Journal of Global Business and Trade

Vol.12 No.1 May 2016

IAGBT

The Journal of Global Business and Trade

International Academy of Global Business and Trade

Journal of Global Business and Trade

Vol.12 No.1 May 2016

Journal of Global Business & Trade

Vol.12 No.1 May 2016

IAGBT

The Journal of Global Business and Trade

IAGBT

www.ipfw.edu/jgbt

The Journal of Global
Business and Trade

Economic Impact of the ASEAN-China Free Trade Agreement on Philippine Fresh Banana Exports

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ABSTRACT

The study determined the economic impact of the Association of Southeast Asian Nations (ASEAN)-China Free Trade Agreement (ACFTA) on Philippine fresh banana exports covering the period 1990-2013. Results of the shift and share analysis revealed that ACFTA was not trade creating but rather diverted the trade of the Philippines from Japan to ASEAN member countries and to China. The country's fresh banana exports to China were also not price competitive before and after the zero tariff regime in ACFTA. In terms of quality competitiveness, the Philippine fresh banana exports to China were also not competitive due to the stricter sanitary and phytosanitary (SPS) measures adopted by China for the country's fresh banana exports. Using multiple regression analysis, the volume and value of Philippine fresh banana exports to China were significantly affected by tariff, real domestic price, trade disputes, and SPS measures. It was recommended that the Philippines should improve local production of fresh bananas, reduce marketing costs in the fresh banana chain, address trade dispute with China, improve and harmonize SPS standards, and explore other markets for fresh banana exports.

Keywords: ACFTA, competitiveness, fresh banana, shift and share, trade dispute
JEL Classifications: F10, F59, F60, Q17

I. Introduction

The Philippines has bananas as one of its major agricultural exports. It produces a number of banana cultivars like Saba and Lacatan, but the Cavendish cultivar mainly comprises the country's fresh banana exports. This cultivar is widely grown in the provinces of Davao del Norte, Compostela Valley, and Bukidnon in Mindanao. In 2014, the total export volume of Philippine fresh bananas reached 3.63 million metric tons (mt) valued at USD 1.13 billion (FAOSTAT, 2016). The top export destinations include Japan, the People's Republic of China, and the Republic of Korea (PSA-BAS, 2016). The Philippines engaged in trade agreements with these countries and such agreements have provisions concerning agricultural exports which include fresh bananas. The Japan-Philippines Economic Partnership Agreement (JPEPA), which took

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effect in December 11, 2008, has already reduced the tariff for fresh bananas from 10 to 8.7 percent in summer and 20 to 18.7 percent in winter as of 2014. The Philippines also participated in the Association of Southeast Asian Nations (ASEAN)-Japan Comprehensive Economic Partnership Agreement (AJCEPA) as a member country of ASEAN. It implemented the agreement on July 1, 2010. In the case of China and South Korea, the Philippines is one of the signatories to the ASEAN-China Free Trade Agreement (ACFTA) and the ASEAN-Korea Free Trade Agreement (AKFTA). By virtue of ACFTA, ASEAN member countries, which includes the Philippines, started to enjoy zero tariff for fresh banana exports to China since 2010. However, despite this preferential tariff, the country has experienced problems related to the export of fresh bananas to China.

One of the major concerns for Philippine fresh banana exports is the stringent SPS measures adopted by China beginning in 2007. Despite ACFTA, it continued to use the more stringent standards. In March 2012, importers in China rejected the fresh banana exports coming from the Philippines due to claims of pest infestation. Local banana players complained of losing about USD 23.68 million (The Asia Sentinel, 2012). In April 2012, the Philippines and China also began their territorial conflict on Scarborough Shoal. A month after the start of the conflict, around 150 containers of Philippine fresh banana exports remained unsold and were left to rot in ports in China. About 200,000 workers in the domestic banana industry were said to be negatively affected by the incident (Corr and Tajucan, 2013). Whether it is because of the territorial conflict or not, such a conflict posed as a trade dispute could affect the country's exports to China. This study, therefore, seeks to assess how ACFTA, China's sanitary and phytosanitary (SPS) measures, and trade disputes have affected Philippine fresh banana exports to China. It also aims to determine the effects of foreign exchange rate and domestic wholesale price on the volume and value of Philippine fresh banana exports to China.

II. Objectives of the Study

The general objective of the study was to analyze the economic impact of the ASEAN-China Free Trade Agreement (AFTA) on Philippine fresh banana exports to China covering the period 1990-2013. Specifically, it describes the trend in domestic production, area, number of bearing hills, yield, and prices as well as export volume, value and prices. It also analyzed the trade patterns in Philippine fresh banana exports. Furthermore, it compared the local and international standards for fresh bananas. Lastly, it determined the factors affecting the volume and value of Philippine fresh banana exports bound to China.

III. Methodology

Descriptive analysis was done to present the trends in production, area, number of bearing hills, yield, prices as well as export volume, value and prices of Philippine fresh bananas. It was also used to describe the export destinations of the country's fresh banana exports and to compare the SPS measures for fresh bananas. Secondary data were obtained from the Bangko Sentral ng Pilipinas (BSP), Philippine Statistics Authority – Bureau of Agricultural Statistics (PSA-BAS), the United Nations Commodity Trade Statistics (UN Comtrade), and the Food and Agriculture Organization of the United Nations (FAO-UN). Local and international standards were gathered from the Philippine National Standards (PNS) – Bureau of Agriculture and Fisheries Product Standards (BAFPS), currently known as the Bureau of Agriculture and Fisheries Standards (BAFS), and the FAO/WHO Codex Alimentarius Commission, respectively. Meanwhile, China's SPS was from the Administration of Quality Supervision, Inspection and Quarantine (AQSIQ). Primary data on expenditures on port, storage and distribution, and exporter's margins were collected from the secretary of Orient Multifoods Manufacturing Corporation (OMMC) and the director

of the Philippine Food Processors and Exporters Organization (PHILFOODEX).

Shift and share analysis was used to analyze the trade patterns in Philippine fresh banana exports. It was done to determine whether the country's accession into ACFTA has resulted in trade creation or diversion. On the one hand, trade creation takes place if the agreement results in an increase in the total exports between its member countries. It happens due to the increase in output in which the exporting country has comparative advantage to compensate the increase in demand from the importing countries. On the other hand, trade diversion occurs when the agreement results in a decrease in the total exports in trading with countries outside the agreement. It takes place when member countries favor exports to less efficient but tariff-free countries, which compensates efficient but not tariff-free countries. The trading partners of the Philippines were classified as ASEAN countries, China, Japan and rest of the world. Japan was isolated from the rest of the world being the top export destination based on the total export volume from 1990 to 2013. In ACFTA accession, the growth rate of shares of Philippine fresh banana exports to the four trading partners were computed for the period 1990-2009, which is before ACFTA, and for the period 2010-2013, which is after ACFTA.

Price and quality competitiveness of Philippine fresh banana exports to China were assessed using the comparison between export parity price and domestic wholesale price of fresh bananas and the comparison among the local, Codex, and China's SPS for fresh bananas. If the price ratio between the export parity price and domestic wholesale price is greater than 1, then the country's fresh banana exports to China are competitive. If the local SPS is at par with Codex and China's SPS and the country is able to comply with China's SPS, then the Philippine fresh banana exports to China are competitive in terms of quality.

Multiple regression analysis was employed to determine the factors affecting the volume and value of Philippine fresh banana exports to China. Using volume and value as the dependent variables, two regression models were estimated. The explanatory variables considered were tariff with China, foreign exchange rate, real domestic wholesale price, trade dispute dummy variable, and SPS dummy variable.

$$VOL_t = \alpha + \beta_1 T_t + \beta_2 FX_t + \beta_3 WP_t + \beta_4 TD_t + \beta_5 SPS_t + \mu \tag{1}$$

$$VAL_t = \alpha + \beta_1 T_t + \beta_2 FX_t + \beta_3 WP_t + \beta_4 TD_t + \beta_5 SPS_t + \mu \tag{2}$$

(linear form)

$$\ln VOL_t = \alpha + \beta_1 T_t + \beta_2 FX_t + \beta_3 WP_t + \beta_4 TD_t + \beta_5 SPS_t + \mu \tag{3}$$

$$\ln VAL_t = \alpha + \beta_1 T_t + \beta_2 FX_t + \beta_3 WP_t + \beta_4 TD_t + \beta_5 SPS_t + \mu \tag{4}$$

(logarithmic-linear form)

$$VOL_t = \alpha + \beta_1 \ln T_t + \beta_2 \ln FX_t + \beta_3 \ln WP_t + \beta_4 TD_t + \beta_5 SPS_t + \mu \tag{5}$$

$$VAL_t = \alpha + \beta_1 \ln T_t \, \beta_2 \ln FX_t + \beta_3 \ln WP_t + \beta_4 TD_t + \beta_5 SPS_t + \mu \tag{6}$$

(linear-logarithmic form)

$$VOL_t = \alpha + \beta_1 \ln T_t + \beta_2 \ln FX_t + \beta_3 \ln WP_t + \beta_4 TD_t + \beta_5 SPS_t + \mu \tag{7}$$

$$VAL_t = \alpha + \beta_1 \ln T_t \, \beta_2 \ln FX_t + \beta_3 \ln WP_t + \beta_4 TD_t + \beta_5 SPS_t + \mu \tag{8}$$

(linear-logarithmic form)

where: VOL = volume of Philippine fresh banana exports to China (kg) in year t;

VAL = value of Philippine fresh banana exports to China (FOB USD) in year t;

T = tariff with China (%) in year t;

FX = foreign exchange rate (PhP/USD) in year t;

WP = real domestic wholesale price (PhP/kg) using CPI2000 = 100 in year t;

TD = trade dispute dummy variable (1 = no trade dispute from 1990-2011 and 0 = with trade dispute from 2012-2013); and

SPS = SPS dummy variable (1= less stringent years from 1990-2006 and 0 = more stringent years from 2007-2013).

Four functional forms were tested to satisfy the assumption of linearity. Other assumptions in regression such as absence of heteroscedasticity, multicollinearity, autocorrelation of residuals and measurement error, and normality of residuals were validated.

IV. Results and Discussion

4.1. Production, Area, Yield and Domestic Prices of Philippine Fresh Bananas

Using data from PSA-BAS (2016), the volume of fresh banana production in the Philippines averaged 5.87 million metric tons (mt) from 1990 to 2013. Although it posted an annual growth rate of 5.24 percent covering the period 1990-2008, the trend in production has decreased by 1.52 percent annually from 2009 to 2013. The level of yield, which averaged at 4.73 mt/ha, also followed the same trend with 3.27 percent annual growth in the period 1990-2008 and 0.40 percent annual decline from 2009 to 2013. This can be explained by the increase in the price of fertilizers such as urea (38.92%), ammonium sulphate (55.09%), and complete fertilizer (77.82%) in 2008 and occurrence of Typhoon Pablo in Mindanao in 2012. According to Fusilero (2014), the typhoon negatively affected the Philippine fresh banana industry with a decrease in the volume of exports from 50 to 40.739 million boxes of Cavendish bananas. To achieve an increase in yield, Bathan and Lantican (2010) identified the use of more fertilizer and labor; ownership of land; cultivation of three banana cultivars, namely, Saba, Latundan, and Lakatan; planting in clay loam and sandy claim loam soil; maintaining a distance between hills of equal or greater than 20 square meters; and a shorter distance between farm and residence as factors which could improve the yield of banana farms using data from 80 randomly sampled respondents in Oriental Mindoro in 2007.

Farm area devoted to fresh bananas posted an average of 388,667 hectares, which increased by 1.73 percent yearly from 1990 to 2012 while the number of bearing hills averaged 202.47 million from 1990 to 2013 grew by 3.18 percent yearly (PSA-BAS, 2016). This could be due to the widespread use of bananas as an intercrop in coconut and other types of farms in the Philippines. From 1990 to 2013, nominal farm, wholesale and retail prices also increased by 7.38, 5.96, and 6.40 percent per annum, respectively (PSA-BAS, 2016).

4.2. Export Volume, Value and Prices of Philippine Fresh Bananas

Based on the data from UNCTAD and FAOSTAT (2016), the highest banana export of the Philippines amounted to 3.13 million mt in 2013, valued at USD 897 million, while the lowest was registered in 1992 with 821,000 mt, valued at USD 143 million. From a total of 39.54 billion kilograms of fresh bananas exported by the Philippines covering the period 1990-2013, about 53 percent was to Japan, followed by China (10.96%), South Korea (8.96%), United Arab Emirates (8.08%), and Iran (6.35%). Other markets include Saudi Arabia (2.82%), Singapore (2.28%), New Zealand (1.44%), Kuwait (0.74%) and the United States (0.33%). This is valued at USD 7.80 billion as distributed to the following countries: Japan (53.93%), China (10.67%), South Korea (8.78%), United Arab Emirates (6.98%), Iran (5.58%), Saudi Arabia (2.77%), Singapore (2.42%), New Zealand (1.61%), Kuwait (0.84%), and the United States (0.71%).

Export prices of Philippine fresh bananas from 1990 to 2013 averaged USD 192.23 per mt with an annual growth rate of 6.79 percent (FAOSTAT & PSA-BAS, 2016).

4.3. Trade Patterns in Philippine Fresh Banana Exports

The Philippines still favored fresh banana exports to ASEAN countries and China as shown by the growth rate of shares registered at 361.34 and 57.41

percent, respectively (Table 1). Furthermore, the growth rate of shares of Philippine fresh banana exports to ASEAN is greater than those to China. However, ACFTA was found to be trade diverting for countries outside the agreement, like the case of Japan. Instead of the agreement leading to trade creation, the opposite happened and trade was diverted since the increases in the share of Philippine fresh banana exports to ASEAN and China were compensated by the 20.55 percent decrease in the fresh banana exports to Japan (Table 1).

Table 1. Results of the Shift and Share Analysis for ACFTA Accession, 1990-2013

Share of Philippine Fresh Banana Exports	Trading Partners (%)			
	ASEAN Countries	China	Japan	Rest of the World
1990-2009	9.12	1.38	57.43	32.07
2010-2013	14.36	6.36	45.63	33.65
Growth Rate of Shares of Philippine Fresh Banana Exports	361.34	57.41	(20.55)	4.93

Sources: UNCTAD (2016) and Food and Agriculture Organization of the United Nations Statistics Division (2016).

4.4. Price Competitiveness of Philippine Fresh Banana Exports to China

As shown in Table 2, the Philippine fresh banana exports remained uncompetitive in China based on the computed price ratios. In 2009, when there was still a tariff for Philippine fresh banana exports, the country is not competitive in China since the price ratio is less than one. Tariff reduction by virtue of ACFTA did not lead to the competitiveness of Philippine fresh banana exports as the price ratio was still less than one in 2014.

Table 2. Results of the Price Competitiveness Analysis before and after ACFTA Accession, 2009 and 2014

Item	Type of Tariff Regime	
	2009 (with tariff)	2014 (zero tariff)
At Foreign Exchange Rate of PhP/USD	47.64	44.40
FOB Manila (USD/kg)	0.17	0.29
FOB Manila (PhP/kg)	8.10	12.88
Less		
Port Costs	0.41	0.64
Storage and Distribution Costs	1.22	1.93
Exporter's Margin	0.81	1.29
Export Parity Price (PhP/kg)	5.66	9.02
Versus		
Domestic Wholesale Price (PhP/kg)	8.33	13.09
Price Ratio	0.68	0.69

Sources: Bangko Sentral Ng Pilipinas (2016), Philippine Statistics Authority-Bureau of Agricultural Statistics (2016), and key informants from Orient Multifoods Manufacturing Corporation and the Philippine Food Processors and Exporters Organization (2015).

4.5. Quality Competitiveness of Philippine Fresh Banana Exports to China

Table 3 summarizes the similarities and differences among the local, Codex, and China's SPS for fresh bananas. The Philippine National Standard for Fresh Bananas is generally on par with that of Codex, except in some provisions where Codex has more require- ments. These minimum requirements include the following: (1) practically free of bruises; (2) free of malformation or abnormal curvature of fingers; (3) pistils removed; (4) stalk intact; (5) without bending, fungal damage or desiccation; and (6) hands and clusters must include a cleanly cut crown, not beveled or torn, with no stalk fragments. In the case of China's SPS, it requires of importers the following: (1) filing of

import fruits; (2) tendering documents including a Certificate of Origin, Sanitary Certificate, and Health Certificate; (3) Inspection and Quarantine Declaration; (4) Customs Declaration; (5) release authorization; (6) compliance with the National Food Safety Standard; (7) keeping records of fruit imports and sales for at least two years. Before a trade contract is approved in China, an application shall be filed with the Administration of Quality Supervision, Inspection and Quarantine (AQSIQ) for the examination and approval formalities for the quarantine and inspection of fruits. After which, an Entry Animal and Plant Quarantine License of the People's Republic of China (EAPQL) must be obtained. The EAPQL is presented to the inspection and quarantine institution when filing an inspection and quarantine. These SPS measures threaten the competitiveness of Philippine fresh banana exports to China. For instance, in March 2012, Shenzhen quarantine officers discovered Aonidiella comperei mckenzie, a type of scale insect, during a customs inspection of Philippine fresh banana exports. As a result, AQSIS adopted stricter SPS measures for fresh bananas coming from the Philippines.

Table 3. Comparison of the Sanitary and Phytosanitary Standards for Fresh Bananas in the Philippines: Codex, ASEAN importing countries and China

| Item | SPS Measures | | Administrative Measures of Inspection, Quarantine, and Supervision of Entry Fruits[c] |
	PNS/BAFPS 64:2008[a]	CODEX STAN 205-1997, AMD. 1-2005[b]	
Similarities	- Scope - Provisions - Guided by the WTO Agreement on SPS Measures	- Scope - Provisions	- Guided by the WTO Agreement on SPS Measures
Differences	- Detailed definition of terms - Detailed size classification	- Stricter minimum requirements - Additional requirements for physical qualifications of fresh banana - Detailed provision concerning presentation in a package - Detailed marking and labeling	- Stricter quarantine inspection - Required import permit - Required radiation certificate - Pre-export inspection - Phytosanitary certification and documentation - On-arrival inspection by AQSIQ

Note: [a] Philippine National Standard for Fresh Banana, [b] Codex Standard for Fresh Banana, [c] China's SPS on Fresh Banana Imports adopted on July 15, 2005.

Sources: Philippine National Standards – Bureau of Agriculture and Fisheries Product Standards (2016), Codex Alimentarius Commission (2016), and Administration of Quality Supervision, Inspection and Quarantine of People's Republic of China (2016).

4.6. Determinants of Volume and Value of Philippine Fresh Pineapple Exports to China

The double-logarithmic form was selected for both models since it exhibited the highest F-value, R^2 and adjusted R^2. There was also no autocorrelation based on the Durbin Watson test statistic of 1.771. Furthermore, multicollinearity was removed upon dropping domestic production and real export price in the models. Lastly, the assumption of homoscedasticity and other assumptions on the residuals were also validated. On the one hand, tariff, real domestic wholesale price, trade dispute, and China's SPS were found to negatively affect the volume of fresh banana exports to China. On the other hand, tariff, real domestic wholesale price, trade dispute, and China's SPS also negatively affect the value of fresh banana exports to China.

Based on the coefficients, a one percent decrease in the tariff had resulted in a 0.936 percent decrease in the volume and a 1.007 percent decrease in the value of Philippine fresh banana exports to China, holding other factors constant (Table 4). Since ACFTA has already reached a zero tariff, it can no longer be used to increase the country's fresh banana exports to China.

Whereas, when the real domestic wholesale price of fresh banana increases by one percent, the volume and value of Philippine fresh banana exports would decrease by 0.933 and 0.885 percent, respectively (Table 4). Furthermore, if the trade dispute and China's stringent SPS continue, then the country's fresh banana exports to China would significantly decline based on the signs of the coefficients for these two variables (Table 4).

Table 4. Results of Multiple Regression Analysis Showing the Effects of Different Factors on the Volume and Value of Philippine Fresh Banana Exports to China, 1990-2013

Item	Coefficient	Volume	Value
Intercept	A	17.928	17.984
Tariff	β_1	(0.936)***	(1.007)***
Foreign Exchange Rate	β_2	(0.262)^{ns}	(0.0325)^{ns}
Real Domestic Wholesale Price	β_3	(0.933)***	(0.885)***
Trade Dispute	β_4	(0.546)***	(0.578)***
China's SPS	β_5	(0.466)**	(0.486)**
R^2		0.790	0.782
Adjusted R^2		0.732	0.722
F-value		13.582***	12.929***

Note: *** and ** = significant at 1% and 5% level of probability, ns = not significant at 10% level of probability.

V. Conclusions and Policy Implications

Trends in Philippine fresh banana production and yield registered negative growth rates from 2009 to 2013 due mainly to increased fertilizer prices and the occurrence of a destructive typhoon. Despite the expansion in area planted and number of bearing hills, an increase in domestic production cannot rely solely on farm lands devoted to fresh bananas as agricultural land is becoming scarcer due to rapid urbanization and industrialization.

Fresh banana exports from the Philippines are brought mainly to East Asia, particularly Japan, China, and South Korea. China, as the number two export destination of the country's fresh banana exports, is quite challenging to pursue as the main market because of the country's trade dispute and their stringent SPS measures. Results of the competitiveness analysis revealed that the Philippine fresh banana exports to China are both not price and quality competitive. Nonetheless, there are other markets for Philippine fresh banana exports such as the Middle East, Southeast Asia, New Zealand, and the United States.

Regression analysis showed that the tariff, real domestic wholesale price, trade dispute and China's SPS significantly and negatively influenced the volume and value of Philippine fresh banana exports bound to China. Since the tariff level has reached zero by virtue of ACFTA, a decrease in domestic wholesale price, absence of trade dispute, and compliance with China's SPS can be expected to stimulate the Philippine fresh banana exports to China.

It is recommended that local production of fresh bananas should improve and the cost of moving fresh bananas along the marketing chain should be reduced. An increase in local supply and reduction in marketing cost could lead to a lower domestic wholesale price which could result in a higher volume and value of Philippine fresh banana exports. This can be done by maintaining the ideal characteristics of a banana farm in terms of type of soil and distance between hills; adopting high-yielding and disease-resistant tissue culture bananas; planting multiple banana cultivars; and promoting the use of bananas as an intercrop in coconut, coffee, cacao, and other types of farms. Trade disputes can be addressed through diplomatic relations, dialogues, and talks with China. In the face of China's stringent SPS measures, the Philippines should continue to improve its standards and also promote the harmonization of SPS standards as a signatory of the WTO, AFTA, and ACFTA. As trade disputes and

complaints regarding China's SPS are still in the pipeline, the Philippines should continue to forge better trade relations with countries in the Middle East such as the United Arab Emirates, Iran, and Kuwait; Southeast Asia such as Singapore; New Zealand; and the United States, where the country's fresh bananas are already being exported.

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A Study on Innovation Efficiency of Shandong Strategic Emerging Industries: From the Perspective of Social System Environment

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ABSTRACT

Strategic emerging industries represent not only the future development direction of China's industry but also the main force in enhancing the independence of innovation abilities. This paper statistically analyzes the existing development and innovation circumstances of listed companies in Shandong strategic emerging industries and establishes the theory framework to analyze social system environment. Then, using an empirical analysis method, it comprehensively analyzes the impacts of different factors of the exterior social system environment on innovation efficiency of Shandong strategic emerging industries. The research findings are as follows. Firstly, improvement of the education environment and openness can promote innovation efficiency, while the reinforcement of intellectual property protection plays a stronger role. Secondly, the tax-burden strangles the enhancement of innovation efficiency and the development of emerging industries. According to the results of the theory and empirical analysis, in order to further improve the innovation efficiency of Shandong strategic emerging industries, enhance enterprises' innovative abilities and promote the growth of strategic emerging industries, this paper proposes a direction of improvement and reform path for the Shandong provincial social system environment.

Keywords: Shandong, social system environment, strategic emerging industries
JEL Classifications: A10, C41, L60

I. Introduction

In the post-crisis era, the global economy is trapped in a slow development stage. The Solow model and endogenous growth model of economic growth theory considered that technological progress and innovation will promote economic growth.

Therefore, countries around the world have been increasing investment in the innovation funds of strategic emerging industries, looking forward to promoting the development of science and technology, promoting the upgrading of industrial structure, and developing strategic emerging industries to guide the economic return on the road to revival.

Strategic emerging industries have both strategic and emerging characteristics. Strategic are mainly reflected in its great potential for growth and

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significant social and economic benefits, which will enable it to have the ability to reposition the international division of labor in the future. Emerging are mainly reflected in the breakthrough in the forefront of scientific and technological problems and sustainable development, which will provide a steady stream of support for future economic development. Based on the classification standards of industry leading forces, industrial development and industrial competitiveness forces, strategic emerging industries are divided into seven categories: energy-saving environmental protection industry, new generation information technology industry, biological industry, high-end equipment manufacturing industry, new energy industry, new materials industry, and new energy electric vehicle industry. With the purpose of seizing a favorable position, counties around the world have put forward relevant support policies to promote the rapid development of strategic emerging industries. Under the current macro background, the development of China's strategic emerging industries is the inevitable choice for China to promote sustainable economic growth. However, due to the weak foundation of technological innovation and lack of technical reserves, as well as some other reasons, the development of China's strategic emerging industries is facing with problems such as a lack of technology and slow progress in major research breakthroughs.

In recent years, for the sake of promoting the strategic emerging industries as pilot and pillar industries, China has greatly increased investment in strategic emerging industries and has elaborated on the strategic planning of the development of emerging industries. At the same time, China has also increased support and guidance in developmental policy, which has led to some achievements. However, owing to R & D capital, strategic emerging industries still cannot meet practical needs, especially when coupled with the low utilization efficiency of resources and low innovation resource allocation efficiency, resulting in a gap in the development level between China and other developed countries and regions. Therefore, it is necessary to perform an analysis of the specific impact

of the social environment, intellectual property protection system, educational environment, and tax burden as well as the openness of these four aspects of strategic emerging industries from the perspective of innovation efficiency. The use of the analysis results presented will improve the social system environment and improve the policy path for innovation efficiency of strategic emerging industries, which will be more focused on the development of strategic emerging industry planning and guidance. In addition, as the eastern coastal province of China, Shandong province has a strong industrial base, strong technological innovation capability and industrial cluster development. Therefore, this paper chooses Shandong Province as a case study sample to analyze the impact of the social institutional environment on the innovation efficiency of strategic emerging industries.

II. Literature Review

With the development of a new round in the world economy, strategic emerging industries have become the focus of domestic and foreign research scholars. Because there is no concept of strategic emerging industries abroad, there is no research on this topic and foreign research scholars are basically using technical progress, industrial upgrading and other theories to analyze it.

Since China issued the "State Council's Decision on Accelerating the Cultivation and Development of Strategic Emerging Industries" in 2010, research literature on strategic emerging industries in China has sprung up, and the main research literature is reflected in the following three aspects.

First, we provide an explanation of the current situation of China's strategic emerging industry research. Cui (2010) analyzed the current situation of strategic emerging industries opening to the international market by using foreign trade data from China. Research found that China's export growth in some areas is obvious, indicating that the trade competitiveness of China's technology intensive trade

commodities is gradually improving, and China's strategic emerging industries in the international trade market have great potential in the future. Song (2011) analyzed the development of strategic emerging industries in Henan Province, and this study found that Henan Province, above the scale of the high-tech industries, has realized an added value 152.2 billion yuan and the overall size of the industry in Henan is increasing. However, the overall size is still relatively small. In addition, fields of new materials, electronic information and other industries in Henan have a certain degree of development base, but the industrial innovation capability is still not strong. Zhang (2015) analyzed the current situation of spatial distribution of strategic emerging industries in 31 provinces of China by utilizing the spatial autocorrelation method, and the results show that China's strategic emerging industries exhibit significant clustering features in the space and there are still large differences between provinces . Next we provide research on the innovation efficiency of strategic emerging industry. Some scholars have analyzed the impact of institutional factors on the research efficiency of strategic emerging industries. Ju (2011) analyzed the role of government in the development of strategic emerging industries and deemed that when strategic emerging industries are in the early stages of development, government policies play a positive role in supporting the development of emerging industries, but the government needs to play its own advantages and at the same time to pay attention to the basic role of market regulation. Zhao and Xu (2014) analyzed the impact of the patent system on strategic emerging industries by using Jiangsu Province as the research sample. Through empirical analysis, it was found that the patent application and patent protection system have different promoting effects on the development of strategic emerging industries.There are also some scholars who have analyzed the influence of different external factors on the innovation efficiency of strategic emerging industries. Jia and Wei (2011) believe that the cultivation of strategic emerging industries must comprehensively consider the basic strength of science

and technology, market environment, government guidance, capital investment, financial support and the development of the industry itself as well as other factors by analyzing factors affecting the development of strategic emerging industries in Shenyang city. Lv and Sun (2013) use a stochastic frontier production function model to analyze the factors affecting China's strategic emerging industries, and the study found that firm size and industry concentration have a positive effect on innovation efficiency, but foreign direct investment and the proportion of state-owned economy have a negative effect on China's strategic emerging industries.

Third, we provide research on countermeasures to promote strategic emerging industries. Fu (2011) looked at China's specific provinces and specific industries as an example and summed up the current situation of tax support for strategic emerging industries. Also, he put forward policy recommendations which enrich the theory of tax support policy. Xiong (2011) believes that China is currently facing a situation which pertains to both industrial upgrading and transformation and the development of strategic emerging industries. Therefore, the development strategy regarding the strategic emerging industries and traditional industries "driven and benign interaction" should be adopted in China. Liang and Liao (2015) used Jiangxi Province as the research object; they believe that China needs to extend the industrial chain, slowly extending from low-end resource processing to deep processing in the back end of the industrial chain when promoting the development of strategic emerging industries. China should encourage enterprises to create comprehensive laboratories so as to enhance the level of product technology.

Although the literature on strategic emerging industries has emerged at an increasing rate, most literature mainly focuses on the aspects of the current situation, influencing factors of strategic emerging industries and countermeasures to promote the development of strategic emerging industries. Research on how the social system environment

affects the innovation efficiency of strategic emerging industries is still rare. How to improve the innovation efficiency of strategic emerging industries by improving the social system environment has important theoretical significance and policy reference value. What's more, at present, research on the impact of the social system environment on the innovation efficiency of strategic emerging industries, most of which are based in theoretical analysis, with quantitative analysis in the literature being even less, and the index of the social system environment is not complete, so the research cannot effectively reflect the differences in the social system environment and the concrete influence directions and degrees of different factors. Based on this, this study intended to use Shandong Province as the observed sample of strategic emerging industries, utilizing quantitative methods to measure the specific impact from innovation and efficiency. In this way, the development of the performance of the external social system was comprehensively explained along with the different external social system environment factors of emerging industries on strategic innovation efficiency.

III. Present Situation Analysis of the Innovation Efficiency of Strategic Emerging Industries in Shandong Province

North of the Beijing Tianjin Tangshan Economic Zone, Shandong belongs to the Bohai economic circle. Across the sea is South Korea, and it also depends on the south of Suzhou. Shandong has superior geographical conditions. At the same time, Shandong is also one of China's greater population and economic provinces. It has a solid industrial foundation, so it has the basic conditions for the development of strategic emerging industries. Targeting Shandong Province as an innovative Province, the Ministry of Science and Technology announced the first batch of provincial strategic emerging industrial enterprise project lists in 2012. On the list of the project, a total of 100 companies were selected, of which 22 were listed

corporations, and the number of listed corporations accounted for 22% of the total number of enterprises. Analysis of the distribution in this industrial area found that on the list of the first batch of provincial strategic emerging industry enterprise projects, the largest number of enterprises were in Jinan, followed by Weifang, Yantai, Dezhou, Weihai, and finally, Qingdao, Zibo and other places. From the industrial project category distribution, the six major categories of strategic emerging industries are new materials, new energy, energy saving and environmental protection industries with the greatest priority; all are 5. Next, the new generation of new information technology industry and new medicine and biological industry are level 4. The high-end equipment manufacturing industry is also rated at 4. The last is the marine development industry at 1. Of 22 listed companies, a total of 8 companies are listed on the main board. A total of 9 companies are listed on the SME board, 4 companies are listed on the gem, and only 1 company is listed in Hong Kong.

Despite the Shandong provincial government compliance with the central call, which has launched a great number of good policies and the introduction of a large number of foreign direct investments to support the development of emerging industries, the effect and the development of strategic emerging industries are still not satisfactory. Because the method of reflecting the efficiency of industrial innovation is mainly analyzed from the perspective of input and output, the following is mainly from the current input and output situation of Shandong province strategic emerging industry innovation in the analysis of its innovation efficiency.

3.1. Innovation Investment Status of Strategic Emerging Industries in Shandong Province

Investment in science and technology innovation includes two aspects: capital and labor. Specifically this has shown in government financial investment in science and technology, enterprise R&D funding,

R&D personnel and other aspects of specific performance.

3.1.1. Financial Investment in Science and Technology Is low

Financial science and technology investment is the proportion of science and technology funding in fiscal expenditures. To a certain extent, it reflects the supportive extension of the local government to the development of science and technology, and it is an important material guarantee to carry out scientific and technological innovation activities. However, the investment in science and technology in Shandong province has been lower than the national average, and the proportion of the national financial investment in strategic emerging industries has gradually increased during the period from 2009-2012, and the proportion of the Shandong financial investment in strategic emerging industries has long hovered around 2 percent. Specific conditions are shown in Table 1.

Table 1. A Comparison of Shandong Province and the National Financial Science and Technology Investment FROM 2009-2012

(Unit: %)

Year	National Financial Science and Technology Investment	Financial Science and Technology Investment in Shandong Province
In 2009	4.25	2.05
In 2010	4.12	2.11
In 2011	4.23	1.92
In 2012	4.58	2.02

3.1.2. Insufficient Funds in Enterprise R&D

Enterprise R&D funding is an important indicator reflecting the technological innovation of enterprises, and it is the key to deciding transformation between enterprise research and development. Through the data found that through the scale of enterprises in Shandong Province, R&D funds invested have shown a steady increasing trend since 2006 and occupy a higher proportion in the GDP of the whole province. In the national enterprise the proportion of R&D funding for industrial added value is decreasing yearly. Before 2010, the proportion of enterprise R&D funding was lower than the national level in Shandong Province. However, it was more than the national level after 2010. In 2009, the scale of enterprises in Shandong province achieved an R&D internal expenditure of 45.67 billion yuan, an increase of 21.5% which accounted for 12.1% of the whole country, ranking third in the country. This suggests that enterprises above designated size generally attach great importance to innovation projects in Shandong province. Although the total investment in Shandong province ranked at the forefront of the country, the scale and intensity of R & D investment in Shandong province has a large gap between foreign developed countries. Through the data, we found that R & D investment is still inadequate in Shandong province. First of all, the government as the main body of R & D investment is insufficient, with a large gap between individual provinces. R & D investment in Shandong province lags behind the average level of the whole country, and the proportion of this in 2013 was only two percent. Second, investment and financing mechanisms are inadequate, resulting in increased R & D investment requirements for a single source of funding (Table 2).

Table 2. National Enterprise R&D Funds Accounting for the Proportion of Industrial Added Value from 2009
to 2012 in Shandong Province   (Unit: %)

Year	National Enterprise R&D Funding Proportion of of Industrial Added Value	Shandong Province Enterprise R & D Funding Proportion of Industrial Added Value
2009	2.40	1.76
2010	2.32	2.03
2011	2.34	2.25
2012	2.29	2.42

3.1.3. Lack of Scientific and Technological Human Resources

Human resources in science and technology is an international common index and is one of the main indicators to measure the innovation and development of a country or region. In 2011, the number of R&D personnel was 32.7 million, and the total number of people accounted for 7.56% of the country, ranking fourth in the country. Among them, the number of R&D researchers was 197,000, accounting for 60.2% of the total number. Some 46,700 have a doctorate and master's degree, accounting for 14.3% of the total number engaged in R&D activities. Analyzing from this perspective of the industry, we can find that engaged manufacturing R & D staff hold a dominant position, accounting for 69.75% of the total number, followed by personnel in the education sector, accounting for 8.93%, showing that investment in a large number of scientific and technical personnel has played a positive role in promoting the development of the education industry. Those engaged in scientific research, technical services and geological prospecting industry practitioners are relatively small at only 0.49%. The culture, sports and entertainment industry and the financial sector are the smallest, of which two industry practitioners accounted only 0.007% and 0.01%. In short, through the data comparison, we can find that the number of R&D activities in Shandong Province in the manufacturing sector accounted for the high number, and the number of people engaged in scientific research, technical services and other technological innovation is too small. This shows that the talents of high-tech research in Shandong province are inadequate for the long term, which will not be conducive to future breakthroughs at the international forefront of technical bottlenecks. In our long-standing educational system, there are several millions of college students graduate every year. However, because of a lack of practical experience and project management skills, the knowledge structure is not a match with the actual demand of the enterprises such that enterprises lack senior technical and management personnel while college students' graduations means the unemployment phenomenon is more prominent. In addition, as the domestic research and policy environment is not perfect, the phenomenon of the loss of high tech talent is more serious. The lack of scientific and technological talent has become a bottleneck restricting China's strategic emerging industries, which has become a constraining factor in the development of strategic emerging industries.

3.2. The Current Situation of Innovation Output of Strategic Emerging Industries in Shandong Province

3.2.1. Stable Increase in the Number of Scientific and Technological Achievements and Patents

Shandong province won 39 national scientific and technological achievements awards in 2011. Among them: 33 National Invention Awards and 6 National Science and Technology Progress Awards. Provincial Science and technology awards numbered 97, and 2379 major scientific and technological achievements were achieved, mainly in agriculture, industry, medical and health and other fields. The number of patent applications and licensing has maintained rapid growth

(Table 3).Patent applications increased 7.24 times during 2009-2014, with an average annual growth rate of 25.2%. The number of patent applications accepted increased 7.66 times during the period from 2009-2014, with an average annual growth rate of 26.38%, which displays the implementation of the the independent innovation strategy with synchronization. However, there is still a problem in how to effectively translate patents into specific products for production and sales, rather than just chasing growth in the number of patents.

Table 3. Patent Application and Licensing in Shandong Province, 2009-2013   (Unit: 10,000 PCS)

Year	Patent Applications in Shandong Province	Patents Granted in Shandong Province
2009	6.69	3.45
2010	8.09	5.15
2011	10.96	5.88
2012	12.86	7.55
2013	15.52	7.70

3.2.2. Research Papers and Publications with Remarkable Results

Various scientific research institutions have published 72,600 papers on science and technology and 2,528 kinds of science and technology. Among them, research institutions published 5,929 papers, accounting for 8.16% of the total annual scientific and technological papers published. Colleges and universities accounted for 66.93% and enterprises accounted for 13.34%. 206 kinds of books were published by research institutions, accounting for 8.15% of the total annual publishing of scientific work. Colleges and universities accounted for 65.90% and enterprises accounted for only 0.16%. By comparing the number of published scientific papers and published works to each department, the paper finds that the enthusiasm of enterprises is still not high. Enterprises should be in pursuit of maximizing the interests of the company's products for technological innovation, so companies still lack the initiative to carry out technological upgrade research.

3.2.3. Strong Development of High-tech Industry

The driving function of science and technology innovation in industry is directly reflected in the high-tech industry. Development of a high-tech industry can not only promote the comprehensive development of Shandong economy but also has become the direction of economic structural adjustment in Shandong Province in the future. In recent years, the proportion of high-tech industries accounting for the total economic output in province is rising, and the relative speed of development and scale in the industry is constantly increasing. In order to promote the development of strategic emerging industries，Shandong province has carried out a number of favorable policies, so the development of the high-tech industry in Shandong province is generally good. From a regional perspective on the analysis of current situation in Shandong Province，it was found that the information industry of Qingdao has developed rapidly and has become a national demonstration base for the software and information service industry. In 2012, the IT industry output value reached 470 billion yuan and earned a profit of 20 billion yuan, ranking third in the country. Jinan formed a integrated circuit and software development-oriented enterprise focused area and launched a number of representative information products, such as cloud computing. Along the Jinan Railway, the information technology industry has formed computer communications, printer manufacturing and optical electronic machinery manufacturing-based industry clusters. From an industry perspective on the analysis of current situation

in Shandong Province，it was found that Shandong has built a number of new pharmaceutical industrial parks and made some achievements: in the Gulf of Jiaozhou, shipbuilding; Binzhou, wind power generation equipment; Longkou, high-end aluminum material. This which shows that the high-end equipment manufacturing industry in Shandong province is gradually moving around the world. Rizhao, Weihai and Weifang are the representatives of the marine economic industry, through the construction of the marine economy has its own

characteristics. Yantai has become the leading city in the development of marine economy in Shandong.

It can be seen from the statistics of the basic situation of the high-tech industry in Shandong province (Table 4) that the development of new industry in Shandong province has made gratifying achievements. From 2009 to 2012, the emerging industry has developed rapidly, but there are also many problems mentioned above. Only by targeting to solving existing problems can we promote the development of strategic emerging industries in Shandong province better and faster.

Table 4. The Basic Situation of High and New Technology Industries in Shandong Province, 2009-2012

Project	2009	2010	2011	2012
Number of enterprises (individual)	1907	1847	1514	1875
Annual average number of employees (10000 people)	52.3	54.5	55.3	67.5
Gross output value of current year (One hundred million yuan)	4555.7	5175.6	6201.1	7881.1
Main business income (One hundred million yuan)	4548.8	5148.8	6121.4	7729.2
Profit (One hundred million yuan)	279.1	383.6	463.7	612.9
Profit and tax (One hundred million yuan)	407.7	554.7	660.9	901.1
Number of enterprises with R&D activity (individual)	354	331	320	472
R&D staff full time equivalent (man)	17681	20704	29257	37499
R&D internal expenditure (One hundred million yuan)	60.1	72.0	99.0	134.6
New product development fund (One hundred million yuan)	72.2	79.5	109.6	142.7
Patent Application (spiece)	3371	4129	5611	6970
Number of invention patents (spiece)	1758	1640	2375	3912
Number of construction projects	715	762	980	1154
Number of newly started projects (individual)	404	464	631	806
Number of projects completed or put into operation (individual)	342	384	626	695
Investment amount (One hundred million yuan)	476.8	521.0	695.3	1086.6
New fixed assets	214.8	260.7	383.9	598.7

IV. Empirical Analysis

4.1. Selection of Data and Variables

In order to study the influence of different factors on the innovation efficiency of strategic emerging industries in Shandong province, this paper selects

innovation efficiency as the dependent variable. Additionally, protection of intellectual property rights (IPR), scientific and technological innovation ability, technical innovation level of stock of human capital, regional tax burden were selected with regional opening degree as the independent variable. Details are shown in table 5.

Table 5. Definition of Data and Variables

Project	Variable	Definition	Source
Dependent variable	E	It represents innovation efficiency and measures the result of innovation by the number of patents in Shandong Province and the amount of research and development expenditure in Shandong province to measure the innovation investment. Finally, the ratio of the two is used as the proxy variable of innovation efficiency.	Statistical Yearbook for each year in Shandong Province
Independent variable	ZC	It represents protection of intellectual property rights. The number of patents granted and the proportion of the number of applications are measured. It is used to reflect the protection of intellectual property rights in a region, but also indirectly reflects the level of industrial technology innovation activities carried out.	Statistical bulletin of the national economic and social development of Shandong Province
	EDU	It represents the proportion of the number of students in Higher Education in Shandong province accounted for the number of employees. It is used to reflect the education environment of Shandong province and the human capital stock with the level of science and technology innovation ability and science and technology innovation.	Statistical bulletin of the national economic and social development of Shandong Province
	SGDP	It represents tax revenue as a share of GDP in Shandong province and is used to measure a regions's tax burden.	Statistical Yearbook for each year in Shandong Province
	OUTPUT	It represents the openness of Shandong province, and it is measured by the ratio of Shandong's total exports to the local GDP.	Statistical bulletin of the national economic and social development of Shandong Province

4.2. Construction of Model

In order to analyze the impact of social institutional environment on the innovation efficiency of strategic emerging industries in Shandong province, the four aspects of the protection of intellectual property rights, education environment, tax burden and openness were analyzed. In order to eliminate the problem of cross section deviation of a random error term, this paper uses the panel data of 9 cities in Shandong province from 2003-2013, and chooses to use a cross-sectional weighting (cross-section weights) of the GLS method. The model of panel data measurement is established:

$$\ln E_{it} = \alpha + \beta_1 ZC_{it} + \beta_2 EDU_{it} + \beta_3 SGDP_{it} + \beta_4 OUTPUT_{it} + \mu$$

Among them, EDU   represents the innovation efficiency of different years in different cities; indicates the ratio of the number of applications to granted patents in different years around the city; represents the proportion of the number of students with higher education accounting for employees in different years around the city,   represents the proportion of taxes in GDP in different years around the city;   represents the ratio of total exports in local GDP in different years around the city.

4.3. Empirical Result Analysis

4.3.1. Statistical Description

Table 6 shows the descriptive statistics for multiple variables, including mean, median, maximum, minimum, standard deviation, Skewness, and kurtosis. According to the results shown in the table, it is observed that the sequence follows normal distribution.

Table 6. Descriptive Statistics of Variables

	E	ZC	EDU	SGDP	OUTPUT
Means	0.193	51.872	93.029	4.181	19.389
Median	0.098	50.800	10.630	4.060	12.900
Maximum	1.050	98.390	8013.000	8.130	60.370
Minimum	0.007	5.870	4.010	1.810	4.810
Standard error	0.235	18.964	804.133	1.303	14.555
Skewness	1.907	-0.010	9.798	0.585	1.214
Kurtosis	5.682	2.526	96.999	2.957	3.740

4.3.2. Empirical Test

In view of this, this article uses the Eviews 8 software to carry out the quantitative analysis. First of all, we establish the pool object respectively containing the indicators of the 9 cities in Shandong province. Because the variable coefficient model is applicable to the different structure parameters of different individuals, this paper decides to use the variable coefficient model. In the following formula, among them, i=1, 2,... , N means individual members, and T=1, 2,... , T represents the time span. The variable coefficient model assumes that the coefficient and intercept in the template are not the same. Through the Hausman test, we can reject the original hypothesis that there is no systematic difference between the fixed effect model and the random effect model.

In summary, there are different social system environments existing in different regions, so there are differences between various regions in the sensitivity of the strategic emerging industries. In order to test the influence of the social system environment on the innovation efficiency of strategic emerging industries in different regions of Shandong Province, this paper decides to adopt the variable coefficient model with fixed effects, seen in the following formula (1).

$$y_{it} = \alpha_i + \sum_{i=1}^{k} \beta_{it} x_{it} + \delta_{it} \tag{1}$$

The strengthening of intellectual property protection and the improvement of the education level means that the government should pay more attention to the encouragement and protection of independent innovation and the cultivation of reserve forces of innovation. From the analysis of the impact of the social system environment factors on the innovation efficiency of strategic emerging industries in Shandong

province in Table 10, the protection of intellectual property rights and educational environment are a significant obstacle to innovation efficiency and their estimated coefficients were -0.0219 and -0.0002. This suggests that every rise in unit in intellectual property rights protection and education environment can make the innovation efficiency of overall strategic emerging industries in Shandong province decrease by 0.0219 and 0.002 percentage points. This shows that the protection of intellectual property rights and education environment does not promote the innovation efficiency of strategic emerging industries in Shandong province. Also, at a deeper level in Shandong province, it implies the outstanding property rights protection system and education environment for the development of strategic emerging industry is not practical. Strategic emerging industries, due to high technology, high research and development, high investment, strong competitiveness and other typical characteristics, if only imitating innovation, will not adapt to the requirements of the development trend. This must be through independent innovation to improve innovation efficiency, in order to truly grasp the industrial development of cutting-edge technology and seize the opportunity of technological innovation. We must improve innovation efficiency through independent innovation. The existing patent examination and approval system has more procedures, which will not be conducive to technological innovation. For the education environment, the existing education ideas have deviated from the need of social development for a long time. Although the proportion of those with higher education is rising, technical skills and talents are gradually declining. More students enter colleges that are more willing to

choose finance, literature and other humanities or social sciences rather than scientific and technological innovation, which leads to the negative innovation effect of the education environment on strategic emerging industries efficiency.

Table 7 shows that tax burden blocks innovation efficiency of strategic emerging industries. This shows that a heavier tax burden can promote the innovation efficiency of strategic emerging industries. This shows that China's existing tax support policies for strategic emerging industries did not bring a larger tax burden on strategic emerging industries. This is because in the industry, compared with the traditional industries, most products of strategic emerging industries have high technical content, high added-value, and high value-added characteristics, so taxes do not play a role in blocking innovation. However, with the strength of the future market competition for the strategic emerging

industries, the industry will gradually lose the advantage in this respect.

Openness has a positive role in promoting innovation efficiency, but the results didn't pass the test of significance. Expanding the degree of openness is conducive to the exports of industrial products of high-tech industries, core technology and equipment. Today, China's export volume of high-tech products is growing sharply; it accounts for about 30% of the total amount of export trade. Only by continually expanding the degree of openness, foreign technology, management experience and excellence can companies enter China. This has promoted the vitality of China's strategic emerging industries. Because the long-term protection by government will make the strategic emerging industries held back from the forefront of science and technology, this will make it gradually lose competitiveness in the international market in the future.

Table 7. Impact of the Social Institutional Environment on Innovation Efficiency of Strategic Emerging Industries in Shandong Province (in general)

	Coefficient	T test	P value
Constant term	0.8034	3.8792	0.0002
ZC	-0.0219	-32.8096	0.0000
EDU	-0.0002	-4.7697	0.0000
SGDP	0.6138	14.6806	0.0000
OUTPUT	0.0009	0.2585	0.7966
R^2		0.9584	
Model test		F statistic =165.2936 P=0.0000	

Analysis of the influence different social system environmental factors on innovation efficiency of strategic emerging industries from the view of Shandong Province follows. Table 8 is the result of quantitative analysis. From the table, we can observe that the intellectual property system has a positive effect on the innovation efficiency of strategic emerging industries in areas like Ji'nan, Rizhao, and Binzhou. Areas of hindered innovation are Qingdao, Zibo, Dongying, Yantai, Weihai, and Jining. Education environment regions promote innovation efficiency for strategic emerging industries in regions

like Dongying, Yantai, Weihai, Jining, and Binzho and were obstacles to efficiency in the regions of Ji'nan, Qingdao, Zibo, and Rizhao. The tax burden on the strategic emerging industry innovation efficiency has a promoting effect in areas such as Jinan, Qingdao, Dongying, Yantai, Weihai, Jining, and Binzhou and was the main obstacle for innovation efficiency in Zibo and Rizhao. Openness of strategic emerging industry innovation efficiency has a beneficial effect in the areas of Jinan, Qingdao, Dongying, Yantai, Weihai, Jining, and Binzhou were the main obstacles to innovation efficiency in Zibo and Rizhao.

Table 8. Impact of THE Social Institutional Environment on Innovation Efficiency of Strategic Emerging
         Industries in Shandong Province (Subregion)

Variable	ZC	EDU	SGDP	OUTPUT
Jinan	0.0061	-0.0867	0.4558	0.4558
	(0.7139)	(-1.4603)*	(3.7838)***	(3.7838)***
Qingdao	-0.0647	-0008	0.1571	0.1571
	(-5.7850)***	(-1.6712)*	(0.6088)	(0.6088)
Zibo	-0.0803	-0.1256	-0.1052	-0.1052
	(-10.7387)***	(-3.0168)***	(-0.5853)	(-0.5853)
Dongying	-0.0089	0.0194	0.7170	0.7170
	(-0.8768)	(0.4995)	(2.5137)***	(2.5137)***
Yantai	-0.0092	0.0517	0.7719	0.7719
	(-1.9474)**	(1.1098)	(5.8273)***	(5.8273)***
Weihai	-0.0034	0.3262	0.2055	0.2055
	(-0.4605)	(7.5912)***	(1.7344)*	(1.7344)*
Rizhao.	0.0135	-0.0582	-0.1380	-0.1380
	(3.9110)***	(-9.0705)***	(-2.1823)**	(-2.1823)**
Jining	-0.0427	1.1697	0.4433	0.4433
	(-13.8337)***	(8.7807)***	(3.4844)***	(3.4844)***
Binzhou	0.0021	0.1765	0.3211	0.3211
	(0.1802)	(4.0590)***	(2.2573)**	(2.2573)**
Adjusted R2		0.9964		
D.W value		2.2966		
F statistic		628.0089		
P value		0.0000		

Note: T statistics for the corresponding coefficients in brackets, in which * indicates a significant level of 10%, ** indicates
      a significant level of 5%, and *** indicates a significant level of 1%. No sign indicates that the variable is not signific-
      ant.

V. Conclusions and Policy Recommendations

This paper uses panel data of 9 regions in Shandong Province to analyze the influence of four aspects of the protection of intellectual property rights, which are educational environment, the burden of taxation and the openness of the social system on the innovation efficiency of strategic emerging industries. First, according to the data, we analyzed the current situation of development of strategic emerging industries in Shandong province and exploring the existing problem. Second, we established the econometric model for empirical analysis. The results showed that, first of all, the protection of intellectual property rights system and the improvement of education have the function of hindering innovation efficiency. Secondly, the social system environment of the 9 regions in Shandong province has different impacts on the innovation efficiency of strategic emerging industries. It was found that the four social systems in Binzhou have a positive effect on

innovation efficiency. In the social system environment in Jinan, Dongying, Yantai, Weihai and Jining, there is only one factor that hinders innovation efficiency. In the social system environment of Qingdao, Zibo and Rizhao, there are more than two factors have bad effect on innovation efficiency.

As an important economic development zone in the eastern coastal areas of China, in order to better improve the innovation efficiency of Shandong's strategic emerging industries and based on the above research conclusion, this paper puts forward the following suggestions.

First, the government should improve the protection of the patent system and highlight the focus of research and establish an R & D activities guide. The government should strengthen the protection of intellectual property rights. The government must make the research and development activities of the invention patent a key point of innovation resources, and at the same time take into account the utility model patents and the appearance of patent research of

development activities. The establishment of R & D activities is to solve development problems, such as the lack of systematic problems. Coordinating the problems in R & D activities of various units, such as a lack of communication to enhance the sharing of research and development information, focus on the limited resources for breakthroughs, increase the success probability of research and development, and improve the efficiency of innovation. On the premise of strict audit research and development results, simplifying approval procedures and speeding up the authorization of outstanding patent results, will allow more and better patent achievements to become real income

Second, optimizing the educational environment, improving the quality of higher education and strengthening the construction of higher education research institutions are key. Also, the construction of reserve forces of creative talent is of vital importance so as to provide an inexhaustible motive force for the development of strategic emerging industries. Man is the core and the soul of innovation. To improve the efficiency of innovation, basic improvements in human capital are needed. Innovative talent plays a key role in technological innovation and technological diffusion; higher education shoulders the historical responsibility of training high level creative talents. Shandong province has been affected by the Qilu culture. A strong learning atmosphere and cultural atmosphere is a major province of telecommunications education. Shandong Province should not only improve the quality of higher education, but also vigorously develop vocational education and train a large number of high tech workers, which will promote its innovation in the production process.

Third, further improving the existing export structure and expanding the export of manufactured goods and technology in high tech industries are needed. Shandong province should take advantage of its good location on the eastern coastal area and reasonably improve the export proportion of high tech industries and core technology equipment, and improve the original export mode of agricultural products. Enhancing of export capacity of our enterprises and innovation efficiency should be done so that more innovative achievements can be transformed into the production of goods through technology incubation.

Fourth, we should support the introduction of tax policies to support the structure, reducing the tax burden of strategic emerging industries, taking direct and indirect taxes and implementing a variety of preferential tax policies, so as to promote the improvement of innovation efficiency. We can combine the experience of the United States, Japan and other developed countries for specific transfer tax policy choices, and educe VAT rates for imports of equipment needed for emerging industries. At the same time, the export of products is exempt from export duties. On the choice of enterprise income tax policy, allow enterprises to deduct "science and technology development fund" and the accelerated depreciation of fixed assets should be allowed. The scope of low tax rates are should be increased. For personal income tax, relax the provisions on the exemption of scientific and technological innovation by the scientific and technological innovation; continue to implement the policy of business tax exemption from the income obtained by individuals engaged in technology transfer and other services; and reduce the marginal tax rate of personal income tax. Through the reform and optimization of the tax policy, we can reduce the tax burden on strategic emerging industries, make it easier to carry out innovative research and development, and improve innovation efficiency so more people benefit from innovative results

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Disaggregating the Coffee Supply Chain Network in Benguet, Philippines: A Step Towards Understanding Relational Ties

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ABSTRACT

Baguio City and the municipality of La Trinidad are the centers of coffee trading in Benguet and the Cordillera Region in the Philippines. The study examines the coffee supply chain network in both places while providing an overview of the global, national, and local coffee industry, explaining the relationships among the players in the supply chain network at the disaggregate level, determining the issues, weaknesses, and gaps, and offering recommendations for each supply chain and the entire network. Methodologies employed were key informant interviews of farmers, traders and coffee shop operators, visual observations and secondary data gathering, and descriptive analysis. Findings reveal that Benguet coffee supply chains have a complex and complicated networks of chain participants, interactions, and relationships. Seven supply chains which comprise the whole supply chain network in the area were identified with varying degrees of relational ties. Recommended interventions include developing road networks in the area, providing good quality planting materials, and utilizing financing products or schemes that are friendly to chain participants. Some investment entry points at the network level are the establishment of a coffee institute or center and coffee processing and/or warehousing or storage facilities.

I. Introduction

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For hundreds of years, coffee has been one of the most popular drinks in the world. In the Philippines, most Filipinos' breakfast will not be complete without a cup of coffee. It is also consumed throughout the day to help perk up people, especially during the afternoon when it is "siesta" time. With this daily situation,

Filipinos should have a steady supply of coffee in their hands.

The International Coffee Organization (ICO) reported a supply-demand gap of about 462 M kgs of coffee in 2014. This clearly shows the need for coffee in the world market. In the Philippines, there is a supply-demand gap of 5.2 M kg as reported by the Philippine Statistics Authority.

In view of this situation, it is imperative to evaluate the coffee supply chain in the locality so that interventions can be put into place and enable increased production to meet the increasing demand for coffee. Benguet is an ideal area for the Arabica variety of coffee because of its favorable climatic conditions. An average altitude of 5,000 feet above sea level, cool weather all year round and rich soils are best suited for good production of Arabica coffee. Arabica coffee is considered the premium coffee worldwide compared to Robusta and Liberica. It is used mostly by gourmet coffee shops because of its aroma and flavor, while Robusta coffee is used mainly for instant coffee production.

Coffee is ingrained in the local people's culture, tradition and heritage. This adds another dimension to studying the coffee supply chain in the area since much of the people's attitude toward the commodity is affected by their culture and perspective. Coffee is an integral component to the economic livelihood, cultural rituals and culinary practices of the indigenous people in the area. In the earlier times, they used to bring their coffee to the city and exchange this for food staples, like rice or sugar, using the barter system. In this area, coffee is not just another commodity but also part of the local people's heritage and tradition. However, in recent years, local coffee has not been receiving the value and importance that it once had. The local people now prefer to consume and serve instant coffee since it is viewed more as being socially acceptable. Now, their idea of coffee with a good taste is instant coffee.

Baguio City and La Trinidad are the ideal areas to study when it comes to the Benguet coffee industry. Although all municipalities in Benguet grow coffee, a majority of the coffee trading activities are done in Baguio City and La Trinidad. Hence, the study of the coffee supply chain was focused on Baguio City and La Trinidad to identify the needed interventions that support organizations can provide and the investment opportunities that potential investors can tap.

II. Literature Review

The Philippines Statistics Authority (PSA) in 2014 reported that the country has a demand-supply gap of 5.2 M kg of coffee. In 2014, production was 21,127,000 kg of coffee while domestic consumption was 26,305,469 kg. Fig. 1 shows the demand-supply trend over the past 10 years.

Fig. 1. Coffee Demand-Supply Gap in the Philippines (Million kgs), 2005-2014
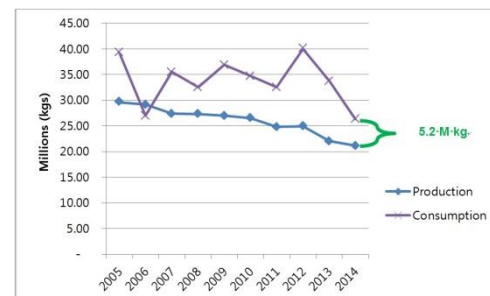
Source: PSA (2015).

The way the present coffee supply chain operates leaves the small farmers capturing less than 10% of the retail price of coffee. Small farmers are easy prey for local traders, exporters and subsidiaries of multinational companies, who offer them low prices for their crops (Brown et al, 2012). This situation is exclusive not only to the coffee supply chain but also to the majority of agriculture-based commodities, and it is common especially in developing countries. Brown et al (2012) stated that the heavy concentration of the coffee supply chain is not advantageous to the producers who are price takers. Multinational corporations involved in the coffee sector control an ever-increasing percentage of processing, marketing

and retailing. These multinationals can set the rules of the game since they are trading with a large number of small producers in 80 countries. This buyer-driven supply chain means that multinationals can capture most of the added value linked to the production of coffee. Coffee farmers do not have the capabilities to counteract these unbalanced practices of traders and other intermediaries in the supply chain. Therefore, there is indeed a need to conduct this study to help improve the coffee industry particularly in the study areas.

III. Data and Methodology

3.1. Methods of Data Collection

A combination of primary and secondary data was collected in this study. For the primary data, key informants involving the key players in the coffee industry in the area were interviewed to obtain the whole picture of the coffee supply chain in Benguet. Coffee experts from the academy (Benguet State University) and from a non-government organization (Cordillera Regional Arabica Coffee Council, Inc.) were interviewed to understand the general situation of the coffee sector in the area. Their expert opinions were solicited to determine some of the gaps or weaknesses that they perceive affect the chain. They were also asked to identify possible interventions needed to enhance the development of the coffee sector in their area. One hundred twenty-seven (127) farmer representatives all over Benguet province were also interviewed. The two major traders based in Baguio City, and small trader based in La Trinidad, were also interviewed. Furthermore, nine (9) coffee shop owners were interviewed on the demand side of the coffee supply chain. Non-participant observation was also done to further understand the different activities in the processing entities and help determine the issues and gaps in the chain.

Secondary data were collected from the different government agencies such as the Department of Agriculture (DA), Department of Trade and Industry (DTI), Department of Environment and Natural Resources (DENR). Moreover, some secondary data were also obtained from the organizations and associations involved in the Arabica coffee industry in Cordillera like the Cordillera Regional Arabica Coffee Council, Inc. (CRACC) and Benguet Organic Arabica Coffee Enterprises, Ltd. (BOCAEL). Benguet State University (BSU) also provided data and information, especially on coffee production in the area.

3.2. Methods of Data Analysis

The study employed qualitative analysis to describe, characterize and map out the coffee supply chain properly. This was also used to identify the gaps or weaknesses in the supply chain, the interventions needed and the investment entry points. The socio-cultural impacts of these interventions in the chain were also determined. Quantitative analysis was used in the computation of the different costs that were incurred along the supply chain. On the other hand, economic and financial analysis were used to determine the financial impacts of the interventions to the whole supply chain and the investment entry points for the individual players' finances.

IV. Results and Discussion

4.1. Interactions Among the Supply Chain Participants and Mapping out of the Coffee Supply Chain Network in Baguio City and La Trinidad, Benguet

The coffee supply chain network in Baguio City and La Trinidad is a combination of networks, interactions and relationships among the supply chain participants. The participants usually use Ilocano and Tagalog/Filipino in their communications since this is the local dialect used in the area. Fig. 2 shows the major supply chain network in the area. Within this supply chain network, there are few smaller chains which operate and are unique from the others.

Fig. 2. Baguio City and La Trinidad Coffee Supply Chain
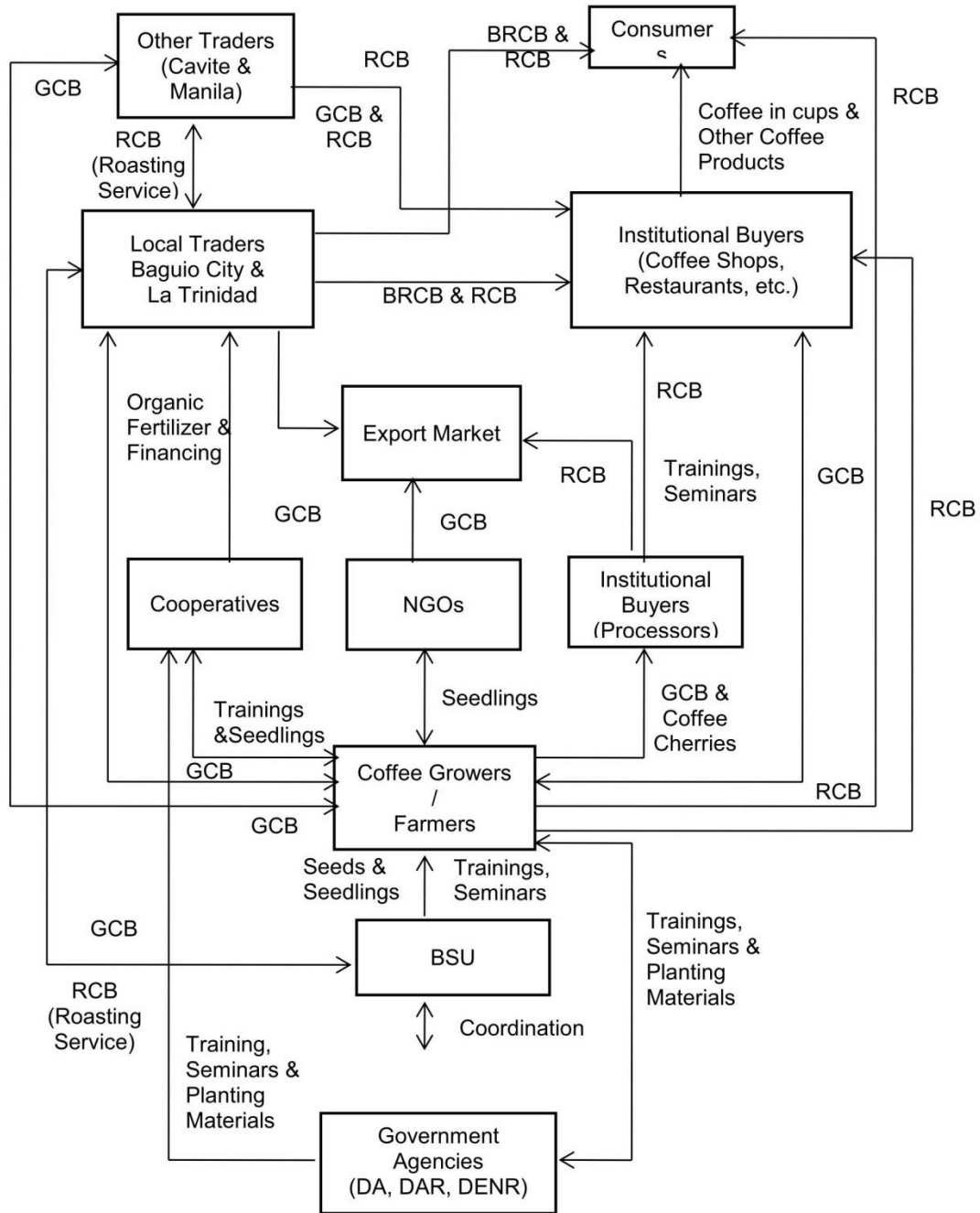
Note: GCB=Green Coffee Beans, RCG=Roasted Coffee Beans, BRCB=Blended Roasted Coffee Beans.

Government agencies (DA, DAR, DENR and BSU) provide support services to farmers and cooperatives in terms of conducting training, seminars and providing planting materials (seeds and seedlings) to people who want to start coffee production. One institutional buyer, Café Maleng-ag, also provides

training on post-harvest management hoping that the farmers will be able to provide them with high quality coffee beans for their café. However, as mentioned in the previous section, the contents of the trainings and seminars are not uniform, resulting in confusion among the farmers on what technologies they should adopt on their farms.

Other traders and institutional buyers (processors), cooperatives, NGOs, and local traders, on the other hand, buy coffee cherries and green coffee beans directly from the farmers. During the harvest season, they go to the production areas with their vehicles and collect the coffee beans from the farmers, saving the transportation effort. It appears that there is a competition among the buyers of the produce. After this activity, the buyers then sell the beans to other traders, processors and also to the export market.

The major players in the Baguio City and La Trinidad, Benguet coffee supply chain are two local traders, Garcia's Pure Coffee and Kape Umali. They buy about 70% of their coffee supply not only from Benguet but also from the Cordillera region. They can dictate the price of coffee since most coffee farmers do not know the prevailing market price and production costs of their coffee beans. Thus, they do not know at what price they have to haggle with the buyers in order to earn a higher profit. Fig. 2 shows the interaction of the different participants in the supply chain.

4.2. Disaggregation of Supply Chains

4.2.1. Supply Chain 1

Supply Chain 1 depicts one of the newest developments in the coffee supply chain in the study area. Gourmet Farms Inc. (GFI) a processor and trader of coffee located in Silang. Cavite started buying directly from coffee growers in Benguet. The GCBs are roasted and sold to institutional buyers, and the excess is sold in their café and restaurant. GFI used to buy and sell coffee from other local traders like Kape Umali. They had a long relationship since the former roasts GCBs in GFI's roaster. However, during the previous season, GFI offered a price which was ₱ 50-70 higher than the prevailing price to the farmers and caused local traders to increase their buying price.

In Supply Chain 1 (Fig. 3), the relationship between the trader and the growers is still weak since it started only during the last harvest season, barely one year ago. Furthermore, the reason for the growers selling to GFI is because of the higher price. There are no networks that were created in this supply chain. GFI goes to the different growers individually so that there was no need for growers to group themselves and be able to consolidate their produce for a larger volume. Also, logistics is already provided and managed by GFI in terms of transportation as well as storage warehouse of the green coffee beans.

Fig. 3. Coffee Supply Chain 1
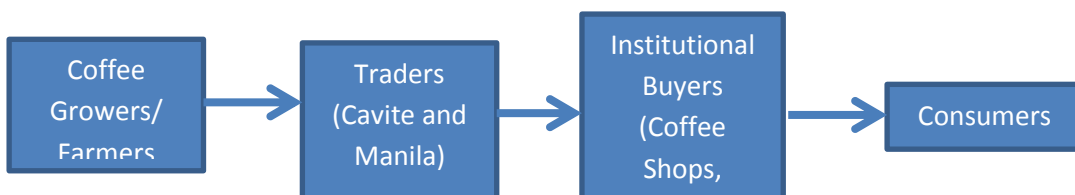
4.2.2. Supply Chain 2

Supply Chain 2 also starts with farmers who sell their GCBs to local traders in the area. The coffee trader brings the coffee beans to the lowlands (Cavite and Manila) to be processed, traded and shipped

through Manila Port for export. This is done since there is a lack of adequate processing facilities in the area. RCBs are brought back to Baguio City to be sold to institutional buyers and consumers as RCBs and BRCBs.

Relationship marketing in this supply chain is very strong since it has existed for a long time and it is not just business but also personal. The local traders loan organic fertilizers or money for coffee production as well as personal expenses like tuition fees, etc. During the harvest season (December to February), farmers inform the traders of the schedule and estimated volume of their GCBs to be picked up so that the traders can prepare the money that they should bring. They bring the GCBs to designated pick-up locations since road networks in remote areas are not available. During the off-peak season, farmers usually have to haul the coffee from their houses to the nearest road by foot. In very remote areas, there is only one vehicle travelling from their location to the city, and it usually leaves very early in the morning so that the farmer has to catch up with this vehicle. Going back home, the

farmer can opt to wait for the same vehicle to ride, or he can just walk. This transportation problem discourages farmers from going into coffee production and makes them shift to the production of other crops which would be easier to market.

The local traders play a major role in the supply chain (Fig. 4) since it operates on providing the production inputs to the marketing of the coffee beans. Its strong relationship marketing more or less has ensured a coffee supply and has made it withstand the test of time. This makes the chain strong. However, there is also a lack of established standards when it comes to buying GCBs since the traders just rely on the "feel" (whether the coffee beans are wet or dry to the touch or when bitten) and "look" of the coffee beans as the basis of pricing.

Fig. 4. Coffee Supply Chain 2
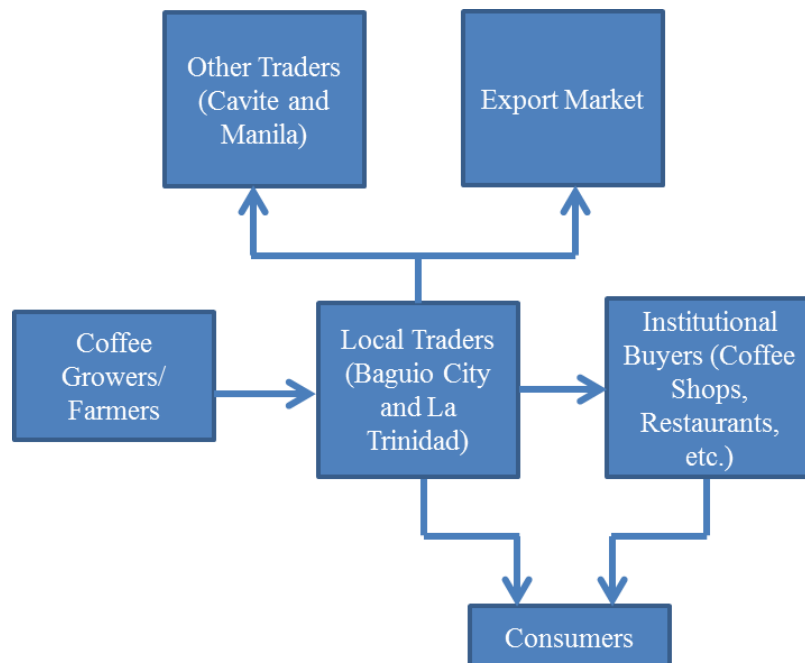
4.2.3. Supply Chain 3

Supply Chain 3 starts with the farmers selling GCBs to a local institutional buyer (processor) "CANCOFFEE", a private processing and marketing

organization that buys coffee cherries from farmers who do not like to further process the beans and do not have the facilities to further process their coffee cherries. "CANCOFFEE" sells roasted coffee beans in

the export market and to local and Manila-based coffee shops and restaurants. They also sell coffee on the export market, particularly to Canada. However, complete information on this supply chain is not available since the buyer did not agree for an interview. Pieces of information mentioned were from other people in the industry who have knowledge of "CANCOFFEE's" transactions.

Supply Chain 3, as shown in Fig. 5, can be considered a moderately strong supply chain. The relationships between and among the chain participants are moderately strong, especially the link between the growers and "CANCOFFEE". The growers prefer to sell unprocessed coffee cherries because of their lack of processing facilities. It also has a strong link with the export market since it is with a Canadian company. However, their main constraint is that they do not have enough supply to sustain their export requirement due to the lack of coffee cherries and GCBs for their operations.

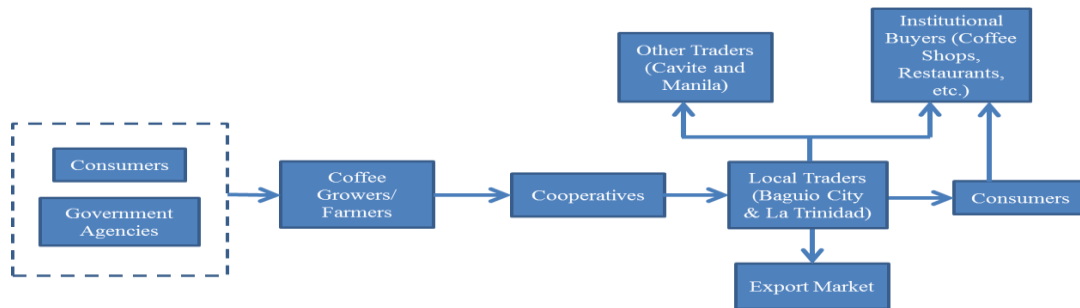Fig. 5. Coffee Supply Chain 3
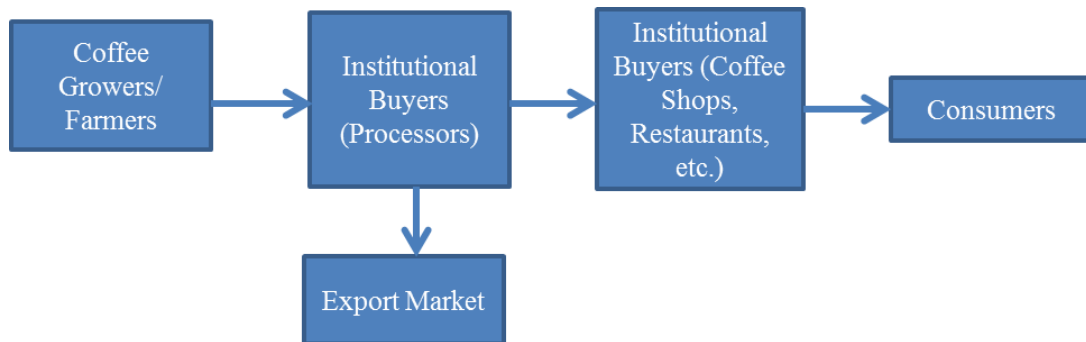
4.2.4. Supply Chain 4

Supply Chain 4 (Fig. 6) has the farmers' cooperative as its major player. The members have a good technical background from the training and seminars that BSU and other government agencies provide. However, there was confusion when it came to differences in information provided by several organizations which provided the training and seminars. Some government agencies provide good quality seedlings to the cooperatives while BSU sells them at reasonable prices. Despite being organized, they still have not developed a marketing strategy or an alternative market; thus, they sell their GCBs to the local traders. However, they have strong bargaining power because of their accumulated volume.

The market of the local traders is consistent with Supply Chain 2 as they bring the coffee to the processors and then bring back the coffee to sell locally. However, the local trader, Kape Montañosa, brings the GCBs to BSU for roasting and then sells the RCBs in the vegetable trading post. Kape Montañosa is a small coffee trader based in La Trinidad. Because of its size, it cannot have economies of scale in transporting coffee to bigger processing/roasting facilities in the lowland.

The local trader and the cooperative are the major players in the supply chain. Since the farmers have joined into cooperatives, they have greater leverage in negotiating with the traders, and they are also able to benefit from government support. In contrast, the local trader also has a strong relationship with the existing coffee shops and restaurants where the coffee beans of these cooperatives can be sold.

Fig. 6. Coffee Supply Chain 4

4.2.5. Supply Chain 5

Supply Chain 5 (shown in Fig. 7) is the shortest chain since it just contains the farmers, the NGO and the export market. The NGO, Cordillera Green Network (CGN), initially distributed coffee seedlings to farmers all over the Cordillera region as a reforestation crop since it is the main goal of the organization. However, when the coffee trees bore fruits, they were forced to engage in the processing and marketing of coffee. The head of the organization, a Japanese national, was able to find a potential market in Japan, but they had a hard time complying with the 100% Arabica requirement.

This supply chain can be considered a weak supply chain as of the moment because of the lack of expertise of the players. However, this has the potential to become a strong supply chain since they have a future source of coffee through the reforestation project. On the other hand, they still have to learn a lot about the coffee industry.

Fig. 7. Coffee Supply Chain 5

4.2.6. Supply Chain 6

Supply Chain 6 is different from the other chains since the farmers' training and seminars are not provided by the usual support organizations, but rather by the institutional buyer. The institutional buyer has its own coffee shop and restaurant, Café Maleng-ag. The owners wanted to ensure that the coffee that they serve in the shop is high quality. Thus, they trained their farmers to produce and sort GCBs properly. Furthermore, they bring used clothes for the farmers' families they visit. This led to strong relationship marketing between the farmers and owners of the shop.

However, Café Maleng-ag was affected by Supply Chain 1. Café Maleng-ag's farmer-partners texted and called the owners about this development and they did not immediately sell to GFI. It was forced to increase the price slightly to prevent the farmers from selling their coffee beans to GFI. With this problem, it is now considering having an alliance with other traders, like Garcia's Pure Coffee, to be able to have more strength in competing with GFI.
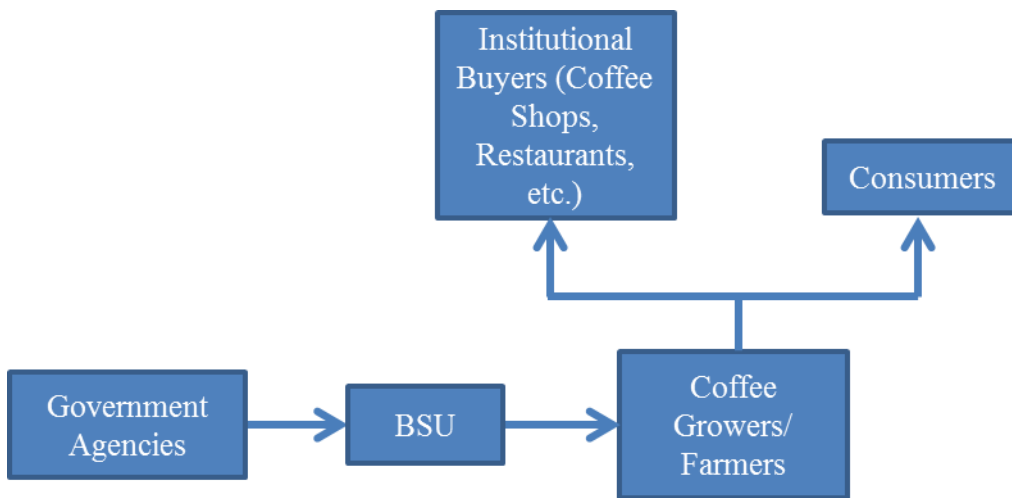
Fig. 8. Coffee Supply Chain 6

4.2.7. Supply Chain 7

Supply Chain 7 involves a group of farmers who did not form into a cooperative, but they cooperate in order for them to consolidate their produce as well as to be able to share the expenses of their transactions. These farmers have attended training and seminars which were sponsored by the government. Through these seminars, there were able to share money and were able to buy a small roaster and grinder. The produce of the farmers is consolidated, processed and packed by the same farmer group. They then sell their roasted coffee beans and roasted ground coffee to the coffee shops and restaurants in the city as well as individual consumers.

This supply chain (shown in Fig. 9) could be a strong chain if the farmers can create a legal entity which makes them eligible for some support from the government (e.g. roasters, grinder, packing equipment, etc.).

Fig. 9. Coffee Supply Chain 7

4.2.8. Characteristics of the Supply Chain Network in Baguio City and La Trinidad, Benguet

The Baguio City and La Trinidad coffee supply chain is a very complex and complicated network of chain participants, interactions and relationships. There were seven identified smaller supply chains which comprise the whole supply chain in the area. However, due to the complexity of the supply chain, one chain is not exclusive to itself. There are times when one supply chain overlaps with another and sometimes, it even disrupts the whole supply chain.

Generally, networks among the members of the chain are not that strong. However, chain participants are considering entry into alliances with each other in order to compete with a new entrant in the industry.

Furthermore, it was discovered that there are chain participants that have strong relationship marketing. These relational ties were established many years ago, and trust and reliance play a very important role in transactions. Moreover, the chain is weak in terms of transaction economics and operational/management logistics. The inefficiency is compromised by inadequate infrastructure (road networks, warehousing, processing facilities, etc.

4.2.9. Strong Supply Chains

Supply Chains 2 and 6 were identified as strong supply chains since both have proven their strength through the decades of operation as well as through their strong relationship marketing. Both also have strong foundations in terms of training and seminars given to farmers. Because of this, they are somehow assured of better quality GCBs.

However, Supply Chain 6 is stronger than Supply Chain 2 since one participant, Café Maleng-ag, owns the other two nodes of the chain (trading and processing), and it also has direct links with the growers and the consumers, enabling transactions to be faster and more cost efficient. Networks also exist within the chain, specifically between the café and the growers, as it is a necessity in order for them to have stable source of coffee. Furthermore, Supply Chain 2 does not have an established coffee grading system; thus, quality RCBs suffer.

Nevertheless, both have problems in terms of transportation and logistics since the road networks to the coffee production sites are not developed. Vehicles become run down because of the bad road condition to and from the production sites.

4.2.10. Potential to be a Strong Supply Chain

Supply Chains 3, 4 and 5 are slightly strong while Supply Chain 7 is a weak supply chain, but all have the potential to be strong supply chains. Supply Chain 3 has strong relationship marketing with growers, but coffee production is lacking. However, they are already planning on doing some backward integration and having their own coffee farm.

Cooperatives in Supply Chain 4 have a strong technical background on coffee production from the training and seminars attended. They also have access to high quality planting materials that can produce good quality coffee cherries at a higher yield. However, these cooperatives can improve their negotiating power with the traders if they have the market information locally and internationally, particularly price. They should learn the whole agribusiness and supply chain for themselves in order to be able to maximize their profits within the chain.

CGN, on the other hand, still has to learn more about the industry and how to operate in the industry so that it can meet the demands of its export market (Supply Chain 5). They will have a large potential source of green coffee beans once the coffee trees they have planted are mature and produce coffee cherries.

Farmers in Supply Chain 7 should group themselves into a cooperative so that they can avail themselves to the benefits that cooperatives in Supply Chain 4 receive. Also, they will have better access to financing, which can make their operation more sustainable. Networks with government institutions can also entail benefits, and networks with the local and export markets can give higher profits for the chain participants. This could spell success for these supply chains once all of these are achieved.

4.2.11. Weak Supply Chains

Supply Chain 1 was identified as the weakest supply chain of all major supply chains. The relationship marketing among the chain participants is weak as shown by the other supply chain players having a negative or antagonistic attitude towards GFI. They are now thinking of forming an alliance for a stronger network against GFI. There are also problems in sourcing coffee because of the stiff competition for the limited supply. Furthermore, there is not one entity that is perceived to be strong in this chain.

4.3. Identification of the Issues, Gaps and Weaknesses of the Baguio City and La Trinidad, Benguet Coffee Supply Chain Network

4.3.1. Supply Chain 1

The main weakness of this supply chain is the trader-supplier relations. The two chain participants have not yet established a strong relationship since their supply chain is still new. The trader goes to the different growers while the growers do not create networks to pool together their coffee beans.

4.3.2. Supply Chain 2

Coffee Supply Chain 2 is dominated by the local coffee traders. The local coffee traders do not have processing facilities in the area, so they have to transport their coffee the lowland for processing and storage. This entails an increased cost as well as prolonged transaction time aggravated by limited vehicle availability and poor road networks. Furthermore, there is no established coffee grading system in this supply chain and market information is not readily available to farmers. Thus, the risk of the farmers being shortchanged is high.

4.3.3. Supply Chain 3

In Supply Chain 3, the main weakness is the lack of processing facilities. Some farmers do not process their coffee and just sell it as coffee cherries, giving them much less income. Farmers' attitudes are also a problem since they do not want the hassle of post-harvest activities; thus, they sell their coffee in the form of cherries.

4.3.4. Supply Chain 4

The weaknesses of Supply Chain 4 are inadequate transportation, lack of a coffee grading system and market information for farmers. Furthermore, confusion that arises when farmers attend several training sessions and seminars which disseminate different sets of information on the best technologies to adopt.

4.3.5. Supply Chain 5

Although the main participant in this supply chain, CGN, has a direct link to the coffee growers as well as the market, they do not have sufficient knowledge about the coffee industry in the area. This is because they are basically an NGO which advocates reforestation in the Cordillera region. Coffee production was only incidental. There is also a need to improve their production and postharvest activities so that they can meet the demands of their market.

4.3.6. Supply Chain 6

Like in other supply chains, transportation is also a problem in this supply chain. Bad road conditions worsen the wear and tear on the few vehicles travelling to and from the production sites. The attitudinal problem of the farmers is also an issue. The farmer-partners have already been trained in the proper post-harvest activities like sorting. They had adopted these activities in the beginning, but some of them wavered and stopped.

4.3.7. Supply Chain 7

Low accumulated volume of the product and no formal entity are the weaknesses of this supply chain. Although the farmers have grouped themselves together, they have not organized a system to pool together a considerable volume to sustain their operations selling roasted and packed coffee beans. Furthermore, they were not able to form into a cooperative or any other formal entity in order to avail themselves to the benefits from the government as cooperatives are common beneficiaries of some government programs and projects.

V. Conclusion and Recommendation

Relational ties among the participants are better understood by analyzing each disaggregated supply chain's transactions and interactions. This, therefore, improves supply chain dynamics, which may have a bearing on business performance.

5.1. Investment Entry Points

A potential investment entry point in this chain is the establishment of a coffee institute or a coffee center. The center should be operated by the private sector to ensure that the center will continue its operations without being affected by politics. People who are interested in being involved in the coffee industry can enroll here. It could be a database center for marketing and financing of chain participants. It should provide training and seminars to people who will enroll in the areas of 1) farm production and cultural practices in coffee, 2) post-harvest management, 3) quality standards in coffee, 4) marketing, and 5) agribusiness management.

The coffee center can teach a person about coffee production. They can enroll in courses which will include Good Farming Practices for Benguet Coffee. Land preparation, fertilization, and farm management activities (like pruning habits) will be taught in this course. Students will also be taught on how to rejuvenate senile trees. Senile trees are not always a bad thing. Century old coffee trees have survived through pests, diseases and the harsh climatic conditions. It would be good to utilize these as sources of good planting materials since they have proven their resistance to different pests and diseases as well as resilience to harsh climatic conditions. Just by following the proper cultural practices, coffee production can increase yield from a measly 300 g per tree to 1 to 3 kilograms (Bacbac, 2015) of coffee per tree.

Furthermore, growers should be capacitated in the post-harvest processes to reduce the postharvest losses and increase the quality of the coffee beans. Improvement of quality can also be done through proper processing of the coffee beans since this is where most coffee farmers ruin the premium coffee beans that they harvested. Moreover, the center can develop a set quality standards for coffee and a systematic processes of grading the coffee beans to enable farmers get a fair price for the quality of product that they produce.

Furthermore, the students-farmers will also be taught about marketing strategies like product positioning and branding. Proper packaging will also be taught based on what processes the beans have undergone. They can create their own brand and reflect the indigenous people's culture through their marketing so that they can add novelty to their products.

The center can also offer free service in providing market information to the coffee chain participants. One of the reasons why there is imbalance during negotiation is because one party usually knows more than the other. Having a more transparent information flow can even out the playing field for the chain participants. Furthermore, they can also provide market links and financial links for supply chain participants who are looking for markets for their products as well as to help chain participants access financial assistance from various financial institutions.

The institute will produce a well-rounded coffee grower. They will not be experts in coffee production and processing, but they will be agri-businessmen. If these agri-businessmen can succeed in their coffee ventures, then they can be a good advertisement for the institute.

Another investment entry point could be the establishment of coffee processing facilities and/or warehousing or storage facilities in the area. This will reduce the transaction costs such as bringing the coffee beans to the lowland for processing. Available proper warehousing and storage facilities will enable farmers to sell their produce when the price in the international market is high. This can be operated and can be leased to coffee producers for a fee.

5.2. Development Entry Points

The government should consider developing the farm to market road networks in the area to make

transactions more efficient and less costly. Farmers who do not sell their coffee beans in the market because of transportation problem may be encouraged to sell if there were better road networks. The coffee industry will not only benefit from this intervention but also the highland vegetable industry.

The government and other organizations should provide high quality planting materials. These will produce high quality coffee beans and the yield will be significantly higher than the wildlings.

Government financing institutions should provide financing products or schemes that are coffee-friendly. These products and schemes should consider the gestation period of coffee as well as the resources of coffee chain participants. Farmers may have longer grace periods, or they may pay in kind.

These recommendations may help develop the coffee supply chain in Baguio City and La Trinidad, Benguet. With the coffee industry, the indigenous people in the area may begin to appreciate and value coffee both as part of their heritage as well as an important part of their economy.

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J. Glob. Bus. Trade Vol. 12 No. 1 (May 2016), 37-42

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A New Business Model for E-commerce: T-commerce and Its Implications on Financial Institutions

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ABSTRACT

Since the mid-1990s, due to the worldwide spread of the internet, the new frontier of E-commerce has evolved from narrowly defined E-commerce to M-commerce and T-commerce. T-commerce can be defined as follows: customers using Interactive DTV (iDTV) and telecontrollers to make inquiries, orders, or payments regarding certain products, or to conduct financial transactions such as banking and stock trading. This thesis constitutes an examination of T-commerce in the aspects of its business model, value chain and future development, and a proposed plan for financial institutions to utilize T-commerce.

I. Introduction

E-commerce refers to using the Internet for sharing business information, maintaining business relations and completing business transactions (Zwass, 2003). The speedy development and popularity of computers have enabled customers to carry out business activities electronically, thus giving birth to E-commerce. With the further development of information technology, new mobile communication technology has been incorporated into E-commerce, enabling individuals or companies to conduct business activities electronically using mobile communication technology; this is the origin of M-commerce. In recent years, with the application of high-tech networks, the birth and

prevalence of iDTV and the swift development of Internet technology, T-commerce has emerged as a new E-commerce business model. T-commerce supplies interactive two-way communication services. By means of TV sets, TV viewers can take part in interactive TV programs and also conduct interactive E-commerce business, i.e., such E-commerce activities as making orders and payments (Lyytinen & Yoo, 2002a, 2002b). T-commerce is a brand new commercial transaction methodology that combines the technologies of E-commerce and iDTV, and is a general term for referring to TV-enabled business transactions. It utilizes T-commerce means such as TV shopping and online shopping to enable commercial activities and interactive communication. With this business model, T-commerce has won approval and credibility from markets with its business gains and values, and its own unique markets. In addition, TV is

easier to operate and more convenient to use compared to computers and mobile phones. TV, as a credible media, has been credited with a huge potential to provide new-concept services and to shape customers' behaviors.

T-commerce boosts the sales of products and makes banking, financial services and stock exchange tools more accessible to banks and as such can fully satisfy customers' needs for single-step purchasing. As a result, many financial institutions view T-commerce as a new business model and a new source of income, and engage in T-commerce with continual infrastructure investment. This thesis constitutes general research that frames the concept of T-commerce, probes its value chain and business model, and states the implications of T-commerce for financial institutions.

II. The Concepts and Characteristics of T-Commerce

T-commerce is short for Television commerce, which is TV-based E-commerce. T-commerce combines the technologies of E-commerce and iDTV. Viewers of T-commerce can use interactive digital playing services to make orders or payments for needed products or services, such as banking services, stock trades, non-free video games, music, clothes, and etc (Kim et al., 2004; Kim et al., 2005). T-commerce uses iDTV to achieve its purposes. Big electric appliance producing companies in China view the "Digital Networked TV Age" as the way of the future and strongly advocate "Digital Network TVs", which make the commercial operation of networked integrated TV broadcasting platforms more market-oriented and more popular (Tsaih et al., 2005). The practical and entertainment value of the networked TV has won the approval of consumers. According to a survey conducted by the market research organization AVC on 1200 urban households, the approval rate of networked TV is as high as 84%. Many companies predict that T-commerce will be widely popular. Thus, judging from companies' emphasis on networked TV

technology and consumers' attitudes, T-commerce has a bright future awaiting it. Table 1 compares T-commerce with other sale channels (Kim, 2006). By utilizing iDTV to deliver business transaction services, T-commerce has the advantages of both TV shopping and online shopping. The advantage of TV shopping is that product information is offered by presenters, thus forging an intimate relation between TV and viewer. The drawback of TV shopping is that it is one-way communication limited by its broadcasting time and finite numbers of products. T-commerce, similar to online shopping, enables viewers to screen and search before making orders; therefore, it simultaneously possesses the advantages of online shopping. Thus, T-commerce's combination of the conveniences of TV and the two-way characteristics of online shopping will greatly impact customer behavior and has the potential to overtake TV shopping and online shopping as a new retail sales channel.

Table 1. Comparison of the Characteristics of T-commerce against Those of Other Sales Channels

Characteristics	T-commerce	E-commerce	Home-shopping
Searchable Interactivity	Yes	Yes	No
Entertainment Value Conveyed by Anchors	Yes	No	Yes
Diversity	Yes	Yes	No
Convenience	Yes	No	Yes

T-commerce can be divided into categories of product delivering, service delivering, and catalogue delivering. The product delivering type of T-commerce introduces or sells multiple products, and is quite similar to TV shopping. However, TV shopping only introduces products while T-commerce not only supports searching for products but also supports TV banking services and instant payment services such as credit card services. The service delivering type is aimed at delivering convenient services, and introduces or sells common services, including TV banking services, TV securities services, booking services,

ordering services and so on. The catalogue delivering category is made up of video games, films, music downloads and text message services by means of TV networks.

III. The Business Model of T-Commerce

3.1. The Value Chain of T-commerce

The value chain of T-commerce can be divided into the following links: information processing, service delivering, infrastructure maintenance and terminals. Information processing refers to the process where audio-visual information is produced. In this link, perfection is a basic requirement in terms of artistic value, cultural aspects, data collection and formulation. Thus, relatively speaking, specifying information according to its own proper affiliation. Service providing agencies are responsible for integrating different media, varying information, and for providing services to customers. Broadcasting and communication associations have been playing a dominant role in this aspect. Infrastructure maintenance refers to the hardware for information transmission and the network for providing information. Terminals refer to such software and hardware as TV receivers and set-top-boxes that enable customer to search, screen and use information (Styles et al., 1996).

3.2. The Business Model of T-commerce

T-commerce is composed of holistic activities including program making, packaging and sending, and it also plays a retailing role that enables business transactions. This is because users' purchases are made through TV programs. That is, in terms of purchasing activities regarding products shown on TV, the program senders are viewed by consumers as shop owners. As such, T-commerce has to act as a retailer in order to integrate consumers' purchases and provide satisfactory services. By fulfilling such retailing

functions and analyzing the sales of products, T-commerce can optimize its product portfolio according to the tastes of customers and make suitable adjustments to enhance sales. However, since T-commerce is the result of new broadcasting environments, participants are different from those in TV shopping. They can be divided into suppliers, customers and third party agencies (as a link between supply and demand). Combined with the knowledge of the aforementioned value chain, we can obtain an understanding of new market players.

From the supply side, players in the market include product suppliers, designers of existing programs and digital broadcasting program makers, with T-Mall as a retailer and broadcasting program senders. As is the case with TV shopping, the broadcasting program makers are involved, but T-commerce delivers its service in digital data broadcasting, so broadcasting program makers can be categorized as the designers of existing programs and digital broadcasting program makers. Additionally, there are participants in charge of the structure and management of products similar to TV shopping, and there is also the T-Mall to provide ordering, payment making, delivery and purchase exchange services. T-Mall is in charge of product suppliers' information and the products in data broadcasting and, as such, plays a pivotal role in T-commerce users' information management and the whole transaction at large. There are also broadcasting program senders that are responsible for sending T-commerce programs to viewers.

The customers are referred to as TV viewers. The biggest characteristic of T-commerce is its interactivity. Viewers can take part in interactive broadcasting programs to interact and communicate using a TV set and telecontrollers. From the perspective of viewers, TV programs are not only to be watched but also to be taken part in or utilized. Viewers will become digital data broadcast users. The third party agency is the transaction processor that stands between the suppliers and customers. When suppliers' product information and T-commerce users' requirement information is fed into the feedback channel of T-Mail, the third party

agency will be responsible for its logistical service, payment, accounting and authentication, and so on. T-commerce conducts business transactions in digital data broadcasting and processes online shopping, authentication, payment, acknowledgement and delivery through E-commerce technologies. It combines the technologies of radio, TV shopping and E-commerce business transactions, and constitutes a T-commerce business model that can enable E-commerce transactions by means of TV.

The business model of T-commerce combines those of E-commerce and of data broadcasting, and through the media of TV can safely, conveniently and speedily process product sales. Its technology is based on the same technology that enables E-commerce transactions, and it relies on data broadcasting as its media. The following passages will explain the business model of T-commerce by focusing on the processes of different components of the T-commerce business model.

Product suppliers will transmit the products and services information in existing broadcasting programs to the T-Mall along with digital data broadcasting program information. Product information refers to specific information needed in carrying out sales activities, including product names, characteristics, functions, applications and target end users. Digital data broadcasting program information refers to supplying customers who watch T-commerce programs with interfaces to buy products or services; that is, in T-commerce, the interfaces supplied by digital data broadcasting are used for detailing product information, ordering and payment making, like those in E-commerce. The T-Mall is responsible for managing both product and service information and digital data broadcasting program information.

T-commerce customers use set-top boxes to watch, screen, and search needed products, and can make purchases with telecontrollers. The operation process is quite like those processes in E-commerce and M-commerce; the customer clicks the order button, confirms product information (quantity, color, price) and then places orders. After orders are made,

payments are made through the consumer authentication system. Here, ordering, authentication and payment information is transmitted through the feedback channel in set-top boxes to T-Mall which will send instructions to logistical institutions that are in charge of delivery. T-Mall will send integrated delivery information upon requests back to customers. T-Mall possesses all suppliers' and digital data broadcasting users' information, as well as processed orders, logistics and after-sale services. Essentially, the T-Mall provides services to ensure customer satisfaction and is responsible for delivering after-sale services.

IV. The Implications of T-commerce for Financial Institutions

4.1. The Present Condition of T-commerce Applications in Financial Institutions

At the present moment, the financial institution most capable of using T-commerce effectively is the bank. At home and at any time customers can make inquiries about deposits, make remittances and transfers, and get loans using telecontrollers and networked TV sets linked with banks. Television banking services are most prevalent in Britain and France. In 1998, in collaboration with satellite Digital Broadcasting Corporation-TPS Company, the French Bank Credit Agricole first launched its television banking services. In Asia, in December 2000, Japan's Sakura Bank first delivered this service with South Korea's Woori Bank following its lead in November 2003 to venture into television banking services. At present, banks using internet and TV banking can not only reduce operations costs but also raise core competitiveness, enabling customers to access a low-cost banking model that not only incorporates the banking industry but also includes aspects of the securities trading industry. For example, with wireless keyboards enabling stock exchange services such as hot-button operation, direct accessing, purchasing, selling, inquiring, cancelling and altering, even

customers who are computer-illiterate such as the elderly and housewives can easily trade stocks online. Some banks are offering simple TV banking services but still have not fully adopted the T-commerce business model. These banks need to update their business strategies and carry out more rigorous research into the T-commerce market. Moreover, to better utilize the media of TV, the issue of investment in infrastructure is involved, and thus existing resources need to be employed along with the increasingly popular set-top box technologies.

4.2. Strategic Blueprints for Financial Institutions

The gradual development of T-commerce has been a new source of revenue for financial institutions, and financial institutions have four options to turn to when it comes to strategic decision making. The gradual development of T-commerce has been a new source of revenue for financial institutions, and financial institutions have four options to turn to when it comes to strategic decision making.

Firstly, set up a secure and effective confidentiality and authentication system. In terms of business activities via financial institutions, the most crucial aspect is to protect user information from being leaked. Similarly, protecting user information is crucial for T-commerce financial transactions. As is the case with E-commerce and M-commerce, authentication software can be utilized to protect account numbers and passwords in T-commerce. As a means of combining software and hardware for security measures, other devices can be used to encrypt user information as well, such as USB keys and receiver cards, which are used to encrypt special information for set-top boxes.

Secondly, open up new sales channels by diversifying services in a phased way. Financial institutions must diversify services gradually, carry out marketing based on services, and expand the scope of concern in terms of information for customers phase by phase. Active research and improvement need to be made to deliver required services on the one hand and achieve the "portalization" of T-commerce on the other hand. Though T-commerce cannot replace other sales channels such as real shopping malls, online sales and mobile phone sales, it can be a whole new sales channel coexisting with other sales channels. In the short term, T commerce is not the optimal new sales channel, but in coexistence with E-commerce and M-commerce, it can be a profitable new means of marking sales.

Thirdly, effectively use the TV media in publicity efforts to enhance approval among users. TV is the main carrier of advertisements and media coverage with huge potential to not only treat T-commerce as a means of making sales and making payments but also as an effective publicity media T-commerce and M-commerce by mainly using pictures and words to describe products, while T-commerce can effectively incorporate advertisements with moving visual images and voiced descriptions to raise credibility.

Fourthly, specifically categorize and analyze target customers and carry out marketing research. Though T-commerce has seen the rise of its accompanying "online shops", like E-commerce and M-commerce, its main target customers significantly differ from those of E-commerce and M-commerce. Thus, the need to specify and focus on target customers arises. Financial institutions need to promote and carry out T-commerce among 40 years and older individuals, middle-aged and elderly consumers who are not familiar with using computers or mobile phones. Elderly citizens with solid financial assets in particular are highly likely to become mainstream customers of T-commerce business. Further, financial institutions should also be adaptable to a younger generation of users who might be interested in T-commerce at the management level. Since the younger generation is an acute player in new markets, has changing tastes, responds to fashion, and has a need for fashionable things, it is a big potential customer group and poses a challenge for financial institutions trying to open up T-commerce markets. Moreover, in order to enhance adaptability, markets need to be specifically categorized, and customers' behaviors in spending and using financial tools researched so that marketing efforts can be focused.

V. Conclusion

The emergence and development of E-commerce is the result of mature conditions and fit well with the trend of technological development. Hindered by manual processing, traditional modes of commerce cannot deal with large amounts of data nor keep up with complex commerce proceedings, thus holding back the globalization of commerce and limiting its full development. With the development and application of computer technologies, the internet and information technologies, E-commerce and T-commerce have made great strides forward. At its initial stage, the T-commerce model as of now only provides through telecontroller operation limited services, such as accessing product catalogues, making orders, processing payments and delivery inquiries. While having been held back by problems in the popularization of set-top boxes and in consumer habits, many T-commerce agencies are currently making headway on developing the functionality of T-commerce and on marketing the popularity of T-commerce; T-commerce will experience significant growth in the next 2-5 years. Digital broadcasting technicians are developing broadcasting transmitter and receiver technology. Technology experts in digital programming are designing and revising, and others are working actively to expand its scope of business and carrying out research to standardize the operation of T-commerce. In business dealings, application-oriented services and commerce models are being developed along with satellite broadcasting services. At present, the infrastructure upon which T-commerce relies on is gradually maturing, although relevant academic research lags behind.

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Assessing the Economic Benefits of Investment in Capacity Building: The Case of the Philippine Government-Funded Rural Enterprise Development Project

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ABSTRACT

This paper presented the results of an economic assessment study commissioned by the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development of the Department of Science and Technology (PCAARRD-DOST). Primary data on production, costs, investments, and socio-economic and farm-specific characteristics were obtained from 382 goat enterprise owners from Leyte, La Union, Isabela, and Nueva Ecija, Philippines using a pre-tested structured questionnaire. The analytical method used to measure the return on the donor's investment is the Benefit-Cost-Analysis (BCA). The study showed that the investment on capacity building generated a Net Present Value (NPV) of Php 3.8 million, a Benefit-Cost Ratio (BCR) of 1.36 and an Internal Rate of Return (IRR) of 35.48%. It is therefore concluded that the Rural Enterprise Development (RED) project provided positive returns on the investments of PCAARRD and the participating Local Government Units (LGUs). Hence, it was recommended that the Department of Agriculture institutionalize the RED Project so that it could be replicated in other regions of the country.

Keywords: benefit-cost analysis, firm organization, impact assessment
JEL Classifications: E26, Q12, Q16

I. Introduction

Slaughter goat production in the Philippines was considered a sunrise industry, dominated by small backyard farmers. Because of the increasing demand for goat meat, also called *chevon*, a number of farmers have intensified their production of slaughter goats. According to the Bureau of Agricultural Statistics (Bureau of Agricultural Statistics, 2013), the Northern

and Central Regions on the island of Luzon in the Philippines are among the top five regions with the highest production of goat meat at the backyard and commercial level. Goat, also called the poor man's cow, continues to be a popular choice of livestock among small farmers because it requires less investment and provides an alternative source of income.

Despite the prospects of the industry, a number of small-hold farmers faced high mortality and morbidity among goat kids due to a high incidence of parasites. The Australian Center for International Agricultural Research (ACIAR) and the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) responded to this problem by developing a package of technology options that could effectively address the issue. Montes, Zapata, Alo and Mullen (2008) reported that parasite control technology was able to reduce the mortality rate from 67% to 3% among goat kids. This resulted in a reduction in the production cost of goat meat which generated a total economic surplus of Php 2.8 billion.

Since the successful ACIAR and PCAARRD collaboration to address the problems of the goat industry, a number of projects focused on improving productivity of goat farms were implemented. In 2007, PCAARRD funded the Rural Enterprise Development Through Innovative Goat Production System Project Phase 1 ("RED Project"). According to Cerbito, Datuin, Nayga and Orden (2009), the primary goal of the RED Project is to "contribute to the Philippine government's bid to alleviate poverty in the rural areas by transforming goat raising from a subsistence type of farm activity into a viable livestock-based rural enterprise." The project was implemented in four provinces in the Philippines, namely La Union (Region I), Isabela (Region II), Nueva Ecija (Region III) and Leyte (Region VIII). In 2009, Phase 2 of the RED Project was launched. It has the same objectives and methods as RED Phase 1. However, Phase 2 has expanded the scope of implementation to include the provinces of Pangasinan, Ilocos Sur, Nueva Viscaya, Tarlac and Samar, Philippines.

It has been the practice of PCAARRD to examine whether its investments in Research, Development and Extension (RD&E) provide positive returns to the economy. Hence, in 2013, PCAARRD commissioned the University of the Philippines Los Banos (UPLB) to conduct an impact assessment study on Phase 1 of the RED Project. This paper described the processes and dynamics involved in the conceptualization, implementation and evaluation of the RED Project. It also assessed the economic impacts and net benefits from implementation of project. The results of the analysis served as inputs in drawing policy implications for the further development of the goat industry.

II. Review of Literature

An ex-post impact assessment is an evaluation method that is designed to identify and measure the consequences of R&D interventions. It takes place after the intervention has taken place (Walker, Maredia, Kelley, La Rovere, Templeton, Thiele & Douthwaite, 2008). An impact assessment provides an "after the event" perspective that measures the return on the investments of donor institutions (Davis, Gordon, Pearce & Templeton, 2008). It is a useful learning tool for project participants and project managers. Several studies (Davis et al., 2008; Hailey, James & Wrigley, 2005; Templeton, 2009; Walker et al., 2008) discussed approaches and methods in impact assessment. However, the methodology often varies depending on the type of R&D intervention being investigated.

ACIAR used the Input-Output-Outcome-Impact framework for assessing the impact of R&D investments (Davis et al., 2008). The inputs are cash and in-kind investments that the donor and partner institutions spent to generate the program or project outputs. Outcomes are evaluated on the basis of effectiveness, which is the use of outputs and sustained production benefits (Hailey et al., 2005). The change in behavior and practices is expected to generate an impact on the target users, community and industry as a whole. Impact is assessed by looking at the change

from the original problem situation (Hailey et al., 2005). The standard economic welfare analysis is the most common approach in measuring the benefits for consumers and producers.

The impact assessment study becomes more challenging when capacity-building projects are being considered. "Capacity is the ability of people, organizations and society as a whole to manage their affairs successfully…. Capacity building is more often understood as a purposeful, external intervention to strengthen capacity over time." (Simister & Smith, 2010) Capacity includes new knowledge, skills, management capabilities, and even infrastructure. These bring changes in policy, practice or products (Davis et al., 2008). Investment in human capital is inherently valuable. Most impact assessments ignored the importance of training. Rather, the assessment "only went as far as identifying the output (capacity built) or the outcome (use of that capacity), stopping short of quantifying capacity-building impacts." (Templeton, 2009)

According to Hailey et al. (2005), assessing the impact of capacity-building projects is complicated because it is intrinsically complex, intangible and the process is often ill-defined. "Attribution tends to be more difficult because capacity built is combined with other inputs to produce the adoptive outputs that ultimately lead to the higher-order outcomes and impacts" (Templeton, 2009). The interplay of internal and external factors, as well as changing circumstances is a major challenge. It is difficult to establish the causal relationship between an intervention and wider change (Hailey et al., 2005)

Because of the complexities in assessing the impact of a training program, several studies (Hailey et al., 2005; Simister & Smith, 2010) suggested the use of triangulation.

This is very important for obtaining the most credible picture possible while collecting the minimum necessary data. Balancing of different methods and tools is necessary. Though quantitative methods have been one of the most common tools in impact assessment, it often has limitations, such as the

inability to explain why something has occurred (Hailey et al., 2005) Triangulation methods are implemented to verify and validate the results of the research study. Using various methods would help build a picture of the change (Simister & Smith, 2010). Balance is achieved by using quantitative and qualitative data in assessing impacts. Methodological rigor does not always depend on complex analytical techniques but on the sufficiency of data.

Quantitative techniques provide useful insights that are less subjected to bias. For example, productivity analysis of resources could be estimated through production function analysis. According to Gabunada, Zapata, Manilay, Elauria and Aquino (2011), this method involves the determination of parameter estimates of inputs that best explain variation in output. Baseline data should be available to assess the contribution to improvement of certain projects. Since each capacity building project is unique, an appropriate set of impact indicators should be used (Van der Werf, 2007). Determining the performance measurement indicators is crucial in assessing impacts. According to Gordon and Chadwick (2007) the economic indicators include yield, production costs, prices, market access, and off-farm income. Social indicators include percent of population below the poverty line, days of illness, and number of active community consultation groups. The environmental indicators include air, soil and water quality, biodiversity, and area of habitat protected.

Qualitative methods may be used to substantiate the links between capacity-building activities and to substantiate linkages between the training provided and the intended or observed outcomes and impacts. (Templeton, 2009) One commonly used qualitative approach is the Most Significant Change (MSC) technique which is capable of describing the complexity of individual, organizational and societal change. The strength of MSC "lies in its ability to produce information-rich stories that can be analyzed for lesson learning. MSC also involves a transparent process for the generation of stories that shows why and how each story was chosen." (Simister & Smith,

2010) "The use of participatory self-assessment methods that involve organizations' members and external stakeholders is crucial." (Hailey et al., 2005) Moreover, Depositario, Aquino and Feliciano (2011) used a set of Personal Entrepreneurial Competencies (PEC) as the indicators of entrepreneurial inclinations.

In the Philippines, a number of impact assessments on agricultural R&D intervention projects were already conducted. However, there are limited studies that focused on capacity building projects. As mentioned in the foregoing discussions, the impacts of training programs are complex and difficult to trace. Nevertheless, this paper is one of the few assessment studies in the Philippines that examined capacity building.

III. Methodology

3.1. Conceptual Framework

The input-output-outcome-impact framework (Figure 1) of this study was adopted from Davis et al. (2008). For the RED Project, the inputs include the investments made by DOST-PCAARRD and the Local Government Units (LGUs). The outputs, on the other hand, refer to the trainees, research outputs, awards received and infrastructure generated by the project. The outcomes were assessed by looking at the adoption pathway, which would include changes in attitude and practices. The impacts, on the other hand, refer primarily to the change in income, as well as social and environmental impacts.

3.2. Data Collection

The inputs, processes and outputs of the project were identified from the RED Completion Report. The in-kind costs and indirect outputs, on the other hand, were determined with the aid of key informants from Central Luzon State University (CLSU), Isabela State University (ISU), Department of Agriculture (DA), Local Government Units (LGUs) and PCAARRD. Since an impact assessment study aims to measure the marginal costs and benefits from an R&D intervention, it is essential to gather baseline data on the key performance indicators of the target user populations.

In the case of the RED project, the baseline data are incomplete due to data storage problems. Hence, the "with" and "without" scenarios were established through a survey of "control" and "treatment" farmers conducted from August 5 to 17, 2013 for Nueva Ecija and Isabela, October 1-11, 2013 for Leyte and December 2-14, 2013 for La Union.

The "control" respondents are farmers who are engaged in goat production and marketing but do not have access to any formal or informal training about the innovative goat production system. The sampling frame for this set of respondents was generated with the help of the project implementers. The "treatment" farmers, on the other hand, are the ones who were directly or indirectly trained through the RED Project. The list of "treatment" farmers was obtained from the RED Completion Report. Efforts were made to conduct a survey among all "control" and "treatment" farmers in the study areas. However, some farmers could not be located or were unavailable during the survey.

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Fig. 1. Conceptual Framework for the Impact Assessment of the Rural Enterprise Development through the Innovative Goat Production Systems Project
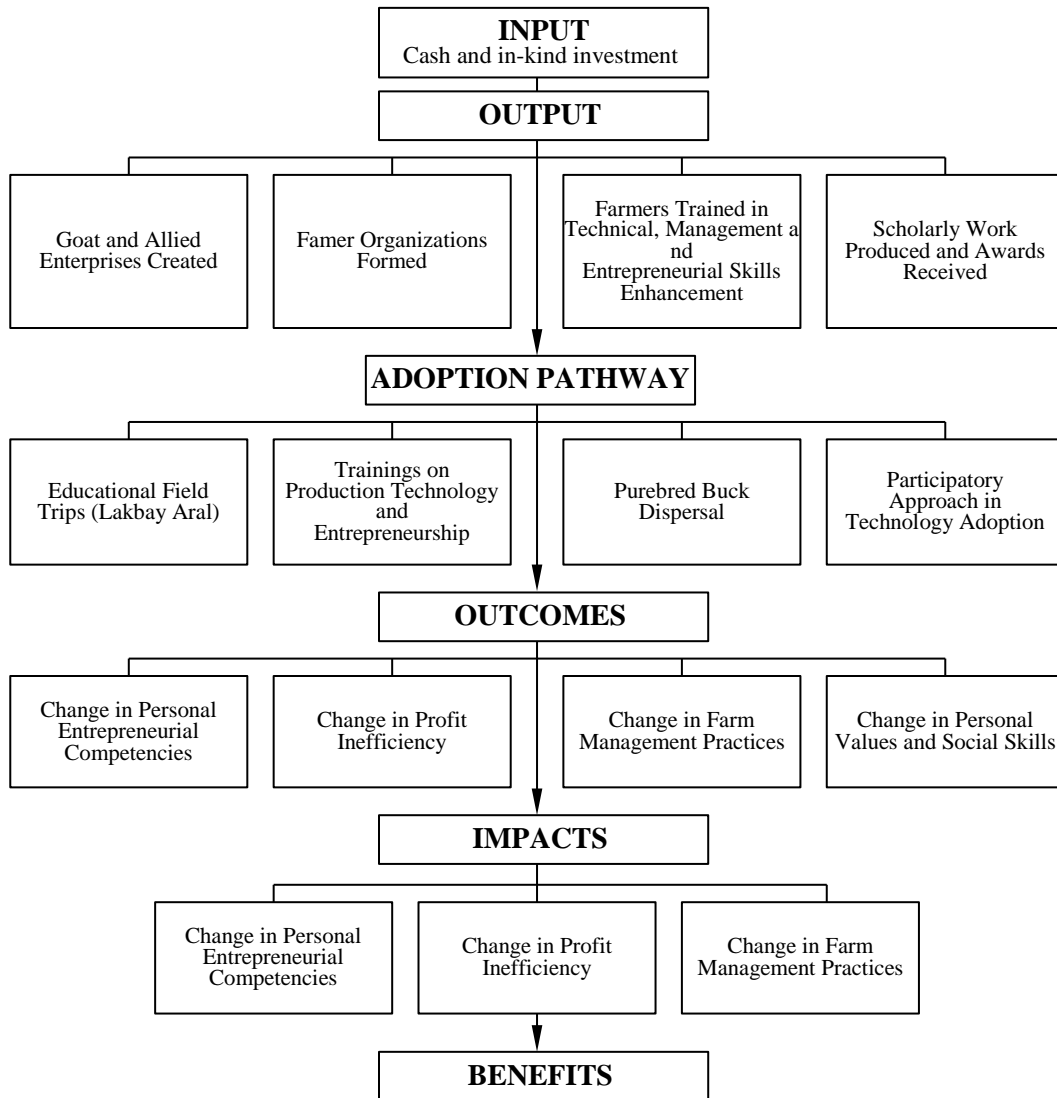
3.3. Data Analysis

The first step in the BCA is to estimate the nominal input costs. These nominal values of annual input costs were then converted into real costs. This was done to remove the effects of price changes over time. This makes use of a price deflator or price index that treats prices as constant over time utilizing a base year. Davis et al. (2008) recommends that Gross Domestic Product (GDP) deflator rather than the Consumer Price Index (CPI) be used. For this analysis, the Philippine GDP deflator was used. The base year for deflating costs is 2012 (Table 1). The real value was calculated by finding the ratio between the nominal value and the price deflator.

Table 1. Philippine GDP Deflator for the Period 1993-2012

Year	GDP Deflator (Base Year: 2000)	GDP Deflator (Base Year: 2012)
1993	53.61	32.05
1994	58.96	35.25
1995	63.41	37.91
1996	68.27	40.81
1997	72.52	43.36
1998	88.75	53.06
1999	94.60	56.55
2000	100.00	59.78
2001	105.55	63.10
2002	109.94	65.73
2003	113.46	67.83
2004	119.72	71.57
2005	126.70	75.74
2006	132.97	79.49
2007	137.08	81.95
2008	147.43	88.13
2009	151.52	90.58
2010	157.91	94.40
2011	164.32	98.23
2012*	167.27	100.00

Source: FAO (2013).

Note: *Derived using GDP Deflator % increase from BSP (2013).

The pattern of technology adoption and the impact pathway of the target user population were analyzed using frequency counts. This is the most straightforward approach to working with quantitative data. Items are classified according to a particular scheme and an arithmetical count is made of the number of items that belong to each classification in the scheme. A descriptive analysis was utilized to describe the data. Moreover, descriptive statistics such as mean, standard deviation and range were also used to describe the basic features of the data in the study. It provided simple summaries about the sample and the measures. An independent t-test was also conducted to test if the difference between the means of the income and percent share of goat income to total income is statistically significant.

The BCA required the measurement of input costs and benefits over time. The values were discounted to estimate the present value of the cost and benefit flows. The three measures of net benefits that were used in this analysis are Net Present Value (NPV), Benefit-Cost Ratio (BCR), and Internal Rate of Return (IRR).

NPV, also called the discounted cash flow (DCF), is a financial measure which is based on the concept of the time value of money. It represented the real or inflation-adjusted value of project net benefits at the present year or the year of analysis. Theoretically, it is the most accurate measure of economic value. A positive NPV implies that the benefits have exceeded the costs. The net present value of future amounts was obtained through discounting and compounding. In this process, the interest rate or the opportunity cost of capital of 6% was used. The BCR was computed as the ratio of the present value of real benefits to the present value of real costs. The IRR, on the other hand was computed as the discount rate that made the present value of benefits equal to the present value of costs.

IV. Results and Discussion

4.1. Inputs

The inputs for the RED project are composed of cash and in-kind investments from various institutions such as PCAARRD and LGUs. The estimated nominal and real investment costs for the period 2007-2012 (Table 2) in the provinces of La Union, Isabela, Nueva Ecija and Leyte is Php 10.5 million (in real and present value terms). These investments were used to build the capacity of farmers to produce goats and earn profit from the business operations. It is important to note that the technologies introduced to the farmers were generated by previous projects financed by the Australian Center for International Agricultural Research (ACIAR), the International Livestock Research Institute (ILRI), PCAARRD, DA and other agencies. These investments from previous projects were no longer included in this analysis. One reason for this is the extent of technology adoption in the study area. A number of farmers who did not undergo training from the RED Project were also adopting the innovative goat production system technology. Hence, the "without" scenario would exhibit a considerable degree of technology adoption. The RED Project is not limited to technical skill development. It also includes organizational development and entrepreneurial training. In other words, the strategic parasite control technology is just a small component of the project.

Table 2. Investments in the RED Project of Various Partner Institutions in La Union, Isabela, Nueva Ecija and Leyte for the Period 2007-2012

Year	Nominal Value of Investment Costs (Php)					Real Value	Present Value (2012)
	La Union	Isabela	Nueva Ecija	Leyte	TOTAL	TOTAL (Php)	TOTAL (PhP)
2008	910,185.50	900,185.50	630,185.50	970,185.50	3,410,742.00	3,869,908.58	4,885,670.42
2009	660,185.50	900,185.50	630,185.50	720,185.50	2,910,742.00	3,213,479.05	3,827,304.96
2010	60,000.00	300,000.00	160,000.00	120,000.00	640,000.00	677,939.14	761,732.42
2011	60,000.00	300,000.00	30,000.00	120,000.00	510,000.00	519,180.00	550,330.80
2012	60,000.00	300,000.00	30,000.00	120,000.00	510,000.00	510,000.00	510,000.00
TOTAL	1,750,371.00	2,700,371.00	1,480,371.00	2,050,371.00	7,981,484.00	8,790,506.77	10,535,038.60

The LGUs are an important partner for PCAARRD in implementing the project. The contributions of the LGUs are primarily in-kind investments such as personnel support and coordination. According to interviews, the amount of time spent by Agricultural Technicians in assisting RED participants ranges from 10% to 40% of their work time per week. Breeder goats were also dispersed to the farmers by some LGUs. For example, in 2010, the LGU of Guimba in Nueva Ecija dispersed 10 bucks to farmer-partners. All of these in-kind and cash costs were considered in the estimation of inputs.

4.2. Process

The implementation of RED in the study sites followed a framework (Figure 2) that is different from FLS and other related projects. The focus of the RED Project is not limited to production. The project placed strong emphasis on capacity-building for organization, management, market linkages and entrepreneurship. The goal of the project is to establish goat and goat-based enterprises.

Fig. 2. Framework of the RED Project
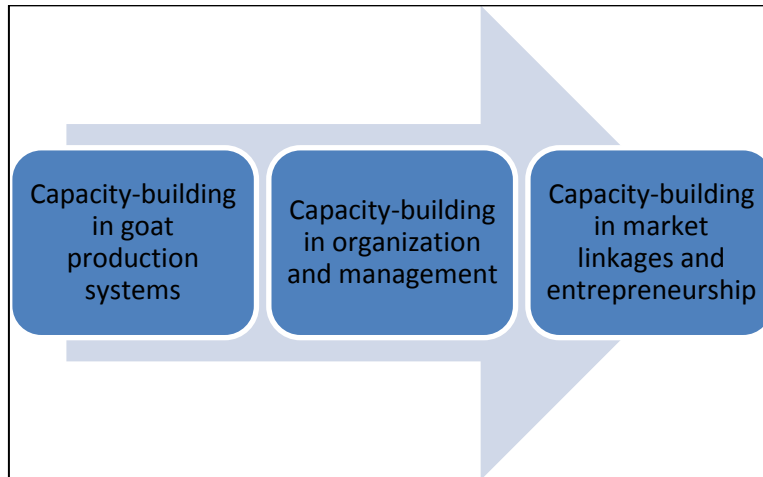
In the planning stage of the project, the focal sites were carefully selected. According to the RED Project Completion Report, the project sites were selected based on goat density, economic importance of goat production, accessibility, high probability of radiation effect and presence of support systems.

In the provinces of La Union, Isabela, Nueva Ecija and Leyte, the intervention was done in the municipalities of Pugo, Echague, Guimba and Villaba, respectively. After site selection, the farmer-participants were identified. According to the RED Project Completion Report, the selection criteria are as follows:

a. Willingness to cooperate and participate in the pro-ject

b. Smallholder livestock farmers with at least 5 head doe-level of goats per household/ family

c. Positive receptivity to innovative technologies/ development projects

d. Some knowledge and understanding of feed, animal performance, production/ management systems, e.g. deworming, housing, etc.

e. Enterprising with existing business, interested with enthusiasm in goat enterprise development and possessing inherent value-oriented aspirations for the farmer/family/household.

After the organization of the project team and the farmer-participants, capacity-building activities were conducted. Foremost of these activities was the training on the innovative goat-production system. Unlike the past training on goat production, such as the Farmer Livestock School (FLS), which runs for six months, the technical skills enhancement component of RED was conducted for two days only. However, the participatory approach to technology adoption was still the primary method of technology transfer. In this approach, the farmers may select from a basket of technology options (see the RED Project Completion Report for the detailed discussion of the technology options) that would fit his needs and capabilities. This training was also complemented with educational field trips (*lakbay aral*) which aimed to expose the participants to best practices in the industry.

The RED Project was unique in such a way that it also included entrepreneurial skills enhancement. This was provided to farmers in two ways. First, the project implementers saw the need to form an organization that would empower the farmers and build their confidence. Hence, the participants were taught how to form a farmers' organization that is duly registered at the Securities and Exchange Commission (SEC). Second, there was a need to develop an entrepreneurial mindset among farmers. The project provided a

training entrepreneurial skills enhancement that focused on market linkages.

4.3. Outputs

The investments made by PCAARRD and the partner institutions produced tangible products which represent the output of the RED Project. Table 3 summarizes the output generated by the project proponent in each study site. The primary output of the project is the training of farmers. Almost 700 farmers participated in various capacity-building training/ seminars. As a result of this training, farmers' organizations were created. In La Union, the Goat Raisers Association – Pideg and Amallapay Chapter (GORA-PA) and the Goat Raisers Association – Palina and Cuenca Chapter (GORAPACU) were formed. On the other hand, the Echague Goat Raisers Association (ECHAGORA) and Guimba Goat Raisers and Producers Association (GUIGAROPA) were established in Isabela and Nueva Ecija, respectively. Moreover, selected goat farmers in Leyte instituted the Villaba Association of Goat Entrepreneurs (VILLAGE).

The enterprises developed through the project beneficiaries were not limited to slaughter goat production. The project implementers also introduced allied goat enterprises such as bucks for hire, legume plant material production and breeder goat raising. There were also innovations introduced by each project proponent. For example, ISU helped establish the Community-based Breeding Center to support the production of upgraded goat breeds. CLSU, on the other hand, introduced the Goat Negosyo (Business) Seminar in order to enhance the appreciation of farmers for goat-based enterprises.

The scholarly work produced from the RED Project received recognition from various award-giving institutions. All proponents presented the results of the project in their respective consortium conferences. All papers were given awards.

4.3. Outcomes

Given the costs of adoption, the farmers would change their practices only if the perceived benefits from the intervention are greater than the costs. It is important to note that a farmer must be a goat raiser before he qualifies for the project. However, some of them were not fully aware of the innovative production system that could improve productivity. Though a majority of the farmers adopted the things they learned from the training, there are also some who discontinued their goat enterprise. Table 4 shows the total number of "treatment" respondents who stopped goat production. The highest percentage share of respondents who discontinued goat production was recorded in Nueva Ecija. The main reason for ceasing operation is the inadequate pasture area. This is especially true in Guimba, Nueva Ecija where the National Irrigation Authority (NIA) installed irrigation facilities in a number of rain-fed rice farms. Tables 5-8 show some socio-economic characteristics of the farmer-beneficiaries.

Table 3. Outputs of the RED Project

Type of Output	La Union (DA-RFU 1)	Isabela (ISU)	Nueva Ecija (CLSU)	Leyte (DA-RFU 8)
Trainings/Seminars:				
Participatory Planning Sessions	5 sessions / 180 participants	2 sessions / 80 participants	5 sessions / 143 participants	5 sessions / 290 participants
Technology Trainings	5 trainings / 180 participants	2 trainings / 80 participants	5 trainings / 143 participants	4 trainings / 100 participants
Educational Tour	5 tours / 180 participants	4 tours / 80 participants	1 tour / 35 participants	3 tours / 100 participants
Attendance in Goat Festival/Shows	180 delegates	180 delegates	13 delegates	200 delegates
Entrepreneurial Training	1 training / 40 participants	1 training / 22 participants	2 trainings / 44 participants	2 trainings / 40 participants
Farmers Organization	- Goat Raisers Association-Pideg and Amallapay Chapter (GORAPA) / - Goat Raisers Association – Palina and Cuenca Chapter (GORAPACU)	Echague Goat Raisers Association (ECHAGORA)	Guimba Goat Raisers Producers Association (GUIGORAPA)	Villaba Association of Goat Entrepreneurs (VILLAGE)
Allied Goat Enterprises Established				
Buck for Hire	4 farmers	2 farmers	5 farmers	3 farmers
Legume Plant Material	1 farmer	2 farmers	1 farmer	1 farmer
Breeder Goat	98 farmers	25 farmers	4 farmers	15 farmers
Scholarly Paper Produced	1 paper presented at the PSAS Annual Convention (Oct. 22-24, 2008)	1 paper presented at the ISU In-house R&D Review	1 paper presented at the CLSU In-house R&D Review	- 1 paper presented in the Joint DA-BFAR-FIDA-ATI In-house R&D Review / - 1 poster displayed at the Joint ViCARP and RRDEN Regional R&D Symposium / - 1 poster displayed during the Agri-Trade Fair of the Leyte Landing Celebration (Oct.20,2008)
Awards/ Recognition	- Finalist in the ILARRDEC Regional Symposium Best Paper Competition / - The project leader was awarded the Civil Service Lingkod Bayan Award – Regional Level	- 2nd Best Paper Award under the Development Category (CVARRD Regional Symposium) / - CHED Best R&D Project / - GAWAD SAKA Award – Regional Level	- Outstanding R&D Project under the Development Category (CLARRDEC Regional Symposium) / - The project leader was awarded the 2008 PSAS Outstanding Researcher	- 2nd Best Paper R&D Award (ViCARP Regional Symposium) / - 2008 PCARRD Ugnay Award - ViCARP Consortium (RED was included in the output of ViCARP)
Other Innovations	Establishment of the Pugo Small Ruminant Center	Community-based Breeding Center	- Launching of the "GOAT NEGOSYO" Seminar / - Community-based Breeding Center	- Holding of the first ever Villaba Goat Festival / - Planned establishment of a Goat Multiplier Farm

Table 4. Number of "Treatment" Respondents Who Stopped Goat Production Operations

Province	Frequency	% of Total Respondents
La Union	20	27.02%
Isabela	5	12.20 %
Nueva Ecija	11	36.67 %
Leyte	11	18.03%

Table 5. Socio-Economic Characteristics of the Respondents from La Union

Parameters	Control (n= 45)				Treatment (n= 74)			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Age	48.47	13.60	22	77	50.41	11.66	22	77
Household size	3.89	1.70	1	8	4.50	2.19	1	10
Years in goat farming	11.36	8.94	2	33	10.19	9.54	1	40

Table 6. Socio-Economic Characteristics of the Respondents from Isabela

Parameters	Control (n= 41)				Treatment (n= 41)			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Age	42.61	12.96	22	72	45.93	12.30	25	69
Household size	3.93	1.75	1	9	4.76	1.59	2	8
Years in goat farming	7.66	6.96	2	35	11.46	10.08	1	46

Table 7. Socio-Economic Characteristics of the Respondents from Nueva Ecija

Parameters	Control (n= 30)				Treatment (n= 31)			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Age	49.93	15.08	20	78	47.81	14.23	23	75
Household size	4.43	1.68	2	8	4.55	2.35	2	11
Years in goat farming	11.43	10.62	2	41	10.52	10.83	1	40

Table 8. Socio-Economic Characteristics of the Respondents from Leyte

Parameters	Control (n= 59)				Treatment (n= 61)			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Age	50.05	12.10	25	75	49.12	12.38	17	76
Household size	4.78	2.16	1	10	4.34	2.17	1	12
Years in goat farming	8.27	6.52	1	27	9.89	9.49	1	40

The main motivation of farmers in joining the project is the additional knowledge that they could derive from the training (Table 9). A considerable number of respondents also mentioned that they would like to increase their income from goat raising. It is important to note that each beneficiary is required to invest in the improvement of his own farm to qualify for the training. Hence, there is no incentive for farmers whose intention is to merely take advantage of dole outs from the governments.

Table 9. Reasons for Joining the RED Project as Cited by the Farmers

Motivation for Joining the RED Project	Number of Times Cited *			
	Nueva Ecija	Isabela	La Union	Leyte
Additional Knowledge on Goat Farming	16	13	38	46
Additional Source of Income	5	10	34	33
Convinced by the Project Implementers	5	6	18	27
Avail of Dispersal Goats	2	1	14	23
Encourage by Friends	3	3	17	19
Upgrade Breed of Goats	1	4	10	15

Note: Respondents may provide multiple answers.

The treatment group differs from the control group when it comes to the types of products offered by the enterprise. Most farmers in the control group are engaged primarily in the production and marketing of fatteners or slaughter goat. However, the treatment group is also engaged in the production of breeder goats. This type of operation would be viable only if upgraded breeds are present in the herd. The most common types of breed present in the farms of the RED participants are Boer and Anglo-Nubian, which are meat-type goats. The Anglo-Nubian is being crossed with native does to improve the body structure of the progeny. This is essential before the Boer blood line is introduced. Some farmer-participants are also engaged in buck-for-hire services and legume seedling production. The diversity of farm business operations increased as a result of the RED project.

The adoption rate of the RED project was estimated using the data from the survey and the terminal report. Table 10 shows that capacity to engage in goat enterprises was developed starting in the year 2008. In this year, almost all beneficiaries in the focal site pursued their goat enterprise. However, the survey results and the key informant interview revealed that some project beneficiaries started to stop their enterprise starting in 2010. It is important to note that spill-over farmers also pursued goat-based enterprises. To make the estimate more conservative, it was assumed that the number of spill-over farmers did not change for the period 2008-2012.

Table 10. Number of Farmer-Beneficiaries with Goat Enterprise*

	La Union		Isabela		Nueva Ecija		Leyte		Total	
	Focal	Spill-over	Focal	Spill-over	Focal	Spill-over	Focal	Spill-over	Focal	Spill-over
2008	40		20		23		24		107	0
2009	40	70	20	40	23	10	24	74	107	194
2010	35	70	19	40	18	10	22	74	94	194
2011	29	70	18	40	15	10	20	74	82	194
2012	29	70	18	40	15	10	20	74	82	194

Source: Projected based on the survey of farmers and the data obtained from the RED Terminal Report.

4.3. Impacts and Net Benefits

The impacts of the RED Project could be classified into economic, social and environmental. These impacts are summarized in Table 11. For the economic impact, change in income was the primary measure. The result of the survey shows that project beneficiaries have higher average income from goat production (Table 12). This was confirmed by the perceptions of farmer-participants on the economic benefits gained from the RED Project. The social impact of the project is primarily the improvement of the farmers' network or linkages. Because of the project, the farmers were able to link with technical experts, institutional buyers, and other goat farmers. The project also improved their self-esteem and socialization skills. For the environmental impact, the project helped reduced incidences of property destruction due to unconfined goats. Before project implementation, most of the goats in the community were let loose to feed in the pasture. However, on many occasions, the goats entered private properties and fed on the crops available. Moreover, some farmers were able to improve the soil quality of their farms with the use of goat manure as an organic fertilizer.

Table 11. Summary of Economic, Social, and Environmental Impacts of the RED Project

	Economic	**Social**	**Environmental**
Farm/ Farmer	Increase in income from goat raising Increase in the diversity of sources of farm-based income	Establishment of networks with technical experts, markets, and input suppliers Improvement in self-confidence due to better status of living	Recycle and reuse of farm by-products Improvement in soil quality due to the use of goat manure as fertilizer
Community	Increase in the number of alternative source of livelihood for jobless individuals	Improvement of the bargaining power of the goat raisers' associations	Reduction of incidences of destruction of properties/crops
Industry	Increase in the number of input suppliers such as legume planting materials, and buck service. Availability of supply of slaughter and breeder goats Improvement in the appreciation of the LGUs in the prospects of the goat industry Increase in goat population	Improvement in networking among industry players	Reduction in the incidence of inbreeding Increase in the number of sources of organic fertilizer Reduction of disease incidence

Table 12. Net Income of Respondents from Goat and Goat-related Enterprises in 2012

Province	Type of Respondent	N	Mean (php)	SD (php)	SD
Leyte	Control	34	4,434.97	7,686.49	-2.133*
	Treatment	42	18,668.50	34,272.58	
Isabela	Control	37	14,216.62	25,368.64	-0.846**
	Treatment	35	32,048.46	52,839.28	
Nueva Ecija	Control	28	14,906.96	37,134.84	Ns
	Treatment	19	19,484.37	36,030.45	
La Union	Control	33	9,456.64	11,190.36	0.669*
	Treatment	47	13,944.36	44,342.96	

Note: *significant at the 5% level, ** significant at the 10% level, and ns – not significant.

To assess the returns on investment of PCAARRD and the LGUs, it is important to quantify the impacts. This study focused on the quantification of the economic impacts by looking at the benefits derived by the project beneficiaries. The value of benefits was computed by finding the product between the number of farm enterprises/adopters (Table 10) and the incremental income attributed to the RED Project (Table 12). Table 13 shows the estimated benefits from the RED Project for the period of 2008-2012.

Table 13. Real Value of Benefits from Increased Income in Goat Farming

Year	La Union	Isabela	Nueva Ecija	Leyte	TOTAL
2008	179,508.80	356,649.20	105,280.43	341,604.72	983,043.15
2009	493,649.20	1,069,947.60	151,054.53	1,394,885.94	3,109,537.27
2010	471,210.60	1,052,115.14	128,167.48	1,366,418.88	3,017,912.10
2011	444,284.28	1,034,282.68	114,435.25	1,337,951.82	2,930,954.03
2012	444,284.28	1,034,282.68	114,435.25	1,337,951.82	2,930,954.03

The Net Present Value (NPV), Internal Rate of Return (IRR) and Benefit-Cost Ratio (BCR) were computed from the estimated net real benefits per year.

The Benefit-Cost Analysis (Table 14) showed that the NPV is Php 3.8 million and the IRR is 35.48%. Consequently, BCR is 1.36. All financial indicators

lead to the conclusion that the RED Project provided positive returns on investments of PCAARRD and the participating LGUs.

Table 14. Benefit-Cost Analysis of the RED Project

Year	Real Value of Costs	Real Value of Benefits	Net Benefits	PV (2012) of Benefits
2008	3869908.58	983043.15	-2886865.43	-3644601.09
2009	3213479.05	3109537.27	-103941.78	-123796.32
2010	677939.14	3017912.10	2339972.96	2629193.61
2011	519180.00	2930954.03	2411774.03	2556480.47
2012	510000.00	2930954.03	2420954.03	2420954.03

Net Present Value (NPV)	3838230.71
Internal Rate of Return (IRR)	35.48%
Benefit-Cost Ratio (BCR)	1.36

The reliability of the BCA results was further tested by subjecting the base results to sensitivity analysis. The impact of the RED project is greatly dependent on the number of enterprises that resulted from the capacity-building efforts. In this regard, the number of spill-over farmers is the variable that was considered in the sensitivity analysis shown in Table 15. It is apparent that the result still shows that the RED Project is still a good investment, even if the spill-over farmers decreased by 10% every year for the period from 2008-2012.

Table 15. Sensitivity Analysis

Cases	Scenario	NPV	IRR	BCR
Base Scenario	The number of spill-over farmers remain constant for the period 2008-2012	3838230.71	35.48%	1.36
Scenario 1	The number of spill0over farmers will decrease by 10% every year from year 2008 to 2012	2594742.01	27.61%	1.25
Scenario 2	The number of spill-over farmers from year 2008-2012 will increase by 10% per year	5254390.73	43.23%	1.5

V. Conclusion and Recommendations

It is apparent that the RED Phase 1 Project in La Union, Isabela, Nueva Ecija and Leyte provided a positive impact for the beneficiaries. The investments of various stakeholders earned positive returns in the form of higher incomes for the farmers. There are lessons learned from the experience of the RED Phase 1 Project. The after-action review showed that the involvement of the value-chain participants (i.e. farmer, market, regulators, etc.) in the project conceptualization and planning process helped make the project objectives responsive to the need of various stakeholders. Moreover, the participatory approach in choosing technology options provided the farmers with flexibility in implementing their own enterprises, and it encouraged participation of other farmers. It is also apparent that the appreciation and participation of the LGUs in the project implementation allowed the continuous flow of financial and technical support.

There are also aspects of the project that did not work well. For example, the creation of allied goat enterprises such as legume seedlings production, buck service, goat's milk, and UMMB did not progress well

due to limited markets. In some areas, the distribution of breeder bucks became a source of dispute among farmers. There were no clear criteria for choosing the recipient of breeder bucks. On some occasions, the farmer did not take good care of the animals granted to them.

The foregoing analysis clearly showed that the RED Project empowered the backyard goat farmers in establishing a profitable enterprise and taking advantage of market opportunities. Based on the insights and lessons learned from the study, the following strategies are being recommended:

5.1. For DOST-PCAARRD

a. Adapt the participatory approach to technology dissemination in other R,D&E projects.

b. Implement consultation with the participants in the value chain before R,D&E activities are formulated, funded and implemented.

c. Establish a database system that would facilitate the storage and retrieval of baseline technical and socio-economic data of R,D&E activities conducted. This aids in conducting impact assessment studies.

d. Enhance the sustainability of R,D&E activities by forging strong partnerships with the LGUs who could provide continuous financial and technical support.

e. Require the farmer-beneficiaries to provide counter-part investments in any R,D&E projects in order to increase the farmers' commitment to the project.

f. Integrate market linkage in designing R,D&E activities. This would help ensure that the projects are market responsive.

g. Advocate and implement inter- and trans-disciplinary R,D&E activities. This would facilitate a comprehensive and systematic approach in addressing problems in agriculture, aquatic and natural resources.

5.1. For the DA and LGUs

a. Institutionalize the RED Project so that it could be replicated in other regions in the country. It would also ensure availability of financial support.

b. Enhance the capacity of agricultural technicians to provide technical services to the farmers. On many occasions, the farmers could not get the necessary technical assistance after project completion.

c. Continuously provide a source of breeder animals as breeding is one of the new enterprises generated by the RED Project. Rotation of breeder bucks in several barangays or municipalities would help reduce incidence of inbreeding. The introduction of the artificial insemination technology would also be helpful.

5.3. For the Farmer's Organization

a. Develop the capability of the farmers' organization to identify and tap market opportunities.

b. Provide common service facilities to farmer-members. This could include Artificial Insemination (AI) services, milk collection and processing facilities, and meat vacuum packing services.

c. Invest in the continuous training and education of farmers.

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