Threats and Challenges to Agriculture Towards Sustainable Rice Farming

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Abstract *- The study is mainly a qualitative research work base on phenomenological approach. Archival method was also utilized to retrieved past data and information necessary for the study; present records from selected government offices was also used ; and most importantly, first hand information were gathered from people whose age and experienced in rice farming is immeasurable.*

This piece of research work was based on the personal experience of the researcher from her childhood days down to her present status: a social science professor in an agricultural state university in Laguna, province, Philippines, and a member of a rice farm community.

It presents how Laguna Province, an agricultural and a rice farming area in the Philippines, endowed with all its natural resources, geographical, climatic condition, and strong manpower is being threatened by problems in increasing population, climate and global warming, capital, profit, and manpower, technology, and industrialization.

A social theory known as the "Gintong Butil" (Golden Seed) is being proposed to meet the challenges and threats to agriculture towards a sustainable rice farming development. A social framework had been formulated to elucidate its essence and fullest realization.

Keywords: Agriculture, Rice Farming, Golden Seed

I. INTRODUCTION

Rice is a staple food of the Filipinos and all the Asian populace. As mentioned and believed by De Datta (1983), a rice research scientist "the ancient home of rice is monsoonal Asia, and it remains the area of the agriculture, and much of their hopes" [1].

The Philippines is part of the monsoonal Asia which is endowed with nature that is fitted for agriculture and mainly for rice farming. Before, teachers in the elementary school usually emphasized to their pupils that the countryside is the backbone of this nation. It is the place where tracks of farm lands, fruit trees, rivers and springs can be found. It is the main source of food that feeds the nation then.

Ecologically and geographically the country is suited for agriculture. The mountain ranges that surrounds it serves as the source of water for lowland farms. It has tropical climate appropriate for rice production; and has enough rains and good soil for rice farming.

The Philippines is a rice producing nation. The rice areas are located in the provinces and one of these is Laguna . But due to the inclusion of Laguna in the so called CALABARZON, the western part of the province at the moment has undergone massive changes in its landscape. Like its neighboring provinces, the western side of Laguna has partly switched from agricultural to industrial economy (The Diocese of San Pablo and Its Churches, 2000) [2].

Industrialization is all over the Philippines, the natural resource which is the country itself is under threat. In the desire of the government to give more employment, farm land is being converted to commercial centers. The growing number of population in Manila affects the countryside this include the western part of the Laguna province.

At present, the people in the Third, Fourth and part of the Second Districts in Laguna still enjoy rthe remaining beauty of nature – rice fields, green lush forests, and vibrant life of Laguna de Bay. However, rice farmers and fishermen are still struggling to survive on their own capacities with minimal government assistance. They are in need of assistance from Government, the private sectors (NGOs), and the business sectors (corporate social responsibility) for the protection of the environment and resources in the countryside which are the great attributes to the sustainability of rice farming.

The researcher believes that the environment cannot be sacrificed in exchange for progress through industrialization and commercialization neither it is the answer to the under lying problem of poverty. The God-given land and water resource is the only source of life and the hope for future generation particularly in the Province of Laguna.

The focus of this study is to determine the sustainable development of the municipalities of the Province of Laguna, Philippines as a rice farming community. It presents the following: 1) the ecological profile of the province in terms: 1.1. Historical background, 1.2. Geographical and physical description, 1.3. Natural resources,1.4. Economic structure, 1.5. Number of municipalities and respective population,
1.6 Average hectares of land devoted to rice farming by each municipality, 1.7. Rice production and rice sufficiency; 2.) challenges of rice farming on the present threats of: 2.1 Increasing population, 2.2. Climate and global warming; 2.3. Capital, profit, manpower, and technology;2.4. Industrialization; 3) the participation of some government and non-government agencies in the sustainable development of rice farming communities: 3.1. Rice millers and Rice traders, 3.2. IRRI and PhilRice, 3.3. Department of Trade and Industry (DTI), 3.4. National Food Authority (NFA), 3.3. National Irrigation Administration (NIA) ,3.4. Department of Agriculture (DA), 3.5. Famers Association and Cooperatives;

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4.the theoretical framework developed based on the findings of the study.

II MATERIALS AND METHODS

The research is primarily a qualitative and descriptive study. Thus, it makes use observation which is a phenomenological approach. Phenomenology as defined by Van Manen (1990) seeks to describe basic lived experience. He further emphasize that research using phenomenology seeks to uncover the meanings in the everyday existence. Its ultimate aim is ″the fulfillment of human nature: to become more fully who they are" [3].

Van Manen understands phenomenological research in the human sciences as an interplay of six research activities: (1) turning to a phenomenon which seriously interests the researcher and commits herself to the world;(2) investigating experience as they live it rather than as they conceptualize it;(3) reflecting on the essential themes which characterize the phenomenon; (4) describing the phenomenon through the art of writing and rewriting; (5) manipulating a strong and oriented pedagogical relation to the phenomenon;(6) balancing the research context by considering parts and whole.

In this study, the researcher finds rice farming as the ultimate divine gift for man's search for physical survival. But one has to labor for it and protect it for the continuity of human life

The researcher is both an observer and a participant. Her observation started from the time of her early childhood when her family used to visit the province. She was enchanted then by the beautiful blue Sierra Madre and the vast rice field of the native province of her father. And when she was about to take her High School, the family permanently stayed in the province. It was during this moment that she learned some knowledge of what rice farming is. Her father though a government employee motivated her brothers to work in the rice field.

Her interest in rice farming was expanded when she teaches in an Agricultural School in the province and the actual experience happened when she married an agriculturist whose specialization is rice farming.

Interview were intensively utilized but were not use for quantitative analysis.

Lastly, the study made use of secondary data to established historical base line; a situationer to understand rice farming in Laguna. Archival research was utilized intensively by tracing the past event and historical records that is relevant to this study.

III. RESULTS AND DISCUSSION

Based from old folks and some historical books, Laguna derived its name from the word lagoon.This lagoon becomes popularly known as "Laguna de Bay." It is considered as the largest living lake in Southeast Asia and serves as a catchment basin of the major river systems.

The Laguna Lake (Laguna de Bay) is the source of water for irrigation of the rice fields, and for domestic purposes. It is the home of freshwater fishes such as tilapia, dalag, kanduli, hito and useful for local consumption thus fishing and rice farming are the main source of income of the people then [4].

Laguna is thirty (30) kilometres south of Metro Manila. It is bounded in the east by the Sierra Madre Range, Quezon Province in the south, and on the north western part are the provinces of Batangas and Cavite.

The province has a total land area of 175,973 hectares or 1,759.73 square kilometres, Laguna is considered as the second smallest province of Region IV-A (CALABARZON). Its size is about 3.75 percent of the whole Region IV and about 0.58 percent of the total land area of the country [4]. On the data gathered from the Bureau of Agricultural Statistics, Laguna province is always second in terms of rice production in the whole CALABARZON, Quezon is the first having the largest area in the region (BAS, 2012).

Among the 1,759.73 hectares, 38 percent 49,311 hectares are forest land; 86,062 hectares, or 48.9 percent are agricultural; 2,105 hectares or 1.5 percentage industrial; 1,804 hectares, or 1 percent is commercial; 36,691 hectares or 20.9 percent is residential.

From 86,062 hectares of agricultural land, 18,441.75 are rice farms while the rest are forests, fruits trees and vegetable crop land.

Economy The province economy is divided into three namely: 1. Agriculture and Fishing industries; agriculture, centers on fruit, vegetable cropping, and rice farming, 2.small scale businesses, 3. and big scale industries.

For the last two decades, the Province of Laguna emerged one of the country's most important economic hubs. The province enjoys economic success in both agricultural and industrial activities. Notably, the municipalities and cities in the first and second districts of the province, which are nearer to Metro Manila, have become highly industrialized areas. On the other hand, the municipalities and city in the third and fourth districts primarily engage in agricultural production, cottage and small-scale industries.

Municipalities and Population**.** The province has twenty six (26) municipalities, four cities, and 674 barangays; it is divided into four political districts namely: 1st Disrict, San Pedro, Binan, and Sta Rosa;2nd District Cabuyao, Calamba City, Los Banos and Bay; 3rd District, Calauan,Victoria, Alaminos, San Pablo City, Rizal, Nagcarlan, and Liliw;4th District, Majayjay, Magdalena, Cavinti, Luisiana, Pila, Sta. Cruz, Pagsanjan, Lumban, Kalayaan, Paete, Pakil, Pangil, Siniloan, Famy, Mabitac and Sta. Maria.

The fourth congressional district namely Majayjay, Magdalena, Cavinti, Luisiana, Pila, Sta. Cruz, Pagsanjan, Lumban, Kalayaan, Paete, Pakil, Pangil, Siniloan, Famy, Mabitac, and Sta Maria are considered the rice producing municipalities of the province. They are located at the eastern portions of the province. There are also some portion in the first District and Second district which maintain certain hectares of rice farms like Sta. Rosa, Calamba, and Cabuyao.

Rice Production and Rice Sufficiency**.** Base on the actual and projected population and the per capita consumption, rice

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sufficiency level decreases from year 2007-2009. Sta. Maria and Mabitac were the remaining municipalities that have attained rice sufficiency level in 2009. This was the year when the province was also hit by storm depression Ondoy. Palay were almost to be harvested when Ondoy came and flooded the rice farm. But in 2006-2007 there were eight municipalities who have reach rice sufficiency level, these were: Calauan, Victoria, Majayjay, Pila,Siniloan, Famy, Mabitac, and Sta. Maria (See appendices 3-5).In 2007-2008 there were six municipalities which have reached the rice sufficiency level, these were: Calauan, Victoria, Lumban, Famy, Mabitac, and Sta. Maria. These municipalities are within District III and IV.

Challenges and Threats in Rice farming

Increasing Population. Based on the ecological Profile of the province sudden increase of population happened in 1990. This was the period when different manufacturing industries take form. People come to get job and many settled for good in the place. Home Developers started to take their business. Farmers were attracted to sell their rice farm in an amount that is good enough for them thus decreasing arable land in the District I and II of the province [4].

Rice production in most of the municipalities of the fourth district such as Sta. Maria, Mabitac,Siniloan, Lumban, Sta. Cruz, Pila, and Victoria, have retained its production and in some cases increase. The municipalities mentioned have lesser population from District I and I.

Climate and Global Warming. Rice production has two cropping season, the dry season, and wet season. There are rice farms that are only planted during dry season or wet season. Rice farms which are near shoreline of the Laguna de Bay are usually planted in dry season only while rainfed rice field are planted only during wet season. There are rice farms that are planted both in dry and wet season. The El Nino phenomenon brought increase in production along the areas along the shoreline of Laguna de Bay. These municipalities are: **Siniloan,** Pangil, Pakil, Paete, Kalayaan, **Lumban, Sta. Cruz**, **Pila, Victoria,** Bay, and Los Banos.

On the other hand La Nina phenomenon brought increase in rice production in some areas being seldom planted particularly on the upland area that rely only on rain for water irrigation. But it has to take note that there are many rice farms that are located at the shoreline of the Laguna de Bay therefore La Nina may definitely decrease the rice production.

Capital, Profit, Technology and Manpower**.** Farmers in Laguna can be classified into certain types: a landowner who is either having other business or works and thus can afford to have means to sustain the expenses of his rice farm; a landowner and farmer who rely mostly to the profit that he will gain from rice production and where he will get his expenses for the next cropping season; a farmer and tenant of a rice farm where expenses and profit rely on the agreement between the landowner and the tenant; a farm laborer who is being paid by the farm owner from his services.

Rice farmers of the province find his own means to support his financial expenses. Some of them have their own capital while some has to loan from persons or banks or lending agencies while others have already set aside certain amount of money from the last cropping season.

Regarding the profit in palay production based from a personal communication from Mang ising (2012), "profit from palay is also good that is if there was no calamity or pests that may happen, more so if the prize of fertilizer and palay seedling are not so high. But if you are going to get all the expenses of the family from its product, including the capital, it may not be enough".

Payment of labor depends on the prevailing cost in the farm community or as agreed by the farm worker and farm owner An ordinary farmer whose has no enough capital for rice farming will work on his own and sometimes labor also to other rice farms for his family's sustenance..

Expenses in rice production are high as well as labor. Being a rice farmer is a great task. His physical strength, patience in work, and resiliency in facing the odds of farming are his great capital.

Based on the personal interview from are Andy del Rosario, (2012) Municipal Agriculturist of Mabitac, Laguna, "farm workers are not a problem in Mabitac. There numerous me willing to work in the farm as long as they will be paid."

Participation of some government and non-government agencies in sustainable development of rice farming communities

a. Rice Miller and Rice Traders. Rice miller has a great importance in the post harvest processing of rice production. They usually buy palay during harvest season. They sell them or stored it in the rice mill and wait for the price to move up. Price of palay increases during the non harvest season. It usually happened during June to August of the year.

In as much as farmers in Laguna are mostly small land owners and tenants many of them had in one way or another lack capital or have not set aside the money meant for the planting season. Some of them usually borrowed capital from the rice trader in town to whom they promise to pay on the harvest season. This money is being given interest by the rice traders until the time they harvested their palay.

b. Internatonal Rice Research Institute (IRRI) and PhilRice. Thru the effort of the United Nation and must have known the importance of rice among the life of the people particularly among the Asians, the International Rice Research Institute was established in 1960. This lead to the discovery of variety of rice that can be harvested for almost three months, thus a farmer can plant palay twice a year or even trice (given a better climate). PhilRice was established in the Philippines in 1980 at Nueva Ecija. This agency of the government sustain the assistance to the local farmers. They study how rice can be better improved with the kind of problem that usually beset the rice local farmers.

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c. National Food Authority (NFA). This is the agency which is mandated to assist the farmers in marketing their palay.

As observed by Adricula (2012) NFA serves as monitoring council of rice. Rice miller and rice traders consider the prices of rice from the NFA as the basis for their rice price, "we base our rice price on their trice price implementation and the quality of rice they are selling."

NFA are not visible in many municipalities of the province. In some instance there are NFA rice dealers only in town but they do not buy palay. They only sell rice. Siniloan being a center of trade in the Fourth District has NFA agent that buy palay and base from a personal interview to Mang Ising Fernandez (2012*)* "they usually buy palay which have low quality and it should be well dried".

d. National Irrigation Administration. It is the government thru the National Irrigation Administration (NIA) that is responsible for construction of irrigation system for rice farm. They plan water distribution and construct outlets of water for irrigation. This is applied more to rice farming areas in upland and some part of low land areas.While irrigation is viewed as an important input to the agricultural production systems, most Asian countries are abundant of water and observed the traditional paddy field in rice farming. This also true to the rice farms in Laguna. With 18,441.75 as the total land area of rice farm, the NIA has covered 7,738 rice farm service area (NIA, 2012). The rest which are not covered by the National Irrigation Administration rely mostly on water resources such as rivers and irrigation canals that were structured by the farmers thru bayanihan (cooperation).

e. Department of Agriculture. The Department of Agriculture is working with the Local Government Units in implementing its program for agriculture. For every region, provinces, and municipalities, there are assigned directors and officers from the national office to supervise, monitor, and coordinate the activities with the LGUs. It is also the national government who provides main subsidy to the farmers while local government is on optional basis depending on their means. "But the subsidy provided by the government are not really enough, so only those farmers who always attend the seminar given by the respective municipal agriculturists are usually the one being given," described by del Rosario.

f. Department of Trade and Industry. The agency assists the local business entrepreneurs among the different towns of the province. Knowing that rice production solely may not be enough for the people's daily sustenance, the government thru this agency provide training and even financial assistance (DTI Informants, 2012). It has to take note that each of the town in the province has other means of livelihood. Municipalities have distinguishing product raised, a very good example of this is woodcarving in Paete, salted eggs in Victoria, native slippers in Liliw, quesong puti (native white cheese) in Lumban and Sta. Cruz, barong making and embroiderie also in Lumban and many others.

g. Farmers Associations and Cooperatives. Group associations are common among farmers. To name some, Farmers Association, Rice Seedlers Assocation, Aamahan ng mga Manananim, Samahan ng mga Bangkero (who are being use to transport palay from the shoreline of the a rive or Laguna de Bay to the road). The association is important in maintaining harmonious relation among farmers and for proper maintenance and sustenance of rice farms.

IV. CONCLUSION AND RECOMMENDATION

The Province of Laguna and its municipalities sustained rice farming due to its climatic condition, natural resources, and manpower. The mountain ranges are the source of water for the crops. Rice farm was the main source of life of the people before and even at present particularly among the municipalities of Districts Three and Four.

The challenges and threats to rice farming such as sudden increase in population in the province may be attributed to industrialization that started in 1990. This was also the cause of the shrinking of arable land due to the establishment of manufacturing companies, commercial centers, and subdivisions.

El Nino phenomenon has little effect on rice production particularly on rice land along the seashore of the Bay. Some of them have increased their production. It is the La Nina phenomenon that they feared which may flooded their rice farm. At present the people still enjoys the remaining natural resources of the area particularly in the District Three and District Four.

Due to other demands of everyday life a farmer has a hard time getting capital for rice farming. Expenses in rice production are high as well as labor. Being a rice farmer is a great work. His physical strength, patience in work, and resiliency in facing the odds of farming are his great capital in rice farming. Earnings and profit depends on the existing price for palay and labor.

Manpower is still being sustained particularly within the Districts Three and Four. Rice farming is still considered a noble work in the province.

Rice miller and traders historically have significant role on the sustainability and development of rice farming in the province though there are instances that they monopolize the price of palay.

The government agencies thru the Department of Agriculture (D.A), National Food Authority (NFA), and National Irrigation Administration (NIA) serve each of its purpose but is not enough to fully assist the rice farmers and improve rice production. Services among the farmers by the mentioned agencies particularly the Department of Agriculture, Department of Trade and Industry, are in some cases politically influenced.

Productions of rice have improved tremendously as compared to the past. This is due to the continuous researches

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undertaken by the International Rice Research (IRRI) and the PhilRice.

Farmers Association are a long time existing group among farmers that was formed due to the needs in farming activity in the locality.

Increasing population has been so much attributed to the industrialization that started in 1990. Sudden influx of people from neighboring provinces results to the decreasing of arable land particularly the rice farm. The remaining arable land of the municipalities of the province are presently located in the Third and Fourth Districts of the province.

Based on the findings and conclusions the following are highly recommended:

1. Agriculture should be strengthened and industrialization should be minimized.
2. Science and Research should be encourage and strengthened.

A theory known as the **Golden "*Butil*" (Seed) Theory** is being proposed and recommended as a social framework based on its findings. It is the seed that feeds nation, a product of human labor. There is no other gold that can equalized the treasure these pieces of seeds can bring to a hungry nation.

This golden "butil" can only be attained through the six entities:

Politics and government is the most important entity. It is the government who has the power to set policies and implement them for the protection of rice farms knowing its great importance among its constituents. As Sayer and Campbell (2004) [5] , believe there is strong correlation between bad governance and bad resource management. As observed by Sayer and Campbell much major natural resource management crises are in badly governed countries. They further described that these countries have the characteristics of population increase which they said caused resource degradation. He also mentioned that in countries like those, the elite groups are appropriating resources through corrupt practices. This they said result in resource degradation and few resource benefits to the poor.

Demography is the measurement of population. Historically one of the main cause of sudden increase of population in the province is due to migration brought about by the industrialization. District 1 and 2 have the highest population rate in the province with District 3 and 4 as the densest. Minimizing industrialization may result to decreasing population in the province. People may find other decent means to survive from other place or may remember to till again the soil that they have forgotten in their respective provinces.

Base on the demographic profile the province has a strong working force. Table 3 shows that in Calendar year 2000 the province has a total population of 1,965,872, about 910,774 were male and female whose age range from 20-54 or has an equivalent of 47% of the total population; 50% belong to those whose age is from under I year and 10-14 years old which can be classified as future and potential part of the working force group. Fusao Tomita (2004) [6], Director of Hokkaido Study Center in Japan may mean on his study on the available labor force in agriculture, fishery, and forestry in Asia. He mentioned that "though Asia has not attained the adequate goal for keeping up with the demands of the alarmingly increasing population the Asian can cope with this problem because of the available labor force.

Social responsiveness and cooperation of other non-government agencies and constituents. People should have the sense of re-valuing the importance of rice farms for the next generation. This can be better implemented in the program of the Department of Education by bringing back the Home Economics and Supervised Farming. If possible they should be included in their respective curricular program from Elementary to Secondary Schools. Based on the data of the province , 50% of the populace of the province are young citizen whose age are from 5 to 15 years of age. These young citizens should be properly oriented on the importance of agriculture and most especially the rice farming.

The government should give provisions for those Agricultural Colleges and Universities who are offering Agricultural Courses. Students who are mostly children of rice farmers may be given incentives and motivation to take Agricultural courses. Free tuition fees and other scholarships can be offered.

The zoning policy under Republic Act 8435 should not only be the concern of those in the government. It is also the responsibility of all the constituents of this country including the business sectors. If possible they should also be encouraged by the government to venture in agriculture.

Malls, big groceries and other commercial establishments are starting to sprout in the province, from District I to District II it is already moving towards District III and IV. Where can the people get the money for buying if rice farms will be lost? Where can the poor farmer get their subsistence if there are no soils to plant?.

Ecology. Climate and ecological changes in the environment is a global problem but can be minimized by protecting the country's forest. Protecting and planting trees will control flood and will minimize the harm that will be brought by La Nina and will bring water for the El Nino phenomenon. This will bring a better scenario for increasing rice production. The DENR is mandated as the government agency responsible for protecting the country's forest.

The calamity brought by Ondoy in 2010 is an example of catasthropic incident that no one can think can happen particularly in a highly urban society.

There must be a balance of everything. The natural resources should be first be taken into consideration before personal and business profit.

Economic Structure**.** Basically the country's economic structure is agriculture and fishing. This is due to the fact that the country's geographical and physical structure particularly the province of Laguna is meant for agriculture and fishing. This is God's given nature and should be protected. People of Laguna basically rely on fishing and farming though some

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also engaged in small scale industry to supplement their needs.

The Third and Fourth Districts engaged in rice farming, fruits, and vegetable crop industry. These are the product of human labor and a gift of the environment.

Geographical and physical setting of the country is fitted for rice farming and fishing therefore should be protected. The mountain ranges serves as the barrier against storm and tropical depressions and the water flowing from it is the main source of water that irrigated the rice farm and also use for domestic consumption.

Laguna Lake serves as the catchment basin of the water of the rivers around the province of Laguna which serves as the fishing ground of the people.

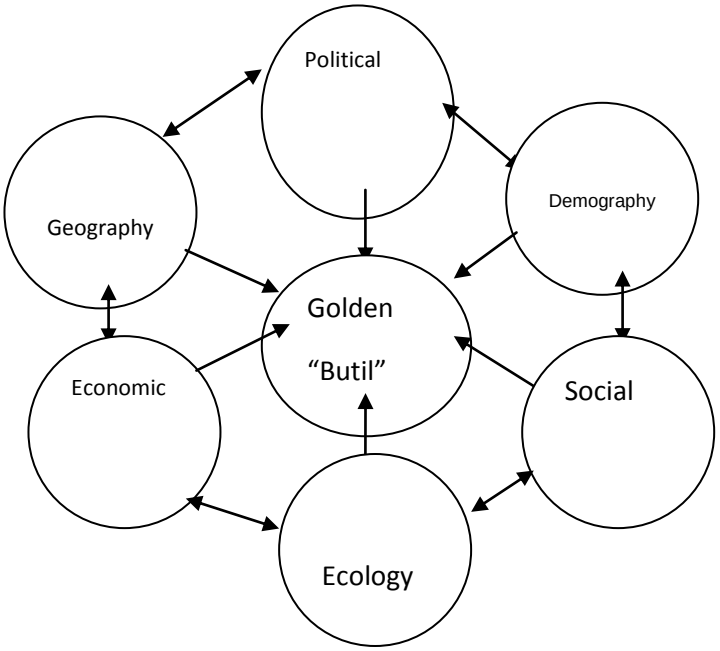

Figure 2 Proposed Social Framework of Sustainable Rice Farming Development: Convergence of Six Entities' (Fernandez, 2012).

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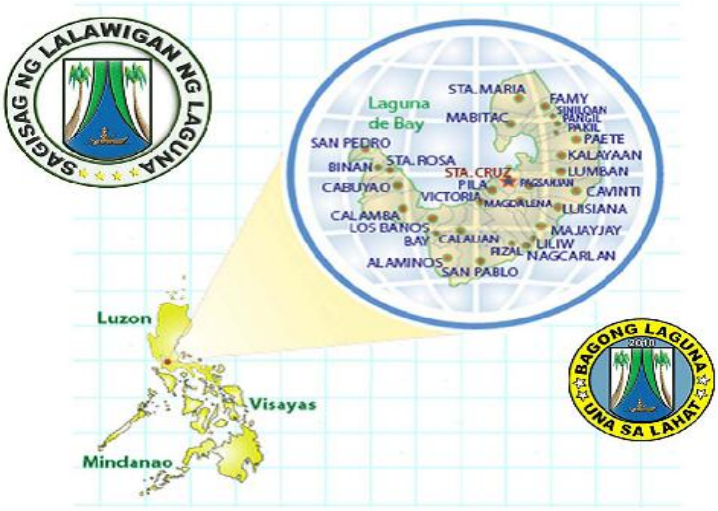
Appendix 1



RICE PRODUCTION
PROVINCE OF LAGUNA

Municipality (Name)	DS 2006-2007			WS 2007			QTA 2007			TOTAL AREA HARVESTER	TOTAL PRODUCTION	PER CAPITA CONSUMPTION	AVAILABLE SUPPLY	POPULATION	REQUIREMENT	SUFFICIENCY LEVEL	sufficient/ deficit
	Area Planted (HAS)	Production (MT)	AveYield (MT/HA)	Area Planted (HAS)	Production (MT)	AveYield (MT/HA)	Area Planted (HAS)	Production (MT)	AveYlled (MT/HA)	(HAS)	(MT)	(KG)	(MT)		(MT)	(%)	(MT)
1. San Pedro	0	0	0	0	0	0	0	0	0	0	0	113	0	312,594	35,323	0.00	-35,323.12
2. Biñan	66.2	364.1	5.50	153.1	765.5	5.00	66	369.6	5.6	285.30	1,499.20	113	705.94	283,088	31,989	2.21	-31,283.00
3. Sta Rosa	211.9	1059.5	5.00	511	2534.17	4.96	44	231.44	5.26	766.90	3,825.11	113	1,801.17	288,850	32,640	5.52	-30,838.88
4. Cabuyao	125.6	628	5.00	460.25	2308.77	5.02	55	236.5	4.3	640.85	3,173.27	113	1,494.23	172,799	19,526	7.65	-18,032.06
5. Calamba	844.33	4643.815	5.50	908.4	4434.42	4.88	20	100	5	1,772.73	9,178.24	113	4,321.85	409,248	46,245	9.35	-41,923.18
6. Los Baños	57.25	286.25	5.00	57.25	280.73	4.90				114.50	566.98	113	266.98	100,404	11,346	2.35	-11,078.67
7. Bay	871.05	4790.775	5.50	1041.8	5039.31	4.84				1,912.85	9,830.09	113	4,628.79	55,088	6,225	74.36	-1,596.15
8. Calauan	1391.5	8001.125	5.75	1195.7	5772.07	4.83				2,587.20	13,773.20	113	6,485.52	55,480	6,269	103.45	216.28
9. Victoria	849	4924.2	5.80	1090.3	5412.8	4.96	85	433.5	5.1	2,024.30	10,770.50	113	5,071.61	37,716	4,262	119.00	809.71
10. San Pablo City	953.7	5054.61	5.30	652.9	3234.83	4.95	49	245	5	1,655.60	8,534.44	113	4,018.70	250,214	28,274	14.21	-24,255.48
11. Rizal	90	450	5.00	90	437.4	4.86				180.00	887.40	113	417.86	15,566	1,759	23.76	-1,341.10
12. Nagcarlan	373.55	1867.75	5.00	539.9	2648	4.90	50	250	5	963.45	4,765.75	113	2,244.10	57,408	6,487	34.59	-4,243.01
13. Liliw	490.5	2452.5	5.00	263.5	1128.3	4.28	35	175	5	789.00	3,755.80	113	1,768.53	32,934	3,722	47.52	-1,953.01
14. Majayjay	775	3875	5.00	775	3487.5	4.50				1,550.00	7,362.50	113	3,466.85	27,926	3,156	109.86	311.22
15. Magdalena	20.5	102.5	5.00	247	1045.6	4.23	50	250	5	317.50	1,398.10	113	658.34	24,687	2,790	23.60	-2,131.29
16. Cavinti	597.05	2985.25	5.00	203.5	915.75	4.50				800.55	3,901.00	113	1,836.90	25,843	2,920	62.90	-1,083.36
17. Luisiana	118	590	5.00	25	122.5	4.90				143.00	712.50	113	335.50	18,432	2,083	16.11	-1,747.31
18. Pila	828.1	4802.98	5.80	1403.1	7030.36	5.01	247	1284.4	5.2	2,478.20	13,117.74	113	6,176.88	49,052	5,543	111.44	634.01
19. Sta Cruz	327.9	1934.61	5.90	1428.9	7858.95	5.50	268	1340	5	2,024.80	11,133.56	113	5,242.57	101,956	11,521	45.50	-6,278.46
20. Pagsanjan	698.1	4014.075	5.75	573.1	3066.085	5.35	75	397.5	5.3	1,346.20	7,477.66	113	3,521.08	38,909	4,397	80.08	-875.64
21. Lumban	390.4	2147.2	5.50	131.4	993.7	7.56	45	238.5	5.3	566.80	3,379.40	113	1,591.29	33,198	3,751	42.42	-2,160.08
22. Kalayaan	143	743.6	5.20	213.6	1068	5.00				356.60	1,811.60	113	853.05	24,294	2,745	31.07	-1,892.18
23. Paete	40.05	200.25	5.00	20.2	101	5.00				60.25	301.25	113	141.85	24,928	2,817	5.04	-2,675.01
24. Pakil	278.88	1478.064	5.30	383.08	1915.4	5.00				661.96	3,393.46	113	1,597.91	22,239	2,513	63.59	-915.09
25. Pangil	532.68	2929.74	5.50	212.03	1166.165	5.50				744.71	4,095.91	113	1,928.68	26,244	2,966	65.04	-1,036.89
26. Siniloan	1022.3	5878.225	5.75	502.5	2889.375	5.75				1,524.80	8,767.60	113	4,128.49	35,013	3,956	104.35	172.02
27. Famy	257.9	1379.765	5.35	435.6	2178	5.00				693.50	3,557.77	113	1,675.28	11,667	1,318	127.07	356.91
28. Mabitac	1247.1	7357.89	5.90	839.8	4494.15	5.35	55	308	5.6	2,141.90	12,160.04	113	5,725.92	18,241	2,061	277.79	3,664.69
29. Sta Maria	1295.9	7645.81	5.90	1406	8084.5	5.75	98	558.6	5.7	2,799.90	16,288.91	113	7,670.12	28,421	3,212	238.83	4,458.55
30. Alaminos	0	0	0.00	0	0	0.00	0	0	0	0.00	0.00	113	0.00	44,483	5,027	0.00	-5,026.58
TOTAL	14,897.44	82587.584	5.54	15,763.91	80,413.34	5.10	1,242.00	6,418.04	5.17	31,903.35	169,418.96	113.00	79,776.00	2,626,842	296,833	26.88%	-217,057.15

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Appendix 2

RICE PRODUCTION
PROVINCE OF LAGUNA

Municipality (Name)	DS 2008-2009			WS 2009			TOTAL AREA HARVESTED	TOTAL PRODUCTION	PER CAPITA CONSUMPTION	AVAILABLE SUPPLY	POPULATION	REQUIREMENT	SUFFICIENCY LEVEL	sufficient/ deficit
	Area Planted (HAS)	Production (MT)	AveYield (MT/HA)	Area Planted (HAS)	Production (MT)	AveYield (MT/HA)	(HAS)	(MT)	(KG)	(MT)		(MT)	(%)	(MT)
1. San Pedro	0	0	0	0	0	#DIV/0!	0	0	113	0.00	330,087	37,300	0.00	-37,299.87
2. Biñan	99.5	497.5	5	127.8	392.31	3.07	227.3	889.81	113	418.99	304,718	34,433	1.22	-34,014.11
3. Sta Rosa	505.2	2607.8	5.16	476.7	2201.1	4.62	981.9	4808.9	113	2,264.41	319,307	36,082	6.28	-33,817.27
4. Cabuyao	400.7	1984.45	4.95	640.7	2117.9	3.31	1041.4	4102.35	113	1,931.71	207,039	23,395	8.26	-21,463.69
5. Calamba	864.1	4477.54	5.18	890.52	2337.4	2.62	1754.62	6814.94	113	3,209.02	438,227	49,520	6.48	-46,310.66
6. Los Baños	63.85	317.75	4.98	48.85	177.48	3.63	112.7	495.23	113	233.19	105,652	11,939	1.95	-11,705.45
7. Bay	1034	5246.95	5.07	945.7	3112.2	3.29	1979.7	8359.15	113	3,936.16	57,392	6,485	60.69	-2,549.17
8. Calauan	1557.3	7782.99	5.00	1421.5	3654.3	2.57	2978.8	11437.29	113	5,385.59	59,042	6,672	80.72	-1,286.13
9. Victoria	1284.1	6374.05	4.96	1277.6	847.95	0.66	2561.7	7222	113	3,400.70	39,071	4,415	77.03	-1,014.29
10. San Pablo City	534.3	2648.44	4.96	550.89	2339.1	4.25	1085.19	4987.54	113	2,348.53	259,507	29,324	8.01	-26,975.71
11. Rizal	90	441.05	4.90	90	247.5	2.75	180	688.55	113	324.22	16,325	1,845	17.58	-1,520.54
12. Nagcarlan	598.37	3008.24	5.03	601.98	1445.3	2.40	1200.35	4453.54	113	2,097.08	59,962	6,776	30.95	-4,678.59
13. Liliw	346.1	1664.52	4.81	261.3	947.6	3.63	607.4	2612.12	113	1,230.00	34,541	3,903	31.51	-2,673.09
14. Majayjay	755	3311.09	4.39	785	2677.6	3.41	1540	5988.69	113	2,819.95	28,442	3,214	87.74	-394.01
15. Magdalena	242.6	1206.84	4.97	321.26	785.03	2.44	563.86	1991.87	113	937.93	25,118	2,838	33.04	-1,900.45
16. Cavinti	588.6	2566.57	4.36	364.19	1106.9	3.04	952.79	3673.47	113	1,729.76	26,196	2,960	58.44	-1,230.35
17. Luisiana	563	2411	4.28	280	1015.6	3.63	843	3426.6	113	1,613.52	19,042	2,152	74.99	-538.18
18. Pila	1457.1	7139.09	4.90	1460.2	5765.1	3.95	2917.3	12904.19	113	6,076.32	51,364	5,804	104.69	272.14
19. Sta Cruz	1197.7	6139.77	5.13	1281	1602.6	1.25	2478.7	7742.37	113	3,645.73	104,665	11,827	30.82	-8,181.46
20. Pagsanjan	676.4	3799.66	5.62	699.86	2220.1	3.17	1376.26	6019.76	113	2,834.58	39,967	4,516	62.76	-1,681.65
21. Lumban	775	4570.2	5.90	730.33	184.99	0.25	1505.33	4755.19	113	2,239.12	34,033	3,846	58.22	-1,606.62
22. Kalayaan	106	531	5.01	122	61	0.50	228	592	113	278.76	24,831	2,806	9.93	-2,527.19
23. Paete	69	343.75	4.98	12.6	16.46	1.31	81.6	360.21	113	169.62	25,419	2,872	5.91	-2,702.73
24. Pakil	225	1123	4.99	224.6	173.1	0.77	449.6	1296.1	113	610.31	22,965	2,595	23.52	-1,984.78
25. Pangil	693.4	4237.55	6.11	412.37	624.84	1.52	1105.77	4862.39	113	2,289.60	27,155	3,068	74.62	-778.86
26. Siniloan	696.9	3620.55	5.20	542	767.9	1.42	1238.9	4388.45	113	2,066.43	36,535	4,128	50.05	-2,061.99
27. Famy	308.8	1829.23	5.92	308.28	99.49	0.32	617.08	1928.72	113	908.20	12,551	1,418	64.03	-510.09
28. Mabitac	1266.27	6639.36	5.24	942	564	0.60	2208.27	7203.36	113	3,391.92	19,030	2,150	157.73	1,241.52
29. Sta Maria	1301.65	7035.02	5.40	1117.8	200	0.18	2419.45	7235.02	113	3,406.83	28,946	3,271	104.15	135.89
30. Alaminos	0	0	0	0	0	0.00	0	0			45,873	5,184	0.00	-5,183.61
TOTAL	18,299.94	93554.96	5.11	16,937.03	37,684.85	2.22	35,236.97	131,239.81	113.00	61,798.20	2,803,001	316,739		-254,940.96

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Appendix 3

RICE PRODUCTION
PROVINCE OF LAGUNA

Municipality (Name)	DS 2007 - 2008			WS 2008			TOTAL AREA HARVESTED (HAS)	TOTAL PRODUCTION (MT)	PER CAPITA CONSUMPTION (KG)	AVAILABLE SUPPLY (MT)	POPULATION	REQUIREMENT (MT)	SUFFICIENCY LEVEL (%)	sufficient/ deficit (MT)
	Area Planted (HAS)	Production (MT)	AveYield (MT/HA)	Area Planted (HAS)	Production (MT)	AveYield (MT/HA)								
1. San Pedro	0	0	0	0	0		0	0	113	0.00	321,222	36,298	0.00	-36,298.04
2. Biñan	235.3	1223.56	5.20	100	475	4.75	335.3	1698.56	113	799.82	293,704	33,189	2.41	-32,388.71
3. Sta Rosa	498.4	2492	5.00	457.6	1951.85	4.27	956	4443.85	113	2,092.52	303,697	34,318	6.10	-32,225.23
4. Cabuyao	166.9	834.5	5.00	819.8	4058.41	4.95	986.7	4892.91	113	2,303.97	189,146	21,373	10.78	-19,069.50
5. Calamba	790.83	3557.97	4.50	886.4	3489.91	3.94	1677.23	7047.88	113	3,318.71	423,490	47,854	6.94	-44,535.65
6. Los Baños	26.25	125	4.76	44.85	212	4.73	71.1	337	113	158.69	102,994	11,638	1.36	-11,479.68
7. Bay	1063.4	5335.6	5.02	928.42	4756.56	5.12	1991.82	10092.16	113	4,752.20	56,228	6,354	74.79	-1,601.60
8. Calauan	1353.5	6960.2	5.14	1447.19	7254.97	5.01	2800.69	14215.17	113	6,693.64	57,233	6,467	103.50	226.29
9. Victoria	806.8	4032.4	5.00	1227.73	6116.05	4.98	2034.53	10148.45	113	4,778.70	38,387	4,338	110.16	440.93
10. San Pablo City	617.15	3062.8	4.96	559.6	2705.58	4.83	1176.75	5768.38	113	2,716.21	254,818	28,794	9.43	-26,078.21
11. Rizal	90	522	5.80	76	385.6	5.07	166	907.6	113	427.37	15,941	1,801	23.73	-1,373.98
12. Nagcarlan	556.13	2959.4	5.32	605.1	2961.39	4.89	1161.23	5920.79	113	2,787.98	58,671	6,630	42.05	-3,841.84
13. Liliw	309.13	1516.685	4.91	244.8	1123.4	4.59	553.93	2640.085	113	1,243.16	33,728	3,811	32.62	-2,568.07
14. Majayjay	799.01	2464.13	3.08	775	3226.81	4.16	1574.01	5690.94	113	2,679.75	28,183	3,185	84.15	-504.92
15. Magdalena	307.7	1583.71	5.15	323.7	1528.07	4.72	631.4	3111.78	113	1,465.27	24,902	2,814	52.07	-1,348.63
16. Cavinti	602.8	2914.81	4.84	383.8	1749.7	4.56	986.6	4664.51	113	2,196.42	26,019	2,940	74.71	-743.69
17. Luisiana	353	1331	3.77	290	1421	4.90	643	2752	113	1,295.86	18,734	2,117	61.21	-821.11
18. Pila	1379.7	8278.2	6.00	1430.3	1421	0.99	2810	9699.2	113	4,567.16	50,195	5,672	80.52	-1,104.87
19. Sta Cruz	1310.07	6961.92	5.31	1494.6	7490.7	5.01	2804.67	14452.62	113	6,805.45	103,302	11,673	58.30	-4,867.66
20. Pagsanjan	681.4	3987.96	5.85	824.5	4044.06	4.90	1505.9	8032.02	113	3,782.12	39,434	4,456	84.88	-673.96
21. Lumban	846.4	4588.7	5.42	650.5	3993.4	6.14	1496.9	8582.1	113	4,041.14	33,613	3,798	106.39	242.87
22. Kalayaan	22	105.5	4.80	316	1580	5.00	338	1685.5	113	793.67	24,561	2,775	28.60	-1,981.75
23. Paete	121.5	619	5.09	58.9	284.25	4.83	180.4	903.25	113	425.32	25,172	2,844	14.95	-2,419.15
24. Pakil	202.1	1015.8	5.03	292.8	1292.8	4.42	494.9	2308.6	113	1,087.07	22,599	2,554	42.57	-1,466.64
25. Pangil	620.7	3516.32	5.67	534.4	2609.85	4.88	1155.1	6126.17	113	2,884.69	26,695	3,017	95.63	-131.89
26. Siniloan	888.7	4598.7	5.17	782.7	3901.12	4.98	1671.4	8499.82	113	4,002.40	35,766	4,042	99.03	-39.14
27. Famy	519.11	3403.9	6.56	302.8	1480.3	4.89	821.91	4884.2	113	2,299.87	12,101	1,367	168.19	932.46
28. Mabitac	979.61	5592.5	5.71	1200.5	5855.1	4.88	2180.11	11447.6	113	5,390.45	18,631	2,105	256.04	3,285.10
29. Sta Maria	1161.6	6958.4	5.99	1714.6	8878.98	5.18	2876.2	15837.38	113	7,457.51	28,682	3,241	230.09	4,216.39
30. Alaminos	0	0	0.00				0.00	0.00	0	0.00	45,172	5,104	0.00	-5,104.49
TOTAL	17,309.19	90542.665	5.23	18,772.59	86,247.86	4.59	36,081.78	176,790.53	113.00	83,247.12	2,713,022	306,571		-223,324.35

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