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# Free Ranging Desi Poultry As A Component In Maize Integrated Farming System And Its Effect On Growth And Yield Of Maize (*Zea Mays L.*)

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**Abstract**

A field experiment was conducted in farmers field at Devarayapuram village, Coimbatore during *kharif,* 2016 *and* winter 2016 -17 to study the effect of introducing free ranging desi poultry in maize integrated farming system and its on growth and yield of maize. The popular maize hybrid CP 804 was used as test variety. Two farming systems *viz.,* Maize (Aug to Nov) – Maize (Dec to Mar) and Maize (Aug to Nov) – Maize (Dec to Mar) + desi poultry (two hens and one rooster in 3 cents) were evaluated under field conditions. The maize + desi poultry recorded better growth parameters, yield attributes and yield than maize under sole maize. Maize – Maize cropping system along with desi poultry lowered the weed density and dry weight during critical stage of the crop growth. The increase in yield under maize + desi poultry was negligible when compared to grain yield of sole maize. The yield attributes *viz.,* cob length, cob girth, number of grain rows $cob^{-1}$, number of grains $row^{-1}$, cob weight and test weight were slightly higher under maize + desi poultry farming systems. The treatment combination of maize with desi poultry recorded higher available soil nutrients (NPK) than sole maize cropping system.

***Key words:*** Maize, desi poultry, weed density, growth, yield

## 1. Introduction

Maize (*Zea mays* L.) is the third most important cereal next to rice and wheat, in the world as well in India. It is a versatile crop and can be grown in diverse environmental conditions and has multiple uses. Besides its use as food, feed and fodder, maize is now gaining increased importance on account of its potential uses in manufacturing of starch, plastic, rayon, textile, adhesive, dyes, resins, boot polish, syrups, ethanol, etc. The availability of land for agriculture is shrinking as it is increasingly utilized for non-agricultural purposes. Under this situation, one of the important strategies to increase agricultural output is the development of new high intensity cropping systems including intercropping systems. The main purpose of intercropping is to produce more yield on a given piece of land by making effective use of resources that would otherwise not be utilized by a single crop efficiently.

Small holder poultry production (i.e. family poultry) is an appropriate system that makes the best use of locally available resources. Family flocks are important providers of eggs and meat as well as being valued in religious and cultural life. Poultry is one of the fastest growing segments of the agricultural sector in and around Coimbatore district of Tamil Nadu. There are three production systems for family poultry - free range, backyard and small-scale intensive with productivity of 40 - 60, 50 - 100 and 80 - 150 eggs / hen / year, respectively. Under free ranging system, desi poultry hens start egg laying from six month onwards. Poultry, particularly in the free range, provide meat, eggs, feathers, manure (convertible to fertiliser and natural gas), pest control, weed clearance, seed cleaning of grasses for mulch, scratching and foraging (Sonaiya *et al*., 2013).

By proper selection programme, egg production of desi hen could be increased up to

135 eggs per year. Productivity of indigenous chicken breeds may be doubled with improved diets and management conditions. The indigenous chickens have not attained their full production potential due to exposure to risks that influence against their survival and productivity under extensive management conditions. However, the research works under field level on age at sexual maturity, average weight at first egg, average live weight at 28$^{th}$ week and hen day egg production at 52 weeks of age have been noticed.

Under free-range systems, desi poultry can easily pick up its food in the backyards once it learns to scavenge in the household surrounding. Under free-range conditions the necessity of supplementary feed/ feed ingredients mostly depends on the free area available in the field, intensity of vegetation and availability of waste grains, insects, grass seeds etc. (Pathak and Nath, 2013).

In western and north western zone of Tamil Nadu, desi poultry are generally kept to supplement the family income and protein diet. These birds which are normally the indigenous stock, are raised on the free-range system scavenging for food comprising mainly of fallen grains, worms, insects, table and kitchen scraps as well as local weeds and grasses.

In the western zone of Tamil Nadu, particularly Namakkal, Salem and Coimbatore districts, free ranging desi birds are introduced in sorghum, maize and sugarcane fields during the maximum tillering to get rid of some weeds and insects (Quisumbing, 1983) and there has been no reported damage to crops.

There are many positive factors associated with desi poultry being integrated into cropping enterprises: (i) crops produced on the farm can be used to feed the desi poulrty, thus minimizing the importing of outside feed stuffs in desi poultry production; (ii) poultry manure can serve as the primary source of nutrients for crop production, thereby cycling of nutrients from the crops through the birds and back out onto the land.

Current agricultural systems utilizing monocultures and short rotations require more external inputs (Karlen *et al*., 1994b), and the question has been raised whether the substitution of capital, energy, and synthetic chemicals for diverse crop rotations can sustain stable and productive agricultural systems (Bullock, 1992; Brummer, 1998; Randall, 2003). As described above, evidence is accumulating that over-reliance on simple crop rotations may have long-term implications that threaten economic and biological sustainability of agriculture in rural India.

Diversification of farming operations could be a viable approach to alleviate many of the problems being documented in our current agricultural production systems (Brummer, 1998). One method for diversifying agricultural systems is through integration of crops and free ranging desi poultry within the same cropping system. Therefore, the purpose of this study was to compare and evaluate the growth and productivity of maize under free ranging desi poultry + maize cropping system.

## 2. MATERIALS AND METHODS

Experiment was conducted in farmer's field at Devarayapuram village, Coimbatore during *kharif* 2016 and winter 2016-17. Initial soil samples were collected at random prior to the field experiment, pooled and analysed for chemical characteristics. The soil of the experimental field was red sandy loam in texture belonging to *Typic Paleustalfs*. The nutrient status of the initial soil was low in available nitrogen (225 kg ha$^{-1}$), medium in available phosphorus (15.2 kg ha$^{-1}$) and high in available potassium (635 kg ha$^{-1}$). The soil pH was 8.23 and soil EC 0.66 dSm$^{-1}$. The experiment was laid out as non replicated trial in two locations. Two farming systems *viz.*, Maize - Maize alone and Maize - Maize + desi poultry (two hens and one rooster for 3 cents) were evaluated under field conditions. The area allocated for the experimental trial was six cents (242.8 m$^2$). In this area, three cents (121.40 m$^2$) was demarked and fenced using shade net. The desi poultry chicks were introduced at 20 days after sowing of maize crop.

Maize hybrid CP 804 was chosen for study. For maize hybrid, a seed rate of 20 kg ha$^{-1}$ was followed. The seeds were sown in ridges and furrows by adopting a spacing of 60 x 25 cm at a depth of 5 cm. Well decomposed farm yard manure at the rate of 12.5 t ha$^{-1}$ was applied uniformly over the field before last ploughing. $ZnSO_4$ @ 37.5 kg ha$^{-1}$ was applied

uniformly as basal to all the plots.

The recommended fertilizer dose followed for maize was 250:75:75 kg NPK ha$^{-1}$. Ten plants in each treatment in the net plot were selected at random as sample plants and tagged for taking observations *viz*., plant height, leaf area index and

dry matter production (DMP). Observations on weed parameters *viz*., weed density and weed dry weight were recorded. Weed count was recorded by placing four quadrats of size 0.5 m x 0.5 m in each plot and the weeds falling within the frames of the quadrat were counted, recorded and the mean values expressed in number $m^{-2}$.

Yield components such as cob length (cm), cob girth (cm), number of grain rows $cob^{-1}$, number of grains $row^{-1}$, weight of individual cob, hundred grain weight, grain yield were recorded. The post-harvest soil samples were collected after the harvest of crop from the individual plots. The samples were shade dried, powdered, sieved through 2 mm sieve and then analyzed for available nutrient content.

## 3. Results and Discussion

### *Growth and yield attributes*

Plant height which represents the time trend of growth was recorded at different phenophases of maize. Numerical difference in plant height was observed with maize alone and maize + desi poultry integrated system during both the seasons. Growth parameters *viz.,* plant height, leaf area index and dry matter production gradually increased upto 90 days after sowing (Table 1). Taller plants and higher dry matter production were recorded in maize – maize along with desi poultry introduced field followed by maize-maize cropping system. Increase in plant height and dry matter production under maize + desi poultry treatment was due to the fact that the optimum nutrients available in maize + desi poultry integrated field due to poultry droppings which probably provided favourable physical environment and helped the plants to grow taller.

### *Weed density and weed dry weight*

Maize – maize along with desi poultry introduced field registered lower weed density and weed dry weight during *kharif* 2016 and winter 2016-17. This might be due to the fact that the emerging weeds were destroyed by poultry birds. This behaviour of desi birds in favourable soil environment might have resulted in reduced crop weed competition for the growth factors such as light, space and nutrients which in turn helped in efficient photosynthetic activity recording taller plants. The plots having higher weed control efficiency got more resources and produced taller plants as earlier reported by Nadeem *et al*. (2010).

### *Yield attributes and yield*

Among the maize cropping systems, meagre variation in cob length, cob girth, number of grain rows $cob^{-1}$, number of grains $row^{-1}$, cob weight and test weight were recorded under maize , maize + desi poultry introduced field during both the seasons (Table 2).

Maize – maize cropping system along with desi poultry introduced field recorded higher grain yield (8136 and 8345 kg $ha^{-1}$, respectively) during *Kharif*, 2016 and winter 2016-17 (Table 1). The yield increase could be attributed to the reason that desi poultry birds might have damaged the emerged weeds avoiding competition for crop growth from initial stages and lasting to later growth stages. The poultry litter addition in maize + desi poultry cropping system provided the nutrients which in turn to the crop could have increased the yield. Similar findings reported by Dwivedi *et al.* (2012) are in support of the present result.

### *Initial and post harvest available nutrients in soil*

The maize - maize cropping system registered lower soil organic matter and available NPK during both the seasons (Table 4). The reduction in soil available nutrients compared to initial status, particularly N and K in maize - maize cropping system might be due to the higher uptake than the quantity of nutrients applied.

The benefits of desi poultry in farming system is maintaining the soil organic matter levels and post harvest available nutrients were well established. This might be due to the influence of sources of nutrients on the addition of poultry manure and other organic residues left after the harvest of each crop. Since, the maize root carbon to soil organic carbon per cent was 1.5 times higher (Balubane, 1996).The present study has suggested that introduction of desi poultry in maize systems improved soil quality and soil organic carbon content.

## 4. Conclusion

Maize – maize cropping system along with desi poultry (two hens and one rooster for 3 cents) recorded better growth and higher yield than maize - maize cropping system. Maize – maize cropping system along with desi poultry bird lowered the weed density and weed dry weight during critical stage of the crop growth. The post-harvest available soil nutrients (NPK) were higher in desi poultry introduced maize field than sole maize.

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**Table 1. Growth parameters of maize as influenced by desi poultry**

| Crop | *Kharif* (2016) | | | | | | | *Winter* (2016-17) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Plant height (cm) | | Leaf area index | | Dry matter production (kg ha$^{-1}$) | | Grain yield (kg ha$^{-1}$) | Plant height (cm) | | Leaf area index | | Dry matter production (kg ha$^{-1}$) | | Grain yield (kg ha$^{-1}$) |
| | 60 DAS | 90 DAS | 60 DAS | 90 DAS | 60 DAS | 90 DAS | | 60 DAS | 90 DAS | 60 DAS | 90 DAS | 60 DAS | 90 DAS | |
| Maize | 212.1 | 235.0 | 5.52 | 4.76 | 7135 | 13420 | 7953 | 205.4 | 224.6 | 5.32 | 4.53 | 6855 | 12845 | 8224 |
| Maize + desi poultry | 215.8 | 238.7 | 5.56 | 4.85 | 7210 | 13530 | 8136 | 207.3 | 228.4 | 5.38 | 4.62 | 6934 | 1350 | 8345 |

**Table 2. Yield parameters of maize as influenced by desi poultry**

| Crop | *Kharif* (2016) | | | | | | *Winter* (2016-17) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cob weight | Cob length (cm) | Cob girth (cm) | Number of grain rows cob$^{-1}$ | Number of grains row$^{-1}$ | Test weight (g) | Cob weight | Cob length (cm) | Cob girth (cm) | Number of grain rows cob$^{-1}$ | Number of grains row$^{-1}$ | Test weight (g) |
| Maize | 226.2 | 15.8 | 14.8 | 13.8 | 30.6 | 33.5 | 210.4 | 14.8 | 13.9 | 13.6 | 28.6 | 30.4 |
| Maize + desi bird | 230.6 | 16.2 | 15.2 | 14.6 | 32.3 | 35.6 | 216.6 | 15.4 | 14.5 | 13.2 | 30.3 | 33.2 |

**Table 3. Weed parameters of maize influenced by desi poultry**

| Crop | *Kharif* (2016) | | Winter (2016-17) | |
|---|---|---|---|---|
| | Total weed density (No. m$^{-2}$) | Total weed dry weight (g m$^{-2}$) | Total weed density (No. m$^{-2}$) | Total weed dry weight (g m$^{-2}$) |
| | 30 DAS | 40 DAS | 30 DAS | 40 DAS |
| Maize | 25.82 | 16.22 | 20.32 | 12.45 |
| Maize + desi poultry | 14.23 | 9.65 | 10.73 | 7.34 |

**Table 4. Post harvest soil available nutrients (kg ha$^{-1}$) of maize as influenced by desi poultry**

| Crop | *Kharif* (2016) | | | | *Winter* (2016 -17) | | | |
|---|---|---|---|---|---|---|---|---|
| | OC (%) | N | P | K | OC (%) | N | P | K |
| Maize | 0.52 | 210.3 | 14.6 | 620.5 | 0.53 | 202.3 | 13.8 | 604.2 |
| Maize + desi poultry | 0.54 | 217.5 | 18.4 | 628.4 | 0.56 | 211.3 | 14.9 | 612.5 |

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