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EFFECT OF INDUSTRIAL FIRMS IN RICE PRODUCTION IN THE FIRST DISTRICT OF ZAMBALES

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ABSTRACT

The study was conducted to determine the effect of industrial firms in rice production in the Municipalities of Subic, Castillejos, and San Marcelino. The descriptive method was used in this study to evaluate the effect of industrial firms on rice production.

There were 88 respondents in the First District of Zambales, 34 of which were from Subic, 24 were from Castillejos, while 30 were from San Marcelino. Results show that most of the respondents were aged 55-64 years old, mainly were males who have finished their secondary education. On the other hand, based on the number of households, most of the respondents from Subic and Castillejos have 3-4 members, while in San Marcelino, they have 5-6 members. The majority of farmers have long been engaged in farming (31-40 years), but some stated that they do not have any monthly income. The majority of the respondents stated that they were slightly affected by the rise of industrial firms, primarily in the sourcing labor force. As a result, many of them decided to engage in machinery and use herbicides. However, the overall yield per hectare of the First District of Zambales from 2013-2017 did not almost increase. Besides industrial firms, other factors were lack of water, the variety used, climate, and pests and diseases.

The study results showed that industrial firms do not nearly affect rice production because of the continuous research and new technologies disseminated nowadays, especially machinery and chemicals. Furthermore, additional study about land conversion is highly recommended by the author.

Keywords: Industrial Firms, First District of Zambales, Machineries, Chemical

INTRODUCTION

Rice is the most important crop for the Filipino citizens because it is most needed by people each day and is generally consumed almost three times a day since it is considered the main part of the Filipino meal. In fact, in terms of worldwide rice consumption, the Philippines

ranked 6th in 2019 with 14.4 million metric tons (Statista, 2020); and has an average per capita consumption of 110 kg per year (Philippine Statistics Authority, 2018).

According to Statista (2020), the Philippines ranked 8th in world production of milled rice in 2018 with 11.73 million metric tons but 2nd in major rice importing countries worldwide. In the 2019 Philippine Statistics Authority annual report, the palay production was 19 million metric tons. It was 0.53 percent lower compared to the 2018 production of 19.1 million metric tons. In the same report, Central Luzon remains the rice granary of the country with 3.73 million metric tons. It was 3.85 percent higher compared to the 2018 production of 3.62 million metric tons. Irrigated palay comprised 93.95 percent of the total production of 3.5 million metric tons, while rainfed palay accounted for the remaining 6.05 percent or 225,543.01 metric tons. Compared with the last quarter of 2018, the volume of irrigated palay was increased by 4.52 percent, while the rainfed palay was decreased by 19.25 percent.

With a 3.54 percent increase in the total volume of palay production, Nueva Ecija remained to be the top producer of palay among provinces in the region as it accounted for more than half (52.44 percent) or 1.96 million metric tons of Central Luzon's total volume of palay production. Tarlac and Pampanga posted 595,463 metric tons and 451359.84 metric tons, respectively, which comprised 28.06 percent of the region's production when combined. The remaining 19.5 percent was from Bulacan, Zambales, Bataan, and Aurora (PSA, 2020).

Dawe et al. (2006, 2009) stated that the fluctuation in domestic rice production has significant impacts on food security, especially for the poorest people that's why its stabilization is a critical concern for the Philippines in terms of food security and the alleviation of poverty.

According to Investopedia (2021), industrialization is how an economy is transformed from a primarily agricultural one to one based on the manufacturing of goods. Individual manual labor is often replaced by mechanized mass production, and assembly lines replace artisans. Characteristics of industrialization include economic growth, the more efficient division of labor, and the use of technological innovation to solve problems instead of dependency on conditions outside of human control.

Many industrial firms such as Hanjin, Keppel, Sanyo Denki, and Hokai entered Subic Bay Freeport Zone (SBFZ) in Zambales. Town of Subic and Olongapo City are highly urbanized places where these firms are established, followed by adjacent municipalities of Castillejos and San Marcelino, located in the 1st District of Zambales. These companies open up jobs for Zambaleños, which decreased the unemployment rate in the province. Zambaleños chose to work on those firms rather than farming. Thus, the study aims to analyze the effect of industrial firms on rice production in Zambales.

METHODOLOGY

Methods and Techniques of the Study

The descriptive method was used in this study to evaluate the effect of industrial firms on rice production. Survey interviews and schedule letters for Barangay Officials' permission to conduct the survey study were prepared. Secondary data were collected from the Department of Agriculture – Local Government Unit of Subic, Castillejos, and San Marcelino.

Location of the Study

The study was conducted in the 1st district of Zambales consisting of Subic, Castillejos and San Marcelino as shown in Figure 1.

Figure 1. Vicinity Map of First District of Zambales

Respondents

The respondents were from the selected barangays of the first district of Zambales, consisting of Subic, Castillejos, and San Marcelino.

Towns	Frequency	Percentage (%)
Subic	34	39.08
Castillejos	24	27.27
San Marcelino	30	34.48
TOTAL	**88**	**100**

Research Instrument

The researcher used the survey method in gathering information on the said topic using face-to-face interviews. Respondents were selected through judgement sampling. Barangay Officials gave a list of rice farmers in their jurisdiction.

Statistical analysis

Frequency counts, percentages, and measures of central tendency, especially the mean, were used as statistical tools. Paired t-test for the volume of production was used in the study.

RESULTS AND DISCUSSION

In this study, the effect of industrial firms on rice production in Zambales was analyzed and discussed.

Table 1 presents the number of respondents per town.

Table 1. Number of Respondents per town

Towns	Frequency	Percentage (%)
Subic	34	39.08
Castillejos	24	27.27
San Marcelino	30	34.48
TOTAL	**88**	**100**

As observed, most of the respondents were from Subic with 39.08% (34 respondents), followed by San Marcelino with 34.48% (30 respondents). Moreover, Castillejos having the least number of respondents, with 27.27% (24 respondents).

Table 2 presents the age distribution of respondents.

Table 2. Age distribution of Respondents

Age	Subic		Castillejos		San Marcelino	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
75-84	7	20.59	1	4.17	1	3.33
60-74	7	20.59	3	12.50	4	13.33
55-64	9	26.47	8	33.33	16	53.33
45-54	6	17.65	4	16.67	7	23.33
35-44	4	11.76	6	25.00	2	6.67
20-34	1	2.94	2	8.33		
TOTAL	**34**	**100**	**24**	**100**	**30**	**100**

As shown in Table 2, the age of the respondents from the three (3) municipalities, the majority of which belonged to those aged 55-64 years old. Where Subic had 26.47%, Castillejos has 33.33% and San Marcelino has 53.33%.

According to Integrated Regional Information Networks (2013), the average age of rice farmers is 57 years old. This farmer's aging phenomenon, however, is not unique to the Philippines. It is a global phenomenon, and according to Rigg et al. (2019), this especially among smallholder rice farmers in Asia. In Thailand, the average age of farmers is 52 years. In China, 50-55 years old (Saiyut et al., 2017; Yang, 2013) it is also noted in Indonesia, Korea, Vietnam, Africa, the United States, Japan, and the European Union (Jöhr, 2012; HelpAge International 2014).

Table 3 presents the gender distribution of the respondents.

Table 3. Gender Distribution of Respondents

Gender	Subic		Castillejos		San Marcelino	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Male	29	85.29	16	66.67	28	93.33
Female	5	14.71	8	33.33	2	6.67

Male respondents dominate the female respondents in the first district of Zambales with 29 (85. 29%) in Subic, 28 (93.33%) in San Marcelino, and 16 (66.67%) in Castillejos.

It is further confirmed by the Philippine Statistics Authority (2018), which stated that only 77% of the employed workers under agriculture are still mainly composed of men, and only 23% are women. Also, several authors claimed that women are less efficient in farming but are more likely to adopt improved seed varieties. (Koirala et al., 2014; Koirala, 2015; Mishra et al., 2017).

Table 4 presents the highest educational attainment of the respondents.

Table 4. Highest Educational Attainment

	Subic		Castillejos		San Marcelino	
Level	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Elementary	14	41.18	8	33.33	4	13.33
High School	16	47.06	13	54.17	19	63.33
Vocational	1	2.94			3	10
College	3	8.82	3	12.50	4	13.33
TOTAL	**34**	**100**	**24**	**100**	**30**	**100**

As shown in Table 4, the majority has attended High School, where 16 or 47.05% were from Subic; 19 or 63.33% were from San Marcelino, and 13 or 54.17% were from Castillejos. Only four (4) from the First District finished Vocational/Technical courses, while ten (10) finished college.

Briones (2017) stated that agriculture tends to have the least educated workforce among the basic sectors. In his study, about one-third of agricultural workers did not finish primary school, compared to only 11 %for industry and 7 % for services. About 38 % are secondary school undergraduates, compared to 29 % for industry and 19 % for services. Whereas about half of workers in industry and services are tertiary undergraduates, only a quarter of agricultural workers are. The most educated workers tend to work in services, followed by industry.

Table 5 presents the distribution of respondents by number of household member.

Table 5. Distribution of respondents by number of household member

	Subic		Castillejos		San Marcelino	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1 -2	5	14.71	3	12.50	6	20.00
3 -4	14	41.18	7	29.17	10	33.33
5 – 6	7	20.59	5	20.83	12	40.00
7 – 8	5	14.71	4	16.67	1	3.33
9 – 10	3	8.82	5	20.83	1	3.33
TOTAL	**34**	**100**	**24**	**100**	**30**	**100**

As shown in Table 5, the majority of the respondents having 3 - 4 members (41.18%) were from Subic and Castillejos (29.17%), while household members with 5 - 6 were the largest in San Marcelino (40%).

Table 6 presents the distribution of respondents as to the number of years they have been engaged in farming.

Table 6. Distribution of Respondents as to the number of years they have been engaged in farming

	Subic		Castillejos		San Marcelino	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1 – 10	4	11.76	4	16.67	4	13.33
11 – 20	5	14.71	5	20.83	5	16.67
21- 30	5	14.71	3	12.50	9	30.00
31- 40	9	26.47	5	20.83	7	23.33
41 -50	3	8.82	4	16.67	3	10.00
51 – 60	6	17.65	2	8.33	2	6.67
61 – 70	1	2.94	1	4.17		
71 – 80	1	2.94				
TOTAL	**34**	**100**	**24**	**100**	**30**	**100**

It is reflected in Table 6 that most of the respondents have been engaged in farming. In Subic and Castillejos, most of the respondents have been farming for 31 – 40 years, 26.47% and 20.83%, respectively. While in San Marcelino majority have been farming for 21 -30 years or 30%.

Table 7 presents the annual income farmers.

Table 7. Annual Income of Farmers

	Subic		Castillejos		San Marcelino	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
30,000 above	1	2.94			2	6.67
20,000	1	2.94			2	6.67
10,000	3	8.82	1	4.17	2	6.67
5,000 below	7	20.59	3	12.50	2	6.67
None	22	64.71	20	83.33	22	73.33
TOTAL	**34**	**100**	**24**	**100**	**30**	**100**

The annual income of the respondents is seen in Table 7. As observed, the majority of the respondents from the First District of Zambales said that they do not have monthly income were 22 (64.71%) respondents were from Subic; 20 (83.33%) were from Castillejos, and 22 (73.33%) were from San Marcelino.

Average Net Income of farmers

In 2013, San Marcelino had the highest net income with 27,004.67 Php, followed by the Municipality of Subic with 23,411.76 Php and Castillejos with 16,250 Php. During 2014, the net income of San Marcelino's respondents dropped by 23,335.33 Php due to the continuous rainfall, followed by Subic, which is almost tied with the net income of San Marcelino and Castillejos 16,241.67 Php. In 2015, the Municipality of San Marcelino back to the top with 28,356.07 Php, followed by the Municipality of Subic, whose income inclines to 25,426.47 Php and Castillejos slowly up by 17,366.67 Php. As the year passes by, the Municipality of San Marcelino slowly down by 27,013.07 Php, followed by Subic, which was also down by 23,626.47 Php and Castillejos 19,562.5. Furthermore, last 2017, San Marcelino has the highest net income among the three municipalities due to their use of machinery and chemicals for their production.Due to the lack of manpower, most of the respondents were forced to use or engage themselves in machinery and chemicals such as tractors and herbicides.

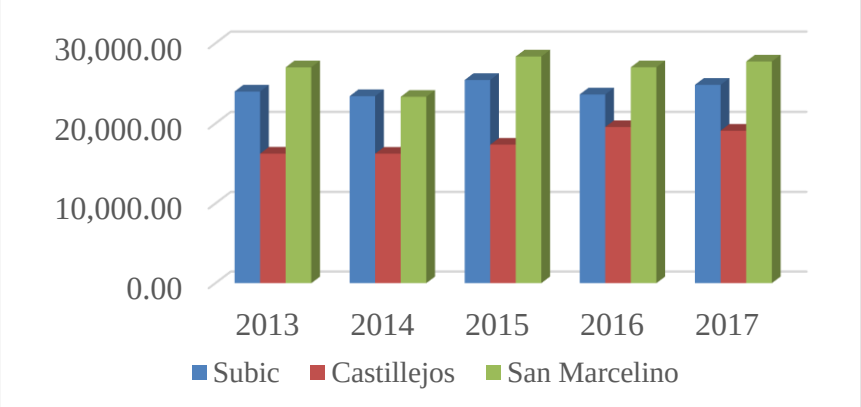

Figure 2. Net Income of the Farmers for the Last Five Years

Average Yield Per Hectare

Figure 3 presents the yield per hectare of the respondents from the three municipalities of the First District of Zambales. In 2013, San Marcelino had the most significant yield per hectare with 54.09 Cavan per hectare; followed by Subic with 50.84; and Castillejos with 31.39 Cavan per hectare. During 2014, the yields per hectare of San Marcelino decreased by 50.4 Cavan per hectare due to natural calamities; followed by Subic with 50.49 Cavan per hectare; and Castillejos with 31.29 Cavan per hectare. In 2015, the Municipality of San Marcelino had the most significant production per hectare among the three municipalities with 55.93; followed by Municipality of Subic, whose yield per hectare inclines to 52.44; and also the Municipality of Castillejos rose by 33.63 yields per hectare because of the abundant water supply. In 2016, San Marcelino slowly decreased it by 54.13 yields per hectare because of the lack of water source, especially those who only count on the rain to irrigate their farms; followed by Subic, where there was a decrease by 50.6 because of the pest and diseases they encountered such as the tungro virus, bacterial blight, stemborers (*Scirpophaga innonata, Chilo suppressalis,* etc.) and whorl maggots (*Hydrellia philippina*). Only in Castillejos has had an increased that year by 35.31 yields by hectare. Furthermore, in 2017, San Marcelino still had the most significant yield per hectare with 54.55, followed by Subic with 51.46 and Castillejos with 35.11 yields per hectare.

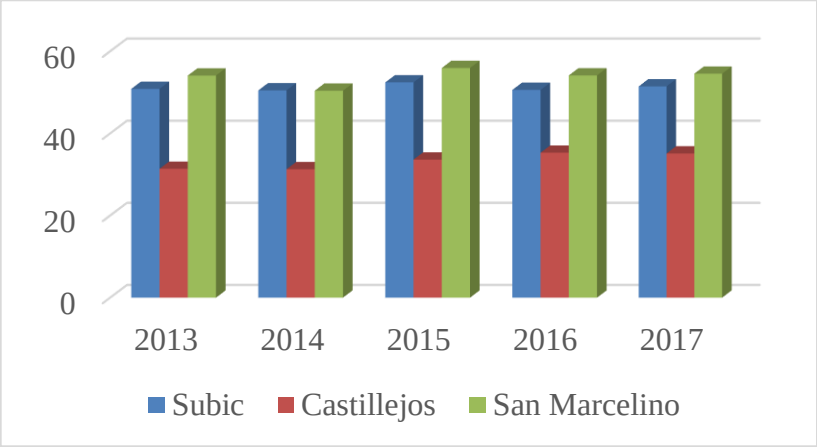

Figure 3. Yield per Hectare

Table 8 presents the factors affecting rice production.

Table 8. Factors Affecting Rice Production

Municipalities	Water Problem	Variety Used	Climate	Pest and Diseases	No. of Respondents
Subic	14	9	4	6	34
Castillejos	8	10	2	0	24
San Marcelino	15	12	3	0	30
TOTAL	**37**	**31**	**9**	**6**	
					88.00
Percentage	**42.05**	**35.23**	**10.23**	**6.82**	

As shown in Table 8, the other factors affecting rice production aside from the effect of industrial firms. Out of 88 respondents, 37 (42.05%) stated that shortage in water was one of the problems in their area. Some respondents said that variety (35.23%) used was one factor affecting the

increase or decrease of their production. At the same time, 10.23% of the respondents stated that natural calamities were one factor in their production. Lastly, with 6.82%, pests and diseases also affected some of the respondents' production.

The result confirmed the statement of Fahad et al. (2019) that the decrease in rice yield was noticed in many parts of the world due to scarcity of good quality water, drought, salinity, land degradation, poor weed control, low input use, uneven patterns of rainfall, high disease occurrence, poor soil fertility, and some socio-economic issues such industrialization and land conversion. Figure 2 represents the yield per hectare of the respondents from the three municipalities of the First District of Zambales. In 2013, San Marcelino had the most significant yield per hectare with 54.09 Cavan per hectare; followed by Subic with 50.84; and Castillejos with 31.39 Cavan per hectare. During 2014, the yields per hectare of San Marcelino decreased by 50.4 Cavan per hectare due to natural calamities; followed by Subic with 50.49 Cavan per hectare; and Castillejos with 31.29 Cavan per hectare. In 2015, the Municipality of San Marcelino had the most significant production per hectare among the three municipalities with 55.93; followed by Municipality of Subic, whose yield per hectare inclines to 52.44; and also the Municipality of Castillejos rose by 33.63 yields per hectare because of the abundant water supply. In 2016, San Marcelino slowly decreased it by 54.13 yields per hectare because of the lack of water source, especially those who only count on the rain to irrigate their farms; followed by Subic, where there was a decrease by 50.6 because of the pest and diseases they encountered such as the tungro virus, bacterial blight, stemborers and whorl maggots. Only in Castillejos has had an increased that year by 35.31 yields by hectare. Furthermore, in 2017, San Marcelino still had the most significant yield per hectare with 54.55, followed by Subic with 51.46 and Castillejos with 35.11 yields per hectare.

Table 9 presents the reactions of the respondents regarding the effects of the industrial firms to their production.

Table 9. Percentage of Effect

	Subic		Castillejos		San Marcelino	
	Frequency	**%**	**Frequency**	**%**	**Frequency**	**%**
Affected	29	85.29	19	79.17	18	60
No Effect	5	14.71	5	20.83	12	40
TOTAL	**34**	**100**	**24**	**100**	**30**	**100**

Among the three (3) municipalities that were affected by the progress of the industrial firms, the municipality of Subic has the most significant percentage (85.29%), followed by the Municipality of Castillejos (79.17%), and lastly, San Marcelino (60%). Problems they encountered because of the progressive industrial firms were lack of labor source; lands being converted into commercial and industrial lands (such as in Cawag, Aningway, San Isidro, and Naugsol in Subic), and increase in wages for farm laborers from 250 – 300 Php.

According to Nguyen and Ferrero (2006), several factors may contribute to the decline of area cultivated and yield harvested. It includes varieties, rice production systems, abiotic and biotic

stresses, increasing production costs in industrialized countries, low returns in developing countries, and increasing public concern for protecting environmental resources.

Table 10 presents the identified main problems in rice production.

Table 10. Identified Main Problems in Rice Production

Municipalities	Labor Source	Increase in Wages	Land Area Converted
Subic	29	15	4
Castillejos	19	4	0
San Marcelino	18	18	0
TOTAL	**66**	**37**	**4**
Percentage	**75**	**42.05**	**4.55**

Out of 88 respondents, 29 from Subic, 19 from Castillejos, and 18 from San Marcelino stated that they suffered from a lack of labor source. Nowadays, people would prefer to work in construction sites or other industrial firms that offer higher wages than a day in farming, which were related to the result of the number of household members being the lesser the household and a higher percentage of identified problem labor source. From that 15 from Subic, 4 from Castillejos, and 18 from San Marcelino, the only way to have a farm laborer was to increase their 250 – 300 Php wages. Only Subic had 4 respondents who stated that their lands were converted for commercial or industrial purposes in terms of land conversion.

According to Nguyen and Ferrero (2006), several factors may contribute to the decline of area cultivated and yield harvested. It includes varieties, rice production systems, abiotic and biotic stresses, increasing production costs in industrialized countries, low returns in developing countries, and increasing public concern for protecting environmental resources.

Table 11 presents the alternate production practices in the control of weeds.

Table 11. Alternate Production Practices in the Control of Weeds

	Subic		Castillejos		San Marcelino	
Herbicide	21	61.76	15	62.5	14	46.67
Hand Picking	13	38.24	9	37.5	16	53.33
TOTAL	**34**	**100**	**24**	**100**	**30**	**100**

As shown in Table 11, the industrial firms affected the farmers in terms of the labor force. Out of 34 respondents from the Municipality of Subic, 21 (61. 76%) of them used Herbicide in controlling weeds, making Subic the top user of chemicals; followed by Castillejos with 15 (62.5%); and 14 (46.67%) for San Marcelino with the least number of user of chemicals. So instead of hiring laborers, the farmers opt to use less expensive chemicals.

Table 12 presents the land preparation and harvesting methods.

Table 12. Land Preparation and Harvesting Methods.

	Subic		Castillejos		San Marcelino	
Machine	17	50.00	5	20.83	7	22.83
Combination	15	44.12	14	58.33	19	63.33
Man-animal Day	2	5.88	5	20.83	4	13.33
TOTAL	**34**	**100.00**	**24**	**100.00**	**30**	**100**

As shown in Table 12, the number of farmers who used machinery as alternatives to continue their production. Based on the survey, Subic has the most significant number of machinery users, with 17 (50%). Farmer's Associations provided some, and some were privately owned. Followed by San Marcelino with 7 (22.83%) and Castillejos with 5 (20.83%). Respondents stated that since it was hard to find farm laborers, they choose to engage in machinery. However, some would also increase farm workers' wages from 250 – 300 Php to encourage them to work at the farm.

Table 13 present the t-test distribution.

Table 13. T-test Distribution

Town	N	Mean	Standard Deviation	Standard Error Mean	t	df	Sig. (1 tailed)	Mean Difference	95% Confidence Interval
Subic	34	1.46	24.15	4.41	0.33	33	0.05	1.46	1.69
Castillejos	24	4.52	14.06	2.87	1.57	23	0.05	4.52	1.71
San Marcelino	30	9.62	12.28	2.24	4.29	29	0.05	9.62	1.70
Overall	88	5.07	18.23	1.94	2.61	87	0.05	5.07	1.66

There was strong evidence that the average yield per hectare of Subic with the t of 0.33 and critical value of 1.69 and Castillejos with the t of 1.57 and critical value of 1.71 does not nearly lead to an increase in production, but in San Marcelino with the t of 4.29 and critical value of 1.70 higher increased in rice production in terms of yield per hectare. The total answer was resulting in the t of 2.61 and a critical value of 1.66. Meaning to say, the overall yield per hectare of the First District of Zambales did not almost increase.

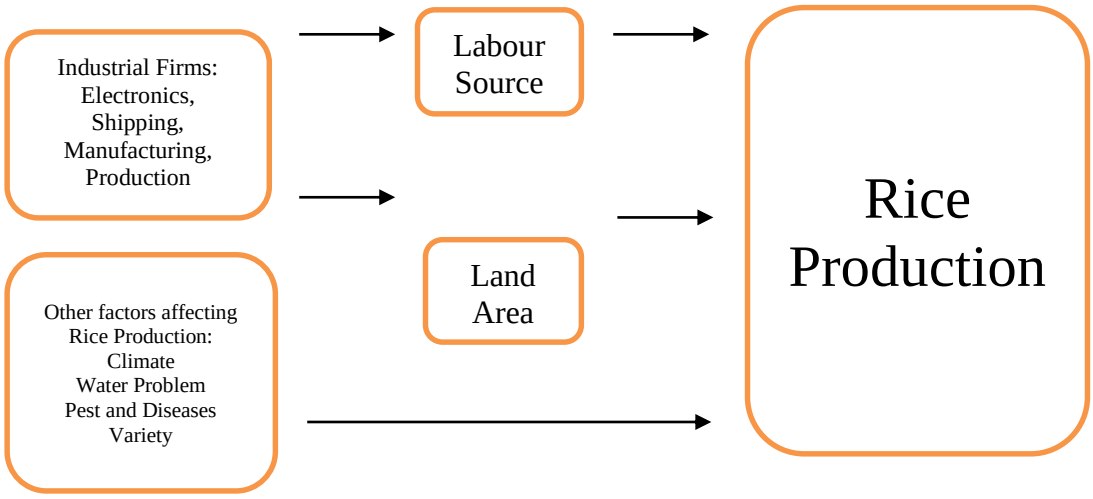

Figure 4. Thematic Framework

The 85.29% in Subic, 79.17% in Castillejos, and 60% in San Marcelino stated that they were affected by the industrial firms in labor source. According to Rahman (2010), the sustained growth of non-agricultural employment and the transfer of part of the rural labor force to the towns have made it possible to stabilize the number of agricultural workers and halt the growth

of population pressure on the land, thus creating the conditions for improved labor productivity and peasant incomes, industrialization has been accompanied by a rapid rise in the demand for food and agricultural prices, creating profitable outlets for agriculture and thus increasing purchases of industrially produced goods.

The lands of 4.55% of the total population were being sold for commercial purposes, especially in the Municipality of Subic. According to Debela et al. (2015), reckless industrialization created a severe impact on the general environment and livelihoods in the nearby area, especially agriculture.

10.23% of the total respondents specified that climate change affects their production. According to the International Food Policy Research Institute (IFPRI) report Climate Change: Impact on Agriculture and Costs of Adaptation forecasts, by 2050, rice prices will increase between 32 and 37% due to climate change. They also show that yield losses in rice could be between 10 and 15%. Also, based on Kawasaki and Herath (2011), Global climate change can affect the crop yield of rice in the future. In the northeast region of Thailand, farmers faced both floods and drought, and low soil fertility, leading to a low food self-sufficiency rate.

The majority of the total respondents from the District of Zambales stated that shortage in water supply was the main problem in their production. According to the International Water Management Institute (2017), water scarcity has a significant impact on food production. Without water, people do not have a means of watering their crops and, therefore, provide food for the fast-growing population.

The 6.82% of the total respondents stated that pests and diseases are among the problems in their production. According to International Rice Research Institute, Rice Knowledge Bank, farmers lose an estimated average of 37% of their rice crop to pests and diseases every year. In addition to good crop management, timely and accurate diagnosis can significantly reduce losses.

35.23% of the total respondents stated that also the variety affects their production positively and negatively. According to Chekene (2015), Farmer's groups also mentioned that lack of a medium maturing variety and a thresher are amongst their most important problems.

CONCLUSION AND RECOMMENDATION

Rice farming is one of the sources of income of farmers in the First District of Zambales and contributes to uplift our country's economic condition.

This study was made to raise awareness of what is happening to the First District of Zambales in terms of Agriculture. More old rice farmers with fewer household members based on the profile identified major problems focusing on the decrease in farm laborers' availability, which affects the farmers. Engaging in machines and chemicals were the alternative ways they know to continue their production. Also, other factors were affecting the production of our farmers like the problem in water supply, variety, natural calamities, pests, and diseases. Although there were changes in our environment, it does not nearly affect rice production because of continuous research and new technologies disseminated nowadays.

Based on the study results, it is recommended that farmers continue to adapt and use machinery and try new technologies that need lesser manpower but improve rice production.

A study on the change of the source of income from agricultural to employment in industrial firms and studying the conversion of agricultural lands to houses, subdivisions, and commercial purposes are recommended.

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