



## Research Article

## NUTRIENT RELEASE PATTERN UNDER LONG TERM PERMANENT FERTILIZER APPLICATION SYSTEM IN RICE

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**Abstract:** Series of experiments or group of experiments plays an important role in agriculture. A fertilizer, pest or disease management package is also recommended after evaluating the effect of the treatments in the field for a number of years and seasons. This study is an attempt to understand the nutrient release pattern under long term permanent fertilizer application system by analysis of group of experiments. Out of the 29 years grain yield data, those years with more than ten outliers were discarded and remaining 21 years' data used for further study. As the error variances of the 21 years grain yield data were found to be homogeneous, carry out the pooled analysis. The significance of the treatment × year interaction in pooled analysis indicate that the treatment effects shows variation over the year. Treatment T6(50% RDN (Recommended Dose of Nutrients) of NPK through fertilizers + 50% through FYM during *kharif* and 100% RDN of NPK through fertilizers during *rabi*) obtained the highest yield over the years.

**Keywords:** Group of experiments, Initial data analysis, Exploratory data analysis, Error variance and Pooled analysis of variance

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## Introduction

Majority of the Indian people are dependent on Agriculture as their primary source of income. In India, it is contributing around 17.9 percent of National Gross Domestic Product to Indian Economy [1]. So, the importance of agricultural field experiments become an important part of research for new innovations. A new variety of rice released only after conducting a series of experiments. Similarly, a fertilizer, pest or disease management package is also recommended after evaluating the effect of the treatments in the field for a number of years and seasons. For this, series of experiments or group of experiments with same experiment is repeat in the research stations or in farmer's fields (in different locations) for a number of years (seasons). The performance of crops generally depends on genotype or variety, input factors such as fertilizer, irrigation, disease, insect control measures, environmental factors and various interaction among these factors. The experimenter has definite control over the genotype and on some factors like fertilizer rate, plant protection, etc. these are called controlled factors. However, environmental changes like the climatic factors such as sunshine, rainfall, soil moisture, soil nutrients, etc. are uncontrollable factors, having significant influence on crop performance. This will vary from location to location or site to site or season to season. A part of error variance is contributed by these environmental factors. This study mainly utilizes the yearly data (*kharif* + *rabi*) on a field experiment on rice (*var. Aiswarya*) viz. 'Permanent plot experiment on integrated nutrient supply system for a cereal based crop sequence' conducted at Integrated Farming System Research Station (IFSR), Karamana for the period from 1985 - '86 to 2013- '14. It is an attempt to understand the nutrient release pattern under long term permanent fertilizer application system by analysis of group of experiments. A long-term study on yield trends, and changes in soil organic -C and available NPK in rice-wheat system under integrated use of manures and fertilizers [2]. Linear regressions fitted to pooled data across the locations revealed highly significant annual increase in yield of rice with integrated supply of nutrients through fertilizers and manures, indicating there by the advantage of combined use of manures and fertilizers over fertilizers alone in

sustaining crop yields.

The result of the combined or pooled analysis of variance indicated that genotype; environment and genotype × environmental interactions were highly significant. The significant genotypic variance shows the genetic diversity among the different genotypes [3]. A long-term fertilizer experiment on ammonia volatilization in Chinese double rice cropping systems [4]. It was observed that, agricultural economic viability and ammonia volatilization mitigation can be simultaneously achieved by balanced inorganic and organic fertilizers applications. In order to compare the treatments across locations and the locations over the treatments, the yield data were pooled for all the years of experiments. Least square linear regression of yield against time or years was calculated for all treatments and for all experimental sites to test the hypothesis that yield trends throughout the experimental period are not significantly different from zero [5].

## Materials and Methods

The field experiment consisted of twelve different treatments on modified fertilizer doses based on the recommended dose including a control T<sub>1</sub> (no fertilizers and no organic manures) and T<sub>12</sub> (farmer's practice). A randomized block design (RBD) with four replications used for experiments. Data were collected for 29 years (1985 to 2014) and converted the yield data in to q ha<sup>-1</sup>. A RBD with four replications used for all these years. In exploratory data analysis, data were subjected to univariate normality tests. Skewness and kurtosis is the most commonly used normality tests. Data follow normality when the skewness value obtained as zero and the kurtosis value obtained as three. Apart from these two, other commonly used univariate normality tests are Shapiro-Wilk, Kolmogorov-Smirnov, Cramer-von Mises and Anderson-Darling. Significance of these tests indicates the observations are non-normal at 5% level of significance. It is observed that for eight years (1994-95, 1997-98, 1998-99, 1999-00, 2000-01, 2009-10, 2012-13 and 2013-14) of data which causes a highly heterogeneous estimate of error variances (MSE). Hence those years with more than ten outliers were discarded and remaining 21 years' data were used for further study.