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To study the Effect of factor productivity of natural farming practices in turmeric crop (*Curcuma longa* L.) under Middle Gujarat conditions

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Abstract

A field experiment was conducted during *Kharif-Rabi* 2025-26 at Gujarat Natural Farming Science University, Halol, Gujarat. The results revealed that treatment of all NF component viz., *Beejamrit*, *Jeevamrit*, *Ghanjeevamrit*, mulching, mix cropping and raised bed recorded significantly higher growth parameters, rhizome yields and economics over other treatments in turmeric crop taken in natural farming conditions as compared other treatment. This treatment also produced the highest turmeric equivalent yield, gross realization, net realization and B:C ratio. The superior performance of this treatment may be attributed to combined effect of all natural farming components which improved soil microbial activity, nutrient availability, moisture conservation, soil aeration and their effect on crop growth. The omission of individual natural farming components reduced yield and profitability compared to adoption of natural farming practices Thus it proved for sustainable and profitable turmeric production under NF condition in Middle Gujarat conditions.

Keywords: Turmeric, natural farming, factor productivity, *Jeevamrit*, *Ghanjeevamrit*, *Beejamrit*, mulching, sustainable agriculture, economics

Introduction

Turmeric (*Curcuma longa* L.) is one of the most important spice and medicinal crops belonging to the family Zingiberaceae. It is widely cultivated in India for its underground rhizomes, which are used as spice, colouring agent and preparing in medicinal products. India is the largest producer, consumer and exporter of turmeric in the world. Turmeric possesses immense medicinal importance due to the presence of curcumin, which exhibits antioxidant, antibacterial, antifungal, anti-inflammatory and anticancer properties.

Natural farming is gaining importance as a sustainable agricultural approach, because it promotes chemical-free cultivation and improves soil health. Natural farming practices mainly includes *Beejamrit*, *Jeevamrit*, *Ghanjeevamrit*, mulching and mixed cropping. These practices enhance microbial activity, nutrient availability and ecological balance in the soil ecosystem. *Beejamrit* acts as a seed treatment material which protects the seed and soil-borne pathogens while promoting healthy germination. *Jeevamrit* supplies beneficial microorganisms and essential nutrients to crops and stimulates microbial activity in the rhizosphere. *Ghanjeevamrit* improves soil physio-biochemical properties under natural farming systems. Mulching is another important component to conserves soil moisture, regulates soil temperature, improve microbial as well as earthworm activities and suppresses weed infestation. It also improves organic matter status in the soil. Similarly, mixed cropping enhances biodiversity, resource utilization efficiency and overall system productivity. Raised bed planting provides better drainage and aeration, especially in turmeric cultivation where water stagnation adversely affects rhizome development. Raised beds improve root growth, nutrients uptake and reduce incidence of disease particularly rhizome rot in turmeric crop. Although natural farming practices are widely promoted, scientific information regarding their integrated effect on turmeric cultivation under Middle Gujarat conditions is

limited. Therefore, the present study was undertaken

to evaluate the effect of different natural farming components on growth, yield, quality, soil properties and economics.

Materials and Methods

The field experiment was conducted during *Kharif-Rabi* 2025-26. The soil of the experimental field was clay loam in texture with pH 7.8 and EC 0.225 dS/m. The soil contained 0.6% organic carbon, 175 kg/ha available nitrogen, 31 kg/ha available phosphorus and 346 kg/ha available potassium. The experiment was conducted in Randomized Block Design with seven treatments replicated four times. The treatments consisted of T₁: All natural farming components (*Beejamrit* + *Jeevamrit* + *Ghanjeevamrit* + Mulching + Mixed cropping + Raised bed), T₂: All natural farming components except *Jeevamrit*, T₃: All natural farming components except Mulching, T₄: All natural farming components except *Ghanjeevamrit*, T₅: All natural farming components except Mixed cropping, T₆: All natural farming components except *Beejamrit* and T₇: All natural farming components except Raised bed planting. Turmeric variety GNT 3 (Pitambari) was used as the test crop due to its high yield potential and suitability under Gujarat conditions.

Results and Discussion

Effect on yield and yield attribute

Weight of mother rhizome

The weight of mother rhizome was significantly influenced by different natural farming treatments (Table 1). Treatment T₁ recorded the highest mother rhizome weight (139.8 g/plant), followed by T₆ (102.8 g/plant) and T₃ (98.3 g/plant), which were statistically at par. The lowest weight (82.3 g/plant) was observed under T₇. The superior performance of T₁ may be attributed to the combined effect of all natural farming components, which enhanced nutrient availability, soil microbial activity, and moisture conservation, resulting in better rhizome development.

Weight of finger rhizome

The data presented in Table 1 further indicated that finger rhizome weight differed significantly among various treatments. Treatment T₁ recorded the maximum finger rhizome weight (692 g/plant), which was significantly higher over all other treatments. The minimum finger rhizome weight was observed under T₇ (363 g/plant). Treatments T₆ (597 g/plant) and T₃ (517 g/plant) were statistically at par and recorded comparatively higher finger rhizome weight among the remaining treatments. The higher finger rhizome weight under T₁ may be attributed to continuous nutrient supply through *Jeevamrit* and *Ghanjeevamrit* along with improved soil conditions created by mulching and raised bed cultivation.

Fresh Weight of rhizome

Fresh rhizome weight per plant varied significantly among the natural farming treatments (Table 1). The maximum fresh rhizome weight was recorded in T₁ (831.5 g/plant), followed by T₆ (700.0 g/plant) and T₃ (608.5 g/plant), which were statistically at par. The minimum fresh rhizome weight was observed in T₇ (445.3 g/plant), remaining at par with T₅ (452.3 g/plant). The enhanced rhizome weight under T₁ could be attributed to the synergistic effect of all natural farming components, resulting in improved soil fertility and crop growth. Similar findings were reported by Kadam and Kamble (2020) [3].

Dry recovery

Dry recovery of turmeric was significantly influenced by the

omission of different natural farming components (Table 1). Treatment T₁ (all natural farming components) recorded the highest dry recovery (16.2%), followed by T₆ (14.1%), which was statistically at par with T₂ and T₃ (13.0%). The lowest dry recovery was observed under T₇ (11.4%), which remained at par with T₅ (11.8%) and T₄ (12.0%). The higher dry recovery in T₁ may be attributed to the combined effect of all natural farming components, which improved soil health, nutrient availability and dry matter accumulation. These findings are in agreement with Kadam and Kamble (2020) [3].

Rhizome volume

The data presented in Table 1 revealed that rhizome volume was significantly influenced by different treatments. Among all treatments, T₁ recorded the maximum rhizome volume (441 cc), which was significantly superior over all other treatments. The minimum rhizome volume was recorded under T₇ (308 cc). Treatments T₆ (356 cc) and T₃ (337 cc) were statistically at par and recorded comparatively higher rhizome volume among the remaining treatments. Higher rhizome volume under T₁ may be due to better soil structure, higher moisture retention and balanced nutrient availability under integrated natural farming practices.

Rhizome yield

The data presented in Table 1 showed that turmeric yield was significantly affected by different natural farming treatments. Treatment T₁ recorded the highest turmeric yield (17,056 kg/ha), which was substantially higher than all other treatments. The lowest yield was observed under T₇ (9339 kg/ha). Treatments T₆ (14,214 kg/ha) and T₃ (12,692 kg/ha) were found statistically at par and recorded comparatively higher yield among the remaining treatments. The significantly higher yield recorded under T₁ might be due to the synergistic effect of all natural farming components which enhanced soil fertility, nutrient availability, microbial activity and moisture conservation, ultimately leading to better rhizome growth and higher yield.

Dry yield of turmeric

Dry yield of turmeric differed significantly among the natural farming treatments (Table 1). Treatment T₁ recorded the highest dry yield (2797.0 kg/ha), followed by treatment T₆ (1750.0 kg/ha) and T₃ (1639.3 kg/ha), which were statistically at par. The lowest dry yield was observed under treatment T₇ (1070.2 kg/ha), remaining at par with treatments T₅ (1120.0 kg/ha) and T₄ (1138.9 kg/ha). The higher dry yield in T₁ may be attributed to the combined effect of all natural farming components, which enhanced crop growth and dry matter accumulation. Similar results were reported by Kadam and Kamble (2020) [3].

Factor productivity varied among the treatments. The highest factor productivity was recorded in treatment T₇ (45.24%), followed by treatment T₅ (44.01%) and treatment T₄ (43.83%), whereas the lowest was observed in T₆ (16.66%). Treatments T₂ and T₃ recorded factor productivity of 32.78% and 25.58%, respectively.

Economics

Gross realization

The gross realization was considerably influenced by different natural farming practices as shown in Table 4.21. Gross realization ranged from ₹4,88,063 to ₹13,07,225/ha. Among all

the treatments, T₁ (all NF components) recorded the highest gross realization of ₹13,07,225/ha, followed by treatment T₆ with ₹10,43,838/ha and treatment T₃ with ₹9,97,550/ha. The lowest gross realization of ₹4,88,063/ha was observed under treatment T₅ (all NF components of practices except Mix crop). The higher gross realization under treatment T₁ might be due to higher equivalent yield and better overall crop performance under complete adoption of natural farming practices.

Net returns

The net returns differed substantially due to different natural farming practices and ranged from ₹3,06,558 to ₹11,23,814/ha. The maximum net returns of ₹11,23,814/ha were obtained under treatment T₁ comprising all NF components viz., *Beejamrit*, *Jeevamrit*, *Ghanjeevamrit*, Mulching, Mix crop and raise bed of practices. This was followed by treatment T₆ (without *Beejamrit*) with ₹8,65,582/ha and treatment T₃ (without mulching) with ₹8,17,148/ha. The lowest net returns of ₹3,06,558/ha were recorded under treatment T₅ (all NF components of practices except Mix crop). The higher net returns under treatment T₁ could be attributed to higher equivalent yield and gross realization obtained through integrated natural farming practices.

Benefit: Cost ratio (B:C ratio)

The Benefit: Cost ratio was markedly influenced by different

natural farming practices and ranged from 2.69 to 7.13. The highest B:C ratio of 7.13 was recorded under treatment T₁ comprising all NF components of practices, indicating greater economic profitability due to higher yield and returns. This was followed by treatment T₆ with a B:C ratio of 5.86 and T₃ (without mulching) with 5.53. The lowest B:C ratio of 2.69 was observed under treatment T₅ (all NF components of practices except Mix crop), mainly due to lower equivalent yield and reduced economic returns. Higher B:C ratio under treatment T₁ indicated the economic feasibility and effectiveness of complete natural farming practices in turmeric cultivation.

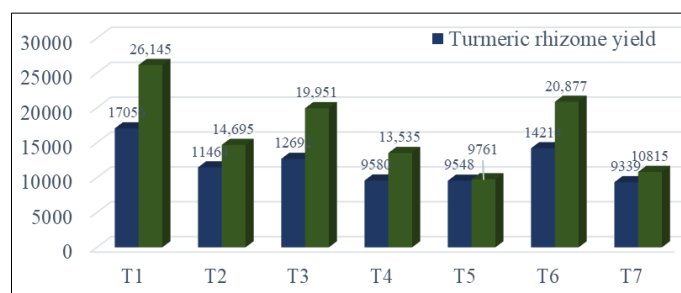


Fig 1: Effect of natural farming practices on turmeric rhizome yield and turmeric rhizome equivalent yield

Table 1: Effect of Natural Farming practices on yield and yield attribute

Treatment	Weight of mother rhizome (gram)	Weight of finger rhizome (gram)	Rhizome fresh weight (gram)	Dry recovery (%)	Volume (cm ³ /rhizome)	Yield of turmeric (kg/ha)	Turmeric Powder (kg/ha)	Factor productivity (%)
T ₁	139.8	692	831.5	16.2	441	17056	2797.0	-
T ₂	97.3	446	542.8	13.0	336	11464	1492.0	32.78
T ₃	98.3	517	608.5	13.0	337	12692	1639.3	25.58
T ₄	88.8	385	472.8	12.0	331	9580	1138.9	43.83
T ₅	85.3	368	452.3	11.8	326	9548	1120.0	44.01
T ₆	102.8	597	700.0	14.1	356	14214	1750.0	16.66
T ₇	82.3	363	445.3	11.4	308	9339	1070.2	45.24
S.Em. ±	6.3	24	34	0.8	21.33	774	89.1	-
CD (0.05)	18.4	69	98.48	2.29	61.78	2242	258.1	-
C.V%	12.8	10	11.74	12.08	12.27	12.91	11.33	-

Table 2: Economics as influenced by effect of natural farming practices in turmeric

Treatments	Treatment details	Equivalent yield (kg/ha)	Total cost of cultivation (₹/ha)	Gross realization (₹/ha)	Net returns (₹/ha)	B:C Ratio
T ₁	All NF components of practices (<i>Beejamrit</i> , <i>Jeevamrit</i> , <i>Ghanjeevamrit</i> , Mulching, mix crop and raise bed)	26145	183411	1307225	1123814	7.13
T ₂	All NF components of practices except <i>jeevamrit</i>	14695	164049	734738	570688	4.48
T ₃	All NF components of practices except Mulching	19951	180402	997550	817148	5.53
T ₄	All NF components of practices except <i>Ghanjeevamrit</i>	13535	177824	676750	498926	3.81
T ₅	All NF components of practices except Mix crop	9761	181505	488063	306558	2.69
T ₆	All NF components of practices except <i>Beejamrit</i>	20877	178255	1043838	865582	5.86
T ₇	All NF components of practices except Raise bed	17303	180398	865125	684727	4.80

Conclusion

Based on the results of the present investigation, it can be concluded that integration of all natural farming components namely *Beejamrit*, *Jeevamrit*, *Ghanjeevamrit*, mulching, mix cropping and raised bed cultivation significantly improved yield and economics of turmeric cultivation. Therefore, adoption of complete natural farming package may be recommended for sustainable and profitable turmeric production under Middle Gujarat conditions.

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