 https://doi.org/10.56572/gjoee.2022.si.0017

CROP DIVERSIFICATION AND INTENSIFICATION APPROACH UNDER FARMER FIRST PROGRAMME

R. K. Mathukia[1], S. G. Savalia[2] and P. K. Chovatia[3]

1,2&3 Department of Agronomy, College of Agriculture, Junagadh Agricultural University, Junagadh-362001
email: rkmathukia@jau.in, M: 7600455459

ABSTRACT

A total of 40 experiments were conducted on farmers' fields at three villages of Bagasara taluka of Amreli district during 2019-20 under the Farmer FIRST Programme "Integrated Resource Management in Agriculture and Allied Fields for Stakeholders". The technological intervention consisting of cotton + sweet corn intercropping + enriched compost was compared with farmers' practice i.e. sole cotton without organic manure. The results revealed that cotton + sweet corn intercropping + enriched compost significantly increased seed cotton equivalent yield to the tune of 50.14% over the farmer's. The technology intervention registered gross income of ₹ 90588/ha, additional cost of ₹ 16125/ha, additional net return of ₹ 13775/ha with B:C of 1.54. The technology considerably reduced EC and pH of soil as well as significantly increased organic carbon and availability of nutrients in soil as compared to initial status. Farmers' feedbacks revealed that the technology is feasible and adoptable to increase yield and income, maintain soil fertility, resilience against vagaries of monsoon and market volatility, efficient use of resources and fodder production for cattle.

***Keywords**: FFP, crop diversification, crop intensification*

INTRODUCTION

Owing to inadequate, scanty and erratic distribution of rainfall, crop failure is a common feature of dryland/rainfed agriculture in India. Hence, the yield of all the rainfed crops is governed by vagaries of monsoon. Further, high volatility in market price of produce is now considered as an additional risk factor. Crop diversification is the only solution to such monsoon and market risks. Crop diversification through intercropping has been shown to improve crop productivity and profitability, conservation of resources and provide a kind of biological resilience against risks and aberrant rainfall behaviour in rainfed condition (Dutta and Bandyopadhyay, 2006).

Groundnut is considered as the pre-dominant *kharif* crop of the Saurashtra region of Gujarat. Yield fluctuation under vagaries of monsoon, disease-pest problem and low market price are the major constraints in groundnut cultivation. Hence, during last few years most of the farmers switched over to Bt cotton cultivation. But further low market price of Bt cotton is now became the major constraint besides some production problems.

Being wide spaced crop and slow growing nature of cotton much of the vacant interspaces remain unutilized during initial stages of the crop growth, which offers ample scope for raising intercrops. This situation can be advantageously exploited for intercropping with short, early maturing crops like blackgram, greengram, soybean, groundnut, sweet corn *etc*. (Thavaprakaash and Velayudham 2007; Harisudan *et al.,* 2009; Patel *et al.,* 2013). Intercropping in cotton has been recently recognized as potential intervention for doubling the farmers' income.

The Farmer FIRST Programme (FFP) is an ICAR initiative to move beyond the production and productivity, to privilege the smallholder agriculture and complex, diverse and risk prone realities of majority of the farmers through enhancing farmers-scientists interface. On this background the project "Integrated Resource Management in Agriculture and Allied Fields for Stakeholders" under FFP was conducted.

OBJECTIVE

To validate cotton + sweet corn intercropping system on farmers' field under farmer FIRST programme as crop diversification and intensification approach of doubling the farmers' income

METHODOLOGY

Field experiments were conducted on 40 farmers' fields at Hadala (23), Mav Jinjava (9) and Deri Pipaliya (8) villages of Bagasara taluka of Amreli district during 2019-20 as crop diversification module of "Integrated Resource Management in Agriculture and Allied Fields for Stakeholders" under the Farmers FIRST Programme (FFP). The region falls under North Saurashtra Agro-climatic Zone–VI. It is an agriculture oriented taluka having medium black calcareous

soils with 600-700 mm rainfall. The crop diversification module of FFP was determined based on problems and need of farming community. The farmers were selected on the basis of bench mark survey and campaigning meetings carried out in the villages. The technological intervention consisting of cotton + sweet corn intercropping + enriched compost was compared with farmers' practice i.e. sole cotton without organic manure. The technology was applied in 0.5 acre per farm family. The critical inputs *viz*., hybrid seed of sweet corn 1.5 kg/0.5 acre and enriched compost 500 kg/0.5 acre were supplied to the selected farmers. Enriched compost was applied to furrow before sowing of the cotton. At onset of monsoon, cotton crop was sown at spacing of 150-180 cm x 60 cm and one row of sweet corn was sown as an additive series of intercropping. The farmers were trained enough through technology application literature, meetings, personal contact and on-campus trainings and exposure visits. The soil samples were collected before sowing and after harvest of the crop. The crop condition was monitored regularly and yield data were recorded as per picking/maturity of the crops. The field days were organised to spread the technology among the other farmers. Farmers' feedback were collected at the completion of the experiments.

RESULTS AND DISCUSSION

Table 1: Yield and economics (Averaged over 40 farmers)

(n=40)

Parameter	Farmer's practice (Sole cotton)	Experiment (Cotton + Sweet corn + Enriched compost)
Seed cotton yield (kg/ha)	1214	1196
Sweet corn cob yield (kg/ha)	-	2238
Sweet corn fodder yield (kg/ha)	-	8431
Seed cotton equivalent yield (kg/ha)	1214	1812**
Yield increase (kg/ha)	-	598
Yield increase (%)	-	50.14
Gross return (₹/ha)	60688	90588**
Cost of cultivation (₹/ha)	42562	58687
Net return (₹/ha)	18126	31901
Additional return (₹/ha)	-	29900
Additional cost (₹/ha)	-	16250
Additional net return (₹/ha)	-	13775
B:C	1.43	1.54

** indicates z-test significant at 1% level of significance

The data presented in Table-1 indicated that cotton + sweet corn intercropping + enriched compost recorded significantly higher seed cotton equivalent yield to the tune of 598 kg/ha (50.14%) over the farmer's practice. The technology intervention registered additional return Rs. 29900/ha having cost of Rs. 16250/ha over the farmer's practice, hence resulted in additional net return of Rs. 13775/ha with B:C of 1.54. The cob and fodder yields of intercrop might have been responsible for increased yield and net return with intercropping system over the farmer's practice. Moreover, application of compost enriched with microbial cultures might have improved physical, chemical and biological properties of soil and thus provided congenial soil environment for plant to uptake of nutrients and moisture needed for growth and development of the crop. The results are in conformity with those reported by Thavaprakaash and Velayudham (2007), Harisudan *et al.* (2009), Patel *et al.* (2013) and Dudhatara et al. (2022).

Table 2: Soil parameters (Averaged over 40 farmers)

(n=40)

Soil parameter	Initial	Post-harvest	Change (%)
EC (dS/m) (1:2.5)	0.30	0.26	-11.89**
pH (1:2.5)	8.27	8.09	-2.24**
Organic carbon (%)	0.45	0.54	19.89**
Available P_2O_5 (kg/ha)	23.28	26.98	15.89**
Available K_2O (kg/ha)	380.55	441.70	16.07**
Available S (ppm)	13.77	16.24	17.92**
Available Fe (ppm)	21.65	25.61	18.30**
Available Mn (ppm)	12.25	14.43	17.78**
Available Cu (ppm)	3.16	3.77	19.60**
Available Zn (ppm)	1.06	1.29	21.93**

* and ** indicate z-test significant at 5% and 1% level of significance

The results given in Table-2 showed that the technology of cotton + black gram/sweet corn intercropping + enriched compost favourably improved soil condition and availability of nutrients compared to initial status. The technology reduced EC (11.89 %) and pH (2.24%) as well as increased organic carbon (19.89%), available phosphorus (15.89%), available potash (16.07%), available sulphur (17.92%) and micronutrients (17.78-21.93%) in soil with cotton + sweet corn intercropping + enriched compost as compared to initial status. The residue of intercrop might have been ascribed to increase organic matter and nutrients availability in soil. Further, the compost directly supplied

organic matter and microbial cultures enriched with it might have increased N fixation, P solubilization, K mobilization and micronutrient solubilization, which in turn reflected in increased status of organic carbon and availability of nutrients in soil. Ahmed *et al.* (2008), Saxena *et al.* (2015) and Jayakumar and Surendran (2017) also reported similar results.

Farmers' feedback revealed that the technology is feasible and adoptable to increase income, maintain soil fertility, resilience against vagaries of monsoon and market, efficient use of resources and fodder production for cattle. Impact survey indicated that the technology is spread to about 500 farmers. Looking to the excellent results of this project, the Government of Gujarat sanctioned 50% subsidy in enriched compost.

CONCLUSION

From the experimentation on 40 farmers' fields under FFP, it can be concluded that higher production and profit can be obtained by adopting cotton + sweet corn intercropping with application of enriched compost, which also maintain soil fertility and productivity under North Saurashtra Agro-climatic Zone of Gujarat.

IMPLICATIONS

(1) The incentives should be availed for intercropping system to diversify and intensify crop production.

(2) Subsidy should be provided to enriched organic manures to improve soil health.

ACKNOWLEDGEMENT

Authors acknowledge ICAR for sanctioning the World Bank funded FFP project. They also highly obliged to Junagadh Agricultural University for providing necessary infrastructural and manpower facilities to conduct the project.

CONFLICT OF INTEREST

There is no conflict between author.

REFERENCES

Ahmad, R., Arshad, M., Zahir, Z. A., Naveed, M., Khalid, M. and Asghar, H. N. (2008) Integrating N-enriched compost with biologically active substances for improving growth and yield of cereals. *Pakistan J. Botany.* 40(1): 283-293.

Dutta, D. and Bandyopadhyay, P. (2006) Production potential of groundnut with pigeonpea and maize under various row proportions in rainfed Alfisols of West Bengal. *Indian J. Agronomy.* 51(2):103-106.

Dudhatara, H. C., Patel, J. K. and Parmar, H. A. (2022) Association between selected characteristics of the farmer and agricultural diversification. *Guj. J. Ext. Edu.* 33(2): 102-105. https://doi.org/10.56572/gjoee.2022.33.2.0021

Harisudan, C., Senthivel, S., Arulmozhiselvan, K., Vaidyanathan, R. and Manivannan, V. (2009) Black gram as an intercrop in cotton- A review. *Agric. Rev*. 30(3): 219-223.

Jayakumar, M. and Surendran, U. (2017) Intercropping and balanced nutrient management for sustainable cotton production. *J. Pl. Nutri.* 40(5): 632-644.

Patel, A. M., Patel, N. I., Ram, C. and Singh, R.N. (2013) Cotton (*Gossypium hirsutum* L.) based intercropping system under rainfed conditions of North Gujarat. *Green Fmg.* 4(6): 773-775.

Saxena, J., Choudhary, S., Pareek, S., Choudhary, A. K. and Iquebal, M. A. (2015) Recycling of organic waste through four different composts for disease suppression and growth enhancement in mung beans. *CLEAN Soil, Air, Water*. 43(7): 1066-1071.

Thavaprakaash, N. and Velayudham, K. (2007) Effect of crop geometry, intercropping system and INM practices on cob yield and nutrient uptake of baby corn. *Asian J. Agric. Res.* 1(1): 10-16.

Received : July 2022 : Accepted : October 2022