EFFECT OF TIMING OF CHICKEN MANURE APPLICATION ON THE GROWTH AND YIELD OF TRANSPLANTED IR64

A PROJECT REPORT

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BACHELOR OF SCIENCE IN AGRICULTURE

by

Timothy Nelson Doromal Arandela

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Presented by TIMOTHY NELSON DOROMAL ARANDELA in partial fulfillment of the requirements for the degree BACHELOR OF SCIENCE IN AGRICULTURE

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EFFECT OF TIMING OF CHICKEN MANURE APPLICATION ON THE GROWTH AND YIELD OF TRANSPLANTED IR64

by

Timothy Nelson D. Arandela

Blanquita S. Garcia, Adviser

This study was conducted from September 19, 1985 to January 11, 1986 at the experimental field of the Crops Research Laboratory, College of Agriculture, Central Philippine University, Jaro, Iloilo City, to determine the best time of applying chicken manure and to determine the effect of chicken manure on the growth and yield of transplanted IR64 rice.

A total land area of 130.35 square meters was divided into three blocks, each block representing a replication. Each replication was further divided into four plots, each one having a dimension of 2 x 4 meters. Each plot was fertilized with inorganic fertilizer in combination with chicken manure. The chicken manure were applied 4, 3, 2 and one week before transplanting to supply 30 kg of nitrogen per hectare. The plots were fertilized with inorganic fertilizer materials using ammonium sulfate and muriate of potash one day before transplanting. Last

application of inorganic fertilizer using ammonium sulfate was done 42 days after transplanting. All plots received an equivalent of 60-0-45 kg N, P_2O_5 and K_2O per hectare, respectively, coming from both organic and inorganic sources. The experimental treatments were arranged in a randomized complete block design replicated three times.

The results showed that the different timing of chicken manure application did not significantly affect plant height in all growth stages of the rice plant. Similarly, tiller count in all stages of growth except at 2 weeks after transplanting were not also affected.

Furthermore, the different timing of chicken manure application did not significantly affect the number of days from transplanting to flowering, weight of grains per panicle and weight of unfilled grains per hill. On the contrary, however, the weight of filled grains per hill was significantly affected by the different timing of chicken manure application at the 5 percent level of probability. Accordingly, the heaviest weight of filled grains was obtained from plants applied with chicken manure 4 weeks before transplanting, which was comparable to that obtained from plants applied with chicken manure 2 weeks before transplanting. These were significantly higher to the weight of filled grains obtained from plants applied with chicken manure 3 weeks before transplanting. The lowest was obtained from rice plants supplied with organic fertilizer one week before transplanting.

Yield of 90.03 cavans per hectare was observed from plots fertilized with chicken manure 2 weeks before transplanting. This yield was significantly more over the yield of plots fertilized 4, 3 and a week before transplanting which were 78.45, 75.76 and 71.94 cav/ha, respectively.

The return on investment analysis of the results revealed that for every peso invested a corresponding 4.63, 3.75, 3.28 and 3.50 return was obtained by applying chicken manure 2, 3, 4 and a week before transplanting, respectively.

Based on the results, the researcher recommends the application of chicken manure at two weeks before transplanting for maximum returns.

CHAPTER I

INTRODUCTION

Animal wastes have been utilized in rice production to increase yield and to maintain soil fertility. There is ample evidence to prove that much of the vast amount of animal wastes could be converted cheaply into organic fertilizer. The return to organic farming will bring about a host of benefits to the country. It will mean the employment of more rural labor, tremendous savings in foreign exchange we pay for imported petroleum and farm chemicals, and bigger income for rural population.[1]

Many researchers revealed that the use of organic manures have greater effect on the yield of the crop. Soil structure was not only improved but other essential mineral elements were also supplied to the plants. Furthermore, recycling of animal wastes have been advocated as a means of circumventing environmental pollution not withstanding its capability of increasing crop production.

The excreta of chickens is an example of animal waste used as an organic fertilizer. Chicken manure is

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[1]Domingo C. Abadilla, "Why Organic Farming," Organic Farming (Quezon City, Philippines: AFA Publications, Inc., 1982), p. 4.

generally valuable as soil conditioner. This organic manure help prevent soil erosion, crushing and cracking. It also retain soil humidity and improve the structure and internal drainage of the soil. Organic matter from this kind of manure promote bacterial and animal life in the soil.

Unfortunately, chicken manure like any other organic manures have low nitrogen, phosphorus and potassium contents. Nitrogen and other nutrients contained in organic matters are released slowly. To meet the required nutrient level of the crop, chicken manure should be applied in greater quantities. If the desired quantities of chicken manure are not available, inorganic fertilizers should be added to prevent nutritional deficiency on the plants.

One beneficial effect of using chicken manure is the considerable increase in crop yield which may be attributed to the fact that aside from being rich in N, P and K, the organic residues of chicken manure improves the physical properties of the soil where the plant grows. Animal manure like chicken manure also contains many minor elements and that it is an excellent host of beneficial soil organisms which furnish nourishment for plant growth and activity. In addition to the increase in crop yield, the use of organic fertilizers is thought to assist growing crops in developing resistance to diseases.

Fertilizer efficiency can be increased by getting higher yields with the same amount of nutrients absorbed if the crop absorbs a high proportion of nutrients added as fertilizer. One way to achieve this is to apply the fertilizer at a time to best meet the demand of rice.[2]

Face with an ever increasing prices and previous reports on the shortage of commercial fertilizers, the common farmer must be helped on his material inputs. One solution to this problem is the application of chicken manure to his crop such as rice. This study, therefore, is important because it would provide information to the farmers as to the best time to apply chicken manure on transplanted rice.

Objects of the study. This study was conducted to achieve the following objectives:

1. determine the best time to apply chicken manure; and

2. determine the effect of chicken manure on the growth and yield of transplanted IR64 rice variety.

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[2] Surajit L. De Datta, "Timing of Nitrogen Application," Principles and Practices of Rice Production (New York: John Wiley and Sons, Inc., 1981), p. 387.

<u>Time and place of the study</u>. This study was conducted from September 19, 1985 to January 11, 1986 in the experimental field of the Crops Research Laboratory, College of Agriculture, Central Philippine University, Jaro, Iloilo City.

CHAPTER II

REVIEW OF LITERATURE

The use of chicken dung as fertilizer has been studied and reported by many researchers. The general findings reveal that it considerably increases crop yield. This has been attributed to the fact that chicken dung is capable to supply essential macro- and micro-nutrients when applied in adequate amount, and at the same time, its residues improve the physical properties of the soil that favor the growth and development of the crop.[3]

Pelobello cited researchers who reported that manure application hastens the emergence of panicle of rice plant during the dry season, but does not significantly increase the tillering of the plants and grain yield during the wet season. Sombito reported that green onions fertilized with hog manure at 120 kg/ha produced

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[3]Pedro Sangatanan and Rene L. Sangatanan, "Results from the Use of Animal Manure," Organic Farming (Iloilo City, Philippines: Diolosa Publishing House, Incorporated, 1982), p. 92.

[4]Liwanag L. Pelobello, "The Response of BPI 3-2 Rice Variety to Organic Fertilizers Applied at Different Times,"(Unpublished Bachelor's Thesis, College of Agriculture, Central Philippine University, Iloilo City, 1976), p. 4.

the tallest plants and gave the highest yield of 5.58 tons per hectare compared to chicken manure-fertilized plants which gave a yield of 4.7 tons per hectare.[5]

Sombito also cited an analysis of dried poultry manure conducted at the University of the Philippines at Los Baños, which showed that the average nitrogen content of dried manure of broiler is 3.17 percent while manure from layers calculated on an oven-dried basis without litter has the following composition: nitrogen, 2.00 percent; phosphorus, 1.88 percent; potassium, 1.85 percent; $CaCO_3$, 2.50 percent; $MgCO_3$, 0.40 percent and boron, 5 ppm. It was further cited that microorganisms such as fungi, actinomycetes and bacteria are responsible for the decomposition of organic residue or organic matter in the soil. The final end product of organic decomposition is a black colloidal substance called humus. Humus has high water absorbing capacity, high nutrient retention, high buffering capacity and has many other actions in the soil.[6]

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[5]Felix F. Sombito, "Response of Green Onions to Different Organic Sources of Nitrogen," (Unpublished Bachelor's Project Report, College of Agriculture, Central Philippine University, Iloilo City, 1973), p. 1.

[6]Ibid., p. 65-66

Tisdale and Nelson stated that nitrogen in some form is needed for the decomposition of organic matter by heterotropic soil microorganisms. If the decomposing organic material has a small amount of nitrogen in relation to the carbon present, the microorganisms will utilize any NH_4^+ and NO_3^- present in the soil to further the decomposition process. This nitrogen is needed to permit rapid growth of microbial population which accompanies the addition to the soil of large supply of carbonaceous materials.[7]

Although organic manures are assuming increasing importance in rice production, there is little information on the decomposition of organic matter in flooded soil in the tropics. It is generally believed that flooding slows down the decomposition.[8]

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[7]Samuel L. Tisdale and Werner L. Nelson, Soil Fertility and Fertilizers (3rd edition; New York: Macmillan Publishing Co., Inc., 1975), p. 129.

[8]IRRI Annual Report for 1982 (Los Baños, Laguna, Philippines: International Rice Research Institute, 1983), pp. 264-265.

CHAPTER II

MATERIALS AND METHODS

Land preparation and field layout. A total land area of 130.35 square meters which was previously planted to rice was initially tilled using a spading fork, then harrowed twice using a carabao-drawn peg-toothed harrow. Pre-planting levelling of the area was done using a rake.

The area was divided into three blocks, each block representing a replication. Each replication was further divided into four plots, each one measuring 2 meters by 4 meters. A dike, 25 cm wide and 25 cm high was constructed to separate each treatment and for irrigation purposes.

Experimental treatments and design. The experiment was laid out in a randomized complete block design, replicated three times. The plots were fertilized at a recommended rate of 60-0-45 kg N, P_2O_5 and K_2O per hectare using inorganic fertilizer in combination with chicken manure. Four different timing of chicken manure application, namely: 4, 3, 2 and 1 week before transplanting constituted the treatments.

One and three-fourths kilograms of dried and well decomposed chicken manure (1.36% N) supposed to supply 30 kg N/ha were broadcasted and incorporated in 8 square meters plot. The chicken manure was incorporated by feet trampling right after broadcasting to facilitate mixing into the soil.

Fertilization. A fertilizer recommendation of 60-0-45 kg N, P_2O_5 and K_2O per hectare was recommended after soil and chicken manure samples were analyzed at the Bureau of Soils Regional Laboratory. Ammonium sulfate (21% N), muriate of potash (60% K_2O) and chicken manure (1.36% N) were used as fertilizer materials.

The total amount of nitrogen (114.40 gm) from the inorganic fertilizer was split applied into two equal parts per plot. One half of the recommended N was applied basally together with the total amount of muriate of potash at 30 gm per plot was applied one day before transplanting. The remaining half of nitrogen using ammonium sulfate (21% N) was topdressed 42 days after transplanting.

Soaking, incubation and sowing. One and one-half kilograms of IR64 seeds were soaked for 24 hours in a big container filled with clean water. After soaking, the seeds were incubated for 72 hours using the wetbed method covered with plastic sheets and jute sacks in a warm shady place in the Crops Research Laboratory. Continuous moistening of the seeds were done to prevent drying. The seeds were watered three times in one day and pressed lightly with the hand for firm establishment of roots and to prevent drying of the seedlings. Pressing and watering of seedlings were done continuously up to five days after sowing.

Transplanting and replanting of seedlings. Eighteen-day old seedlings were transplanted immediately using three seedlings per hill spaced at 20 x 20 cm between hills and rows. Replanting of missing hills was done ten days after transplanting to maintain the desired number of hills.

Water management. Water at a depth of 30 cm was admitted one week after transplanting. The depth of water was gradually increased up to 5-10 cm as the plant grew taller. Water was drained two days before chicken manure application to facilitate feet trampling. Two days after application of chicken manure, water was again admitted at a depth of 3 cm. The field was drained completely one week before harvest to hasten maturity and facilitate harvesting.

Pest control. Weeding was done as soon as the weeds become competitive using a scythe and by handpulling.

Insects such as rice stemborers (*Chilo suppressalis*), green leafhoppers (*Nephotettix virescens*), rice bugs (*Leptocorisca oratorius*) and other insects were controlled by spraying Nuvacron 300 SCW (0,0-dimethyl 0-(2-methyl-carbamoyl-1-methyl vinyl) phosphate) at the rate of 2 tbsp per 19 liters of water. Spraying was done three times and no spraying was done 2-3 weeks before harvesting.

Rodents were controlled by putting up baiting stations along the dike intersections as soon as signs of rat infestation became evident. The bait material used was commercial chick starter ration mixed with Racumin at a recommended mixing ratio of 1:19.

Harvesting and processing. Harvesting was done in a 5.92 square meter effective yield area, when 80 percent of the grains in the panicles showed full maturity as indicated by yellowing and drooping of panicles. A scythe was used in harvesting. The harvested grain samples were placed in separate plastic bags properly labelled with replication and treatment numbers.

Threshing was done by feet trampling and threshed grains were placed separately in properly labelled plastic bags. The threshed grains from every treatment were sun-dried for two days on empty sacks and the dried grains were winnowed using a flat basket after which all the grains were weighed. A 250-gm sample from each plot was obtained after weighing the grains for yield, and this was used in moisture content determination using a Steinlite moisture tester.

Data collected. Except yield, the following data were collected from ten randomly marked sample plants per replicated treatment. Agronomic characteristics were taken two weeks after transplanting.

1. Plant height. Height was measured from the base of the plant to the tipmost portion of the longest leaf at two-week intervals starting from two weeks after transplanting to panicle initiation stage (42 DAT). Final plant height was measured at harvest. Measurements were expressed in centimeters using a meterstick.

2. Tiller count. Tiller count was taken simultaneously with height measurement at two-week intervals starting from two weeks after transplanting until the maximum tillering stage. Tillers that have filled grains were considered productive while those which have unfilled grains were considered unproductive. The data for the tiller count was taken from ten randomly marked sample plants per replicated treatment.

3. Number of days from transplanting to flowering. This was taken when 50 percent of the plants had at least one opened spikelet exposing the anther. The data was taken from ten randomly marked sample plants per replicated treatment.

4. Weight of grains per panicle. This was taken by getting the total weight of grains per hill divided by the total number of panicles per hill to get the average from the ten randomly marked sample hills.

5. Weight of filled and unfilled grains. These were taken from the sundried grains of the ten randomly marked samples. The sundried grains were weighed using the Toledo platform balance. Filled and unfilled grains were obtained using the formulas:

$$\text{Weight of unfilled grains} = \text{Total weight of grains} - \text{Weight of filled grains}$$

$$\text{Weight of filled grains} = \text{Total weight of grains} - \text{Weight of unfilled grains}$$

6. Yield. Grain yield was corrected to 14 percent moisture content and was expressed in kilograms and cavans per hectare. Yield per plot was converted to yield per hectare using the formula:

$$\text{Yield (kg/ha)} = \frac{\text{Adjusted yield/plot} \times 10{,}000}{\text{Area per plot (sq m)}}$$

$$\text{Yield (cav/ha)} = \frac{\text{Yield (kg/ha)}}{\text{44 kg/cavan}}$$

<u>Statistical analysis</u>. Agronomic and yield data were statistically analyzed using the analysis of variance for randomized complete block design. Significant differences among treatment means were determined using the Duncan's multiple range test.

CHAPTER IV

RESULTS AND OBSERVATIONS

The periodic plant height measurements at 2, 4 and 6 weeks after transplanting and at harvest is shown in Table 1. Results showed no significant differences in all plants applied with chicken manure at weekly intervals before planting. At 2 weeks after transplanting, the rice plants applied with chicken manure 2 weeks before transplanting were taller than those plants applied with chicken manure 1, 3 and 4 weeks before transplanting. At 4 weeks after transplanting, the rice plants applied with chicken manure 2 weeks before transplanting maintained their height advantage over those fertilized with chicken manure but applied 1, 3 and 4 weeks before transplanting. The same trend was observed on plant height taken 6 weeks after transplanting. Final plant height measurement taken at harvest revealed that the height of transplanted IR64 was not significantly affected by the different timing of chicken manure application at the 5 percent level of probability.

The plants applied with chicken manure 2 weeks before transplanting grew slightly taller having an average height of 91.93 cm compared to the plants fertilized with chicken manure but applied at 1, 3 and 4 weeks before transplanting

Table 1. Periodic Plant Height Measurements.

Weeks After trans-planting	Time of chicken manure application	Replication I	II	III	Mean
	-WBT-	cm			
2	1	29.53	32.32	26.32	29.39^{ns}
	2	39.24	29.94	34.20	34.46
	3	29.36	29.13	30.35	29.61
	4	30.08	28.65	27.85	28.86
Mean		30.05	30.01	29.68	
4	1	53.14	52.30	53.87	53.02^{ns}
	2	60.93	54.94	53.87	56.58
	3	53.43	56.94	51.80	53.90
	4	53.21	51.67	49.94	51.61
Mean		55.18	53.85	52.31	
6	1	73.85	67.26	70.46	70.52^{ns}
	2	75.43	73.07	69.50	72.62
	3	68.99	74.05	69.49	70.84
	4	69.30	67.73	68.07	68.37
Mean		71.89	70.53	69.38	

-more-

Table 1. (continued)

Weeks After Trans-planting	Time of Chicken Manure Application	Replication I	II	III	Mean
	-WBT-	cm			
At Harvest	1	92.89	87.24	90.86	90.33^{ns}
	2	94.34	91.66	89.59	91.93
	3	89.60	93.65	90.55	91.27
	4	91.84	91.55	89.37	90.92
Mean		92.22	91.03	90.09	

^{ns}not significant at the 5% level of probability

WBT - weeks before transplanting

with an average height of 90.33, 91.27 and 90.92 cm, respectively.

Table 2 shows the periodic number of tillers at 2, 4 and 6 weeks after transplanting; tiller count of IR64 rice variety was significantly affected by the different treatments. Those plants applied with chicken manure 2 weeks before transplanting produced an average of 9.90 tillers and were comparable with those plants applied with chicken manure 3 and 4 weeks before transplanting, while those plants applied with chicken manure 1 week before transplanting had the least number of tillers with

Table 2. Periodic Tiller Count.

Weeks After Trans-planting	Time of Chicken Manure Application	Replication I	Replication II	Replication III	Mean
	-WBT-				
2	1	8.0	8.0	7.9	7.97^{b}
	2	9.4	9.8	10.5	9.90^{a}
	3	8.7	9.2	10.9	9.60^{a}
	4	8.1	9.3	10.9	9.43^{b}
Mean		8.55	9.08	10.05	
4	1	12.60	18.0	23.1	17.9^{ns}
	2	20.6	25.5	23.9	23.3
	3	21.2	19.8	23.5	21.5
	4	19.9	23.5	23.7	22.37
Mean		18.58	21.70	23.55	
6	1	18.8	15.9	17.8	17.5^{ns}
	2	16.0	20.3	16.3	17.53
	3	17.5	16.7	18.0	17.40
	4	17.4	19.9	18.3	18.53
Mean		17.43	18.2	17.6	

[ab] treatment means followed by the same letter superscripts are not significantly different from each other at the 5% level of probability

an average of 7.9. Results also showed that except at 2 weeks after transplanting, all other stages of growth of IR64 rice variety had tiller counts which were not significantly different from each other at the 5 percent level of probability.

The number of days from transplanting to flowering is shown in Table 3. Based on the results, the timing of chicken manure application on transplanted rice had no significant (P .05) effect on the number of days from transplanting to flowering. Furthermore, the average number of days from transplanting to flowering in most of the treatments was 55 days except in the treatment in which chicken manure was applied 2 weeks before transplanting with an average of 54.67 days from transplanting to flowering. However, this was statistically comparable with the flowering date obtained in the other treatments.

Table 4 shows the data on the number of productive and unproductive tillers at harvest. There were no significant differences on the number of productive and unproductive tillers among rice plants applied with chicken manure at weekly intervals before transplanting. The highest average productive tiller count was 11.53 observed in plants applied with chicken manure 4 weeks before transplanting, while the lowest with a value of 9.03 tillers was observed in plants applied with chicken manure one week before transplanting. On the other hand, the highest

Table 3. Number of Days from Transplanting to Flowering.

Time of Chicken Manure Application	Replication I	II	III	Mean
-WBT-				
1	55	55	55	55.00^{ns}
2	54	55	55	54.67
3	55	55	55	55.00
4	55	55	55	55.00
Mean	54.75	55.00	55.00	

^{ns}not significant at the 5% level of probability

WBT - weeks before transplanting

non-productive tiller count was observed in plants applied with chicken manure 2 weeks before transplanting, and the lowest was obtained from plants applied with chicken manure one and three weeks before transplanting.

The weight of grains per panicle shown in Table 5 showed non-significant differences among treatment means at the 5 percent level of probability. The plants applied with chicken manure 3 weeks before transplanting gave the heaviest grain weight of 2.10 grams per panicle on the average. The lightest grain weight per panicle was obtained in plants applied with chicken manure 4 weeks

Table 4. Number of Productive and Unproductive Tillers at Harvest.

Time of Chicken Manure Application	Tiller Count	Replication I	II	III	Mean
-WBT-					
1	Productive	9.8	8.0	9.3	9.03^{ns}
2		8.6	12.5	10.8	10.63
3		10.0	10.0	9.8	9.93
4		10.9	12.5	11.2	11.53
Mean		8.30	10.75	10.28	
1	Unproductive	1.0	1.0	1.0	1.0^{ns}
2		1.0	1.67	1.67	1.45
3		1.0	1.0	1.0	1.00
4		1.2	1.25	1.0	1.15
Mean		1.05	1.23	1.17	

^{ns}not significant at the 5% level of probability

WBT - weeks before transplanting

before transplanting with an average of 2.04 grams per panicle.

Data on weight of filled and unfilled grains are presented in Table 6. Results showed that filled grain

Table 5. Weight of Grains per Panicle.

Time of Chicken Manure Application	Replication I	II	III	Mean
-WBT-		gm		
1	1.92	2.15	2.07	2.05^{ns}
2	2.26	1.93	2.08	2.09
3	2.13	2.26	1.92	2.10
4	2.18	1.99	1.97	2.04

^{ns}not significant at the 5% level of probability

WBT - weeks before transplanting

production was significantly affected by the different timing of chicken manure application. Weight of filled grains from plants applied with chicken manure 4 weeks before transplanting was the heaviest with an average of 17.0 grams per panicle. This was comparable to the weight of grain per panicle of the plants applied with chicken manure 2 weeks before transplanting, which was significantly higher than the average weight of grain per panicle obtained from plants applied with chicken manure 3 weeks before transplanting. This in turn was higher than that obtained from plants applied with chicken manure one week before transplanting.

Table 6. Weight of Filled and Unfilled Grains per Panicle.

Time of Chicken Manure Application	Grain Type	Replication I	II	III	Mean
-WBT-		gm			
1	Filled	15.5	14.2	14.8	14.83[c]
2		14.9	18.7	17.1	16.90[a]
3		16.8	17.5	14.4	16.23[b]
4		18.2	17.9	17.0	17.70[a]
Mean		16.83	17.08	15.83	
1	Unfilled	1.71	1.50	1.63	1.61[ns]
2		1.25	1.33	1.00	1.19
3		1.50	1.13	1.60	1.41
4		1.80	1.29	1.67	1.59
Mean		1.57	1.31	1.48	

[ns] not significant at the 5% level of probability

[abc] treatment means followed by the same letter superscripts are not significantly different from each other at the 5% level of probability

WBT - weeks before transplanting

On the other hand, weight of unfilled grains per panicle was not significantly affected by the different timing of chicken manure application. Numerically, however, the plants applied with chicken manure one week before transplanting had the highest weight of unfilled grains per panicle with value of 1.61 gm per panicle, while those plants applied with chicken manure two weeks before transplanting had the lowest weight of unfilled grain per panicle with a value of 1.19 grams.

The yield of IR64 rice variety applied with chicken manure at weekly intervals starting from the fourth week before transplanting until one week before transplanting is shown in Table 7. Data revealed that grain yield was significantly affected by different timing application of chicken manure. The grain yield expressed in cavans per hectare and reckoned at 44 kg per cavan ranged from 90.03 cavans per hectare to 71.94 cavans per hectare with the maximum and minimum values obtained from plants applied with chicken manure at two and one week before transplanting. The average grain yield of 90.03 cavans per hectare obtained from plants applied with chicken manure 2 weeks before transplanting was statistically comparable with 78.45 and 75.76 cav/ha yields of plants applied with chicken manure 4 and 3 weeks before transplanting, respectively but significantly more than yield of plants fertilized with chicken manure a week before transplanting which was 71.94 cav/ha. only.

The return on investment analysis showed that

Table 7. Grain Yield of IR64 Rice Variety.

Time of Chicken manure Application	Replication I	II	III	Mean
-WBT-	cav/ha			
1	82.54	58.04	75.25	71.94[b]
2	86.00	93.67	90.41	90.03[a]
3	76.01	70.64	80.62	75.76[ab]
4	82.54	81.77	71.02	78.45[ab]
Mean	81.77	76.03	79.33	

[ab]treatments with common letter superscripts are not significantly different from each other at the 5 percent level of significance

WBT - weeks before transplanting

application of chicken manure 2 weeks before transplanting gave a return of ₱4.63 for every peso invested while applying chicken manure 3, 4 and a week before transplanting gave a corresponding ₱3.75, ₱3.88 and ₱3.50 return for every peso invested.

From the results of the analysis, the researcher recommends the application of chicken manure at two weeks before transplanting for maximum returns.

CHAPTER V

SUMMARY AND CONCLUSIONS

This study was conducted from September 19, 1985 to January 11, 1986 at the experimental field of the Crops Research Laboratory, College of Agriculture, Central Philippine University, Jaro, Iloilo City, to determine the best time of applying chicken manure and to know the effect of chicken manure on the growth and yield of transplanted IR64 rice.

A total land area of 130.35 square meters was divided into three blocks, each block representing a replication. Each replication was further divided into four plots each one measuring 2 meters by 4 meters. The plots were fertilized with inorganic fertilizer in combination with chicken manure. The chicken manure was applied 4, 3, 2 and one week before transplanting at the rate of 30 kg N/ha. One day before transplanting, the plots were fertilized with ammonium sulfate (21% N) and muriate of potash (60% K_2O). Last application of inorganic fertilizer using ammonium sulfate was done 42 days after transplanting. Ammonium sulfate (21% N) and muriate of potash (60% K_2O) were applied at the total rate of 30 kg N/ha and 30 kg K_2O/ha, respectively. The experimental treatments were arranged in randomized complete block design replicated three times.

Rice seedlings were raised using the wetbed method. Three seedlings were transplanted at 20 x 20 cm distance between hills and rows with a total of 200 hills per plot. Weeds were pulled out manually and controlled as soon as they became competitive. Insect pests were controlled by applying Nuvacron 300 SCW based on the recommended rate of 2 tbsp/19 liters of water. Rodents were controlled by putting baiting stations along the dike intersections as soon as signs of infestation became evident. The bait material used was commercially prepared chick starter mash mixed with Racumin at the recommended mixing ratio of 1:19.

The results showed that the different timing of chicken manure application did not significantly affect plant height at all stages. Tiller count at 2 weeks after transplanting was significantly affected by the different timing of chicken manure application, but not at 4 and 6 weeks after transplanting.

Moreover, the different timing applications of chicken manure did not show significant differences on number of days from transplanting to flowering, weight of grains per panicle and weight of grains. Results further showed that weight of filled grains was significantly affected by the different timing of chicken manure application, but not the weight of unfilled grains. The highest weight of filled grains per panicle was obtained from plants applied with chicken manure 4 weeks before transplanting which was comparable with that obtained from plants applied with chicken manure 2 weeks before transplanting. This was significantly (P .05) higher than the weight of filled grains per panicle of plants applied with chicken manure 3 weeks before transplanting which, in turn, was significantly (P .05) higher than that obtained from plants applied with chicken manure one week before transplanting.

The different timing of chicken manure application did not show any significant effect on the grain yield of IR64 rice variety, numerically however, plants applied with chicken manure 2 weeks before transplanting gave the highest average yield of 90.03 cavans per hectare reckoned at 44 kilograms per cavan.

Based on the results of this study, the researcher recommends the application of chicken manure to transplanted rice two weeks before transplanting to provide adequate time for the organic fertilizer material to decompose and its nitrogen content to mineralize into forms available to rice plants in order to obtain considerable yield advantage.

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A P P E N D I X

Table 8. Plant Height at 2 Weeks After Transplanting.

Time of Chicken Manure Application	Replication I	II	III	Mean
-WBT-		cm		
1	29.53	32.32	26.32	29.36
2	39.24	29.94	34.20	34.46
3	29.36	29.12	30.35	29.61
4	30.08	28.65	27.85	28.86
Mean	30.05	30.01	29.68	

Table 9. Analysis of Variance on Plant Height at 2 Weeks After Transplanting.

Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Values Calculated	F Values Tabular .05	F Values Tabular .01
Block	2	13.22	6.61			
Treatment	3	61.11	20.37	2.37[ns]	4.76	9.78
Error	6	51.55	8.59			
Total	11	125.88				

c.v. = 9.59%

[ns] not significant at the 5% level of probability

Table 10. Plant Height at 4 Weeks After Transplanting.

Time of Chicken Manure Application	Replication I	II	III	Mean
-WBT-	cm			
1	53.14	52.30	53.62	53.02
2	60.93	54.94	53.87	56.58
3	53.43	56.47	51.80	53.90
4	53.21	51.67	49.94	51.61
Mean	55.18	53.85	52.31	

Table 11. Analysis of Variance on Plant Height at 4 Weeks After Transplanting.

Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Values Calculated	Tabular .05	Tabular .01
Block	2	16.50	8.25			
Treatment	3	39.47	13.16	2.64^{ns}	4.76	9.78
Error	6	29.94	4.99			
Total	11	85.91				

c.v. = 4.15%

^{ns}not significant at the 5% level of probability

Table 12. Plant Height at 6 Weeks After Transplanting.

Time of Chicken Manure Application	Replication I	II	III	Mean
-WBT-		cm		
1	73.85	67.26	70.46	70.52
2	75.43	73.07	69.50	72.67
3	68.99	74.05	69.49	70.84
4	69.30	67.73	68.07	68.37
Mean	71.89	70.53	69.38	

Table 13. Analysis of Variance on Plant Height at 6 Weeks After Transplanting.

Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Values Calculated	Tabular .05	Tabular .01
Block	2	12.66	6.33			
Treatment	3	27.97	9.32	1.28[ns]	4.76	9.78
Error	6	43.80	7.30			
Total	11	84.43				

c.v. = 3.83%

[ns]not significant at the 5% level of probability

Table 14. Final Plant Height.

Time of Chicken Manure Application	Replication I	II	III	Mean
-WBT-	cm			
1	92.89	87.24	90.86	90.33
2	94.54	91.66	89.59	91.93
3	89.60	93.65	90.66	91.27
4	91.84	91.55	89.37	90.92
Mean	92.22	91.03	90.09	

Table 15. Analysis of Variance on Final Plant Height.

Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Values Calcu-lated	Tabular .05	Tabular .01
Block	2	9.08	4.54			
Treatment	3	4.02	1.34	0.25^{ns}	4.76	9.78
Error	6	32.28	5.38			
Total	11	45.38				

c.v. = 2.55%

^{ns}not significant at the 5% level of probability

Table 16. Tiller Count at 2 Weeks After Transplanting.

Time of Chicken Manure Application	Replication I	II	III	Mean
-WBT-				
1	8.0	8.0	7.9	7.97
2	9.4	9.8	10.5	9.90
3	8.7	9.2	10.9	9.60
4	8.1	9.3	10.9	9.43
Mean	8.55	9.08	10.05	

Table 17. Analysis of Variance on Tiller Count at 2 Weeks After Transplanting.

Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Values Calculated	F Values Tabular .05	F Values Tabular .01
Block	2	4.64	2.32			
Treatment	3	6.67	2.22	5.13*	4.76	9.78
Error	6	2.60	0.43			
Total	11	13.91				

c.v. = 7.13%

*significant at the 5% level of probability

Table 18. Tiller Count at 4 Weeks After Transplanting.

Time of Chicken Manure Application	Replication I	II	III	Mean
-WBT-				
1	12.6	18.0	23.1	17.90
2	20.6	25.5	23.9	23.33
3	21.2	19.8	23.5	21.50
4	19.9	23.5	23.7	22.37
Mean	18.58	21.70	23.55	

Table 19. Analysis of Variance on Tiller Count at 4 Weeks After Transplanting.

Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Values Calculated	Tabular .05	Tabular .01
Block	2	50.59	25.29			
Treatment	3	50.61	16.87	3.05^{ns}	4.76	9.78
Error	6	33.17	5.53			
Total	11	134.37				

c.v. = 11.05%

^{ns}not significant at the 5% level of probability

Table 20. Tiller Count at 6 Weeks After Transplanting.

Time of Chicken Manure Application	Replication I	II	III	Mean
-WBT-				
1	18.8	15.9	17.8	17.50
2	16.0	20.3	16.3	17.53
3	17.5	16.7	18.0	17.40
4	17.4	19.9	18.3	18.53
Mean	17.43	18.20	17.60	

Table 21. Analysis of Variance on Tiller Count at 6 Weeks After Transplanting.

Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Values Calculated	Tabular .05	Tabular .01
Block	2	1.32	0.66			
Treatment	3	2.54	0.85	0.27^{ns}	4.76	9.78
Error	6	18.61	3.10			
Total	11	22.47				

c.v. = 9.93%

^{ns}not significant at the 5% level of probability

Table 22. Number of Productive Tillers at Harvest.

Time of Chicken Manure Application	Replication I	II	III	Mean
-WBT-				
1	9.8	8.0	9.3	9.03
2	8.6	12.5	10.8	10.63
3	10.0	10.0	9.8	9.93
4	10.9	12.5	11.2	11.53
Mean	9.83	10.75	10.28	

Table 23. Analysis of Variance on Number of Productive Tillers at Harvest.

Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Values Calculated	Tabular .05	Tabular .01
Block	2	1.71	0.86			
Treatment	3	10.11	3.37	2.21^{ns}	4.76	9.78
Error	6	9.14	1.52			
Total	11	20.96				

c.v. = 12.00%

^{ns}not significant at the 5% level of probability

Table 24. Number of Unproductive Tillers at Harvest.

Time of Chicken Manure Application	Replication I	II	III	Mean
-WBT-				
1	1.0	1.0	1.0	1.00
2	1.0	1.67	1.67	1.45
3	1.0	1.0	1.0	1.00
4	1.2	1.0	1.0	1.15
Mean	1.05	1.23	1.17	

Table 25. Analysis of Variance on Number of Unproductive Tillers at Harvest.

Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Values Calcu- lated	Tabular .05	.01
Block	2	0.07	0.03			
Treatment	3	0.40	0.13	2.98[ns]	4.76	9.78
Error	6	0.27	0.04			
Total	11	0.74				

c.v. = 18.37%

[ns]not significant at the 5% level of probability

Table 26. Number of Days from Transplanting to Flowering.

Time of Chicken Manure Application	Replication I	II	III	Mean
-WBT-				
1	55	55	55	55.00
2	54	55	55	54.67
3	55	55	55	55.00
4	55	55	55	55.00
Mean	54.75	55.00	55.00	

Table 27. Analysis of Variance on Number of Days from Transplanting to Flowering.

Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Values Calcu-lated	Tabular .05	Tabular .01
Block	2	0.17	0.08			
Treatment	3	0.25	0.08	1.00^{ns}	4.76	9.78
Error	6	0.50	0.08			
Total	11	0.92				

c.v. = 0.53%

^{ns}not significant at the 5% level of probability

Table 28. Weight of Grains per Panicle.

Time of Chicken Manure Application	Replication I	II	III	Mean
-WBT-	gm			
1	1.92	2.15	2.07	2.05
2	2.26	1.93	2.08	2.09
3	2.13	2.26	1.92	2.10
4	2.18	1.99	1.97	2.04
Mean	2.12	2.08	2.01	

Table 29. Analysis of Variance on Weight of Grains per Panicle.

Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Values Calculated	F Values Tabular .05	F Values Tabular .01
Block	2	0.03	0.01			
Treatment	3	0.01	0.00	0.11^{ns}	4.76	9.78
Error	6	0.14	0.02			
Total	11	0.18				

c.v. = 7.41%

^{ns}not significant at the 5% level of probability

Table 30. Weight of Filled Grains per Hill.

Time of Chicken Manure Application	Replication I	II	III	Mean
-WBT-		gm		
1	15.5	14.2	14.8	14.83
2	14.9	18.7	17.1	16.90
3	16.8	17.5	14.4	16.23
4	18.2	17.9	17.0	17.70
Mean	16.35	17.08	15.43	

Table 31. Analysis of Variance on Weight of Filled Grains per Hill.

Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Values Calculated	Tabular .05	Tabular .01
Block	2	3.15	1.58			
Treatment	3	13.26	4.42	9.34*	4.76	9.78
Error	6	11.04	1.84			
Total	11	27.46				

c.v. = 8.28%

*significant at the 5% level of probability

Table 32. Weight of Unfilled Grains per Hill.

Time of Chicken Manure Application	Replication I	Replication II	Replication III	Mean
-WBT-	gm			
1	1.71	1.50	1.63	1.61
2	1.25	1.33	1.00	1.19
3	1.50	1.13	1.60	1.41
4	1.80	1.29	1.67	1.59
Mean	1.57	1.31	1.48	

Table 33. Analysis of Variance on Unfilled Grains per Hill.

Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Values Calcu-lated	Tabular .05	.01
Block	2	0.13	0.07			
Treatment	3	0.34	0.11	3.17^{ns}	4.76	9.78
Error	6	0.21	0.04			
Total	11	0.68				

c.v. = 13.01%

^{ns}not significant at the 5% level of probability

Table 34. Grain Yield of IR64.

Time of Chicken Manure Application	Replication I	II	III	Mean
-WBT-	cav/ha			
1	82.54	58.04	75.25	71.94
2	86.00	93.67	90.41	90.03
3	76.01	70.64	80.62	75.76
4	82.54	81.77	71.02	78.45
Mean	81.77	76.03	79.33	

Table 35. Analysis of Variance on Grain Yield of IR64.

Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F Values Calculated	Tabular .05	Tabular .01
Block	2	133,907.15	66,953.58			
Treatment	3	1,070,831.4	356,943.80	2.62ns	4.76	9.78
Error	6	818,220.4	136,370.07			
Total	11	2,022,958.98				

c.v. = 10.62%

ns not significant at the 5% level of probability