PERFORMANCE EVALUATION OF INBRED LOWLAND RICE VARIETIES UNDER VARYING NUTRIENT MANAGEMENT IN IRRIGATED LOWLAND ECOSYSTEM

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RATIONALE

- Rice is very important crop in the Philippines because it accounts for 35% of the average calorie intake of the population.

- Production needs to be increase to meet the population food requirement despite the conversion of the agricultural lands and the use of lesser inputs.

- A major strategy that can be used to meet this enormous challenge is to increase the yield of rice per unit area.

- Fertilizer is vital for rice production where nearly all rice farmers use fertilizers but most farmers do not use the best nutrient management practices in rice production (Buresh, R. J., 2014).

- Site – Specific Nutrient Management promotes the optimal use of existing indigenous nutrients from soil, plant residues, manure, and irrigation water combined with the timely application of fertilizers at appropriate rates to match crop needs during the cropping season.

OBJECTIVES

The study was focused to evaluate the performance of inbred lowland rice varieties under varying nutrient management options in irrigated lowland ecosystem in Luna, Apayao.
Specifically, it aimed to:

1.Compare the growth and yield performance of the different inbred lowland rice varieties under irrigated lowland ecosystem;

2.Determine whether the cultivars respond differently to nutrient management options;

3.Identify the best nutrient management options that can be used in irrigated lowland ecosystem; and

4.Determine the production economics of the different inbred lowland rice varieties grown under different nutrient management options.

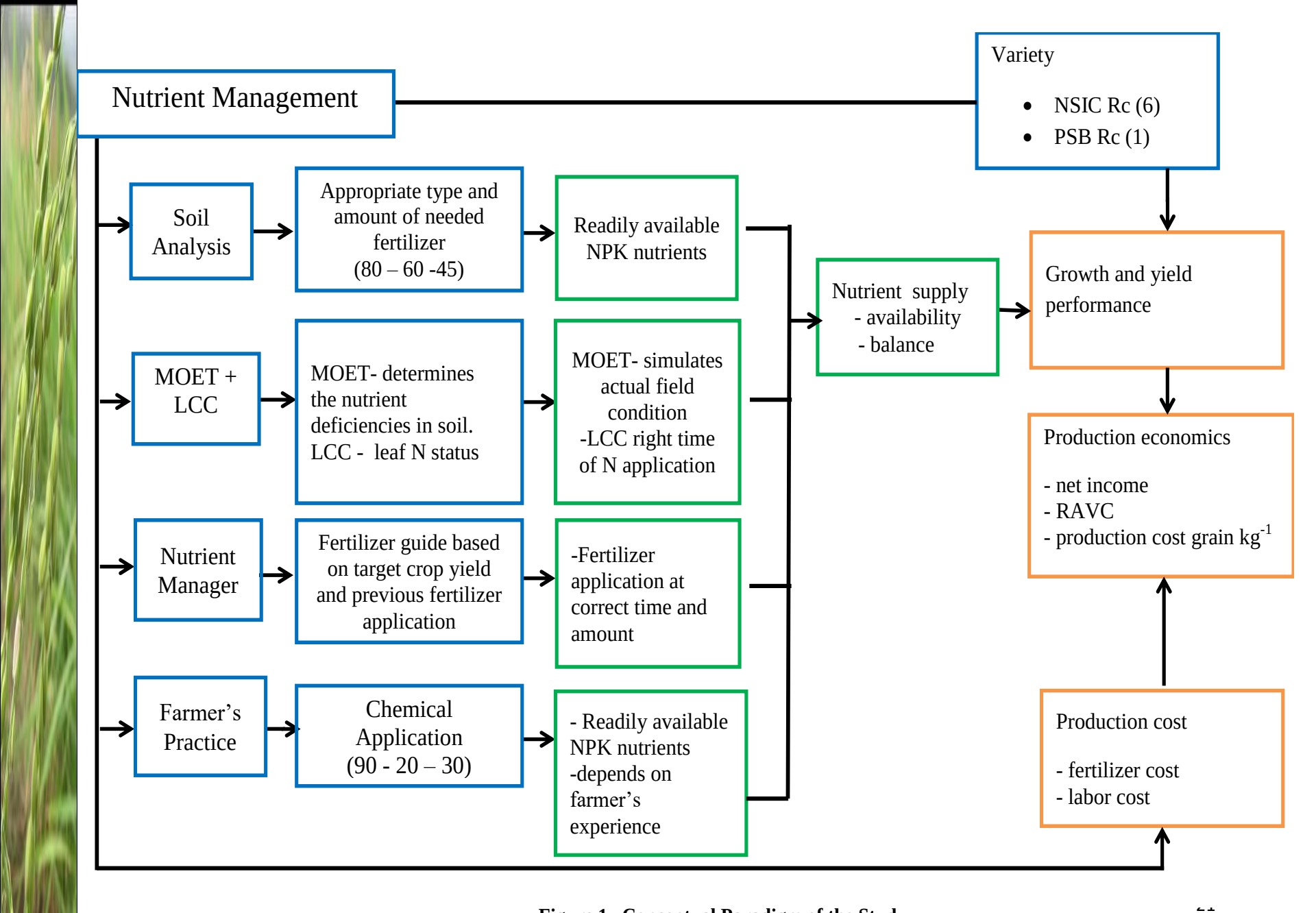
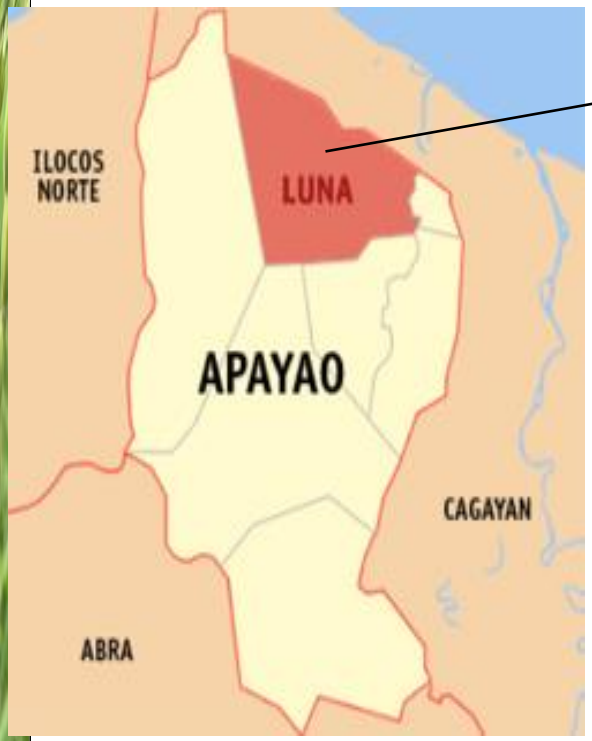
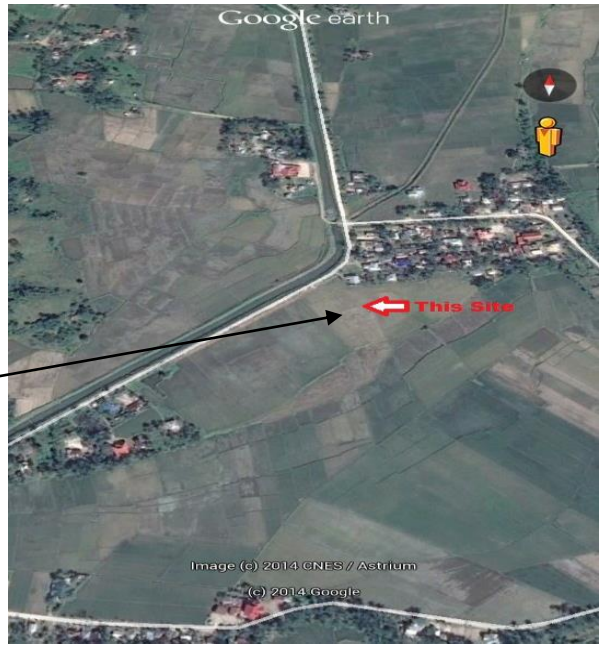


Figure 1. Conceptual Paradigm of the Study.

METHODOLOGY





Locale of the study

Luna is geographically situated in the northern part of the province of Apayao. It is bounded by the Apayao river in the east, the Malunog River in the south, by the Cagayan provincial boundary in the north and by the municipality of Calanasan in the west. Luna is under type 111 climate which is characterized by unpronounced rain period with dry season lasting for one to three months and with a rainfall more or less evenly distributed throughout the year.

Treatments

Nutrient Management (vertical factor)
T1–Soil Analysis
T2– MOET + LCC
T3– Crop Manager
T4–Farmer's Practice
B. Varieties (horizontal factor)
V1 - NSIC 216
V2 - NSIC 222
V3 - NSIC 224
V4 - NSIC 226
V5- NSIC 238
V6–NSIC240
V7- PSB Rc 82 (check variety)

Research Design

Strip- Plot design using R – CropStat program

Nutrient management Used in the Study

Soil Analysis

Table 1. Analysis of soil sample from the experimental site (.52ha)

CROP VARIETY/AGE	NUTRIENT REQUIREMENT		
	NITROGEN	PHOSPHOROUS	POTASSIUM
Hybrid Rice - wet	100	60	65
Hybrid Rice - dry	120	60	45
Inbred Rice - wet	80	60	45
Inbred Rice - dry	100	60	45

Source: Regional Soils Laboratory, Tuguegarao City

Fertilizer Recommendation

Inbred Rice **80 – 60 – 45**

Basal Application. 3.2 bags/ha 14-14 -14, 2.2 bags/ha 1
6-20- 0, 1.7 bags/ha
0-18-0 and 10 bags/ha organic fertilizer

Topdress 1.7 bags/ha 46-0-0
0.75 bags/ha 0-0-60 at panicle initiation

Nutrient management Used in the Study

Minus One Element Technique and Leaf Color Chart (MOET + LCC)

Table 2. Recommendation Per Hectare (For target yields of 5 tons for dry season and 4 tons for wet season.

	10 days after transplanting (DAT) for 21 – day old seedlings	TIMING OF FERTILIZER APPLICATION			
		Mid- tillering Stage		Panicle Initiation Stage	
Deficiency	**14 DAT for dapog Seedlings or 20 DAT for direct Seeded**	Dry season	Wet season	Dry season	Wet season
N,P and S	2 bags of ammophos And 0.5 bag ammonium sulfate	2.5bagsurea	1.5 bags urea		

Source: Minus One Element Technique Kit

Nutrient management Used in the Study

Crop Manager

Table 3. Recommended rate per hectare based on Crop manager.

GROWTH STAGE	DAT	CURRENT YIELD (60 sacks at 50 kg/sack 3/ha-1 (14% MC)
Early	0 -10	14 – 14 – 14: 1 3/4 bags
Active tillering	20 -24	Urea: 27 kg
Panicle initiation	27 - 31	Urea: 1 bag

Source: Crop Manager for Rice

Nutrient management Used in the Study

Farmers' Practice

Table 4. Rate of application for farmers' practice in hectare basis

METHOD AND TIME OF APPLICATION	RATE (ha^{-1}) (bags)	FERTILIZER MATERIAL
7 DAT	1.43	Complete fertilizer
	1.52	Urea
Topdress at 21 DAT	1.43	Complete fertilizer
	1.52	Urea
	3.33	Muriate of potash

Fertilizer Application

Table 5. Method and time of fertilizer application and the rate and type of fertilizer materials used.

NUTRIENT MANAGEMENT	METHOD AND TIME OF APPLICATION	RATE PLOT[1] (g)	FERTILIZER MATERIAL
Soil analysis	basal application	96.00	Complete fertilizer
		66.00	Ammophos
		51.00	Solophos
		300.00	Vermicompost
	Top dress at maximum tillering	51.00	Urea
	Panicle initiation	22.50	Muriate of potash
MOET+LCC	10 DAT	30.00	Urea
		60.00	Ammophos
		.30	Ammonium sulfate
		15.00	Zinc sulfate
	Panicle initiation	30.00	Urea
	Booting stage	30.00	Urea
Crop Manager	5 DAT	100.96	Complete fertilizer
	Active tillering	5.19	Urea
	Top dress PI	57.69	Urea
Farmer's Practice	7 DAT	42.86	Complete
		45.65	Urea
	Topdress at 21 DAT	42.86	Complete
		45.65	Urea
		10.00	Muriate of Potash

Table 6. Growth Parameters of the Inbred Lowland Rice varieties

Treatment	Plant Vigor	Plant Height	Days to Heading	Days to Maturity	Total Tillers	Productive Tillers	Unproductive Tillers
Nutrient management (A)	ns	**	*	**	Ns	*	*
Soil Analysis	4.17	104.00^{bc}	65^{b}	95^{c}	15.74	75.70^{b}	24.30^{a}
MOET + LCC	3.92	107.00^{a}	66^{ab}	96^{b}	16.76	79.41^{a}	20.59^{b}
Crop Manager	3.71	105.00^{b}	67^{a}	97^{a}	16.46	74.45^{b}	25.55^{a}
Farmer's Practice	3.22	102.00^{c}	66^{ab}	97^{a}	16.25	74.74^{b}	25.26^{a}
Variety (B)	ns	**	**	**	*	Ns	Ns
NSIC Rc 216	3.80	97.00^{b}	66^{ab}	96^{ab}	16.90^{a}	72.30	27.70
NSIC Rc 222	4.23	98.00^{b}	64^{b}	94^{b}	17.87^{a}	75.92	24.08
NSIC Rc 224	4.19	107.00^{a}	67^{ab}	97^{ab}	15.06^{a}	77.52	22.48
NSIC Rc 226	3.70	107.00^{a}	64^{b}	95^{b}	15.51^{a}	76.62	23.38
NSIC Rc 238	3.98	108.00^{a}	66^{ab}	96^{ab}	17.73^{a}	75.95	24.05
NSIC Rc 240	3.76	108.00^{a}	69^{a}	99^{a}	14.40^{a}	76.25	23.75
PSB Rc 82	3.63	106.00^{a}	66^{ab}	96^{ab}	16.64^{a}	77.97	22.03
A X B	ns	ns	ns	ns	ns	ns	ns
CVa (%)	1.90	2.76	1.84	1.08	6.14	5.40	17.16
CVb (%)	2.98	2.43	3.00	2.39	15.09	9.83	31.26
CVc (%)	9.45	2.25	1.57	0.93	12.29	6.81	21.66

Table 7. Panicle Length, Filled and Unfilled, Seed size, Harvest Index and Grain Yield

Treatment	Panicle length	Filled Grains	Unfilled Grains	Seed Size g/1000	Harvest Index	Grain Yield (t/ha)
Nutrient management (A)	**	**	**	ns	ns	ns
Soil Analysis	21.90^{b}	60.17^{c}	39.83^{b}	29.49	34.93	3.90
MOET + LCC	22.54^{a}	58.83^{d}	41.17^{a}	29.40	33.75	4.88
Crop Manager	21.45^{c}	70.31^{a}	29.69^{d}	29.32	36.21	4.39
Farmer's Practice	21.94^{b}	68.36^{b}	31.64^{c}	29.35	34.73	3.84
Variety (B)	**	**	**	**	**	Ns
NSIC Rc 216	23.05^{a}	73.43^{a}	26.57^{e}	30.49^{b}	34.82^{ab}	4.57
NSIC Rc 222	21.51^{b}	65.01^{b}	34.99^{d}	28.47^{d}	34.75^{ab}	4.03
NSIC Rc 224	23.93^{a}	57.77^{e}	42.23^{a}	29.63^{c}	36.08^{ab}	4.01
NSIC Rc 226	21.53^{b}	66.49^{b}	33.51^{d}	34.57^{a}	43.00^{a}	5.01
NSIC Rc 238	21.14^{b}	61.43^{d}	38.57^{b}	27.67^{e}	37.06^{ab}	3.72
NSIC Rc 240	21.20^{b}	64.44^{b}	36.56^{c}	27.54^{e}	26.03^{b}	4.47
PSB Rc 82	21.32^{b}	63.38^{c}	36.62^{c}	27.36^{e}	32.58^{ab}	3.93
A X B	ns	**	**	ns	ns	ns
CVa (%)	2.56	8.63	16.05	0.83	27.50	17.32
CVb (%)	4.11	5.03	9.11	1.02	13.21	1.78
CVc (%)	3.57	7.23	13.10	0.76	17.77	9.35

Table 7. Cost and Return Analysis

VARIETY/ NUTRIENT MANAGEMENT	GRAIN YIELD (tons)	PRODUCTION COST (PhP)	GROSS INCOME (PhP)	NET INCOME (PhP)	RAVC (%)	PRODUCTION COST Kg grain^{-1} (PhP)
NSIC Rc 216						
Soil Analysis	4.17	47,137.00	83,400.00	36,263.00	76.93	11.30
MOET+LCC	5.25	38,075.00	105,000.00	66,925.00	175.77	7.25
Crop Manager	4.81	41,119.00	96,400.00	55,281.00	134.40	8.55
Farmer's Practice	4.07	37,641.00	81,400.00	43,759.00	116.25	9.25
NSIC Rc 222						
Soil Analysis	3.70	47,007.00	74,000.00	26,993.00	57.42	12.70
MOET+LCC	4.66	37,932.00	93,200.00	55,268.00	145.70	8.14
Crop Manager	4.16	40,950.70	83,200.00	42,249.30	103.07	9.84
Farmer's Practice	3.61	37,524.00	72,200.00	34,676.00	92.41	10.39
NSIC Rc 224						
Soil Analysis	3.42	46,942.00	68,400.00	21,458.00	45.71	13.71
MOET+LCC	4.75	37,945.00	95,000.00	57,005.00	150.36	7.99
Crop Manager	3.95	40,885.00	79,000.00	38,114.00	93.22	10.35
Farmer's Practice	3.93	37,602.00	78,600.00	40,998.00	109.03	9.57
NSIC Rc 226						
Soil Analysis	4.61	47,254.00	92,500.00	45,246.00	95.75	10.25
MOET+LCC	5.27	38,088.00	105,400.00	67,312.00	176.73	7.23
Crop Manager	5.54	41,301.70	110,000.00	68,692.30	166.32	7.46
Farmer's Practice	4.63	37,778.80	92,600.00	54,821.20	145.11	8.16
NSIC Rc 238						
Soil Analysis	3.32	46,916.00	66,400.00	19,484.00	41.53	14.13
MOET+LCC	4.56	37,906.00	91,200.00	53,294.00	140.60	8.31
Crop Manager	3.97	40,898.00	79,400.00	38,502.00	94.14	10.30
Farmer's Practice	3.04	37,368.00	60,800.00	23,432.00	62.71	12.72
NSIC Rc 240						
Soil Analysis	4.32	47,176.00	86,400.00	39,224.00	83.14	10.92
MOET+LCC	4.91	37,997.00	98,200.00	60,203.00	158.44	7.74
Crop Manager	4.60	41,054.70	92,000.00	50,945.00	124.09	8.92
Farmer's Practice	4.05	37,628.00	81,000.00	43,372.00	115.27	9.29
PSB Rc 82						
Soil Analysis	3.80	43,533.00	76,000.00	32,467.00	74.58	11.46
MOET+LCC	4.74	37,945.00	94,800.00	56,885.00	149.84	8.00

Conclusion

Based on the results of the study, inbred lowland rice varieties were suited and adapted in the locality, specifically, NSIC Rc 226 for it outweighed other varieties in terms of yield, gross income, net income and RAVC. In general varieties performed better on MOET+LCC.

Recommendations

Site-specific nutrient management provides scientific principles for optimally supplying rice with essential nutrients. It enables rice farmers to tailor nutrient management to the specific conditions of their field, and it provides a framework for nutrient best management practices.

The following recommendations are forwarded based on the conclusion and their implications.

To ensure at least an optimum rice yield, Soil analysis and nutrient manager can be used. However, MOET+LCC is recommended to attain maximum yield.

NSIC Rc 226 under MOET+LCC is highly recommended for it give the highest production, gross income, net income and RAVC.


Thank you