Planters-respondents were classified according to the size of their farms. There are planters which are also interviewed from other municipalities like Pura, Ramos, and San Manuel. Total respondents are 130 from farms which are classified as small (10 hectares and below), medium (10.01 to 50 hectares) and large (above 50 hectares).

One-third of small planters came from the municipality of Victoria. This is followed by Gerona and Paniqui. In the case of medium-sized farms, most of them came from Capas, while large planters also came from Capas and Concepcion (18%). Farms were classified in order to know if there are significant differences among farms on production, marketing, and other factors involved in the industry.

Socio-Economic Characteristics of the Sample Planters. In general, most planters are middle-aged, with an average year of 55 years. These planters are relatively younger with an average of 50 years old. For gender, more than 80% of planters are male, uniform to all farm size.

Educational attainment are classified as elementary graduate (EU), elementary graduate (EG), high school undergraduate (HU), high school graduate (HG), college undergraduate

(CU), college undergraduate (CG), and post-graduate (PG). Most planters from all farm sizes, have graduated college and obtained a degree, with the large planters having the highest percentage of 62%. This ratio is twice of that of small planters which is just 30% and very close to the number of high school graduates.

The family size of the planter-respondents range from four to six members. Percentages vary among size brackets, next to family of five, small planters usually live with two or less family member, while medium planters live with more than five.

The main occupation or source of income of the planter-respondents are categorized into farmer (F), government employee (GE), private employee (PE), laborer (L), and self-employed (SE). More than 90% of planters (small and medium) received their income from farming (sugarcane or rice), and a little less of this percentage for large planters which is 88%. Among the government employees or laborers interviewed considered their job only as secondary occupation, since they are more involved in sugarcane farming and treat as their main source of income. There were also a few respondents who are working in private institutions or have their own business and treat sugarcane farming as secondary source of income.

Based from the primary occupation and other sources of income of the household of the planter-respondents, the figure above shows their annual household income. The income was computed annually since there is only one cropping season for sugarcane. The average annual income of planters is roughly half a million pesos, which is just one-third of the income of medium planters. Large planters owning a farm of more than 100 hectares, have an average annual income of more than PhP 10 million. Seventy-five percent of the household income came from sugarcane farming.

For small planters, 59% of them own the land they till, and 16% are either owned or leased. This is very low compared to medium and large planters since who almost 50% of them are owner-operators and lessee at the same time. Fifteen respondents received certification of land ownership award (CLOA) and were granted a parcel of land from the Department of Agrarian Reform (DAR).

In summary, sugarcane planters in Tarlac are male, middle-aged, has college degrees, belong to a family of five, do farming from their own land as their main source of income, and earns PhP 2 million per year.

Characteristics of the Sample Farms. The characteristics of farms are described based on the total area, number of parcels of land, irrigation, land features like topography, soil type, furrow distance, area planted with new plant and ratoon.

Out of 130 planters, 64 or 49% of them have farms with an area of 10 hectares and below, which is twice the number of respondents-large planters (50 hectares and above). On the other hand, forty planters have medium-sized farms (10.1 to 50 hectares). Small and medium planters have one parcel of land, while 35% of large planters have one. The remaining 75% of them owns more than one up to five parcels of land. This is because most of them owns and lease from other areas or outside their barangay or municipality.

Irrigation or water supply is very important in farming. It is an established fact that crops need water in order to grow. Around 70% of sugarcane farms in Tarlac are irrigated, the remaining 30% are depending their water supply from rainfall. Majority of the planters also use deep well irrigation in their farms.

More than 80% of the farm have flat topography, with sandy loam type of soil, and with a furrow distance of 1.5 meters since most of them practice mechanized farming.

It was also found out that most of planters-respondents did not plant in the last crop year and harvested from ratoon plants instead. Forty-four percent of the planters only devoted a quarter or half of their total farm area for new plant.

There are different varieties used or planted in Tarlac mill district. The usual or main variety used by Tarlac planters is 99 series, although many large planters also use VMC 84-524.

Planters commonly use urea, ammonium sulfate, ammonium phosphate, complete, and potash as their fertilizers. The most common brand of fertilizer is Swire. For herbicides, only 44% of them uses chemical, which is 2-4D, while the rest of the respondents do manual weeding.

Farm Production and Land Productivity. Twenty-five percent of sugarcane farms harvested in Tarlac yield within the range of 51-60 ton canes per hectare. The total average yield for the province is 60.4 tc/hectare. This finding follows the trend of the average sugarcane yield in the Philippines which is around 60.4 tc/ha in 2010-2014, and is also 4.5% higher than the average yield in Batangas (58 tc/ha). Among the farm classifications, small planters have higher yield of 63 tc/ha and medium and large planters have not reached 60 tc/ha. It can also be observed that only small and medium planters have yields higher than 90tc/ha.

Based from these yields, the average bags of sugar produced from the mill district is 85 Lkg and using the conversion formula, this results to a PSTc value of 1.10. Large planters have the highest average number of bags of sugar with a value of 88 Lkg/ha. Further analysis will be employed in order to know the cause of the difference in yield and PSTC values among planters.

Planter-respondents were also asked directly regarding the constraints of their farms' productivity. Multiple answers were recorded, and the data shows that most of them have problems in accessing or paying for labor. Medium and large planters experience this more, due to the higher number of laborers they need. Other problems mentioned by planters are sugarcane burning, unavailability of machineries, lack of government support, quality of soil, and unawareness with new technologies.

It can also be seen that large planters do not have a problem when it comes to capital, this can be attributed to their higher income. On the other hand, almost 15% of small planters are facing this problem and more than 25% of them lack inputs or cannot procure due to lack of supply or high costs.
In general, only 22% of the planters expanded their farms. The rest of them did not expand, and even converted their lands for other crops due to the problems mentioned above, and also due to the low price of sugar, resulting to lower income.

Facility Machine Availability. Almost all planters in Tarlac practice mechanization, especially medium and large planters. Table 7 shows the availability and access for the different facility or machine that planters use in sugarcane farming. Looking on the data, all planters believe that tractor is available in their area, and 45% of them have their own tractors (light and/or heavy). In terms of trucking, only two planters cited that trucking service is unavailable in their area. These planters are from Victoria and Paniqui. Twenty-five out of 26 (96%) planters have their own trucks while 63% of small planters rent from the mill or from medium and/or large planters. The last machine evaluated was harvester, and only 27% of the planters did not use or rent the machine, most of them came from the small planters group since medium and large planters are prioritized when renting. Only four out of 130 planters own harvester, since the machine is very expensive. These are large planters

with more than 100 hectares, two of them personally own their farms, while the other two are corporations.

Research, Development, and Extension (RDE) Services. RDE services refer to any kind of support received by the planters, given by government and/or private institutions. These services can be in the form of farm visits, provision of technical advice and materials, farmer field school, study tour, school on the air, seminar or trainings, soil analysis and fertilizer recommendation, and post-harvest or processing technology.

Overall, only 30% of the all planters received extension service from the government institutions, while half of them received the services from private institutions like the miller. Extension services like farm visits and seminars/trainings from the government mostly came from SRA. Forty percent of the sampled planter population were able to attend seminars which are mostly about improving production, farm operations, mechanization, and introduction of new varieties.

When asked if they are willing to pay for technical services, 41% of the planters answered yes as long as it will help their production. Forty-two percent of the planters are also aware of new technologies developed like new varieties and fertilizers, new implements, and the mechanical planter, but only 31% of them adopted it. These new technologies were provided by CAT and SRA.

Credit Support Services. Forty-seven out of 130 planter-respondents are familiar or aware of banks that provide loans for sugarcane farming. These are FICO bank, Landbank, Rural Bank of Angeles, Security Bank, Signa Bank, and United Coconut Planters Bank. On the other hand, there are also non-bank institutions providing loans, wherein most planters are more aware of. These are Agrikulto Inc., ASKI (Alalay Sa Kaunlaran Inc.), ASUCAL, CAT, CATPA, Mabilog Cooperative, NCPAT, PhilSuCor, Tinang SN MPC, and informal like Benito Chan, Dra. Lourdes Plaminiano, and Baby Garvez. Eighty-five or 65% of the planters have availed loan either from bank or non-bank institutions in the last five years.

It can be observed that small and medium planters borrow less amount than large planters, which is logical given their farm size needs and income. The average amount borrowed by planters within the last five years was PhP 342,000 was given in cash. The interest rate varies among the institutions providing the loan and it ranges from 0.8% to 31% per annum. Planters pay the loan through installment, quedan, or by selling their molasses to the lender.

Marketing. All of the planters in Tarlac mill their harvest in Mill A, but 61% of them have no idea regarding the sharing arrangement among the producer, miller and association. In ASUCAL and CATPA the sharing arrangement is 0.66-0.33-0.01, in NCPAT, 0.62-0.37-0.01, for producer, miller, and association respectively.

The average trucking subsidy given to the planters is PhP 31/ton. Small and medium planters sell their harvest through their associations while large planters while 54% of large planters sell directly to traders. Planters do not have problem regarding the logistics of marketing, but rather on the fluctuating and low price of sugar, thirty-six percent of the planters identified this as their major marketing problem.

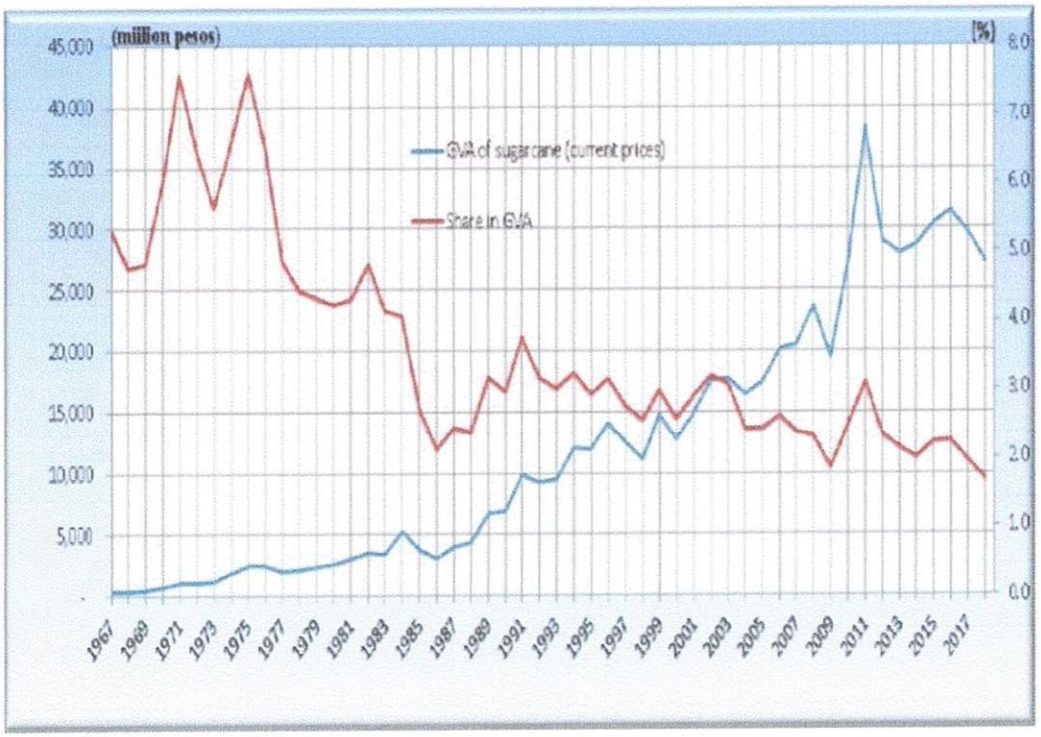
Membership in Organizations. As mentioned in the last report, there are cooperatives and associations present in Tarlac province. These are Mabilog Cooperative, Sapang Multi-purpose Cooperative, Tinang SN Multi-purpose Cooperative, Association of Sugar Planters of Central Luzon (ASUCAL), Central Asucarera de Tarlac Planters' Association, and North Cluster Planters' Association of Tarlac (NCPAT). These groups usually market planters' produce from the miller.

Forty-four percent of Tarlac planters are members of ASUCAL, majority of the members are small planters. Thirty-three percent are CATPA members while only 10% belong to NCPAT, this is because the organization is just mainly composed of planters from the northern municipalities in the province like Paniqui and Gerona. When asked if they experience any organization-related problem, only seven planters responded and mentioned issues in price differential, transparency, and same set of board of directors, but the 95% of them are generally satisfied with their organization.

B. RESULT

Sugarcane used to be the 4th major traditional crop in the country after rice, corn and coconut. Sugar used to be a major export commodity of the Philippines. Thus, the subsector was a major source of employment, income and foreign exchange.

Figure 1. Trends in Sugarcane Sector: Its Contribution to GVA of Agriculture, Fishery and Forestry



Based on its contribution to GVA, the subsector has declining importance.

- Increasing in current prices, but declining in real terms.
- Declining share in total GVA in griculture, fishery and forestry.

Figure 2. Trends in Sugarcane Sector: % Contribution to GVA of Agriculture, Fishery and Forestry

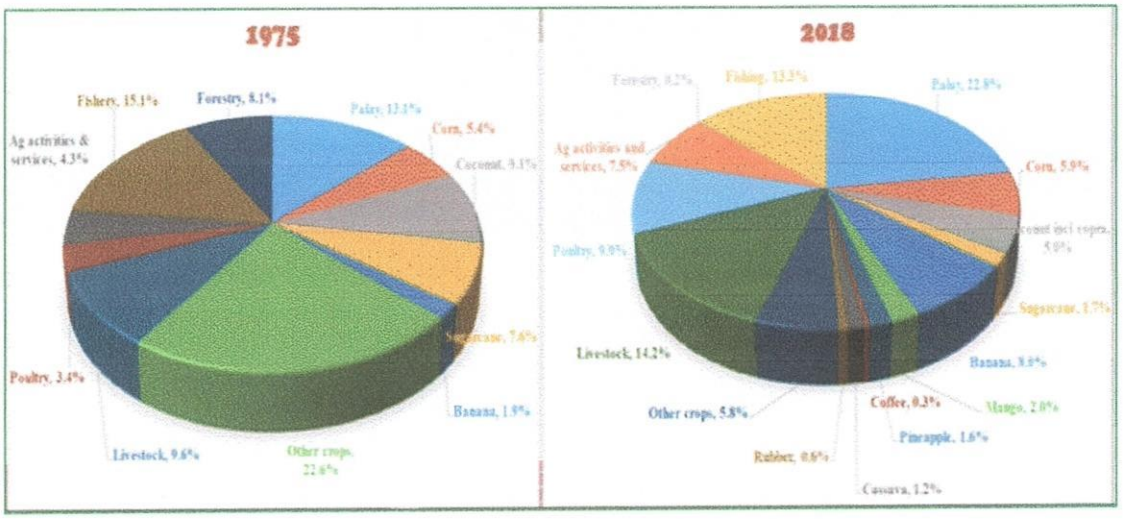
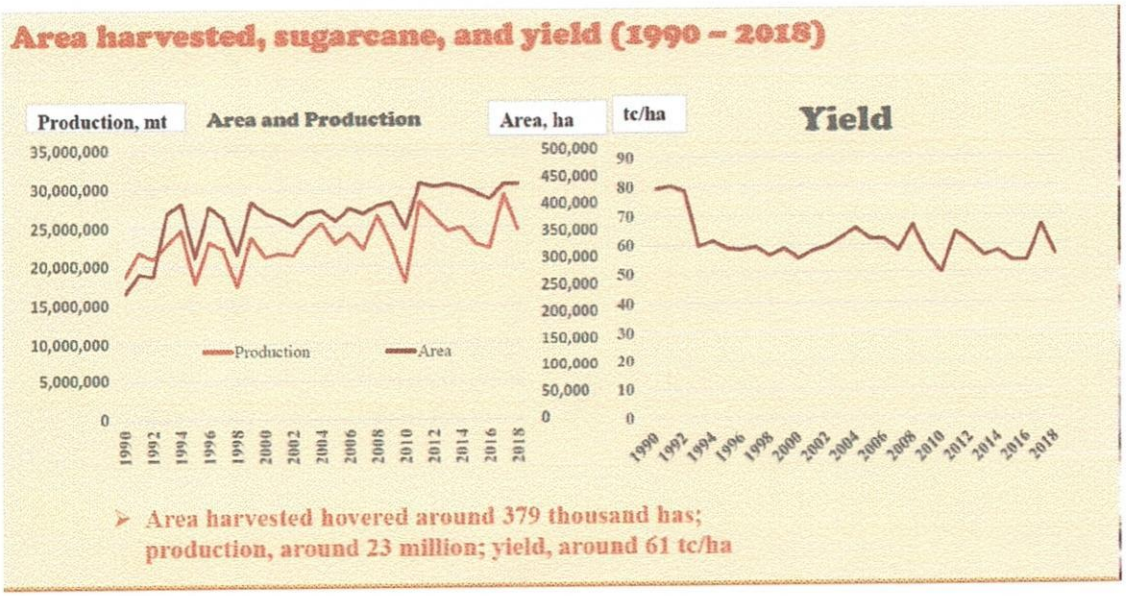


Figure 2 shows that sugarcane crop was among the major performing crops of the Philippines. It has contributed 7.6% to the GVA in agriculture in 1975. However, the performance of sugarcane sector did not achieve sustainability where records show that in 2018, the contribution to GVA was down to only 1.7%.

Figure 3. Trends in Sugarcane Sector: Area harvested, cane and sugar production and yield



The total sugarcane plantation area for crop year (CY) 2017-2018 was 418,215 hectares. As shown in Figure 3, the plantation area decreases overtime which may be attributed to the conversion of sugarcane plantations to plantations for other crops.

Farm productivity or yield is measured by the quantity of cane output per unit area or tons cane per hectare (TC/Hectare). As seen in Figure 3, yield in CY 2017-2018 dropped to

51.99 TC/hectare from a good performance in CY 2016-2017 which averaged to 66.46 TC/Hectare.

Likewise, raw sugar production in CY 2017-2018 dipped to 2,083,641 metric tons from 2,500,509 metric tons in CY 2016-2017. This can be explained by the trend in plantation area and farm productivity which both recorded a decreasing trend.

Table 1. Distribution of the Respondents by Location and Farm Classification Based on Technical Efficiency

Distribution of the 685 respondent sugarcane planters by location and farm classification based on technical efficiency

PROVINCE	FARM CLASSIFICATION							
	Benchmark		Typical (moderate)		Typical (poor)		All	
	n=159		*n=396*		*n=130*		*n=685*	
	No.	%	No.	%	No.	%	No	%
Batangas	20	14	50	35	73	51	143	21
Tarlac	37	28	79	61	14	11	130	19
Negros Occidental	50	34	91	63	4	3	145	21
Negros Oriental	18	15	84	69	20	16	122	18
Bukidnon	34	14	92	63	19	13	145	21
TOTAL	159	23	396	58	130	19	685	100

Table 1 showed the distribution of respondents by location and farm classification based on the technical efficiency. The respondents were represented by 159 for the benchmark farmers, 396 for moderately efficient farmers and 130 poorly efficient farmers. For moderately efficient farms, majority of the respondents were found in Tarlac, Negros Occidental, Negros Oriental and Bukidnon. On the other hand, 51% of the poorly efficient farms were recorded in Batangas.

Table 2. Distribution of the Respondents by Location and Farm Size

Distribution of the 685 respondent sugarcane planters by location and farm size

PROVINCE	FARM SIZE							
	Small		Medium		Large		All	
	n=395		n=154		n=136		n=685	
	No.	%	No.	%	No.	%	No	%
Batangas	118	83	16	11	9	6	143	100
Tarlac	64	49	40	31	26	20	130	100
Negros Occidental	75	52	32	22	38	26	145	100
Negros Oriental	64	52	30	25	28	23	122	100
Bukidnon	75	52	35	24	35	24	145	100
TOTAL	396	58	153	22	136	20	685	100

In Table 2, the data showed that respondents were classified into small, medium and big farmers based on the size of their landholdings. For small farms, size of farm is 0.1 hectare to 5.00 hectares; medium is 10.01 to 50.00 hectares; and big is 50.01 100.00 and up hectares. Majority of the respondents were classified as small farmers and the most number of them were in Batangas. The figures can be explained by highly tenanted areas in Batangas and the effect of comprehensive agrarian reform law in Tarlac, Negros region and Bukidnon where plantation size farms were subsidivided into small farms. The small parcels of land were distributed to farmers and workers, thus, a number of agrarian reform beneficiaries were recorded in these areas.

Table 3. Distribution of the Respondents by Farm Size and Farm Efficiency

Distribution of the 685 respondent sugarcane planters by **farm size** and farm efficiency classification

FARM SIZE	FARM CLASSIFICATION							
	Benchmark		Typical moderate		Typical poor		All	
	n=159		*n=396*		*n=130*		*n=685*	
	No.	%	No.	%	No.	%	No	%
Small	55	35	244	62	97	75	396	58
Medium	34	21	92	23	27	21	153	22
Large	70	44	60	15	6	5	136	20
TOTAL	159	100	396	100	130	100	685	100

Table 3 showed that the large farms were the standard farms or point of reference against which the moderately and poorly efficient farms were compared. Small farms were characterized as moderately efficient to highly inefficient farms. This condition can be connected to absence of economies of scale in smaller farms and insufficient capital of small farmers to invest on recommended technologies in sugarcane farms.

Table 4. Distribution of the Respondents by Farm Size and Farm Efficiency

Average technical efficiency of the 685 respondent sugarcane planters by location and technical classification

PROVINCE	FARM CLASSIFICATION			
	Benchmark	Typical moderate	Typical poor	All
	n=159	*n=396*	*n=130*	*n=685*
Batangas	93.98	74.91	41.34	60.44
Tarlac	94.05	78.80	49.97	80.03
Negros Occidental	95.04	81.21	52.4	84.84
Negros Oriental	94.04	77.11	47.79	74.95
Bukidnon	93.86	79.17	48.11	80.03
AVERAGE	94.11	78.59	44.59	75.74

Table 4 is a comparison of the rate of efficiency between the benchmark farms versus the moderately efficient farms and poorly efficient farms. For the 3 classes of farms, the table indicated that Negros Occidental got the highest average rate of efficiency at 84.84%.

Table 5. Average Productivity of the Respondents

Average productivity of the 685 respondent sugarcane planters by location and farm farm efficiency classification (tc/ha)

PROVINCE	FARM CLASSIFICATION			
	Benchmark	Typical moderate	Typical poor	All
	n=159	*n=396*	*n=130*	*n=685*
Batangas	71.4	65.1	48.9	57.7
Tarlac	76.3	57.4	37.7	60.6
Negros Occidental	79.0	59.6	30.1	65.5
Negros Oriental	75.0	63.0	32.1	57.9
Bukidnon	68.5	49.2	26.9	50.8
AVERAGE	75.8	57.1	41.3	58.4

Table 5 presented the difference of productivity yield between the benchmarks farmerss and the typical farmers. Tons cane per hectare (TC/Hectare) is highest in Negros Occidental and lowest in Bukidnon.

Table 6. Number of Irrigated Farms

Distribution of the 165 respondent sugarcane planters with irrigated farms by province and by farm efficiency classification

PROVINCE	FARM CLASSIFICATION							
	Benchmark		Typical moderate		Typical poor		All	
	n=76		n=80		n=9		n=165	
	No.	%	No.	%	No.	%	No	%
Batangas	4	20	9	18	1	1	14	10
Tarlac	30	81	51	65	7	50	88	68
Negros Occidental	32	64	16	18	1	25	49	34
Negros Oriental	8	44	3	4	0	0	11	9
Bukidnon	2	6	1	1	0	0	3	2
TOTAL	76	48	80	20	9	7	165	24

Most of the benchmark farms are irrigated. However, only 24% of sample farms are irrigated.

Tarlac mill district has the most number of irrigated farms. Overall, 68% of the total respondents in Tarlac mill district have irrigation particularly in the benchmark farms.

Table 7. Constraints in Improving Productivity

Distribution of the 685 respondent sugarcane planters by province and constraints to productivity

CONSTRAINTS[a]	PROVINCE											
	Batangas n=143		Tarlac n=130		Negros Occidental n=145		Negros Oriental n=122		Bukidnon n=145		ALL n=685	
	No.	%	No.	%	No.	%	No	%	No	%	No	%
Lack/high cost of labor	94	66	15	12	74	51	94	77	81	56	358	52
Prevalence of pests	19	13	91	70	42	29	40	33	32	22	224	33
High cost of inputs	74	52	26	20	23	16	32	26	20	14	175	26
Changing weather patterns	0	0	23	18	61	42	41	34	60	41	185	27
Lack of capital	19	13	20	15	33	23	19	16	43	30	134	20

[a] *Multiple response*

Lack or high cost of labor is the eminent reason in improving productivity of the respondents. Due to the growth of the construction sector, there is a migration of laborers from the farm to the construction projects anywhere in the cities and even in the provinces. This problem is true especially during harvest season. The farmers were competing on the available supply of laborers and this cause delays in harvesting and loading of canes. Table 7 showed that this problem is common in Batangas, Negros Regions and Bukidnon.

Tarlac: Value Chain Map

Figure 4. Tarlac: Value Chain Map of Benchmark Planters

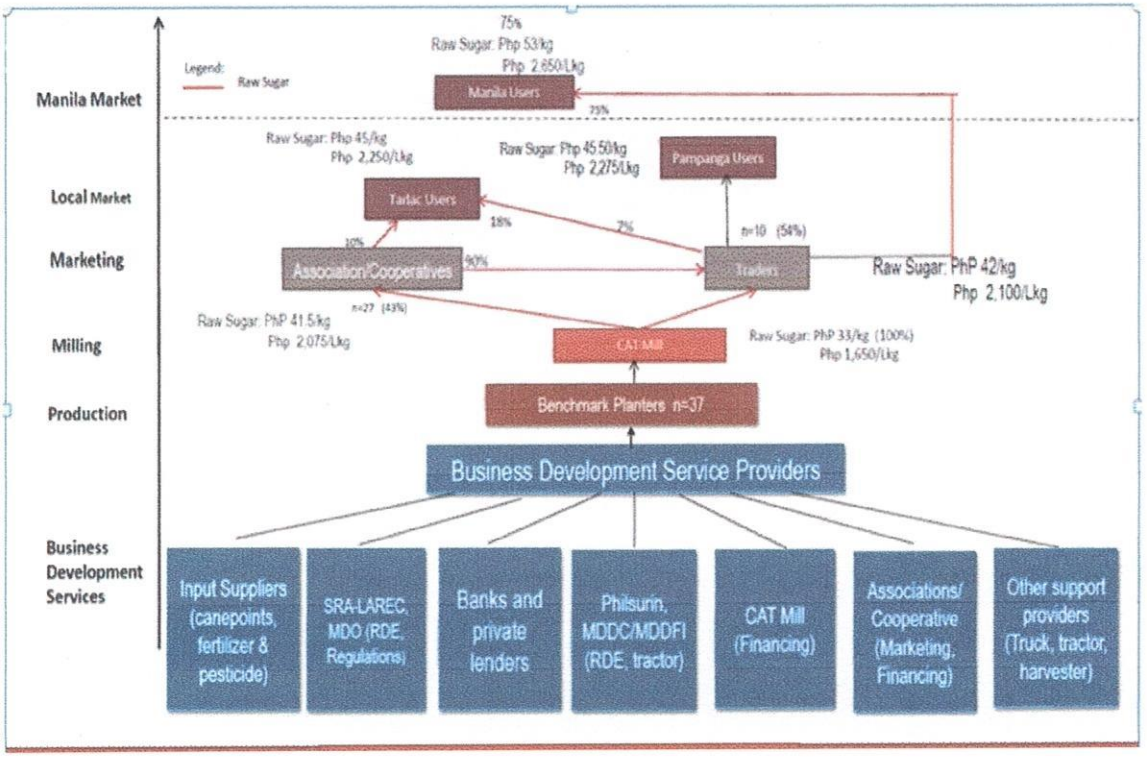
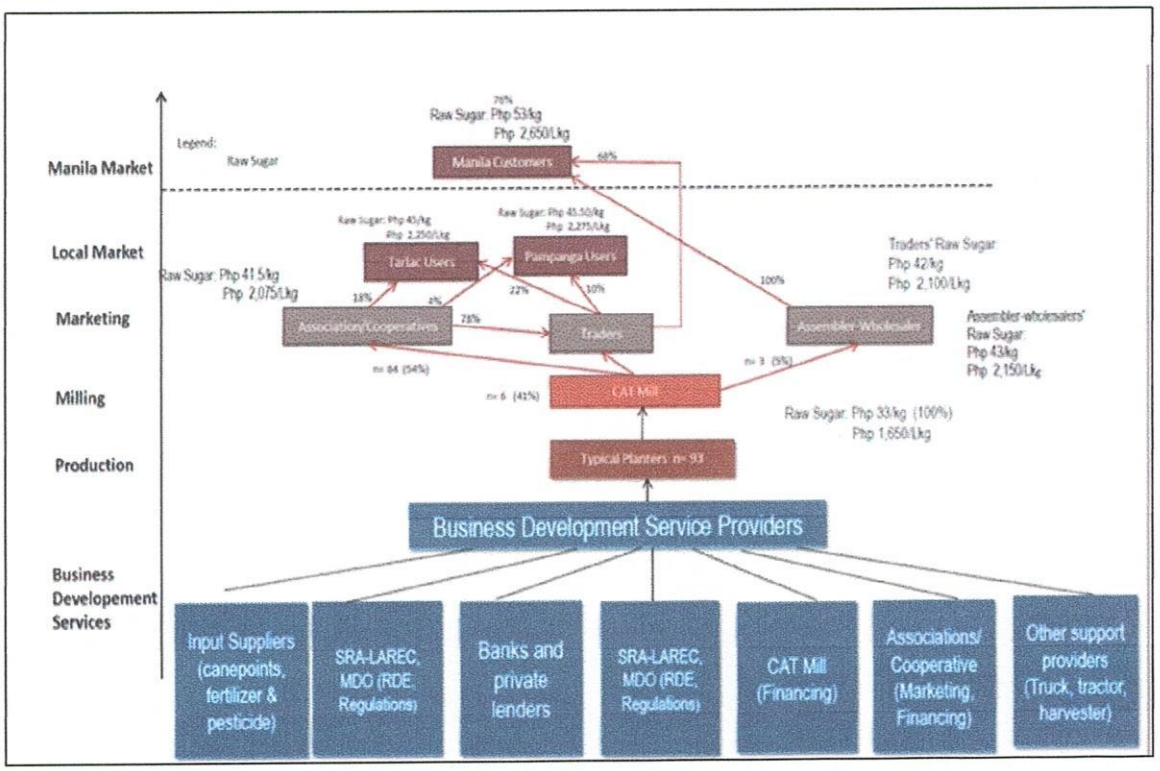


Figure 5. Tarlac: Value Chain Map of Typical Planters



Figures 4 and 5 showed the specific activities in the sugar production chain. The four primary activities are cane production, cane milling, marketing and distribution of sugar. The service providers that help to create values in each chain are: 1) *Cane production* – a) input suppliers of tractor services, fertilizers, canepoints, etc. are sourced either from Mill District Development Councils, agricultural supply distributors/retailers, individual farmers, planters associations, etc., b) SRA's Luzon Agricultural Research Center (LAREC) and Mill District Officers provide farming technologies; c) banks and private lenders provide loans capitalization; d) sugar mills also open financing windows for sugarcane farmers. 2) On *cane milling* – a) the SRA enforces regulatory functions to sugar mills thru the SRA regulation officers who are present in all sugar mills; b) sugar mills offer hauling logistics to farmers for delivery of canes to the sugar mills and canes are milled at an agreed production sharing scheme. 3) In *marketing* of sugar, the farmers sold their quedans either directly to the planters association, or directly to traders, or to quedan assemblers. Sugar quedan is a sugar receipt, a negotiable instrument, which is a proof that a particular farmer has a volume of sugar stored in the mill's warehouse. 4) *Distribution* of sugar to end users, either wholesalers or retailers, were done by planters associations and traders. End-users are industrial and institutional users consisting of food/beverage manufacturers, bakeshops, confectioners, hotels, hospitals, resorts, repackers, etc.

RECOMMENDED STRATEGIES TO RESTORE THE PROFITABILITY OF THE SUGARCANE INDUSTRY

1. Process upgrading

- Mechanization
- Improvement of fertility management
- Investment on irrigation facilities climate change adaptation
- Continuous varietal improvement and planting material propagation and distribution
- Aggressive control of sugarcane pest
- More effective extension system
- Strengthen and capacitate the research centers particularly in terms of staff complement

2. Product Upgrading

- Improvement of cane quality

3. Intra-sectoral upgrading

- Promotion of trading transparency
- Improvement in market information system

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