



# Effect of Organic Manures on Yield Attributes and Grain Yield of Maize in Tawang District of Arunachal Pradesh

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## ABSTRACT

A field experiment was conducted to study the effects of organic manures on yield attributes and grain yield of maize (*Zea mays*) during the *khari* season of 2016 and 2017 at three villages viz. Lemberdung, Khinmey and Changprong in Tawang district of Arunachal Pradesh. The experiment consisted of four treatments of organic manures viz. control, farmyard manure (F.Y.M) @ 8.0t/ha, Vermicompost @ 3.0 t/ha and FYM @ 4.0t/ha+vermicompost @1.5 t/ha. Results conferred that the highest grain yield (53.0 q/ha) was observed in treatment FYM @ 4.0 t/ha + vermicompost @1.5 t/ha as compare to other treatments. Similarly, the highest number of cob/plant (2.0), length of cob (14.0 cm) and grain/cob (235) were recorded with the application of F.Y.M. @ 4.0t/ha+ vermicompost @ 1.5t/ha as compared to sole application of all other three treatments i.e. F.Y.M@8.0t/ha, vermicompost@3.0t/ha and control. Application of Farm yard manure and vermicompost in maize proved economically superior and ecological viable in improving the maize grain yield.

## KEYWORD

Maize, Farmyard manure, Vermicompost, Grain yield, Economics.

## INTRODUCTION

Maize is the third most important crop after rice and wheat in India. India grows about 8.71 million ha of maize, with total annual production of 22.3 million tonnes of grain giving an average yield of 2.55 tonnes per hectare (www.indiastat.com.2014) that is tremendously lower than other maize growing countries of the world (5.1 t/ha). Maize is the second most important food crop of Arunachal Pradesh after rice. In Arunachal Pradesh it is grown over an area 48,800 ha with total production 78,500 mt and average yield is 16.08 q/ha. In Tawang district, it is cultivated over an area of 762 ha with total production 1434.00 mt and the average yield is 18.82 q/ha. The maize productivity in Tawang district is very low due to non availability of high yielding varieties for specific area as well as less use of organic manure. As maize demands nutrient continuously in large amounts. Large use of chemically formulated fertilizers alone is most only feasible but also costly to the resource-poor farmer's, as majority of the maize is grown by small and marginal farmers. Apart from this, use of chemical fertilizers has resulted in progressive rise in multi-nutrient deficiencies, nutrient imbalance, deterioration of soil health and at last crop productivity, Although the organic manure contains plant nutrients in small quantities compared to fertilizers, but they influence in building up of organic matter, good soil aggregation, permeability of soil and related physical properties in addition to long-lasting supply of several macro and micronutrients, vital plant-promoting substances apart from increasing the density of microbes in the soil (Palaniappan and Siddeswaran,1994 and Taipodia and Singh, 2013). This helps in maintenance and possible improvement of soil fertility and health for sustaining crop productivity. Keeping this in view, a field experiment was conducted to study the effect of organic manure on yield attributes and grain yield of rain fed maize.

## MATERIALS AND METHODS

A field experiment was conducted during the rainy (*Khari*) season of 2016 and 2017 in the three villages viz. Lemberdung, Khinmey and Changprong of Tawang district. The area falls under humid, subtropical climate. The daily temperature of the experimental site during the year varies widely between minimum 15°C and maximum 30°C with an average rainfall of 2,220.0 mm. The soil was sandy loam with slightly acidic (pH - 5.8), high in organic carbon (0.87%), electrical conductivity 0.25ds/m and available N 285.00 kg/ha, phosphorous 14.9 kg/ha and potassium 213 kg/ha. The treatment consisted of four levels of organic manures, viz. Control, FYM @ 8.0 t/ha, vermicompost @ 3.0t/ha and FYM @ 4.0t/ha+vermicompost @ 1.5 t/ha. Maize variety "HQPM-1" was sown @ 20 kg/ha seed rate with a spacing of 60x30 cm on 8<sup>th</sup> May 2016 and 10<sup>th</sup> May 2017 respectively at the same location. The seed should be treated with thiram 75% WP @ 3g/kg seed. Since there was enough rainfall during the cropping season, irrigation was not required. The nutrient content of FYM was 0.58% N, 0.30% P and 0.5% K, and vermicompost was 1.1%N, 0.25% P and 0.55% K. The organic manure was applied as basal dose at 20 days interval before sowing of seed.

The weed reduced the yield of maize by 20-25% depending upon the intensity, nature and duration of weed competition. Hand weeding twice after 20 days and 40 days of sowing keep the field reasonably free from weeds. Five random plants/plot were selected in the net plot area and tagged for recording growth and yield attributes. The experiment was observations recorded plant height at harvest (cm),

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cob/plant, length of cob (cm) and grain/cob. The crop was manually harvested and threshed in the month of first fortnight of September. The inputs and outputs prices of commodities prevailed during the study of demonstration were taken for calculating net return and benefit cost ratio.

## RESULTS AND DISCUSSION

### Growth parameters

The growth parameters viz. Plant height at harvesting varied significantly due to application of different organics. Among the different source of organics, application of FYM @ 4 t/ha +vermicompost @ 1.5 t/ha recorded higher plant height (180.5 cm) compared to the other treatments (Table-1). This was closely followed by application of @ 3.0 t/ha. The effect of FYM and vermicompost, in combination was more pounced with the advancement of crop growth, indicating better effect of plant height of maize. This may be owing to continuous availability of nutrients to maize plants because of their slow release of nutrients from FYM during crop season. Moreover, vermicompost added a good amount of NPK in the soil, besides supplying other essential macro and micronutrients.

### Yield parameters

The yield parameters viz. Cob/plant, length of cob and grains/cob varied significantly due to application of organics.

Since the plants were healthy under the treatment having combination of FYM and vermicompost. The application of FYM @ 4.0 t/ha + Vermicompost @ 1.5 t/ha resulted in significantly highest cob/plant (2), length of cob (14 cm) and grains/cob (235 gm) followed by vermicompost @3.0t/ha and FYM@8.0t/ha (Table-1).

### Yield

The results indicated that, grain yield of maize varied significantly among different sources of organic manures (Table-1). The grain yield was significantly higher with application of FYM @ 4.0 t/ha+vermicompost @ 1.5 t/ha (53.0 qt/ha) compared to the other source of organics. This was followed by vermicompost @ 3.0t/ha (44.0 qt/ha) and FYM @ 8.0 t/ha (37.0 qt/ha) respectively (Table-2). This was mainly owing to the fact that apart from source of nutrients, application of organics improved the physico-chemical properties of soil that resulted in better root system with increased absorption of moisture and nutrients from the deeper layers, which in turn enhanced the growth and yield-attributing parameters of maize and finally grain yields. These results are in line with the findings of Sujatha et al. (2008); Choudhary and Suresh Kumar (2013); Taipodia and Singh (2013); Praveen et al. (2012) and Suresh Naik et al. (2012).

**Table 1:** Effect of manures on organic carbon, yield attributes and seed yield of "HQPM-1" maize (pooled of 2 years)

Treatment	Organic carbon in soil (%)	Plant height at harvest (cm.)	Cob/plant	Length of Cob (cm.)	Grain rows/cob	Grains /row (gm)	Grains / Cob	1000-grain weight (g)
Control	0.71	162.5	1.2	10.5	10.75	18.5	198.8	234.0
F.Y.M.@ 8.0 t/ha.	0.94	168.0	1.3	11.25	11.25	19.25	216.5	234.25
Vermicompost @ 3.0t/ha.	0.95	175.0	1.5	11.50	11.50	19.50	224.25	234.50
F.Y.M.@ 4.0t/ha.+Vermicom Post @ 1.5 t/ha.	0.98	180.5	1.7	14.0	12.0	20.0	135.0	235.0

### Economics

Among the treatments, application of FYM @ 4.0t/ha + vermicompost @ 1.5t/ha. give significantly higher return (Rs. 60,500/ha) and B:C ratio (2.3:1) followed by application of vermicompost @ 3.0 t/ha and FYM @ 8.0t/ha respectively. The lowest net return and B:C ratio were recorded in the control plots (Table-2). High cost of FYM and vermicompost, resulted in increased cost of cultivation without too much increase in net return, this overall effect of FYM and vermicompost reflected in net return.

### Soil physico-chemical properties

Application of FYM @ 4.0 t/ha+vermicompost@ 1.5 t/ha resulted in significantly higher soil organic carbon (0.98%) followed by vermicompost @ 3.0 t/ha and FYM @ 8.0 t/ha alone. The control plot recorded low content of organic carbon (0.71%) (Table-1). The increase in soil organic carbon from its initial value in manured plots compared to the control may be due to the facts that in manured plots microbial population might have increased, and as a result soil aggregation and decomposition has resulted in increased organic content in soil.

**Table 2:** Effect of organic manure on yield and economics of "HQPM-1" maize (pooled of 2 years)

Treatment	Grain yield (qt./ha.)	Gross return (Rs./ha.)	Gross cost (Rs./ha.)	Net return (Rs./ha.)	Benefit: cost ratio
Control	31.0	62,000/	31,700/	30,300/	1.9:1
F.Y.M.@ 8.0t/ha.	37.0	74,000/	36,900/	37,100/	2.0:1
Vermicom-post @ 3.0t/ha.	44.0	88,000/	41,300/	46,700/	2.1:1
F.Y.M.@ 4.0t/ha. + Vermicompost @ 1.5 t/ha.	53.0	106,000/	45,500/	60,500/	2.3:1

## CONCLUSION

Application of FYM @4.0t/ha+vermicompost @1.5t/ha to maize proved economically superior and ecological viable in

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