



Comparative study of green gram cultivation in natural farming vs recommended practices

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Summary

A comparative study on green gram cultivation in natural farming vs recommended practices was carried out at Krishi Vigyan Kendra, Abusar Jhunjhunu in Kharif-2022 to assess future possibilities of Natural farming practices in the district. In natural farming plot no manure and fertilizer were applied, seeds were treated with beejamrit and after sowing Jeevamrit was applied in field as per recommendation while in other plots all recommended doses of fertilizers were applied, seeds were treated with imidacloprid and NPK consortia, for management of weeds herbicide pendamethalin was applied after sowing. Whiteflies were observed in both plots. Neemastra and imidacloprid were applied in natural farming and other plots to control white flies. All observations were recorded from both plots and analyzed. Results revealed that lower yield was observed in natural farming plots (4.54 q/ha) than recommended practices (5.82 q/ha.). Possible causes of low yield in natural farming plots were weeds and severe white fly infestation. In recommended practices, pendamethalin herbicide was applied as pre-emergence, which reduced weed population, while Imidacloprid was sprayed to control white flies, reducing pest infestation. Soil samples after harvesting of crops were taken from both plots and analyzed for available organic carbon and NPK level. In the natural farming plot organic carbon level was slightly higher than in another plot which is a positive sign that it may increase the yield of the next crop.

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Introduction

Green gram is a major kharif pulse crop in the Jhunjhunu district of Rajasthan, grown in approximately 55-60 thousand hectares. The low productivity of pulse crops in district is a major production constraint. The district's soil is almost always sandy loam, which is low fertile. The organic carbon of district soil is around 0.15 %. Mostly soil samples are deficient in organic carbon, nitrogen, sulphur, magnesium, calcium, zinc and iron. Because of low production and productivity, cost benefit ratio of pulse crop is very low (Ushasri et al. 2022). Reduction in cost of production and enhancement in soil fertility by without chemicals is only way to increase net income and cost-benefit ratio. Increased microbial activity in soil increases available organic carbon and other beneficial nutrients required for plant growth. Wallenstein (2017) stated that we need to feed the soil microbes to restore soil fertility. It can be possible by adding organic material back to the soil, minimizing tillage activities and stopping synthetic fertilizers and chemicals. Initially, a Japanese farmer, Masanobu Fukuoka proposed a different thought of farming; Natural farming, which is based on the philosophy of working with ecological cycles and processes of the natural world (Fukuoka, 1987). It is contemplated as a solution to end reliance on costly agro-inputs, improve family health &

nutrition, and sustainable crop yield. Natural Farming (NF) is a unique chemical-free farming technique considered an agro-ecology-based diversified farming system, which integrates crops, trees and livestock, allowing functional biodiversity (LVC 2010; Rosset & Martinez-Torres 2012; Bana et al. 2022; Sarangthem et al. 2023). Natural farming in India was proposed by an agriculturist Sh. Subhash Palekar in the mid-1990s, who was awarded by the highest civilian award of India, Padma Shri in 2016 for the promotion of natural farming practices (Mishra 2018; Niyogi 2018; Haldhar et al. 2017). It has resulted in large-scale adoption at different levels in many states, especially, Andhra Pradesh, Karnataka, Maharashtra, and Himachal Pradesh. It is considered to drastically lower production costs by replacing the chemical fertilizers and pesticides with home-made products like *Jeevamritha*, *Beejamritha*, *Neemastra*, etc, and adopting inter-cropping and mulching (Palekar 2005). According to him, the method requires only one indigenous cow for 30 acres of land. It is also contemplated to restore soil health, improves soil organic carbon even without the need of adding a high quantity of FYM (farmyard manure) as in the case of organic farming and thus help in attaining sustainable agriculture with the reduced carbon footprint. By keeping the above statements, a field trial was laid in kharif 2022 at experimental farm of Krishi Vigyan Kendra, Abusar Jhunjhunu to Compare production, productivity and cost-benefit ratio in natural farming vs recommended practices of green gram cultivation.

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Materials and Methods

A field trial was laid in randomized block design using two treatments with natural farming and recommended cultivation practices. Crop was sown in first week of July at instructional farm of Krishi Vigyan Kendra, Abusar Jhunjhunu. Soil samples were collected before sowing

and analyzed for organic carbon, Nitrogen, Phosphorous and Potash. Vale of organic carbon, nitrogen, phosphorous and potash were 0.160 %, 258 kg/ha., 36 kg/ha., and 181 kg /ha. respectively. Different agronomic practices followed in both treatments are as follows:

Activities	Natural farming block	Recommended practices block
Previous crop	Wheat	Wheat
Tillage	No tillage, directly sown by seed drill	Primary tillage by disc plough followed by dist harrow and sown by seed drill
Variety	MH-1142	MH-1142
Seed treatment	By Beejamritha	By Imidacloprid followed by trichoderma culture and NPK consortia
Application of chemical/ organic fertilizers	Application of Jeevamritha	Recommended dose of NPK fertilizers
Weed management	Manually without hoeing	Pre-emergence application of pendamethalin followed by hoeing
Insect pest management	Spray of Neemastra to control white fly	Spray of Imidacloprid to control white fly

Five plants were selected randomly from each plot for sampling purposes and observations were recorded accordingly. The harvesting and threshing were done plot wise by labour. The observation was recorded viz., plant height (cm), number of pods per plant, number of seeds per pod, grain yield per hectare, straw yield per hectare, harvest index and fertility status of both plots (Organic carbon, available N,P,K) after harvesting. Finally, the economic viability of the treatments was also determined in terms of cost of cultivation, gross monetary returns, net monetary returns and B: C ratio. Data about various parameters were tabulated and subjected to statistical analysis for interpretation of results.

Result and Discussion

The results revealed that plant height in the natural farming plot (53.60 cm) was less than plot where recommended practice (61.50 cm) was adopted. The possible reason behind less plant height might be low nitrogen content in the soil, which is a significant requisite for the plant's vegetative growth. Plants grown in natural farming plots produce less number of pods per plant (10.20), a number of seeds per pod (10.60), grain yield (4.54 q/ha.), straw yield (8.20 q/ha.) and harvest index (30.15) (Table 1). Low production in natural farming plots might be the result of lower content of primary nutrients; nitrogen, phosphorous and potash. Same results in natural farming were also reported by Kumar et al. (2020).

Cost of cultivation in natural farming (14500 Rs/ha) plot was lower than chemical applied plot (28800 Rs/ha). In natural farming, inputs cost was highly diminished due to the abstinence of pesticides, insecticides, and use of natural inputs such as jeevamritha, beejamritha, ghanjeevamritha, and neemastra. Similar findings have been reported by Mishra (2018), he stated that farmers

had a decreased cost of cultivation for all the crops grown in natural farming. In another study, it was observed that the total cost of cultivation was reduced across all the crop combinations, which indicate that the natural farming system reduces farmers' direct costs and promotes the use of locally sourced non-synthetic inputs, compared to capital-intensive farming (Chandel et al. 2021).

The profits and losses from farming are reflected through its net income. It constitutes gross returns from the farming after deduction of total cost incurred. The statistical analysis for net returns under natural farming and recommended practice is shown in Table 2. Here, it is very apparent that green gram cultivated in natural farming have significantly higher net returns and B:C ratio than green gram cultivated using recommended practices. Similar results of higher net return and B:C ratio in natural farming in different crops were also published by NITI Ayog (2022).

After harvesting, soil samples were collected from both plots and analyzed accordingly for organic carbon, nitrogen, phosphorous and potash content (Table 3). Soil organic carbon was found slightly higher in natural farming plot (0.178 %) than in recommended practice (0.165 %), possibly due to increased microbial activity by application of jeevamritha/ beejamritha. Jeevamritha improves soil fertility by stimulating microbial activity to make nutrients plant-available and increase soil carbon (Devarinti 2016; Anuslia2018). Fertilizers were applied in green gram fields cultivated as per recommended practice, resulted in higher amount of nitrogen, phosphorous and potash content in the soil sample (Table 3). Similar findings of higher nutrient content in fertilizer applied plot were also reported by Kumar et al. (2020).

Table1. Effect of natural farming and recommended cultivation practice on plant height, number of pods per plant, number of seeds per pod, straw yield, grain yield and harvest index

Agronomic practice	Plant Height (cm)	No. of pods/ plant	No. of seeds/ pod	Yield (q/ha)	Straw yield (q/ha)	Harvest Index (%)
Natural farming	53.60	10.20	10.60	4.54	9.1	31.65

Recommended practice	61.50	16.40	11.40	5.8	12.1	32.48
S.Em $\pm$	0.62	0.11	0.10	0.07	0.07	0.24
CD (P:0.05)	3.79	0.67	0.31	0.44	0.47	1.02

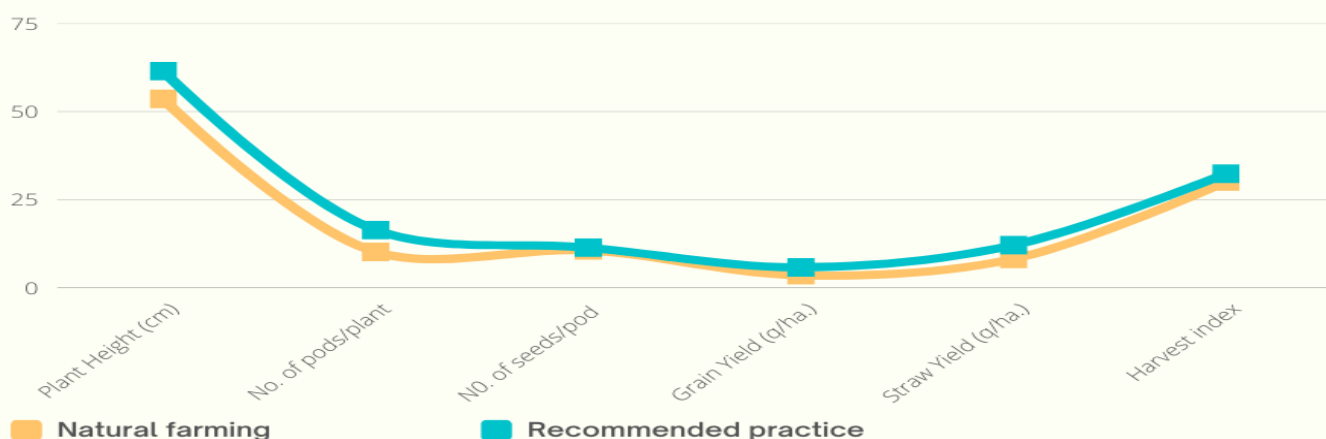
Table 2. Effect of natural farming and recommended cultivation practice on cost of cultivation, gross return, net return and B:C ratio

Agronomic practice	Cost of Cultivation	Gross Return	Net Return	B:C Ratio
Natural farming	14500	37658	23158	2.60
Recommended practice	26850	48160	21310	1.79

Table 3. Effect of natural farming and recommended cultivation practice on soil organic carbon, available nitrogen, phosphorous and potash

Agronomic practice	N (Kg/ha)	P (Kg/ha)	K (Kg/ha)	OC (%)
Natural farming	265	37.2	187	0.178
Recommended practice	281	40.42	198	0.165
S.Em $\pm$	4.77	0.31	4.96	0.01
CD (P:0.05)	19.01	1.90	30.17	0.03

Fig. 1 Effect of natural farming and recommended cultivation practice on plant height, number of pods per plant, number of seeds per pod, straw yield, grain yield and harvest index



Conclusion

A final conclusion from this comparative study is that natural farming helps in increasing net farmer income, even when crop yield is lower than conventional practice. Moreover, in the long term, it would help in big way in regenerative agriculture because of high level of microbial activity and improved soil organic carbon, soil health would improve significantly. Apart from this, it might have various indirect benefits, such as no use of chemical fertilizers would reduce the financial load of fertilizer subsidy. Non-chemical crop production with locally available resources may give better alternative choice for both- farmers as well as consumers.

Declaration of interests

The authors have no conflict of interest to declare.

Data Sharing

All relevant data are within the manuscript.

References

1. Anusha. 2018. Effect of Liquid organic Manure 'jeevamritha' on the Productivity of wheat Under ZeroBudget Natutat Farming System, M'Sc' Thesis, CSKHPKV' Palampur.
2. Bana RS, Dawar Rakesh, Haldhar SM, Godara S, Singh A, Bamboriya SD, Kumar V, Ishra AK & Choudhary M. 2022. Natural farming: Is it safe to march ahead? *Journal of Agriculture and Ecology*, 14: 01-11.
3. Campesina LV. 2010. *Sustainable peasant and family farm agriculture can feed the world*. La Via Campesina, Jakarta, Indonesia.
4. Chandel R S, Gupta M, Sharma S, Sharma P L, Verma S & Chandel A. 2021. Impact of Palekar's natural farming on farmers' economy in Himachal Pradesh. *Indian Journal of Ecology*, 48: 873–878.
5. Devarinti SR. 2016. Natural Farming: Eco-friendly and Sustainable?" *Agro Technology*, 5: 147.
6. Fukuoka M. 1987. *The Natural Way of Farming: The Theory and Practice of Green Philosophy*. Japan Publications. ISBN 978-0-87040-613-3.
7. Haldhar SM, Jat GC, Deshwal H, Gora JS & Singh D. 2017. Insect pest and disease management in organic farming. Book 'Towards Organic Agriculture' edited by B. Gangwar and N. K. Jat. Today & Tomorrow's Publishers, New Delhi, Page: 359-390, ISBN: 81-7019.
8. Kumar R, Kumar S, Yashavanth BS, Meena PC, Ramesh P, Indoria AK, Kundu S. & Manjunath M. 2020. Adoption of Natural Farming and its Effect on Crop Yield and Farmers'

- Livelihood in India. ICAR-National Academy of Agricultural Research Management, Hyderabad, India.
9. Mishra S. 2018. *Zero Budget Natural Farming: Are this and similar practices the answers?* Working Paper No. 70, Nabakrushna Choudhury Centre for Development Studies, Bhubaneswar.
 10. NITI Aayog. 2022. *Compendium of Success Stories of Natural Farming*. ISBN: 978-81-953811-4-2.
 11. Niyogi DG. 2018. Andhra farmers taste success with Zero Budget Natural Farming. *Down to Earth*, (Online). <https://www.downtoearth.org.in/author/deepanwita-gita-niyogi-2399>.
 12. Palekar S. 2005. The philosophy of spiritual farming. 2nd ed. Zero Budget Natural Farming Research, Development & Extension Movement, Amravati, Maharashtra, India.
 13. Rosset PM. & Martinez-Torres ME. 2012. Rural social movements and agro-ecology: Context, theory and process. *Ecology and Society*, 17(3): 32-42.
 14. Sarangthem I, Haldhar SM, Mishra LK & Thakuria D. 2023. The book of abstract: international conference on natural farming for revitalizing environment and resilient agriculture (NF-RERA, 2023). Pub: College of Agriculture, CAU, Imphal, pp: 374, ISBN: 978-81-947184-4-4.
 15. Ushasri, B., Singh, K., Haldhar, S., Devi, T., Jidung, L., Gokulnath, R., & Singh, L. (2022). Bio-efficacy of ground plant powders on the population of *Tribolium castaneum* (Herbst) in stored green gram. *Journal of Agriculture and Ecology*, 14(14), 37–43. <https://doi.org/10.58628/JAE-2214-26>.
 16. Wallenstein M. 2017. To restore our soils, feed the microbes. *The Conversation*. Online article <https://source.colostate.edu/restore-soils-feed-microbes>.

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