

Magnitude and Viability of Mechanization of Agri-Fishery Industry in Camarines Norte

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Abstract: *The study assessed the extent of mechanization and the viability to modernize agri-fishery industry in Camarines Norte. The assessment determined and evaluated the agri-fishery industry's employment and utilization of machineries and equipment, productivity and efficiency and its implications on the AFMech Law (RA 10601) in the Country. Data were supplied by the 601 farmer-entrepreneurs as respondents through the interview schedule. It utilized the descriptive-evaluative research design and was statistically analyzed using the SPSS v.2.0. Mechanized farming by the utilization of modern machineries and equipment was appraised significantly to be low. Productivity and efficiency levels were also found significantly low. Productivity and mechanization level revealed insignificant correlations but was significantly correlated as regards efficiency. Government supports and the inhibiting factors in the adoption/employment of agri-fishery mechanization were identified to address productivity and efficiency program; capitalization strategy (materials and machine); technical trainings and certifications; and, infrastructure and financial supports. The study concluded that the mechanization of the agri-fishery industry in the province has yet to be revolutionized. Based on the findings, it drafted four programs for the policy recommendations which may be the basis for the concerned government agencies and other key players for the development and modernization of the agriculture and fishery industry.*

Keywords: Agri-fishery industry, level of mechanization, production efficiency, productivity and policy recommendations

1. Introduction

Rationale

Agricultural and fisheries mechanization refers to the development, adoption, assembly, manufacture and application of appropriate, location specific and cost-effective agricultural and fisheries machinery using human, animal, mechanical, electrical, renewable and other nonconventional sources of energy for agricultural production and postharvest/postproduction operations consistent with agronomic conditions and for efficient and economic farm and fishery management towards modernization of agriculture and fisheries (Section 3. b, AFMED law). With the implementation of AFMED Law (RA 10601-An act Promoting Agricultural and Fisheries Mechanization Development in the Country), the province agri-fishery production and income sources have to be looked into to ensure that effectiveness along its productivity and efficiency are considerably enhanced. The province farmers and fishers are assured of livelihood technology for income generation anchored on the mandate of the government on sustainable production through mechanization. This RA 10601 is viewed to improve the lives of the Filipino farmers and fisher folks. The modernization of agriculture through mechanization is seen as a mechanism to improve efficiency of production and to promote cost-effective technologies thereby enhancing the meagre farm income. (Aquino, A. P., et. Al, 2013). In the province of Camarines Norte, this agri-fishery industry is an economic sector that would promote sustained income, sustained growth and livelihood, and increase employment through the mechanization program employing the cost

effective tools, equipment and machineries to modernize production of its prime agricultural commodities such as coconut, rice, pineapple, corn, bananas, root crops, vegetables and the like.

Farm tools, equipment and machineries are associated with the components in agri-fishery production and processing for its mechanization not only in the province of Camarines Norte but all throughout the country. Reduction in farm produce is attributed to poor employment of the recent development and frontier agricultural equipment and machinery. Decades ago, farm or agricultural mechanization has been introduced in the Philippines to increase farm productivity and modernize agriculture. But, the targeted production was yet to be met due to non-adoption of our farmers and fishers to mechanization program or the scarcity of the tools, equipment and machinery or its high costs. This is concurred in a report that the different farming activities of selected crops were predominantly operated at low mechanization level (PCARRD, 2009).

The assessment of the employment of tools, equipment and machinery will serve as direction to further the effectiveness of the development of agri-fishery mechanization. The status of the utilization of these tools, equipment and machinery by farmers and the stakeholders will provide breakthrough to assure increased productivity and efficiency for this industry not only to farmers and fishers but more so to the entrepreneurs and fabricators venturing in the business of fabrication/manufacturing and repair (Sec 2 a and b, AFMech Law). Likewise, the key players, program implementers and policy makers may come up for a

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comprehensive and effective development, promotion and implementation of the Agricultural and Fisheries Mechanization (AFMech) law. Studies, such as this, would embark on the appropriateness of the mechanization technology fitting for the demands and requirements of the locales in the province of Camarines Norte.

2. Literature Review

Mechanization in the Philippines

According to the Department of Agriculture (DA) in 2013, mechanization of Philippine farms is on an upswing, as more farmers are now showing more willingness to mechanize their farms. DA targeted in 2016 to raise the farm mechanization level in the Philippines to at least 4 hp/ha for rice and 2.31 hp/ha for all other crops. Rice and corn farms edged the level of mechanization at 2.31 hp/ha. Philmech reported that farm mechanization in the Philippines is beginning to catch up with neighboring countries in Asia at 1.23 horsepower per hectare (hp/ha) targeting it possibly to a level of three hp/ha in 2016. Comparing to countries in Asia, on the lead is Japan with 7hp/ha, South Korea 4.11 hp/ha, China 4.10 hp/ha, and Vietnam 1.56 hp/ha while Pakistan is currently placed at 1.02 hp/ha, and India 1 hp/ha. (Valencia, 2013).

Mechanization in the Philippines is backed up by the Republic Act 10601-An Act Promoting Agricultural and Fisheries Mechanization Development in the Country purposely for attaining food sufficiency and elevating farmers' incomes. The law also seeks to provide a conducive environment for local manufacturing and assembling engines, machinery, and equipment for agricultural and fisheries use, as well as proper registration and quality-control for such. The DA, through the Philippine Center for Postharvest Development and Mechanization (Philmech) would integrate all researches on farm and fisheries mechanization conducted by local government units (LGUs) and state universities and colleges (SUCs) under a National Agricultural and Fisheries Mechanization Research and Development and Extension Agenda. The Agricultural and Fisheries Mechanization Committee (AFMeC) under the National Agricultural and Fishery Council (NAFC) would act as an advisory body to ensure the success of the programs. (Valencia, 2013).

Impacts of Farm Mechanization

Farm machines/implements for tillage, sowing/planting, harvesting and threshing operations when utilized in the farms would tend likely to impact farmers as regards increased income and enhanced economic livelihood through minimization of capital resource on machines and equipment and maximization of potential production. Studies of Dhruv, et. Al, in 2014 proved this effect as additional income to the farmers recorded notable incremental annual farm income. Farm mechanization is considered to be one of the several pathways of agricultural development. In modern agricultural practices, mechanization is needed from the view point of the effectiveness as measured by profitability of agriculture. Farmers mechanized farm operations when the biological sources of energy, e. g., human and animal labor become more costly than the mechanical sources. There is a secular

tendency for the biological sources to become costlier than the mechanical sources due to the increasing ease with which capital can be substituted for labor (rise in the elasticity of substitution) in agricultural and partly to the rise in the cost of human and animal labor relative to that of machines and fuel. Similarly, the measure of power requirement would likely to be the same during the farm operations but would tend to matter in terms of economic gain. Thus an impact as a result of the level of mechanization would best be quantified following the scales or level of mechanization (low mechanization – use of non-mechanical such as man and animal; intermediate mechanization – non-mechanical power source in combination with mechanical power operated by man; and, high mechanization – solely used of mechanical operated by man, UPLB and BAR, 2001) on power conversion as to employment of mechanization in the production operations in the farm utilizing fewer number of human and animal power. With this, the study has anchored on the magnitude of the utilization of tools, machines and equipment to assessing quantitatively the magnitude of mechanization following the scales done by (UPLB and BAR, 2001). Productivity and efficiency level utilized the common measures in economics such as the output over input and efficiency based on net farm income. This is so when agriculture and fishery sectors contributed significantly in the economy in the country along its GDP.

Deterrents to Mechanization

Technically, investments and apprehension on capital recoveries on machineries, high maintenance and repair costs are viewed as among the constraints in mechanization. These are likewise followed by inadequacy in required skills and know how in operating machines and equipment. The size of the farm is vital. Other problems encountered were: unavailability of machine in locality, outstanding credit in banks and unavailability of spare parts. Relevantly, issues on appropriate combination of hand tools, animal draft and mechanical power technologies for each specific condition and introduction of appropriate level of technology are to be given attention by both government and private sectors for higher productivity.

3. Objectives

This research was conducted to assess the magnitude of mechanization and the viability to modernize agri-fishery industry in the province. Specifically, it answered the following: prevailing farm tools, equipment and machineries in the province; status of utilization of mechanization in the various operations in the agri-fishery industry; the level of farm productivity and efficiency; the relationship of the agri-fishery mechanization and the level of farm productivity and efficiency; the agri-fishery mechanization support extended by the concerned agencies of the government; the inhibiting factors in the adoption/ employment of agri-fishery mechanization; and, policy recommendations for an appropriate agri-fishery mechanization program for the province.

4. Methodology

This study utilized the descriptive-evaluative research design. The data were obtained from the sample size of 601 respondents from the population of 79, 871 registered farmer-producers and fishers using the formula in Appendix A. The sample respondents were proportioned from all the targeted municipalities in the province. An Interview Questionnaire was prepared and used to gather the required data from the respondents where questionnaire was pilot-tested for refinements and approval. The data collected include: prevailing farm tools, equipment and machineries; employment and utilization of mechanization in the various operations in the agri-fishery industry; farm productions and expenditures; the agri-fishery mechanization support extended by the concerned agencies of the government; and, the inhibiting factors in the adoption/ employment of agri-fishery mechanization.

Enumerators were hired and trained to ensure that accurate and required data were collected. Statistical analysis utilized the SPSS v.2.0 and the Microsoft Office Excel 2007. A validation and conveyance of the result of the study was done through a mechanization forum participated by identified researchers, DA Specialists, PAFC and MAFC Officers.

5. Results and Findings

The study assessed the magnitude of mechanization, the viability to modernize agri-fishery industry in the province, the relations of mechanization on productivity and efficiency, the existing government mechanization support and deterrent factors for the adoption/ employment of agri-fishery mechanization and the proposed policy recommendations.

Farm tools, equipment and machineries in the province

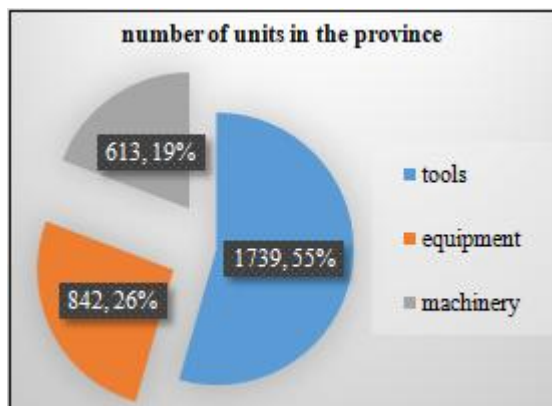


Figure 1: Number of farm tools, equipment and machineries in Camarines Norte, 2018

Figure one depicts the number of farm tools, equipment and machineries in the province of Camarines Norte. Mostly of the machinery as input to production are farm tools at a ratio of three tools per farmer. Farm tools include from simple such as bolo and other handheld tools such as shovel, hoe, rake, etc. Equipment include animal drawn weeder, rotavator and plow, knapsack sprayer, tractor mounted hauler, field handling equipment such as harrow, rotavator, disc plow

etc., mechanical dryer, manual/animal drawn equipment, tractor mounted-mechanical weeder, fertilizer applicator, boat, fishnets, and simple implements. Farmers may only have accessed or owned to at least two equipment which make them incapable to employ the mechanization technology during the production operations. Meanwhile, machineries are accessed on the following: tractor coupled with tractor-mounted implements such as chisel plow, reaper, weeder, pulverizer, etc., thresher with blower, rice combine harvester, water pump and accessories, mechanical dryer, power sprayer, hauler and forklifts and rice mills. (Appendix B).

The prevailing mechanization by employing the farm tools, equipment and machineries in Camarines Norte proved to be very minimal for an agri-based province. During the production and processing operations, farmer entrepreneurs only accessed or utilized at least one machine as input to production/processing making them low level mechanized agri-fishery entrepreneur-producers. This finding is in consonance with the subsequent result that the level of mechanization averaging only to 1.51 which means that extent of mechanization was close to employment of less man labor and animal and farm activities are done in number of days utilizing animal-drawn implements and manually operated machines such as hand tractors, threshers, etc. This was also in consonance with the level that is intermediate mechanization – non-mechanical power source in combination with mechanical power operated by man as defined by UPLB and BAR, (2001). Thus, the employment of farm tools, equipment and machineries in Camarines Norte is yet to be enhanced.

Level of mechanization in the production operations

The level of mechanization was set such that the production and processing operations were rated from 1 to 5 corresponding to the following: 1-Man (animal labor are mostly employed utilizing simple tools and operation takes several days; 2-Employed less man labor and animal and farm activities are done in fewer days than the previous one; 3-Employed machines such as hand tractor and other farm activities are conveniently done faster than the previous one; 4-Operations are done by tractors and mounted implements and accomplished immediately; 5-All activities are done mechanically by an operator only. This scaling was based on the level of mechanization set by UPLB and BAR, (2001) with the incorporation of the equivalent work required per unit of time.

Table 1: Level of mechanization in Camarines Norte, 2019

Level of mechanization	Percentage, %
1.00	49.25
1.1-2.0	27.95
2.1-3.0	22.30
3.1 – 4.0	0.50
mean =1.51	

Table 1 shows the level of mechanization of the agri-fishery industry in Camarines Norte. The level of mechanization was set such that the production and processing operations were rated from 1 to 5 with the corresponding description in the preceding paragraph. Result showed that mechanization

level averaged 1.5 with a range of 1 to 4 for the production operations. This was close to employment of less man labor and animal and farm activities are done in number of days utilizing animal-drawn implements and manually operated machines such as hand tractors, threshers, etc. (Appendix C). This is consistent with the level of mechanization in terms of horsepower per hectare (hp/ha) at 1.23 in 2011 from the paper presented by Dr. William Dar, (2017) at Philmech. Less than a quarter of the farmer-entrepreneur (respondents) are level two in mechanization which was into utilization of machineries such as hand tractor, threshers, etc. and conveniently done faster than employing less man-animal labor. Very few are into operations done by tractors and mounted implements and accomplished immediately or level 4 mechanization. None falls under operations done mechanically by an operator only corresponding to full mechanization or level 5 mechanization.

Level of farm productivity and efficiency

The farm productivity was measured using the gross output over the capital input (Labor, material and machines) in the production and processing operations of the agri-fishery industry in Camarines Norte. While farm efficiency was measured using the cost and net return ratios such that this becomes the ratio of net profit and the total cost.

Farm productivity

Table 2: Level of farm productivity in Camarines Norte, 2018

Level of productivity	Percentage, %
0.02-1.11	25.00
1.2-2.62	25.00
2.63-5.5	25.00
5.6-20.0	20.13
21.0-40.0	3.37
40.0-87.0	1.33
171.43	0.17
mean =5.61	

Table 2 shows the level of productivity of the agri-fishery industry in Camarines Norte. The level of productivity was measured as the ratio of the total output per hectare over the total inputs (total costs) per hectare. Result showed that productivity level averaged 5.61 with a range of 0.02 to 171.43. A productivity of one would mean break even and below one would mean that the respondents are in the losing venture. Nearly a quarter of the respondents would have above average productivity and mostly are below the average of 5.61. Since the kurtosis was found to be high, then there was evidence to suspect an outliers. (Appendix D). The outlier was validated and was found out that his farm was utilized for multi and diverse cropping producing high value crops such as dragon fruit in addition to several high value commercial crops grown in his farm. The outlier accounts to 0.2%. Nearly a quarter of the farmer entrepreneur are having productivity of below one. Fifty percent are from productivity one to the average of 5.61. Above average productivity accounts to also at least a quarter but was highly dispersed to as high as 87 showing more than 75% are below the average productivity. This means that the majority of the farmers and fishers are in the meagre and subsistence level in their agri-fishery industry as

their source of living and income based on the current mechanization level in the province as obtained above.

Farm efficiency

Table 3: Level of farm efficiency in Camarines Norte, 2018

Level of productivity	Percentage, %
(95.14)-2.62	25.00
2.63-44.8	25.00
45.0-69.0	25.62
70.0-98.8	24.38
mean = 31.59	

Table 3 shows the level of efficiency of the agri-fishery industry in Camarines Norte. The level of efficiency was measured as the ratio of the total net return per hectare over the total inputs (total costs) per hectare. A positive efficiency would mean that the agri-fishery ventures are in the gaining side while the negative efficiency would mean that the respondents are in the losing venture. Result showed that more than half of the respondents would have above average efficiency level at 31.59 with a range of -95.14 to 98.84. (Appendix D). Nearly a quarter of the farmer entrepreneur are having negative efficiencies. Efficiencies below the average efficiency of 31.59 account to 15%. Sixty three percent are accounted for the efficiencies above the average of 31.59. Efficiencies accounted to quartile four ranged from 69.22 to 98.84 percent. Generally, the farmer entrepreneurs are in the meagre and subsistence level in their agri-fishery industry as their source of living and income based on the current mechanization level in the province as obtained above.

Correlation of the agri-fishery level of mechanization and farm productivity and efficiency

The effect of the level of mechanization of agri-fishery industry as regards productivity and efficiency was determined. It was tested for validating the intervention for modernization of the agriculture and fishery sectors through modernization.

Productivity and efficiency

Table 4: Correlation of mechanization level and productivity and efficiency in Camarines Norte, 2018

Variables	Productivity	Efficiency
Level of mechanization	-0.063	0.103*
Sig (two-tailed)	0.121	0.012

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4 shows the correlation between levels of mechanization and farm productivity and efficiency of the agri-fishery industry in Camarines Norte. The observed test statistics revealed that there is extremely strong evidence that relating mechanization and productivity is insignificant. It was further revealed by the correlation coefficient, $r = -0.063$ which is close to zero that expresses that this is insignificantly and negatively correlated. Therefore, the results obtained are highly insignificant effect for productivity brought about by the level of mechanization. On the other hand, the observed test statistics for efficiency revealed that there is strong evidence that relating mechanization and efficiency is significant. Though the

correlation coefficient, $r = 0.103$ which is close to zero that expresses that the values for mechanization and efficiencies are weak positively correlated but significant because of the p-value that is 0.012 which is less than 0.05. The results obtained are significant effect for efficiency brought about by the level of mechanization. This means that the modernization initiative to elevate the incomes of farmers and fishers will have a positive impact and contribution. Thus, continued support in the development and modernization of mechanization of agri-fishery have to be ensured for this industry.

Agri-fishery mechanization support extended by the concerned agencies

The mechanization support extended by the concerned government agencies on agri-fishery industry modernization in Camarines Norte are identified by the direct players. These are on assisting to access capitalization in terms of credit/loan facility from authorized lenders, provision of trainings and giving of subsidies for material inputs. (Figure 2, Appendix F). While these are the services extended, these are also found as those factors deterrent to mechanization such that capitalization may not be accessed by mostly of the farmers. Likewise, the lack of trainings to enhance the technical knowhow on machinery operations may not be given direct response from the key players and enablers. More so, the mechanism on giving of subsidies has to be reviewed. Thus, the activities on consultation, documentation and validation be given utmost important consideration and action. These are assisting to access capitalization in terms of credit/loan facility, continuous trainings and provisions of subsidies for material inputs. These supports are included in the drafted policy recommendations in the subsequent section.

Deterrent factors in the adoption of Agri-fishery mechanization

The inhibiting factors for the adoption of mechanization technology in the province of Camarines Norte were identified by the farmer respondents. Some of these factors were actually the supports extended by the concerned government agencies but may be presumed to be not enough. These are validated during the technology forum on mechanization participated by the PAFC and MAFC officers and members. There were 14 deterrent factors: capitalization; lack of trainings on mechanization specifics, seminars and technical supports; unavailability of needed machines or equipment; inaccessibility of the farm/ ponds; lack of technical knowledge on how to operate or repair of machines; pest/diseases control; calamity/climate issues; lack of water supply; small land area (farm land, ponds, etc.); may not recover the investments; unavailability of fertilizer; unavailability of hybrid seeds; seasonal commodities; and, subsidies and government programs as shown in table 5.

Table 5: Factors deterrent to mechanization in Camarines Norte, 2018

Deterrent to mechanization	Percent
Capitalization	43
Lack of trainings, seminars and technical supports	43
Unavailability of needed machines or equipment	31
Inaccessibility of the farm/ ponds	19

Lack of technical knowledge on how to operate or repair of machines	18
Pest/diseases control	16
Calamity/Climate	16
Lack of water supply	15
Small land area (farm land, ponds, etc.)	14
May not recover the investments	9
Unavailability of fertilizer	8
Unavailability of hybrid seeds	5
Seasonality of produce demanded	2
Subsidies and government programs	1

Table 5 shows the factors deterrent to the adoption of the mechanization program in the province of Camarines Norte. The 14 factors identified by the farmer-respondents can be categorized into actions for improvements or policy recommendations. These are: capital/inputs and fertilizer support; pest/disease and environment management; infrastructure support system; mechanization capability and manufacturing and repair services; and, financial and entrepreneurial capabilities.

Policy Recommendation for the modernization of the agri-fishery industry

The foregoing results serve as the basis regards formulation of recommendation/program framework for the modernization of agri-fishery industry. These are categorized into: capital/Input/fertilizer support; capability on mechanization programs; appropriate mechanism for on field cases; environment management; infrastructure support system; mechanization capability and manufacturing and repair services; and, financial and entrepreneurial capabilities; pest and disease management for both production and post-production; and, productivity and efficiency enhancement support. Therefore the recommendation/ program framework that must address the above issues should be on: productivity and efficiency program; capitalization strategy (materials and machine); technical trainings and certifications; and, infrastructure and financial supports.

These are the suggested policy recommendations that the concerned government agency may utilize for the modernization of the agri-fishery industry in the province:

- 1) Policy on elevating the economic conditions of the farmer based on productivity and efficiency program by enhancing mechanization. Five actions/recommendations are:
 - a) Divert production to a multi-crop farming systems following mechanization technology
 - b) Intervene through Research and Development (R&D) to be disseminated through continuous trainings/seminar for adoptive and appropriate technologies on cost-effective and location specific machines
 - c) Ensure progress monitoring so that careful attention must be given to the activities involved in the production/processing (input-output or transformation process)
 - d) Analyze and apply the required usage and timely application of capital inputs and employment of machineries during the cropping cycle
 - e) Institute savings program scheme and free insurance coverage for the farmer-producers

- 2) Policy on showcasing of a profitable farming business ventures based on capitalization strategy for the optimum production in the province to cause economic growth in the agriculture and fishery sector. These actions (policy brief) are highly recommended:
 - a) Intensify technical support in form of capability building as regards profitability by high efficiency output from maximized utilization of inputs such as materials and machines
 - b) Utilize the appropriate and timely application of inputs and invest on mechanization
 - c) Give access to additional land area for multi-cropping system
 - d) Investigate on the utilization and processing of diverse product, by-product and farm wastes and investment on commercialization of planting materials
- 3) Policy on intensification of technical trainings and certifications of those directly involve in the agri-fishery mechanization program in the province. Suggested four actions (policy brief) are highly recommended.
 - a) Institutionalize organization to oversee the agri-fishery industry in the province
 - b) Provide investment in physical resource that may be done on a per association basis to ensure that investment on increasing capitalization would not be a burden to a particular farmer-producer
 - c) Investigate on the utilization and development of adaptive tools, equipment and machineries
 - d) Intensify technical support in form of capability building and certification.
- 4) Policy on ensuring sustainable production based on infrastructure and financial supports. This may be institutionalized to involve all other key players in the industry for mechanization development. Suggested four actions (policy brief) are highly recommended:
 - a) Provide productivity and efficiency improvement support such as enhancing cropping and management.
 - b) Establish marketing and distribution centers by having access to harvesting and post-harvest handling facilities to ensure quality produce that command good farm gate price
 - c) Provide ready information on production and post-production (post-harvesting) pest and disease management on the prevention and control measures of the pest and diseases through on field trainings and diagnoses
 - d) Provide office for price monitoring of produce and inputs (materials and machines).

6. Conclusions and Recommendations

The study assessed the magnitude of mechanization, the viability to modernize agri-fishery industry in the province, the relations of mechanization on productivity and efficiency, the existing government mechanization support and deterrent factors for the adoption/ employment of agri-fishery mechanization.

The study concluded that the extent of mechanization of agri-fishery industry in Camarines Norte is significantly low

which necessitates strong agenda for modernization. The production and processing operations are done on unavailable and insufficient machinery resource. Clearly, mechanization would tend to increase productivity and efficiency. Thus, the policy recommendations on modernization through mechanization of the agri-fishery industry have to be adopted and implemented. Development efforts of the concerned government agencies must go hand and hand following the AFMED on location specific conditions and settings. It is further recommended for validation on a separate study the level of mechanization using the scale method viz a viz the power per hectare (hp/ha) basis on determining the extent of mechanization. This is very important to come up with a standardized and commonality of measuring indicators for assessment purposes as regards the mechanization technology.

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Appendix A

Calculation of the Number of Respondents

$$n = \frac{N(z_{\alpha/2})^2 p(1-p)}{N(E)^2 + (z_{\alpha/2})^2 p(1-p)}$$

Where: n = number of respondents (samples size)

Z_{α/2} = z-based confidence level at 95% = 1.96

p = assume proportion = 0.50

E = desired margin of error = 0.05

N = Number of population (CN farmers) = 79,871

$$n = \frac{79871(1.96)^2 \times 0.5(1-0.5)}{79871(0.05)^2 + (1.96)^2 \times 0.5(1-0.5)}$$

n = 601 (total sample respondents)*

*proportioned to the respondents from the 12 municipalities in CN

Appendix B

Farm tools, equipment and machineries in the province of Camarines Norte

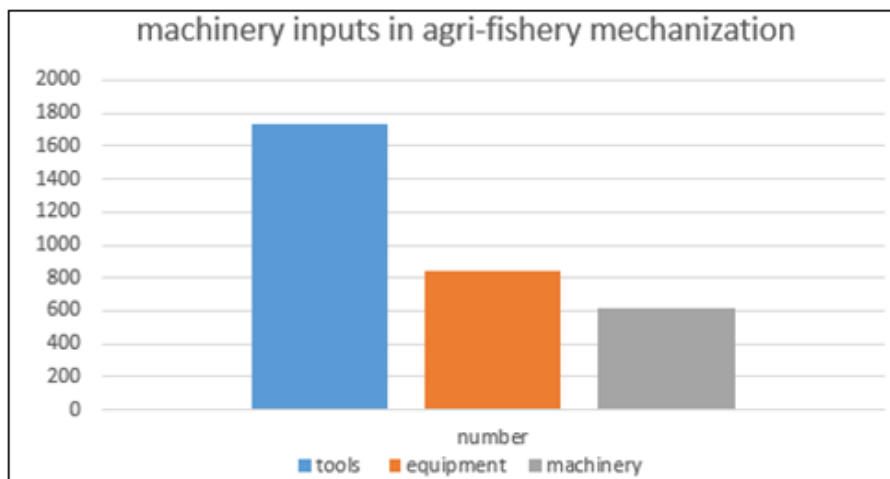


Figure 1: Prevailing farm tools, equipment and machineries in the province

Figure one depicts the number of farm tools, equipment and machineries in the province of Camarines Norte. Mostly are farm tools at a ratio of three tools per farmer. Farm tools include from simple such as bolo to animal drawn such as plow. Equipment include animal drawn weeder, knapsack sprayer, tractor mounted hauler, field handling equipment such as harrow, rotavator, etc., mechanical dryer, manual/animal drawn equipment, tractor mounted-mechanical weeder, fertilizer applicator, boat, fishnets, and simple implements. Farmers may only have accessed or owned to at least two equipment which make them incapable

to employ the mechanization technology during the production operations. Meanwhile, machineries are accessed on the following: hand tractor, tractor-mounted implements such as chisel plow, reaper, weeder, pulverizer, etc., thresher with blower, rice combine harvester, water pump and accessories, mechanical dryer, power sprayer, tractor (4wheel), hauler and forklifts and rice mills.

Appendix C

Descriptive statistics of the level of mechanization in the province of Camarines Norte

Table 1: Statistics of level of mechanization

N	Valid	601.00
Mean		1.51
Median		1.20
Mode		1.00
Std. Deviation		0.57
Skewness		0.51
Kurtosis		-1.22
Minimum		1.00
Maximum		3.00
Percentiles	25%	1.00
	50%	1.20
	75%	2.00

Table 1 shows the SPSS output of the descriptive statistics of the level of mechanization of the agri-fishery industry in Camarines Norte. The level of mechanization was set such that the production and processing operations were rated from 1 to 5 corresponding to the following: 1-Man (animal labor are mostly employed utilizing simple tools and operation takes several days; 2-Employed less man labor and animal and farm activities are done in few days than the previous one; 3-Employed machines such as hand tractor and other farm activities are conveniently done faster than the previous one; 4-Operations are done by tractors and mounted implements and accomplished immediately; 5-All activities are done mechanically by an operator only.

Appendix D

Descriptive statistics of the level of farm productivity in Camarines Norte

Table 2: Statistics of level of productivity

N	Valid	601.00
Mean		5.61
Median		2.63
Mode		1.59
Std. Deviation		11.46
Skewness		7.55
Kurtosis		84.90
Minimum		.02
Maximum		171.43
Percentiles	25%	1.11
	50%	2.62
	75%	5.50

Table 2 shows the SPSS output of the descriptive statistics of the level of productivity of the agri-fishery industry in Camarines Norte. The level of productivity was measured as the ratio of the total output per hectare over the total inputs (total costs) per hectare. Nearly a quarter of the respondents would have above average productivity and mostly are below the average of 5.61. A productivity of one would mean break even and below one would mean that the respondents are in the losing venture.

Appendix E

Descriptive statistics of the level of farm efficiency in Camarines Norte

Table 3: Statistics of level of efficiency

N	Valid	601.00
Mean		31.59
Median		44.80
Mode		11.32 ^a
Std. Deviation		48.74
Skewness		-0.89
Kurtosis		-0.07
Minimum		-95.14
Maximum		98.84
Percentiles	25%	5.16
	50%	44.80
	75%	69.22

^aMultiple modes exist. The smallest value is shown

Table 3 shows the SPSS output of the descriptive statistics of the level of efficiency of the agri-fishery industry in Camarines Norte. The level of efficiency was measured as the ratio of the total net return per hectare over the total inputs (total costs) per hectare. More than half of the respondents would have above average efficiency of 31.59. A positive efficiency would mean that the agri-fishery ventures are in the gaining side while the negative efficiency would mean that the respondents are in the losing venture.

Appendix F

Agri-fishery mechanization support extended by the concerned agencies



Figure 1: Mechanization support extended by the concerned government agencies

Figure 2 shows the mechanization support extended by the concerned government agencies on the mechanization of agri-fishery industry in Camarines Norte. These are assisting to access capitalization in terms of credit/loan facility, continuous trainings and provisions of subsidies for material inputs.