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Assessment of Yield Enhancement Intervention under National Rice Program and Rice Competitiveness Enhancement Fund to Palay Production and Income of Nueva Ecija Farmers

Ronel Leabres

Garduate School, Nueva Ecija University of Science and Technology, Philippines
Email: leabresronel@gmail.com

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Abstract**—***Rice is a staple food for Filipinos and the sufficiency of its supply is essential. The Philippines source its supply of rice from local production and importation from neighboring Southeast Asian countries such as Vietnam and Thailand. Nueva Ecija and its farmers are the largest rice producer in the Philippines. Nueva Ecija was popularly known as the Rice Granary of the country as it produces 9.5 – 10% of the total rice production in country for the last 5 years or equivalent to 1.6 million MT to 1.9 million MT. A percentile change in the production volume of rice in the province will have an impact of approximately 18000MT of change in supply availability. The level of supply in the province may affect the farmgate pricing of palay, affect the income of the farmers and helps determine their willingness to plant in the upcoming seasons. Farmgate price of palay in Nueva Ecija from 2010 to 2020 is Php 12.72 to Php26.68.Low farmgate prices discourage farmers to plant or disable them to do so as they are losing capital for the succeeding seasons. Rice seeds and farm inputs are being provided by the government thru RCEF to selected farmers to increase their productivity and subsidize some of the cost of production. The same programs were rolled out in Nueva Ecija, but farmers still ask for support to help them turn the rice farming profitable.*

Keywords**—RCEF, rice farming, rice production, rice tariffication.**

I. INTRODUCTION

Filipino's whole day meal will not be complete without rice. Similar with Philippine's neighboring Asian countries, a meal is not considered a meal without rice for majority of its population. Filipino's have also made several dishes made of rice - from porridge, to fried rice, to rice cakes and or the normally cooked white rice. There is a deep relation of rice to the normal life of Filipino's.

Philippines all throughout its archipelago is gifted with fields capable to grow rice and Nueva Ecija is one of its provinces with the highest volume of rice produced annually. Nueva Ecija's central plane account to 9.5 to 10% of the total rice production in the Philippines making it popularly known as the rice granary of the Philippines. Nueva Ecija has around 207,401.16 ha of rice fields and account to 43% of the Region III rice growing locations.

The Philippine government had long been aiming to be self-sufficient in producing rice and reduce its dependency in importing rice from other countries to maintain a sustainable supply of food for is more than 100 million population. In 2018, the Department of Agriculture launched Philippine Rice Industry Roadmap with a goal of a "Rice-Secure Philippines". Aside from the 2018 road map, laws were also enacted aiming to boost the rice competitiveness in the country which includes the controversial Rice Tariffication Law.

Nueva Ecija has more than 110000 farmers relying on the tilling of rice fields as their main source of

income. Qualified farmers from Nueva Ecija are recipients of the government programs either in National Rice Program or Rice Competitiveness Enhancement Program. This are programs which aims to enhance the yield of the farmers with the implementation of several interventions in the rice farming.

II. DESCRIPTION OF THE SITUATION

Department of Agriculture Region 3 Rice Program covers the provinces of Bataan, Pampanga, Bulacan, Aurora, Nueva Ecija, Tarlac and Zambales. It is anchored on the Philippine Rice Industry Roadmap twin goals of Masaganang Ani at Mataasna Kita. Under this program, DA-Region 3 provided to the farmers includes the following services:

- Production Support Services
- Extension Support, Education and Training Services
- Research and Development Services
- Irrigation Network Services
- Agricultural and Fishery Machinery, Equipment, and Facilities Support Services

Under the Production Support Services, Nueva Ecija farmers receives commercial hybrid rice seed and certified seeds. Seeds are distributed to farmers to increase their seed production output in contrasts to their selected conventional rice seed. Rice seeds produced by certified seed growers and hybrid rice seed manufacturers are chosen to be part of the rice seed distribution program. In 2019, DA-Region 3 has allocated 549.66 million of budget for its rice seed distribution program.

III. REVIEW OF RELATED LITERATURE

Philippine Rice Industry Roadmap (PRIR)

"The industry vision is a rice-secure Philippines. It is anchored on the societal goal, availability and affordability of food for all Filipinos. For rice, it means availability, affordability and accessibility of high-quality and nutritious rice at all times. It encompasses broad areas relating to rice cultivation, commerce, consumption and competitiveness. The most sustainable pathway to realizing rice security is producing sufficient rice at a competitive cost."

The vision aims to deliver competitive, profitable, resilient and responsive rice industry. It acknowledges that for the rice industry to be profitable, it needs to achieve at least 50% net income for farmers at a baseline of P17/kg farmgate price, production cost of P12/kg and yield level of 4MT/ha.

The Department of Agriculture laid down necessary intervention to achieve the roadmap. It identifies 57 priority provinces. The provinces were selected based on covering yields, area harvested, cost of production and percentage of irrigated area harvested.

Nueva Ecija position itself as one of the priority provinces being one of the high yielding locations and at low production cost.

The Philippine Rice Industry Roadmap 2030 (PRIR) laid the roles and responsibility of the implementing agencies which includes the Regional Field Offices. Under the roadmap, DA-Region 3 Field Office which oversees Nueva Ecija shall exercise the following roles:

- Responsible for in the overall planning, coordination and monitoring of program implementation in the regions
- Coordinate, monitor and implement seed production activities
- Coordinate and monitor implementation of program interventions
- Update Registry System for Basic Sectors in Agriculture
- Assist in the evaluation of qualified farmers organization/beneficiaries
- Deploy subject matter specialist
- Provide accurate and timely reports
- Provide resource person in training courses for AEWs

Department of Agriculture – Region 3 Field Office Rice Program

Mandated under the PRIR, DA-RFO3 has a vison of "A food secure and resilient Philippines with empowered and prosperous farmers and fisherfolk". It has a twin goals of "Masagang ANI at Mataasna KITA". In 2021, the intervention programs launched by DA-RF03 are as follows:

Production Support Services

1. Yield Enhancing and Cost-Reducing Interventions
   - Commercial Hybrid Rice Seed
   - Certified Seeds
   - Inorganic Fertilizers
2. Disaster Response: Buffer Stocking (Registered and Certified Seeds)
   - Hybrid Rice Seed
   - Certified Seeds

Extension Support, Education and Training Services

1. Information Dissemination
   - Radio Program
   - Radio Plugs

- TV Plugs
- Advertisement Placement

2. Generation of RCM Recommendations
3. Incentive Allowance for LGU-AEWs, AFCs and LFTs

Research and Development

1. DA-IRRI Collaboration
   - Pest Risk Identification and Management (PRIME)
   - Next Gen
   - RCM Transition Plan
2. Strategic RDE Support
   - Mushroom on Station Modules
   - Rice Productivity and Cost Reduction Studies for Rainfed and Irrigated Lowland Ecosystems
   - Mechanization Assessment and Database Establishment
3. Regional Rice R4D Projects
4. Collaborative R4D with Other Institutions

Irrigation Network Services

Solar-Powered Fertigation System (SPFS). A modern technology that will redefine irrigation application as production efficiency by reducing production cost and to have an accurate irrigation and fertilizer application

Agricultural and Fishery Machinery, Equipment, and Facilities Support Services

- Four-Wheel Drive Tractors. More efficient because it can deliver 10% more power to the ground for the same fuel consumption, and have much better traction and flotation capabilities, thus, improving the quality of land preparation. In addition, this machinery lessens the time devoted for land preparation in areas affected by typhoons and floods. This machinery can perform well for both dry and wet conditions ensuring that weeds and stubbles will be incorporated thoroughly into the soil for proper decomposition that could minimize weed growth and facilitate distribution of irrigation water.
- Hand Tractors. A multi-purpose equipment since the engine can be utilized for irrigation purposes as well as in transportation of farm inputs and produce.
- Combine Harvesters. In using this machinery, threshed grains are directly placed in the sack and is ready to be sold at reasonable farm gate price reducing the stress and health risk of farmers from sun-drying. This machinery is proven to minimize production losses and fast-track harvesting operation as well as minimizing the cost of harvesting and threshing expenses.

Hybrid Rice

Hybrid rice is a type of rice that has been bred from two very different parents. It can significantly outyield other rice varieties. Hybrid rice has the capability to outperform other varieties in terms of yield when grown in a suitable location. It generates an opportunity of high level of harvest volume and generate high income level for farmers.

In the Philippines, several companies and institutions has been developing hybrid rice varieties for Filipino farmers. As of November 2021, 445 hybrid rice varieties were registered in National Seed Industry Council. Since 2011, 229 of the registered hybrid rice seeds were registered and available to Filipino farmers by seed producers such as International Rice Research Institute, Long Ping High Teck, Corteva Agriscience, Advanta, Philippine Rice Research Institute, University of Philippines-Los Baños, Syngenta Philippines Incorporated, Bayer Crop Science, SL-Agritech Corporation, Prasad Seeds, Bioseeds Research Philippines Incorporated and many other organizations in the country.

The Department of Agriculture recorded in 2021 that the hybrid rice production supported its goal of improving Philippine's food security level. Data from the Philippine Statistics Authority showed that the total production contributed by hybrid rice in 2021dry cropping season reached 3.67 million MT (MMT), which is 37 percent of the total palay production last dry season.

Philippines Rice Tariffication Law (RA11203)

RA11203 or commonly known as Rice Tariffication Law – Act liberalizing the importation, exportation and trading of rice, lifting for the purpose the quantitative import restriction on rice and for other Purposes was signed into law on February 14, 2019. It was a controversial legislation and were feared to impart the farmers. Notable parts of the law are as follows:

"SEC. 13. Rice Competitiveness Enhancement Fund. There is hereby created a Rice Competitiveness Enhancement Fund, herein referred to as the 'Rice Fund'. The Rice Fund shall consist of an annual appropriation of Ten Billion pesos (P l0,000,000,000. 00) for the next six (6) years following the approval of this Act and shall be automatically credited to a Special Account in the General Fund of the National Treasury which shall be in place within nine ty (90)' days up on the effectivity of this Act."

(b) Rice Seed Development. Propagation and Promotion - Thirty percent (30%) of the Rice Fund shall be released to and implemented by the Philippine Rice Research Institute

(PhilRice) and shall be used for the development, propagation and promotion of inbred rice seeds to rice farmers and the organization of rice farmers into seed grower's associations and/or cooperatives engaged in seed production and trade.

SEC. 15. Rice Industry Roadmap. - Upon the effectivity of this Act, the DA, together with the NEDA. Department of Finance (DOF), DBM, DAR, National Irrigation Administration (N1A), TESDA. PCIC. National Anti-Poverty Commission (NAPC) Farmer Sectoral Council Representative and other government agencies concerned, including rice farmer representatives, shall be given a maximum of one hundred eighty (180) days to formulate and adopt the rice roadmap to restructure the government's delivery of support services for the agricultural rice sector. "The following principles shall govern the development and implementation of the roadmap for the rice industry:

(a) Raise sustainable investments in the rice industry particularly on rice support infrastructure and post-harvest facilities;

(b) Improve the productivity, efficiency and profitability of small rice farmers and landless farmworkers

(c) Strengthen research and development programs that will enhance the resiliency of the rice industry

(d) Preserve and enhance the rice production capabilities of future generations

(e) Provide accessible, targeted and technology-oriented support services that cover the entire value chain;

(f) Set up responsible, participatory and effective governance mechanisms: and

(g) Address impact of income loss caused by rice tariffication. "The rice industry roadmap shall be implemented through a complementation of the DA's 13 rice sector programs as funded by the GAA and the Rice Fund created under this Act. A colon is inserted before an equation is presented, but there is no punctuation following the equation. All equations are numbered and referred to in the text solely by a number enclosed in a round bracket (i.e., (3) reads as "equation 3"). Ensure that any miscellaneous numbering system you use in your paper cannot be confused with a reference [4] or an equation (3) designation.

IV. SCOPE AND DELIMITATION

This study covers the impact of the National Rice Program and Rice Competitiveness Enhancement Fund seed distribution program in Nueva Ecija rice production and its farmers.

Other components of NRP and RCEF such as farming mechanization, education and research development shall be out of the scope of the study.

V. DATA GATHERING PROCEDURES

Data used in this study were collected using the available data in the Philippine Statistics Authority. Data downloaded from PSA includes the harvested area and volume of rice harvested in the province of Nueva Ecija. The yield was evaluated in per season and annual basis.

To derive the income of the farmers, available Statistics on Agriculture published by PSA were used to determine the production cost of palay in the Philippines.

Data collected from PSA includes a 10-year data and a 5-year data to analyze the trend of the parameters that this study is looking on to.

VI. SIGNIFICANCE OF THE STUDY

The result of this study will benefit the following:

Department of Agriculture – Region 3 Field Office – Recommendations can help the DA to customize or update its rice seed intervention program in Nueva Ecija. It can assist the agency in crafting programs which will benefit the country in achieving its rice-resilient target and provide more income to more than 100000 Novo Ecijano farmers.

Municipal and Provincial Agriculture Office – The municipal and provincial agriculture office employees will have a visibility of the on-ground intervention needed and the actions needed from their respective office to support and assist the regional field office in crafting the program for the province of Nueva Ecija.

Novo Ecijano Farmers – farmers will receive services from DA and the local government units suitable for their needs and welfare. It will also help the farmers to have an informed decision in selecting seeds for planting.

VII. RESULTS AND DISCUSSION

Nueva Ecija palay production covers 207,401.16 ha from 27 municipalities and 5 cities. 183,201.17 ha of the rice area are irrigated and 24,199.99 ha are rainfed. The vast field of rice fields is tilled by 117,713 farmers.

To determine the yield level of the rice production in Nueva Ecija, harvested area and volume of production in the province was collected both for dry season (H1) and wet season (H2).

Table 1 – Harvested Area ('000 Ha

	2017		2018		2019		2020		2021	
	H 1	H 2	H 1	H 2	H 1	H 2	H 1	H 2	H 1	H 2
Irrigated	137	154	141	157	150	163	149	149	151	153
Rainfed	-	33	-	33	-	24	-	21	-	14

Rice area planted in Nueva Ecija from 2016 to H1 of 2021 ranges from 65% to 92% of the total available area in the province. Planted and harvested area in the province is at lowest rate during the H1 or dry season harvesting where only the irrigated areas were able to plant rice crops. This is equivalent to 65% to 73% of harvestable area from the last six years. Harvested area from the irrigated areas increased by 6.02% in 2019, the same time when NRP and RCEF, compared to previous cropping season. Between 2021 and 2019, an additional 9,564.82 hectare was added in the harvested area from irrigated areas.

Wet season or H2 harvested area increased by 7.6% from 2016 to 2018 but sharply declined by 12.53% from 2018 to 2021. The 2021 H2 harvested area is even lower than 2016 harvested area by 10,552 ha. Decreased in area harvested in mainly driven by the reduction of the areas harvested dependent to rain which steadily decline from 2016 to 2021.

Table 2 – Volume of Rice Produced (Million MT)

	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Nueva Ecija	1.68	1.88	1.87	1.95	1.90	1.88
Region 3	3.34	3.63	3.62	3.73	3.63	3.74
PHILIPPINES	17.6	19.3	19.1	18.8	19.3	19.9

Nueva Ecija consistently produced more than 50% of the total rice volume for Region 3 and remains to be the highest producer of rice in the Philippines from 2016 to 2020. The province posted a steady increased from 2016 to 2019 or equivalent of 271609.14MT of rice production volume.

The volume of production declined in 2020 and 2021 with aggregated reduction of 71,637.17MT. The reduction in volume is expected and can be attributed to the reduction of area harvested on the same periods.

Table 3 – Yield of Rice per ha (MT/Ha)

Table 3.1 Annual Yield Per Ha

	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Nueva Ecija	5.37	5.81	5.66	5.82	5.97	5.91
PHILIPPINES	3.87	4.01	3.97	4.04	4.09	4.15

Table 3.2 Yield per Ha (Semestral)

	2017		**2018**		**2019**		**2020**		**2021**	
	H 1	H 2	H 1	H 2	H 1	H 2	H 1	H 2	H 1	H 2
Nueva Ecija	6.91	5.02	6.68	4.91	6.71	5.10	6.43	5.56	5.93	5.89

Table 3.3 Regional Annual Yield

	2016	**2017**	**2018**	**2019**	**2020**	**2021**
PHILIPPINE	3.87	4.01	3.97	4.04	4.09	4.15
CAR	3.46	3.85	3.51	3.78	3.67	3.71
REGION I	4.37	4.55	4.24	4.55	4.67	4.65
REGION II	4.19	4.53	4.23	4.54	4.49	4.75
REGION III	4.75	5.04	4.97	5.10	5.11	5.14
REGION	3.49	3.53	3.87	3.69	3.64	3.71
REGION	3.75	3.83	4.01	3.99	4.03	3.95
REGION V	3.60	3.67	3.78	3.49	3.74	3.89
REGION VI	3.31	3.41	3.34	3.32	3.49	3.48
REGION	2.89	3.23	3.17	2.72	2.88	3.03
REGION	3.56	3.47	3.51	3.51	3.53	3.50
REGION IX	3.74	4.06	4.10	4.11	4.09	4.12
REGION X	4.44	4.54	4.62	4.65	4.68	4.78
REGION XI	4.27	4.29	4.58	4.37	4.54	4.49
REGION	3.80	3.76	3.85	3.66	3.78	3.69
REGION	3.08	3.11	3.18	3.09	3.22	3.16
ARMM	2.56	2.61	2.82	3.24	3.11	3.57

Annual yield or rice production in Region III, Nueva Ecija in particular, is above the national average rate from 2016 to 2021. Region III recorded a 3.4% yield improvement after the launching of NRP and RCEF. Meanwhile, Nueva Ecija posted an increase in yield by 4.41% from 2018 to

2021. Nueva Ecija farmers yield on the first two years of rice seed intervention had an increase 0.3MT/ha. On the other hand, 2021 yield is 1% lower than 2020 or 60kg lower yield than previous year.

H1 yield level of rice production in Nueva Ecija slightly improved in 2020 but declined to level lower than the pre-NRP/RCEF seed intervention. Yield level in irrigated fields (H1) has declined by 11.2% from 2018 to 2021. The yield level in Nueva Ecija in H1 of 2021 is the lowest yield level the province has in six years.

H2 yield level increased by 20% for the same period in which the dry season declined. The increase is equivalent to 980kg of additional harvested volume per hectare. The double digit increase in the yield during wet season harvest enable Nueva Ecija to retain growth in yield per hectare in 2021 despite the decline in yield in dry season.

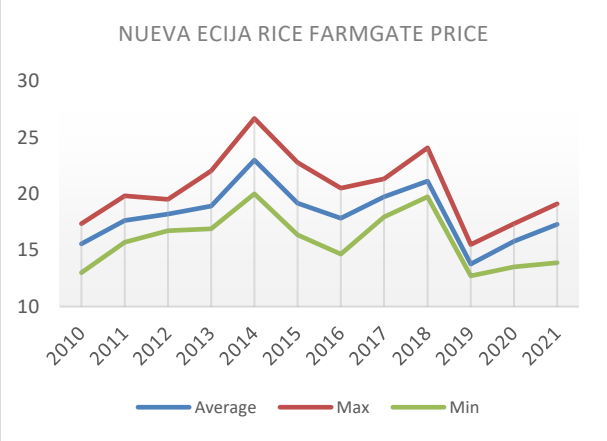

Fig.1 – Rice Farmgate Price in Nueva Ecija per kg

Rice farmgate price in Nueva Ecija from 2010 to 2020 recorded its highest price level in 2014 all throughout the year. Prices has a range of P17 to P20 until 2018. Farmgate price from 2015 to 2018 is within the target farmgate price to deliver 50% profit ration to farmers.

Nueva Ecija rice farmgate price steeply declined in 2019 to P13 level per kg and slightly improved to P17 until 2021. The reduction of farmgate price occurs during the year of implementation of rice seed intervention and increase in the farmer's yield. The farmgate price of the said period may not be attractive for farmers to till their rice fields and thus can be attributed as one of the causes in the reduction of harvested areas for 2019 - 2021.

Table 5 – Rice Production Net Return and Profit Ratio

Table 5.1 Nueva Ecija Farmers Net Return (PHP)

	2016	2017	2018	2019	2020
Philippines	19,811	23,206	33,349	21,324	21,430
Nueva Ecija	44,010	51,806	68,463	25,007	34,936

Table 5.2 Nueva Ecija Farmers Profit Ratio

	2016	2017	2018	2019	2020
Philippines	0.42	0.47	0.7	0.47	0.46
Nueva Ecija	0.67	0.72	1.01	0.38	0.51

Nueva Ecija farmers net return and profit ratio in rice production is above the Philippine average from 2016 to 2020. Year on year income of Nueva Ecija farmers declined in 2019 and 2020 as compared to the prior years. 2019 is the lowest profit ratio and Nueva Ecija farmers net return is close to the average in the Philippines. The profit ratio in 2020 recover to 0.51 and is still below the prior year performance but within the target profit ratio of the NRP.

Philippines rice production in wet season profit ratio for 2019 and 2020 is 0.36 and 0.40 respectively. Nueva Ecija on the other hand has a profit ratio of 0.14 and 0.29 on the same period. Nueva Ecija farmers experience the lowest profit ratio in 2019. A farmer has an average net profit of Php 8210 and Php 18336 in 2019 and 2020 wet season respectively. The increase in yield per hectare for the same period did not result in the increase of farmers income. Lower farmgate price and at-par production cost per kg prior to the NRP/RCEF seed intervention resulted to lower income of farmers.

VIII. CONCLUSION AND RECOMMENDATION

Based on the results of the study, the researchers concluded that : (a) The seed intervention program of National Rice Program and Rice Competitiveness Enhancement Fund increased the rice production volume of Nueva Ecija. It was able to add additional volume to Philippine rice supply. (b) Nueva Ecija was able to increase its rice production volume despite the reduction in area of rice fields planted and harvested. The intervention of providing hybrid and certified seeds to Nueva Ecija framers helps to increase their yield per hectare during wet season harvest. (c) The increase in yield brought by NRP/RCEP seed intervention did not result to higher net profit and profit ratio for Nueva Ecija farmers. The lowest net income and profit ratio was also observed in the same period that seed intervention of NRP/RCEP was implemented. Production cost remains at par prior to the implementation of NRP and RCEF. (d) The seed

intervention during this period is not sufficient to drive better yield for Novo Ecijano farmers. Yield is declining during dry season and is not align with the goal of Masaganang ANI. Based on the findings and conclusions, the following recommendations are given: (a)The Department of Agriculture – Region III Field Office, Municipal and Provincial Agriculture Office should continue the rice seed intervention program in Nueva Ecija to increase the production volume in the province and increase the yield of farmers. (b)Conduct an evaluation of the rice seeds distributed and used for dry season harvest. Evaluation should include the suitability and compatibility of the varieties used for the said season. High performing varieties for dry season must be prioritized and position for distribution and use. (c) Collaborate with seed growers and hybrid rice producers in determining the varieties for distribution to farmers. The said organizations and companies can be required to submit localized adoptability reports as pre-bidding requirements for NRP and RCEF seed intervention programs. DA-Region III and Nueva Ecija Field Offices can leverage the "rice derby" of products offered by different seed producers. (d) Provincial and municipal agriculture office to profile the land in their area of jurisdiction. The profile shall be used by the Regional Field Office in the determination of the rice varieties to be allocated for each municipalities/city. (e) Provincial and municipal agriculture office to plan with the municipal/city/provincial executives to craft intervention programs to manage the farmgate price of palay to at least P17 per kg. With the implementation Mandanas ruling, Nueva Ecija LGU executives may buy palay directly from farmers. RA11321 or known as Sagip Saka Act should be implemented as well in parallel to this LGU interventions. (f) Continuous efforts must be implemented to reduce the production cost of rice in the province.

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