

Evaluation of Different Integrated Nutrient Management Approaches for Sustainable Productivity of Finger Millet + Pigeonpea Cropping System under Rainfed Condition

Thimmegowda, M. N., Mudalagiriappa, Puneetha, K. M., Savitha, M. S., Vasanthi, B. G., Devaraja, K. and Jayashree, H.T.

All India Coordinated Project for Dryland Agriculture, University of Agricultural Sciences, Gandhi Krishi Vignana Kendra, Bangalore-560065, Karnataka

*Corresponding Author E-mail: drylandgkvc@uasbangalore.edu.in

Received: 4.11.2018 | Revised: 19.12.2018 | Accepted: 24.12.2018

ABSTRACT

Experiment was conducted during kharif 2015-18 under rain-fed condition in Baichenahalli village of Tumakuru district under Operational Research Project (ORP) programme of AICRP for Dryland Agriculture, University of Agricultural Sciences, Bengaluru. Drylands are not only thirsty but also hungry, imbalanced nutrition is one of the major threat in achieving sustainable production under dryland condition, hence balanced nutrition is the practice to be advocated for the farmers. Demonstration was carried at farmer's field to access the effect of different sources of nutrients on yield, RWUE and net returns. Two crops Finger millet (GPU 28) + Pigeonpea (BRG-2) with three treatments. T_1 : RDF (50:40:37.5 kg ha⁻¹ NPK); T_2 : 50 % N through FYM + 50 % N and 100 % P, K through inorganic source + ZnSO₄ (12.5 kg ha⁻¹) + borax (10 kg ha⁻¹) + bio fertilizer; T_3 : Farmers practice of only DAP and Urea (Finger millet + akkadi crops) were assessed. During 2015 and 2017, the rainfall received was above normal and erratic distribution caused marginal yield loss. Among different treatments T_2 treatment resulted in higher finger millet equivalent yield of 4580 and 3659 kg ha⁻¹ with net returns of Rs.77,965/- and Rs. 49000/- respectively. However, during 2016, low rainfall and erratic distribution hampered the crop almost to complete loss but among the different treatments supplementation of nutrients both through organic and inorganic sources (T_2) resulted in better yield (1067 kg ha⁻¹) compared to T_1 : RDF alone (963 kg ha⁻¹) and T_3 : Farmers practice (578 kg ha⁻¹). The average additional equivalent yield of 1061 kg ha⁻¹ with 34.29 per cent increment was observed in (T_2) treatment over Farmers practice (T_3) of application of only DAP and urea. Irrespective of quantity and intensity of rainfall received, higher RWUE of 6.08 kg ha-mm⁻¹ was observed in T_2 treatment followed by T_1 (567 kg ha-mm⁻¹) treatment wherein only inorganic source of nutrient was applied. Thus integrated nutrient management with balanced application of nutrients helped in sustaining soil health and fertility.

Key words: Pigeonpea, Millet, Dryland, Cropping system

Cite this article: Thimmegowda, M.N., Mudalagiriappa, Puneetha, K.M., Savitha, M.S., Vasanthi, B.G., Devaraja, K. and Jayashree, H.T., Evaluation of Different Integrated Nutrient Management Approaches for Sustainable Productivity of Finger Millet + Pigeonpea Cropping System under Rainfed Condition, *Int. J. Pure App. Biosci.* 6(6): 1039-1041 (2018). doi: <http://dx.doi.org/10.18782/2320-7051.7242>

INTRODUCTION

Imbalanced and skewed application of N,P,K accompanied by restricted use of organic manures and micronutrients have made soils not only deficient in the nutrients but also deteriorated the soil health resulting in decline in crop response to the recommended dose of fertilizers under these circumstances integration of chemical and organic sources and their management have shown promising results not only in sustaining the productivity but have also proved to be effective in maintaining soil health and enhancing nutrient use efficiency^{3,2}. The supplementary and complimentary use of organic manures and inorganic fertilizers augment the efficiency of both the substances to soil and crop productivity. Continuous use of only inorganic fertilizers has increased the crop productivity in the initial stages. However, It has declined over years as a result of deterioration of soil health. There is a good potential, to reduce the gap of nutrient exhausted and nutrient added through combined use of organic and inorganic fertilizers. Hence, demonstration to study the response of Integrated nutrient management for sustainable productivity of finger millet + pigeonpea cropping system.

MATERIAL AND METHODS

Demonstration on integrated nutrient management was carried out for 3 years during *kharif* 2015-16 to 2017-18 at Baichenahalli Village of Tumakuru district under Operation Research Project of All India Co-ordinated Research Project for Dryland Agriculture. The village was selected based on the vulnerability to drought. Geospatially, the village is located at 13° 24' 19.6" N latitude, 77° 14' 47.6" E longitude and 750 m above MSL. The soils of the village were sandy loam in texture, slightly acidic in reaction; low to high in organic carbon (0.12-0.96 %) and available phosphorous (4.62-94.93 kg ha⁻¹). Whereas available nitrogen (50.4-504.0 kg ha⁻¹) and potassium (110.48-165.90 kg ha⁻¹) were low to medium.

The actual rainfall received during 2015, 2016 and 2017 was 762.5, 601.6 and 842.8 mm; respectively against normal rainfall of 729.8 mm. Deviation of actual rainfall from the normal during 2015 and 2017 was positive i.e., 2.52 and 15.5% respectively. While during 2016, It was negative by 17.30 %. Finger millet + pigeon pea with three treatment combination T₁: RDF (50:40:25 kg ha⁻¹) T₂: 50% N through FYM + 50% N and 100% P K through inorganic source + ZnSO₄ (12.5 kg ha⁻¹) + borax (10 kg ha⁻¹) + bio fertilizer T₃: Farmers practice of only DAP and urea (finger millet + *akkadi* crops). The observation on yield, economics and rain water use efficiently was recorded adopting standard procedure.

RESULT AND DISCUSSION

The pooled data for 3 years (2015-17) showed that the finger millet grain equivalent yield was higher (3102 kg ha⁻¹) in 50% N through organic source + 50% N and 100% PK through inorganic +12.5 kg zinc sulphate + 10 kg borax per ha compared to recommended N, P₂O₅ and K₂O (2914 kg ha⁻¹) with a higher benefit cost ratio of 2.59 (Table 1). The balanced fertilization might have increased root density and proliferation which aid extensive exploration and supply of nutrient and water to the growing plant resulting in increased growth and yield. There was higher finger millet grain yield response (34.20 %) when compared to farmer's practice of only DAP and Urea (T₃). This has clearly demonstrated the necessity of balanced nutrition in the days to come similar to the observations of Rego *et al.*⁵, Higher yield (3102 kg ha⁻¹), Net return (Rs 44,000/-) and RWUE (6.08 kg ha⁻¹ mm) in T₂ might be attributed to better supply of nutrients by conducive physical environment leading to better root activity and higher nutrient absorption, which resulted in better plant growth and superior yield^{4,1,6}. Thus combined application of organics and inorganics improved the soil fertility as compared to application of only fertilizers.

Table 1: Yield and economics of finger millet + pigeonpea cropping system under integrated nutrient management

Treatment	Yield (kg ha ⁻¹)				Net return (₹ ha ⁻¹)	B:C ratio	RWUE (kg ha-mm ⁻¹)
	Finger Millet	Pigeonpea	Akkadi crop	FME			
2015-16							
T ₁	2436	402	-	4263	70,861	3.59	6.16
T ₂	2512	455	-	4580	77,965	3.85	6.62
T ₃	2025	-	PP: 61, CP: 25 FB: 24 Cas: 54, Sor: 29	2576	32,400	2.18	3.72
2016-17							
T ₁	450	154	-	963	4111	1.14	5.01
T ₂	501	170	-	1067	5036	1.16	5.55
T ₃	404	-	PP: 21, Cas: 08 Sor: 12, FB: 15 Ses:12, CP:11	578	-12447	0.59	3.00
2017-18							
T ₁	1256	826	-	3516	46199	2.66	5.84
T ₂	1322	854	-	3659	49000	2.75	6.08
T ₃	1120	-	PP: 67,Cas: 26 Ses: 32,CP: 36 Sor: 52,FB: 30	2970	33379	2.15	4.93
Mean							
T ₁	2071	461	-	2914	40390	2.46	5.67
T ₂	1445	493		3102	44020	2.59	6.08
T ₃	1183	-		2041	17777	1.64	3.88

COC: cost of cultivation, FM: finger millet, PP: pigeonpea, Cas: castor, Sor: sorghum, FB: field bean,

Ses: sesamum, CP: cowpea T₁: RDF

T₂: 50% N through FYM +50% N and 100% P K through inorganic source + ZnSO₄ (12.5 kg ha⁻¹) + borax (10kg ha⁻¹ + bio-fertilizer)

T₃: Farmers' practice of only DAP and urea (finger millet +akkadi crops)

REFERENCES

- Acharya, R., Dash, A.K. and Senapati, H.K., Effect of integrated nutrient management on microbiological activity influencing grain yield under rice-rice cropping system in an acid soil. *Asian J. Microbiol., Biotechnol. Environ. Sci.*, **14**: 365-368 (2012).
- Kumar, M., Vaduvanshi, N.P.S. and Singh, Y.V., Effect of integrated nutrient management on rice yield, nutrient uptake and soil fertility status in reclaimed sodic soils. *J. Indian Soc. Soil Sci.*, **60**: 132-137 (2012).
- Laxminarayana, K., Susanjohn, K., Ravindran, C.S. and Naskar, S.K., Effect of lime, inorganic and organic sources on soil fertility, yield, quality and nutrient uptake of sweet potato in *Alfisol*. *Commun. Soil Sci. Plant Anal.*, **42**: 2515-2525 (2011).
- Manjunath, M.N., Patil, P.L., and Gali, S.K., Effect of organics amended with rock phosphate and P solubilizer on P use efficiency of french bean in a *Vertisols* of Malaprabha right bank command of Karnataka. *Karnataka J. Agric. Sci.*, **19**: 36-39 (2006).
- Rego, T.J., Sahrawat, K.L., Wani, S.P., and Pardhasaradhi, G., Widespread deficiencies of sulphur, boron and zinc in Indian semi-arid tropical soils: on farm crop responses, *Journal of Plant Nutrition*, **30**: 1569-1583 (2007).
- Shahid, M., Nayak, A.K., Shukla, A.K., Tripathi, R., Kumar, A., Mohanty, S., Bhattacharyya, P., Raja, R. and Panda, B.B., Long term effects of fertilizers and manure applications on soil quality and yields in a sub-humid tropical rice-rice system. *Soil quality and yields in a sub-humid tropical rice-rice system. Soil Use Manage.*, **29**: 322-332 (2013).