*Biological Forum – An International Journal* **13(3a): 253-260(2021)**

**ISSN No. (Print): 0975-1130**
**ISSN No. (Online): 2249-3239**

# Efficiency of different Manures on the Growth and Yield of Rice (*Oryza sativa*) under open Condition

***R. Vijaykumar[1*], Biswarup Mehera[2] and Neelam Khare[3]***
*[1]Ph. D. Research Scholar, Department of Silviculture & Agroforestry, College of Forestry, SHUAT, Naini, Prayagraj, (Uttar Pradesh), India.*
*[2]Associate Professor & Associate Dean, Department of Agronomy, SHUAT, Naini, Prayagraj, (Uttar Pradesh), India.*
*[3]Associate Professor & Head, Department of Forest Products and Utilization, College of Forestry, SHUAT, Naini, Prayagraj, (Uttar Pradesh), India.*

*(Corresponding author:* R. Vijaykumar**)*
*(Received 03 July 2021, Accepted 10 September, 2021)*
*(Published by Research Trend, Website: www.researchtrend.net)*

**ABSTRACT: A field experiment was conducted at Forest Nursery and research Centre (College of Forestry) of Sam Higginbottom University of Agriculture, Technology & Sciences Prayagraj during *kharif* season 2019 with sixteen treatments replicated thrice in a randomized block design to efficiency of different Manures on the growth and yield of Rice (*Oryza sativa*) under open condition along with discussion on the experiment finding in the light of scientific reasons to understand the cause and effect relationship dully supported by finding. The data regarding growth, yield attributes, yield, soil physic-chemical parameter were recorded at suitable crop growth stage, respectively were the manures in the experimental field. Among the organic manure, green manure, green leaf manure with control treatments, result shows that significantly. The maximum performance of grain yield observed in $T_6$ (44.41 q ha$^{-1}$) (50% goat manure + 50% green manure (*Crotalaria juncea*) followed by $T_{10}$ (43.55q ha$^{-1}$) (50% goat manure + 50% green leaf manure (*Pongamia glabra*) respectively and minimum grain yield recorded in $T_0$ (37.06 q ha$^{-1}$) (control). The maximum performance of straw yield observed in $T_6$ (25.23q ha$^{-1}$) (50% goat manure + 50% green manure (*Crotalaria juncea*) and minimum straw yield recorded in $T_0$ (23.63q ha$^{-1}$) (control). The maximum performance of biological yield observed in $T_6$ (69.64 q ha$^{-1}$) (50% goat manure + 50% green manure (*Crotalaria juncea*) and minimum biological yield recorded in $T_0$ (60.70q ha$^{-1}$) (control). The maximum performance of harvest index observed in $T_6$ (63.76%) (50% goat manure + 50% green manure *Crotalaria juncea*) and minimum harvest index recorded in $T_0$ (61.06%) (control) under open condition.**

**Keywords:** Rice, Organic Manures, Green Manures, Green leaf manures Manure, open condition.

## INTRODUCTION

On a yearly basis, make use of naturally suitable amendments available nearby, along with organics manure with green manures, in order to balance the harmful effect and maintain a friendly eco-system in farmers land for profit maximization and to restore yield, economic soil fertility status for succeeding crop in farmers land. Furthermore, implement long-term fertility control by adding only organic manures in soil with varying quantities of green manures. Study analysis may be done on the same crop with different organics and green manures, in terms of growth, intake yield, and soil nutrient absorption with and without organic manures, in order to maintain soil health and economic output of rice in a *Moringa oleifera* based agroforestry system.

Agricultural forestry is more effective than agriculture in ensuring nutrient recycling. This hypothesis is based on the premise that agricultural trees often transfer nutrients to intercropping, partially on the effective recycling of nutrients in leafy trees in natural ecosystems. Although several studies of decomposition and release of nutrients have been performed in the tropics, there are few studies conducted in agro-forestry systems for decomposition (Petit-Aldana, *et al.,* 2019). The Indian Agricultural Research Council is discussing its ranges and has begun to collect data bases for policy support from various regions of the country. After all, India belongs to the region known as the cradle of agroforestry and has also pioneered scientific developments on the subject. It is time to grow this sector for income and the creation of workers (Chahal, 2019). Agroforestry is a method of land management, bringing trees and shrubs in agriculture environments to boost productivity in agriculture and farm sustainability (Sharma and Sah, 2020). Agro forestry is a technique in field conditions to change the microclimate. In contrast to monoculture of trees or crops, it offers more opportunities for productive use of natural resources. As a new science branch in the late 1970's, agroforestry is unknown about the form of trees that can be cultivated in combination with arable crops, while multi-purpose trees are a priority (Hulke *et al.*, 2020).

The traditional rice farming method is to flood the fields while or after the young seedlings are placed. This simple strategy involves solid irrigation planning, but inhibits the development, without submerging growth, of less robust weed and pesticides. Although flooding is not required for rice farming, all other irrigation methods demand additional effort during growth seasons in weed and in pest management and a new strategy to soil fertilization. For rural people and their food safety Rice is one of the major foodstuffs and a pillar. It is typically grown in farms of less than one hectare by small farmers. In the cash crop or not in agriculture sectors, rice is also a salary commodity. For many people living in Asia, Latin America, the Caribbean and Africa, rice is critical for the food security of more than half the world's populations; it is essential to the food security of the population.

Cultivation is an agroforestry activity in which permanent trees or backslides are developed at the same time as arable crops. The soil fertility decreases rapidly because of intensive agriculture, which means that the yield of the crop is decreased. Cultivation of various chemical fertilizers, pesticides, rapidly destroying natural soil habitats, polluting water supplies and the atmosphere, correlated with the use of intensive crops (Mondal *et al.,* 2014). Quick growing leguminous tree or shrub species such as *Gliricidia sepium* are favoured as an alley cultivation as they recycle nutrients, contribute to the biological fixation of nitrogen and provide fuel, fodder and wood. Wider spacing minimises competition in tree-crops and a smaller spacing maximises weed control and competition in tree-crops. Therefore, the advantages of this method for nitrogen saving, crop performance and various alley widths in a flatland agroecosystem are investigated.

Organic matter is regarded as a significant parameter in soil fertility and productivity. Their physical structure, plant nutrient sinks and biological averages play a major role in the soil. Organic matter is the principal contribution to soil fertility. It nutritionally replenishes the soil, enhances the retention of water and enables the soil to retain a more effective ventilation for plant root germination and growth (Sarwar *et al.*, 2008). Compost can enhance organic matter status in soil because compost is a rich source of nutrients of high organic matter. Minimal studies have been carried out to assess the impacts of inorganic fertilisers and organic organic combination on rice in Prayagraj (FYM, Vermicompost and Poultry manure). As a consequence of this study, chemical and organic fertilizer impacts were investigated in sandy ground Prayagraj on production, yield, nutrient uptake and consistency of rice (U.P.).

Organic farming is one technique to strengthen the sustainable system of production. In the past 10 years, India has rapidly taken on organic farming without negative environmental and environmental effects Many organic manures are the key of the success of organic farming (Bista & Dahal 2018). Biofertilizers are of particular importance for biofarming to improve soil fertility by fixing atmospheric nitrogen, solubilizing soil phosphorus or accelerating plant growth by enhanced substance growth synthesis.

Tree, plant and pasture land use systems play an important role in the enhancement of soil fertility and its quality in many ways. According to when researching the impact of agro-forestry, one needs to investigate whether agro-forestry systems are regulating the degradation of soil. Preserve the physical properties of the soil. Include the fixation of nitrogen, increase soil nutrients inputs, promote efficient nutrient cycling. Nair, (1984) has noted the ability to minimise erosion and debris, preserve soils organic matter, enhance soil physical properties and increase nitrogen fastening and encourage the efficient cycle of nutrients by the agro-forestry, agri-horticultural and agri-pastoral systems. Many other employees stressed the value of alleys and agro-harvesting (Sharma, 2008).

Increased soil features include the aggregation, preservation of water, hydraulic conductivity and mass density, the compaction ratios, fertility, and resistance to wind and water have been found to be added to organic matter. Rice is one of the most significant staple foods for more than half of the world's population. Previous research have been reported on checks for the (Kumari, 2013). It is ubiquitous across the globe, regardless of nationality, religion or politics. In the central arid area of Myanmar, rice is produced from rain but is grown in locations that may be irrigated as an irrigated crop. Gravel, sandy loam and sandy soils characterize the drier parts of the region. Green dung could minimize soil exposure to erosive processes, enhance nutrient cycling and improve the harmonies between nutrient release and crop demand. The potential advantages of green dung as a food source can only be realized if patterns of nutrient degradation and release are recognized to increase simultaneous nutrient releases when plants are demanding nutrients.

The leguminous $N_2$ fixing tree Pongamia pinnata is native to India and is typically cultivated as an avenue and field borders. This tree is naturally located along the banks of the river and on popular areas of the village. Springing rich in oil (28-42%) and good biodiesel preparation is pongamia seeds (29%). In remote tribal hamlets straight and vegetable oil, a by-product after extracting oil is locally available for power generators to supply electricity and olive grounds (75% of the seed weight). As a source of plant nutrients for promoting the productivity of rainfed crops, large areas of deteriorated crops are being planted in Pongamia in addition to the large number of existing forest trees, a decentralised oil extraction model at villager level and added value to the by-product oilseed cake was evaluating. This will also contribute to greater oilseed cake availability. Previous researchers assessed Pongamia oleaginous cake to increase the performance of fertilizer N as a nitrification inhibitor in soil (Osman *et al.*, 2009). The study was conducted to determine the economic value and suitability of Pongamia seed cake as a sustainable source of herbal nutrients and the tendency to external supplies reduced.

## MATERIALS AND METHODS

The present investigation on efficiency of different manures on the growth and yield of Rice (*Oryza sativa)* under open condition was conducted at Forest Nursery and research Centre (College of Forestry) of Sam Higginbottom University of Agriculture, Technology & Sciences Prayagraj during *kharif* season 2019-2020.Treatment Combinations $T_0$. Control (no manures no fertilizers), $T_1$. 50% FYM + 50% green manure (*Crotalaria juncea*), $T_2$. 50% FYM + 50% green manure (*Sesbania aculeata*), $T_3$. 50% FYM + 50% green leaf manure (*Azadirachta indica*), $T_4$. 50% FYM + 50% green leaf manure (*Delonix regia)*, $T_5$. 50% FYM + 50% green leaf manure (*Pongamia glabra*), $T_6$. 50% goat manure + 50% green manure (*Crotalaria juncea*), $T_7$. 50% goat manure + 50% Green manure (*Sesbania aculeata*), $T_8$. 50% goat manure + 50% green leaf manure (*Azadirachta indica*), $T_9$. 50% goat manure + 50% green leaf manure (*Delonix regia),* $T_{10}$. 50% goat manure + 50% green leaf manure (*Pongamia glabra*), $T_{11}$. 50% poultry manure + 50% green manure (*Crotalaria juncea*), $T_{12}$. 50% Poultry manure + 50% green manure (*Sesbania aculeata*), $T_{13}$. 50% poultry manure + 50% green leaf manure (*Azadirachta indica),* $T_{14}$. 50% poultry manure + 50% green leaf manure (*Delonix regia)*, $T_{15}$. 50% poultry manure + 50% green leaf manure (*Pongamia glabra*). The requisite agronomic and plant protection measures were adopted uniformly for all the treatments during the entire growing period. At maturity, data on plant characters and yield components were recorded from five randomly selected plants in each plot. The growth and yield characters were recorded such as plant height at harvest (cm), number of total tillers plant$^{-1}$, number of effective tillers per hill$^{-1}$, spike length (cm), length of panicle (cm), number of panicle per hill$^{-1}$, number of grains per hill$^{-1}$, 1000-seed weight (g), grain yield (t ha$^{-1}$), straw yield (t ha$^{-1}$), biological yield (q ha$^{-1}$) and harvest index(%). The crop from each unit plot was harvested at full maturity to record the data on grain and straw yields. Soil physic-chemical parameter, Soil characteristics Initial soil status of the experimental field during 2019. The physico-chemical properties of experimental field are presented in Soil depth (0-15 cm). The soil pH 6.91 (1: 2 soil: water), electrical conductivity – 0.25 dS m$^{-1}$, organic carbon -0.31 (%), available nitrogen - 151.52 kg ha$^{-1}$, available phosphorus 14.80 kg ha$^{-1}$, Available potassium 240.03 kg ha-$^{1}$. The data was analyzed statistically.

## RESULTS AND DISCUSSION

The finding have been presented in the light of scientific reasons to understand the cause and effect relationship dully supported by finding of the previous researchers. The data regarding growth, yield attributes, yield, economics, soil physic-chemical parameter were recorded at suitable crop growth stage. The data were subjected to statistical analysis for the convenience of drawing valid conclusion. Some characters are also illustrated with help of graphs wherever felt essential to clarify the results the maximum plant height was showed in $T_6$(105.82 cm) (50% Goat manure + 50% Green manure (*Crotalaria juncea*), followed by $T_{10}$(105.62 cm) (50% goat manure + 50% green leaf manure (*Pongamia glabra*) and $T_7$ (104.42 cm) 50% goat manure + 50% green leaf manure (*Azadirachta indica*), respectively. minimum plant height recorded in $T_0$ (96.95 cm) (control) rice (*Oryza sativa)* under open condition. Plant height was significant. The maximum number of tillers was showed in $T_6$ (69.40) (50% goat manure + 50% green manure *(Crotalaria juncea*) followed by $T_{10}$ (68.87) (50% goat manure + 50% green leaf manure (*Pongamia glabra*) and $T_8$ (68.53) (50% goat manure + 50% green leaf manure (*Azadirachta indica*), respectively. Minimum number of tillers recorded in $T_0$ (62.13) (control) rice (*Oryza sativa)* under open condition. Number of tillers was significant. The maximum leaf length (cm) was showed in $T_6$ (64.83cm) (50% goat manure + 50% green manure (*Crotalaria juncea*) followed by $T_{10}$ (64.36cm) (50% goat manure + 50% green leaf manure (*Pongamia glabra*), and $T_8$ (64.56cm) 50% goat manure + 50% green leaf manure (*Azadirachta indica*) respectively. Minimum leaf length (cm) recorded in $T_0$ (58.09 cm) (control) rice (*Oryza sativa*) under open condition. The maximum leaf area index was showed in $T_6$ (10.01) (50% goat manure + 50% green manure (*Crotalaria juncea*) followed by $T_{10}$ (9.93) (50% goat manure + 50% green leaf manure *Pongamia glabra*) and $T_8$ (9.86) 50% Goat manure + 50% green leaf manure (*Azadirachta indica*) respectively. Minimum leaf area index recorded in $T_0$ (8.82) (control) rice (*Oryza sativa)* under open condition. The maximum performance of plant fresh weight was observed in $T_6$ (205.00 g hill$^{-1}$) (50% Goat manure + 50% green manure (*Crotalaria juncea*), followed by $T_{10}$ (203.67g hill$^{-1}$) (50% goat manure + 50% green leaf manure (*Azadirachta indica*), and $T_7$ (203.00g hill$^{-1}$) 50% Goat manure + 50% green leaf manure (*Pongamia glabra*) respectively and minimum plant fresh weight recorded in $T_0$ (186.33g hill$^{-1}$) (control) Rice (*Oryza sativa)* under open condition.

**Table 1: Efficiency of manures on growth attributes at the different treatments of Rice (*Oryza sativa*) under open condition.**

| Treatment | Plant height (cm) | Number of Tillers | Leaf Length (cm) | LAI | Plant fresh weight (g hill$^{-1}$) | Plant dry weight (g hill$^{-1}$) |
|---|---|---|---|---|---|---|
| $T_1$ | 100.09 | 64.73 | 60.69 | 9.31 | 190.00 | 112.33 |
| $T_2$ | 99.22 | 63.80 | 59.69 | 9.18 | 187.67 | 110.00 |
| $T_3$ | 99.42 | 63.93 | 59.96 | 9.25 | 188.67 | 111.00 |
| $T_4$ | 98.89 | 63.20 | 59.36 | 9.11 | 187.00 | 109.33 |
| $T_5$ | 99.62 | 64.13 | 60.23 | 9.27 | 189.33 | 111.67 |
| $T_6$ | 105.82 | 69.40 | 64.83 | 10.01 | 205.00 | 126.00 |
| $T_7$ | 104.22 | 68.20 | 63.69 | 9.78 | 201.67 | 122.00 |
| $T_8$ | 104.42 | 68.53 | 64.56 | 9.86 | 203.00 | 123.33 |
| $T_9$ | 103.95 | 67.87 | 63.56 | 9.69 | 200.33 | 120.67 |
| $T_{10}$ | 105.62 | 68.87 | 64.36 | 9.93 | 203.67 | 124.00 |
| $T_{11}$ | 102.95 | 66.87 | 62.83 | 9.59 | 196.33 | 119.00 |
| $T_{12}$ | 101.29 | 65.87 | 61.83 | 9.50 | 193.67 | 116.33 |
| $T_{13}$ | 101.49 | 66.47 | 62.09 | 9.54 | 194.67 | 117.33 |
| $T_{14}$ | 100.69 | 65.67 | 61.23 | 9.43 | 193.00 | 115.67 |
| $T_{15}$ | 102.29 | 66.67 | 62.69 | 9.39 | 195.00 | 117.67 |
| $T_0$ | 96.95 | 62.13 | 58.09 | 8.82 | 186.33 | 109.00 |
| **F-test** | S | S | S | S | S | S |
| **C.D.(P=0.005)** | 0.428 | 0.679 | 0.399 | 0.177 | 7.605 | 7.671 |
| **SE(m)** | 0.147 | 0.234 | 0.138 | 0.061 | 2.620 | 2.643 |
| **SE(d)** | 0.209 | 0.331 | 0.195 | 0.086 | 3.706 | 3.738 |
| **C.V.** | 0.251 | 0.614 | 0.385 | 1.113 | 2.331 | 3.927 |

The maximum performance of plant dry weight was observed in $T_6$ (126.00g hill$^{-1}$) (50% goat manure + 50% green manure *Crotalaria juncea*) followed by $T_{10}$ (124.00g hill$^{-1}$) (50% goat manure + 50% green leaf manure *Pongamia glabra*) and $T_8$ (123.33g hill$^{-1}$) 50% goat manure + 50% green leaf manure(*Azadirachta indica*), respectively and minimum Plant dry weight recorded in $T_0$ (109.00 g hill$^{-1}$) (control) rice (*Oryza sativa)* under open condition. The maximum performance of length of panicle was observed in $T_6$ (29.10cm) (50% goat manure + 50% Green manure (*Crotalaria juncea*) followed by $T_{10}$ (28.80 cm) (50% Goat manure + 50% Green leaf manure (*Pongamia glabra*) and $T_8$ (28.13 cm) 50% Goat manure + 50% green leaf manure (*Azadirachta indica*) respectively and minimum length of panicle recorded in $T_0$ (22.30 cm) (control) rice (*Oryza sativa)* under open condition. The maximum performance of number of panicle was observed in $T_6$ (58.80 hill$^{-1}$) (50% goat manure + 50% green manure (*Crotalaria juncea*) followed by $T_{10}$ (58.40 hill$^{-1}$) (50% goat manure + 50% green leaf manure (*Pongamia glabra*) and $T_8$ (58.40 hill$^{-1}$) 50% goat manure + 50% green leaf manure (*Azadirachta indica*) respectively and minimum number of panicle recorded in $T_0$ (50.87 hill$^{-1}$) (control) Rice (*Oryza sativa)* under open condition. The maximum performance of number of effective tillers per hill$^{-1}$ was observed in $T_6$ (7.00 per hill$^{-1}$) (50% goat manure + 50% *Crotalaria juncea*) followed by $T_{10}$ (7.50 per hill$^{-1}$) (50% goat manure + 50% *Pongamia glabra*) and $T_8$ (7.67 per hill$^{-1}$) 50% goat manure + 50% green leaf manure (*Azadirachta indica*) respectively and minimum number of effective tillers per hill$^{-1}$ recorded in $T_0$ (11.73 per hill$^{-1}$) (control) Rice (*Oryza sativa)* under open condition. The maximum performance of number of grains per hill$^{-1}$ was observed in $T_6$ (1174.33 per hill$^{-1}$) (50% Goat manure + 50% *Crotalaria juncea*) followed by $T_{10}$ (1154.33 per hill$^{-1}$) (50% Goat manure + 50% *Pongamia glabra*) and $T_8$ (1142.67 per hill$^{-1}$) 50% Goat manure + 50% Green Leaf manure (*Azadirachta indica*) respectively and minimum Number of grains per hill$^{-1}$ recorded in $T_0$ 901.00 per hill$^{-1}$) (control) Rice (*Oryza sativa)* under open condition. The maximum performance of Test weight (g) was observed in $T_6$ (36.20g) (50% Goat manure + 50% *Crotalaria juncea*) followed by $T_{10}$ (36.13g) (50% Goat manure + 50% *Pongamia glabra*) and $T_8$ (36.03g) 50% Goat manure + 50% Green Leaf manure (*Azadirachta indica*) respectively and minimum Test weight (g) recorded in $T_0$ (30.99g) (control) Rice (*Oryza sativa)* under open condition.

The maximum performance of grain yield observed in $T_6$ (44.41 q ha$^{-1}$) (50% goat manure + 50% Green manure (*Crotalaria juncea*) followed by $T_{10}$ (43.55 q ha$^{-1}$) (50% goat manure + 50% green leaf manure (*Pongamia glabra*) and $T_8$ (43.46q ha$^{-1}$) 50% Goat manure + 50% green leaf manure (*Azadirachta indica*) respectively and minimum Grain yield recorded in $T_0$ (37.06q ha$^{-1}$) (control) Rice (*Oryza sativa)* under open condition. The maximum performance of straw yield observed in $T_{10}$ (25.30q ha$^{-1}$) (50% goat manure + 50% green leaf manure (*Pongamia glabra*) followed by and $T_6$ (25.23 q ha$^{-1}$) (50% Goat manure + 50% green manure (*Crotalaria juncea*) $T_8$ (23.20q ha$^{-1}$) 50% goat manure + 50% green leaf manure (*Azadirachta indica*) respectively and minimum straw yield recorded in $T_0$ (23.63q ha$^{-1}$) (control) Rice (*Oryza sativa)* under open condition.

**Table 2: Efficiency of manures on yield attributes at the different treatments of Rice (*Oryza sativa)* under open condition.**

| Treatment | Length of panicle (cm) | Number of panicle per hill$^{-1}$ | No of effective tillers per hill$^{-1}$ | Number of grains per hill$^{-1}$ | Test weight (g) |
|---|---|---|---|---|---|
| **$T_1$** | 24.78 | 54.27 | 10.33 | 1033.33 | 33.78 |
| **$T_2$** | 24.41 | 52.67 | 10.40 | 996.67 | 33.01 |
| **$T_3$** | 24.44 | 52.73 | 10.50 | 1011.67 | 33.22 |
| **$T_4$** | 24.41 | 52.47 | 10.50 | 989.67 | 32.77 |
| **$T_5$** | 24.71 | 53.27 | 10.33 | 1019.00 | 33.45 |
| **$T_6$** | 29.10 | 58.80 | 7.00 | 1174.33 | 36.20 |
| **$T_7$** | 27.70 | 57.93 | 7.67 | 1134.33 | 35.81 |
| **$T_8$** | 28.13 | 58.40 | 7.67 | 1142.67 | 36.04 |
| **$T_9$** | 27.57 | 57.40 | 8.33 | 1130.67 | 35.79 |
| **$T_{10}$** | 28.80 | 58.40 | 7.50 | 1154.33 | 36.13 |
| **$T_{11}$** | 26.20 | 56.67 | 8.50 | 1136.67 | 34.88 |
| **$T_{12}$** | 25.73 | 55.40 | 9.33 | 1100.33 | 34.54 |
| **$T_{13}$** | 25.93 | 55.93 | 9.17 | 1113.33 | 34.62 |
| **$T_{14}$** | 25.30 | 55.27 | 9.50 | 1091.67 | 34.32 |
| **$T_{15}$** | 25.97 | 56.27 | 8.67 | 1123.33 | 34.70 |
| **$T_0$** | 22.30 | 50.87 | 11.73 | 901.00 | 30.99 |
| **F-test** | S | S | S | S | S |
| **C.D. (P=0.005)** | 1.240 | 0.378 | 1.212 | 67.575 | 1.595 |
| **SE(m)** | 0.427 | 0.130 | 0.418 | 23.284 | 0.550 |
| **SE(d)** | 0.604 | 0.184 | 0.591 | 32.929 | 0.777 |
| **C.V.** | 2.849 | 0.408 | 7.867 | 3.740 | 2.768 |

The maximum performance of biological yield observed in $T_6$ (69.64 q ha$^{-1}$) (50% goat manure + 50% green manure (*Crotalaria juncea*) followed by $T_{10}$ (68.76q ha$^{-1}$) (50% Goat manure + 50% Green Leaf manure (*Pongamia glabra*) and $T_8$ (68.68q ha$^{-1}$) 50% goat manure + 50% green leaf manure (*Azadirachta indica*) respectively and minimum biological yield recorded in $T_0$ (60.70q ha$^{-1}$) (control) rice (*Oryza sativa)* under open condition. The maximum performance of harvest index observed in $T_6$ (63.76%) (50% Goat manure + 50% green manure (*Crotalaria juncea*) followed by $T_{10}$ (63.38%) (50% goat manure + 50% green leaf manure (*Pongamia glabra*) and $T_8$ (63.21 %) 50% Goat manure + 50% Green Leaf manure (*Azadirachta indica*) respectively and minimum harvest Index recorded in $T_0$ (61.06%) (control) Rice (*Oryza sativa)* under open condition. The increased height of rice plants at different growth stages with the increase levels of organic manure and green manure which might be attributed to the increase in the length of internodes and the number of internodes per stem (Neha *et al.*, 2020) and because of their slow release of nutrients, besides supplying other green manure essential to plant height (Ghanshyam, *et al.*, 2010). Moreover, nitrogen encourages the cell elongation, cell division and cell multiplication leading to an overall increasing in vegetative growth rice plant particularly plant height. The results from the experimental field are in harmony with findings (Damera, 2018) and (Fageria, 2007). The advancement of higher plant height between the crop growth periods, the reason might be indicating that better effect pronounced with synchronized availability of important plant nutrients to the crop. Comparable, results were also recorded (Prasad *et al.*, 2018). In addition to this *Azotobacter* has ability to produce antifungal, antibodies and similar compounds against pathogen like *Fusarium* and *Alternaria*. Thus, beneficial effects of *Azotobacter* inoculation could be attributed to their multiple action for synthesise growth promoting substances, antifungal and antibiotics which might have been utilized by the plants in synthesis of protein, carbohydrates, starch and other assimilates, thereby improving overall growth of plant (Kaul *et al.*, 2015). The experiment conducted by (Tanzi *et al.*, 2013) also states that before and after the sample, soil fertility status was determined.

Characteristics contributing to yield and production, for instance: height of plant (cm), number of overall tillers hill$^{-1}$; number of efficient tillers hill$^{-1}$; panicle length (cm); number of grains panicle$^{-1}$, 1000-grain weight (g). The soil pH, where biomass is used, increased little after rice cultivation. Apart from the kalokoroi green biomass, the krishnochura's green leaf biomass has a positive impact on rice production. The works done by (Aasif *et al.*, 2019) states that the nutrient management activities have been identified on rice under the rice intensification scheme. Biometrics including panicles m$^{-2}$, panicle$^{-1}$, length of the panicle, yields of the grain, yield of straw and absorption of nutrients have been reported. Integrated nutrient control has affected the production and absorption of rice greatly. 100% RDF and Poultry Mist (3t-ha$^{-1}$) + 3% foliary spray Panchakavya @ AT, PI, & 50% substantially blooming (Chanda & Golam Sarwar 2018).

**Table 3: Efficiency of manures on yield at the different treatments of Rice (*Oryza sativa)* under open condition.**

| Treatment | Grain yield (q $ha^{-1}$) | Straw yield (q $ha^{-1}$) | Biological yield (q $ha^{-1}$) | Harvest Index (%) |
|---|---|---|---|---|
| **$T_1$** | 39.26 | 24.16 | 63.43 | 61.90 |
| **$T_2$** | 38.50 | 24.00 | 62.50 | 61.60 |
| **$T_3$** | 39.00 | 24.06 | 63.06 | 61.83 |
| **$T_4$** | 38.26 | 24.00 | 62.26 | 61.45 |
| **$T_5$** | 39.26 | 24.16 | 63.43 | 61.90 |
| **$T_6$** | 44.41 | 25.23 | 69.64 | 63.76 |
| **$T_7$** | 43.09 | 25.13 | 68.29 | 63.10 |
| **$T_8$** | 43.46 | 25.20 | 68.68 | 63.21 |
| **$T_9$** | 42.92 | 25.20 | 68.12 | 63.00 |
| **$T_{10}$** | 43.55 | 25.30 | 68.76 | 63.38 |
| **$T_{11}$** | 41.36 | 24.93 | 66.30 | 62.39 |
| **$T_{12}$** | 41.03 | 24.83 | 65.86 | 62.29 |
| **$T_{13}$** | 41.13 | 24.86 | 66.00 | 62.31 |
| **$T_{14}$** | 40.90 | 24.83 | 65.73 | 62.21 |
| **$T_{15}$** | 41.36 | 24.93 | 66.30 | 62.38 |
| **$T_0$** | 37.06 | 23.63 | 60.70 | 61.06 |
| **F-test** | S | S | S | S |
| **C.D. (P=0.005)** | 119.025 | 73.306 | 141.645 | 0.941 |
| **SE(m)** | 41.012 | 25.259 | 48.806 | 0.324 |
| **SE(d)** | 58.000 | 35.721 | 69.023 | 0.458 |
| **C.V.** | 1.736 | 1.774 | 1.289 | 0.900 |

The effects of incorporating dhaincha on subsequent rice crop yield as well as on post-harvest soil nutrient status are identified Nine accessions to dhaincha is used as experimental and control materials (without dhaincha plant). Seeds of accessions to Dhaincha have been seeded into a 60 kg $ha^{-1}$ experimental plot. Dhaincha plants have been mixed with soil for sixty days. Twice, before seeds were planted, and after rice harvest, soil samples were taken. In the well prepared dhaincha integrated plots at a distance of 15 × 25 cm, 40 good five days old rice seedlings were transplanted (plant-plant × row-row). The pH and nutrient status were improved in *dhaincha* incorporated soil over the control. The highest grain yield (5.81 t $ha^{-1}$) was obtained from *dhaincha* incorporated plot followed by (5.73 t $ha^{-1}$) and the lowest in control (4.35 t $ha^{-1}$). Due to the incorporation of *Dhaincha* biomass in soil, the rice grain yield increased 7.82% to 33.56% over the control. Among the *dhaincha* accessions, number 33 showed the best performance in terms of influencing grain yield.

## CONCLUSION

In conclusion, it could be concluded from the results obtained that, the integration of N levels of organic manure, green manure and green leaf manure leads to a promising approach to agricultural aspects where, from an assessment of the inherent yield, soil quality and maximum production, productivity and profitability with farmers, an affordable perspective. Results obtained from this study show that manure *i.e.* among 3 different combinations of Cow Manure, Sheep Manure, Poultry manure and 2 green manures *i.e.* Sunhemp *Crotalaria juncea*, Dhaincha *Sesbania aculeate*, 3 green leaf manures, *i.e. Pongamia glabra*, Neem *Azadirachta indica*, Gulmohar *Delonix regia*, respectively. Therefore, under open condition both growth, yield attributes, yield have been found to be maximal in $T_6$-50% goat manure + 50% (*Crotalaria juncea*) so it is suggested that organic manure to be provided with green manure for achieving high yield. Manure application also offers the positive soil health effect it enhances soil structure and texture consistency. This reduces the bulk density and as a result, the potential for water preservation rises as the volume of available nitrogen increases. This helps plant growth development and even improve yield. Manures use is highly suitable for Rice (*Oryza sativa)* under open condition is very effective and less expensive than manures.

## FUTURE SCOPE IN THE RESEARCH

In recent years, the use of organic manures has become increasingly important in the production of cereal crops. The requirement for increasing output, as well as a higher per-hectare yield of staple foods, need more nutrients. To meet crop requirements while maintaining soil fertility, it is necessary to increase the nutrient status of the soil. To determine the combined effect of organic manures and green manures on rice (*Oryza sativa* L.) grown in a *Moringa oleifera*-based agroforestry system with an open field test, because manures increase nitrogen, maintain soil microclimate, and retain soil moisture, while compost increases NPK intake. I used three different organic manures and five different green manures to see which combination is the most beneficial for rice (*Oryza sativa* L.). It will boost soil fertility while also boosting crop growth and yield.

## REFERENCE


Aasif, M., I. Chinnamani, N. Senthil Kumar, M. Hemalatha, S. Suresh (2019). Influence of Integrated Nutrient Management Practices on Yield and Nutrient Uptake of Rice under System of Rice Intensification. *International Journal of Advances in Agricultural Science and Technology*, *5*(7) pp-10-16.

Ambika, S., Somasundaram, G., Sundaralingam, K., & Nadu, T. (2015). Importance of Green and Green Leaf Manures in Sustainable Agriculture. *Popular Kheti.*, *1*(1), pp- 62–65.

Ambrosano, E. J., Cantarella, H., Bovi Ambrosano, G. M., Ferreira Dias, F. L., Rossi, F., Ocheuze Trivelin, P. C., & Muraoka, T. (2013). The role of green manure nitrogen uses by corn and sugarcane crops in Brazil. *Agricultural Sciences*, *04*(12), pp-89–108.

Bista, B., & Dahal, S. (2018). Cementing the Organic Farming by Green Manures. *International Journal of Applied Sciences and Biotechnology*, *6*(2), 87–96.

Bohlool, B. B., Ladha, J. K., Garrity, D.P. and George, T. (1992). Biological nitrogen fixation for sustainable agriculture: *A perspective, Plant and Soil*, *141*: 1-11.

Chahal, R. (2019). Agroforestry is the need of the day in India. *International. Journal of Scientific Research in Engineering and Management*, *3*(8) 1–6.

Chanda, S. C., & Golam Sarwar, A. K. M. (2018). Status of Dhaincha Incorporated Soil after Rice Harvest in (Boro) Rice–Dhaincha–Rice (T. Aman) Cropping Pattern. *Cercetari Agronomice in Moldova*, *50*(4), pp-75–84.

Damera, J. (2018). Agricultural Growth through Green Manure. Research Review *International Journal of Multidisciplinary*, *3*(03), pp-102–104.

Fageria, N. K. (2007). Green manuring in crop production. *Journal of Plant Nutrition*, *30*(5), pp-691–719.

Ghanshyam Deshmukh, Tiwari R. K. and Dwivedi B. S. (2013). Impact of paddy drum seeder under puddled soil for rice cultivation *JNKVV Research Journal*. *47*(2): pp-224-227.

Hammad, E. I., Al-Agha, M. R., & El-Nahhal, Y. (2018). Enhancing Biogas Production: Influence of Mixing Caw and Chicken Manures. *Energy and Power Engineering*, *10*(08), pp-383–397.

Hulke, V., Harne, S., Ujjainkar, V., Mane, V., & Taide, Y. (2020). Influence Of Microclimatic Parameters On Growth And Yield Of Cotton In Teak Based Agroforestry System. *Journals Management System*, *8*(A), Pp-1–5.

Islam, S., Paul, N. K., Alam, R., Uddin, R., Sarker, U. K., Islam, A., & Park, S. U. (2015). Responses of rice to green manure and nitrogen fertilizer application. *OnLine Journal of Biological Sciences*, *15*(4), pp-207–216.

Javaid, A., & Shah, M. B. M. (2008). Use of parthenium weed as green manure for maize and mungbean pro-duction. *Philippine Agricultural Scientist*, *91*(4), pp-478–482.

Kaul, A., Kaur, R., Choudhary, A. K., Sepat, S., Dass, A., & Scientists, S. (2015). Importance of Green Manuring in Sustainable Agriculture. *Popular Kheti*. *2*(2), pp-8–12.

Kumari, N., Singh, C. S., Prasad, J., Singh, M. K., & Kumar, R. (2013). Influence of organic nutrient sources on productivity of rice (*Oryza sativa*)-based cropping systems in Jharkhand. *Indian Journal of Agronomy*, vol-*58*(3), pp-277–281.

Mayer, J., Jarosch, K., Hammelehle, A., Dubois, D., Gunst L., Bosshard, C., Frossard, E., Mäder, P. and Oberson, A. (2017). Nitrogen budgets in organic and conventional cropping systems - The efficiency-sustainability dilemma, *Organic World Congress*, pp-18-21.

Moe, K., Mg, K. W., Win, K. K., & Yamakawa, T. (2017). Effects of Combined Application of Inorganic Fertilizer and Organic Manures on Nitrogen Use and Recovery Efficiencies of Hybrid Rice (Palethwe-1). *American Journal of Plant Sciences*, *08*(05), pp-1043–1064.

Mondal, S., Miah, M., Elahi, N., Saleque, M., & Rahman, A. (2014). Effect of Nitrogen Levels and Gliricidia Sepium Alley Widths on Rice Based Agroforestry Systems. *Bangladesh Rice Journal*, *17*(1–2), pp-26–32.

Morteza Siavoshi and Shankar L. Laware (2013). Role Of Organic Fertilizers On Chlorophyll Content In Rice (*Oryza Sativa L.). Trends in life sciences an international peer-reviewed journal*, *2*(3), pp1-5.

Mubarik, A. (1999) Evaluation of green manure technology in tropical lowland rice systems, *Field Crops Research*, *61*, pp-61-78.

Neha N., Roy, D.K., Shashank, K. and Ashok, K. (2020). Effect of Nitrogen on Growth, Yield and Nutrient Uptake of Rice under Aerobic Condition, *International .Journal of Current .Microbiology App. Science*, *9*(2): pp-2025-2035.

Nitisha, S., & Girjesh, K. (2013) Biomass productivity of Green Manure crop *Sesbania cannabina* Poir (Dhaincha) in different Planting Density Stress. *International Research Journal of Biological Sciences*, *2*(9), pp-48-53.

Parmjit, S.R., Leo, M.C., Hong, J.D., Sokrat, S. and Roger, M.D. (2005) Effect of green manure addition on soil organic phosphorus mineralisation, *Nutrient Cycling in Agroecosystems*, *73*, pp-181–189.

Osman, M., Wani, S. P., Balloli, S. S., Sreedevi, T. K., Rao, C. S., & D'Silva, E. (2009). Pongamia seed cake as a valuable source of plant nutrients for sustainable agriculture. *Indian Journal of Fertilisers*, *5*(2), 25-26.

Petit-Aldana, J. M. M. L. C. C. A. A. O. (2019). Litter Decomposition Process in Coffee Agroforestry Systems. *Journal of Forest and Environmental Science*, *35*(2), pp-121–139.

Poonam, A., Saha, S., Nayak, P. K., Sathpaty, B. S., Shahid, M., Tripathy, R., Jambhulkar, N. N., Kumar, G. A. K., & Mondal, B. (2018). Integrated Rice-based Farming Systems for Enhancing Climate Resilience and Profitability in Eastern India. *Rice Research for Enhancing Productivity, Profitability and Climate Resilience 1* pp-273–287.

Prasad Rajbhar, Y., Rajbhar, G., PL, R., Shukla, S., & Kumar, M. (2018). Grow Moringa (*Moringa oleifera*), the miracle tree on the earth. *Horticulture International Journal*, *2*(4), 166–172.

Rajput, A. Sujit Singh Rajput and Girish Jha (2017). Physiological Parameters Leaf Area Index, Crop Growth Rate, Relative Growth Rate and Net Assimilation Rate of Different Varieties of Rice Grown Under Different Planting Geometries and Depths in SRI. *International Journal of Pure & Applied Bioscience*, *5*(1), pp-362–367.

Ram, M., Davari, M., & Sharma, S. (2014). Direct, residual and cumulative effects of organic manures and biofertilizers on yields, NPK uptake, grain quality and economics of wheat (*Triticum aestivum* L.*)* under organic farming of rice-wheat cropping system. *Journal of Organic Systems, 9*(1), pp16–29.

Ram, M., Davari, M., & Sharma, S. N. (2011). Organic farming of rice (*Oryza sativa* L.) -wheat (*Triticum aestivum* L.*)* cropping system: a review. *International Journal of Agronomy and Plant Production, 2*(3), pp-114–134.

Rao, Srinivasa Ch. Venkateswarlu, M. Dinesh Babu, Suhas, P. Wani Sreenath Dixit, K.L. Sahrawat and Sumanta Kundu Experiences, O. F. (2011). Soil Health improvement with *Gliricidia* Green Leaf Manuring in Rainfed Agriculture on Farm Experiences. *Technical Bulletin* No.2/2011 *2*, pp-1–24.

Revathi, P., Devi, K. B. S., Reddy, B. G., Rao, V. P., & Padmaja, G. (2014). Influence of Planting Methods and Integrated Nutrient Management on Growth, Yield and Economics of Rice. *Journal of Rice Research*, *7*(1) pp-1-2.

Sarwar, G., Hussain, N., Schmeisky, H., Suhammad, S., Ibrahim, M., & Ahmad, S. (2008). Efficiency of various organic residues for enhancing rice-wheat production under normal soil conditions. *Pakistan Journal of Botany*, *40*(5), pp-2107–2113.

Sharma, A., & Sah, V. K. (2020). Comparative Growth , Yield And Yield Attributes Of Wheat Under Poplar And Eucalyptus Based Agroforestry System. *Plant Archives 20*, *Special Issue* pp-47–52.

Sharma, K. L. (2008). Effect of Agroforestry Systems on Soil Quality – Monitoring and Assessment. *Academia.Edu*, pp-122–132.

Sumpam Tangjang & P. K. Ramachandran Nair. (2015). Rice + Fish Farming in Homesteads: Sustainable Natural-Resource Management for Subsistence in Arunachal Pradesh, India. *Journal of Environmental Science and Engineering A*, *4*(10), pp-545–557.

Tanzi, B. N., Arifin, M. S. A., Mondol, M. A., A. K., & Wadud, M. A. (2013). Effect of tree leaf biomass on soil fertility and yield of rice. *Journal of Agroforestry and Environment, 7*(1), pp129–133.

**How to cite this article:** Vijaykumar, R., Mehera, B. and Khare, N. (2021). Efficiency of different Manures on the growth and yield of Rice (*Oryza sativa*) under open condition. *Biological Forum – An International Journal*, **13**(3a): 253-260.