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Study on Application of Natural Farming Principles in Mizoram

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ABSTRACT

Certain advancement in the field of agriculture resulted in surplus food grain production sustaining India's population to an era of mechanized farming and remote sensing technologies. This, however also brought about a negative impact on the soil and environment through pollution which ultimately resulted in un-remunerative agriculture. In order to combat this adverse effect, several farming practices has been advocated worldwide such as organic farming which on the other hand is difficult for small and marginal farmers to follow and the product is costly and unattainable by middle- and low-income families. This is where natural farming- a regenerative agriculture approach relying on nature and its product aiming low cost of production and yielding comparatively high produce comes into picture. Keeping this in view, the present study was conducted to evaluate the effect of natural farming practices, principles and components at Lungzarhtum village, Lawngtlai district, Mizoram and it was recommended as a good practice that will increase the yield of crop and improve the health of the soil.

Keywords: Bijamrit, Chemical fertilizers, Jivamrit, Mizoram, Natural Farming.

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INTRODUCTION

Intensification of agriculture contributed to negative environmental issues such as global warming, eutrophication and soil degradation mainly due to indiscriminate use of chemical fertilizers (Liao *et al,* 2019). High cost of inputs led to high cost of production and lesser yield. Heavy use of chemicals contaminates the soil and water bodies and leached down to the ground water which is then taken up by plants. This includes heavy metals such as copper, chromium, cadmium, manganese and zinc, which after accumulation in the plant system for long can have adverse effect on human health when consumed (Korav *et al,* 2020). Therefore, shifting towards organic farming has received growing attention. Organic farming is widely adopted by farmers (44 mha area worldwide). Currently, India has 1.78 mha under organic farming. However, very high price of organic products makes it inaccessible to low-income population. The need for large quantity of farm yard manure (FYM) and costly certification processes makes it difficult for small farmers to adopt it (Kumar *et al*, 2020).

Natural farming therefore paves a way for the farmers to increase their production all the while reducing the cost of inputs and production cost which is one big reason for farmer suicide in India. Its philosophy of working with nature to produce healthy food in order to keep everyone healthy is simple yet practical. Natural farming is also called 'Do nothing farming' as the farmer is the facilitator and all the work is believed to be done by Nature itself. It envisages ecological or regenerative agriculture approaches under which the application of any kind of chemicals to soil bio-system is prohibited. Natural farming is location specific farming, however few common principles have been identified as increasing organic matter in the soil, diversified cropping system, minimum soil disturbance, integration of livestock, round the year soil cover, pest management using natural farming methods, use of on-farm made bio inputs, use of locally adapted seeds and banning the use of chemical or synthetic inputs (Technical Manual on Natural Farming, 2025).

Jivamrit, Bijamrit, mulching, soil aeration and disease management are few of the most crucial practices followed in natural farming. Bijamrit is a seed inoculum prepared by mixing cow dung, cow urine, lime, soil and water. This liquid concoction helps in protecting the seeds and roots of seedling from soil and seed borne pathogens. It reduces germination period and enhances seedling vigour. It strengthens the overall plant's immune system and boosts nutrient uptake. Jivamrit is a liquid microbial inoculum prepared by mixing cow dung, cow urine, jaggery, pulse flour, soil and water. It improves soil microbial activity and population enhancing soil structure. Jivamit is diluted

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Table 1. Agricultural Practices applied in the cultivation system.

Practice	Farmer's Practice	Natural Farming
Seed type	Local	Local
Beejamrit	No	Yes
Jivamrit	No	Yes
Mulching	Less to none	Yes
Pest and disease control	None	Neem oil

Table 2. Initial soil physico-chemical properties.

Soil parameter	pH	SOC (%)	N (kg/ha)	P (kg/ha)	K (kg/ha)
Cabbage field	5.25	0.95	185	11.5	247
French bean field	5.41	0.85	175	20.6	220

Table 3. Result of application of Natural farming practices in Lungzarhtum village, Lawngtlai District (B- Bijamrit, J-Jivamrit, M-Mulching, N-Neem oil)

Crop	Components	Area	Production (q/ha)	Gross Income (Rs)	Net Income (Rs)	B: C Ratio
Cabbage	T_1 (Farmer practice)	0.1ha	150	450000	151986	1.51
	T_2 (Natural Farming with B+J)		160	480000	200930	1.72
	T_3 (Natural farming with B+J+M+N)		162.3	486900	251394	1.90
French bean	T_1 (Farmer practice)	0.1ha	46	230000	158792	3.23
	T_2 (Natural Farming with B+J)		54	270000	195000	3.6
	T_3 (Natural farming with B+J+M+N)		55	275000	205556	3.96

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in water (10%) before application. It enhances microbial growth, improve nutrient cycling, and support root development in plants. Application of jivamrit reduces the need for synthetic fertilizer and thus contribute to a sustainable farming system. Mulching helps maintain soil moisture, reduces evaporation and therefore ensure adequate moisture to crop during dry period. Mulch also supresses weed and is a good practice for weed management. After the mulch material decompose it adds organic carbon to the soil contributing to soil fertility, also improving the soil structure and better microbial population.

The three important mulch material used in natural farming are soil mulching, straw mulching and live mulching. Soil aeration or wapahasa is the condition of the soil where balanced concentration of water and air molecules exists in the rhizosphere. This is achieved through natural farming by minimum irrigation, reduced tillage, and enhanced soil humus accumulation from mulching and addition of other natural concoctions. Disease and pest are managed naturally through application of neem oil or by preparation of insect repellent solutions like Neemastra, Brahmastra, Agniastra etc (Biswas, 2020). Karnataka and Andhra Pradesh are the pioneers in Natural farming adoption in the form of Zero Budget Natural Farming since 2002 in Karnataka through Rajya Raitha Sangha following Subhash Palekar's teaching. Similarly, in 2014 through Rythu Sadhikara Samstha (RySS) ZBNF was popularised in Andhra Pradesh. Surveys in these states showed higher crop yields under ZBNF condition with notable farmer income and less expenditure on agricultural inputs as compared to the conventional method of cultivation (Bharucha *et al,* 2020).

Mizoram as a whole is an agrarian state where agriculture and its allied fields are the main source of livelihood for many (Bhalerao *et al,* 2015). As it is evident that North East India is deemed to be 'Organic' by default, owing to the reluctance of farmers towards incorporating chemical fertilizers to their crops. Similarly, North East hills especially Mizoram could also be termed "Natural Farming" state by default, following the same trend of Organic farming because

1. Majority of the farmers are cultivating without the use of synthetic chemical fertilizers, in fact most of the farmers are cultivating without any nutrient supplementation both organic and chemical.

2. The farming system is Jhum farming, therefore the slash and burn method is the main practice here, and the source of plant nutrients are obtained from the residues of the burnt stubbles.

3. Mixed cropping is the main cropping pattern followed in Mizoram which falls in line with the recommended practice of cropping pattern in Natural Farming.

4. Locally available seeds are grown and preferred by the farmers due to specific taste and adaptability to the environment.

Therefore, this study was proposed to analyse the effect of Natural farming components demonstration on the yield of crops of the adopting farmers.

MATERIALS AND METHODS

The study was conducted at farmer's field at Lungzarhtum village, Lawngtlai District. ($22^0$31' N and $93^0$01' E) at three different farms during rabi season 2023-24. The cultivation system was laid out in Randomized Block Design with three treatments viz., T_1- Conventional practice without chemical (farmer's practice) T_2- Application of Bijamrit and Jivamrit T_3- Application of Bijamrit + Jivamrit + Mulching + Pest Management by Neemastra. The treatments were replicated thrice.

Bijamrit is a natural seed inoculum prepared by mixing 25g virgin soil, 2.5kg cow dung, 2.5 L cow urine, wrapped in a muslin cloth and dipped in 10 L of water and incubated for 2d with periodical stirring. This solution can be used for dipping 50kg seed. The seeds to be sown are dipped in Bijamirit concoction for 20 minutes and shade dried after which they are sown right away. Jivamrit is liquid medium natural microbial consortium prepared using mixing 10 kg cow dung, 5 L cow urine, 2 kg jaggery, 2kg Besan (Pulse flour), a handful of virgin soil and 200 L of water. This solution was properly stirred and covered using cloth and incubated for 5 d. This is stirred twice every day. It is applied to the soil @ 100ml/L of water. The local seeds were treated with Bijamrit and the crops were treated with Jivamrit twice a month. Soil Mulching was recommended and practiced in the natural farming plot. Pest management was done by spraying neemastra. Neemastra was prepared by chopping 5 kg neem leaves added to 5L cow urine and 2 kg cowdung, incubated for 24 hrs and filtered. It was applied @20ml/L of water 45 d after sowing.

To determine the soil physico-chemical properties soil samples were collected before application of natural farming concoctions and after harvest of the crop. Soil sampling was done at 0-15 cm depth. The soil samples collected are air dried and made to pass through 2mm sieve before analysis. The soil activity was measured by potentiometric method using glass electrode in 1:2.5 soil: distilled water suspension (Jackson, 1973). The soil organic carbon content is determined by Walkley and Black wet oxidation method as described by Jackson (1973) and expressed in percentage. Available nitrogen was determined by Micro Kjeldahl method (Jackson 1973). Available phosphorus content is described by the method described by Bray and Kurtz (1945). The available potassium was extracted with neutral normal ammonium acetate and the content of potassium in the solution was estimated by flame photometer (Jackson, 1973). The Available nitrogen, phosphorus and potassium content were expressed in kg/ha. The data were statistically analysed with one-way ANOVA through OPSTAT developed by CCS HAU, Hisar (Sheoran *et al*, 1998) and statistical error mean (SEM ±) and critical differences were computed.

RESULTS AND DISCUSSION

The results showed that there was marked difference between the yield of conventional practice of cropping without application of fertilizers and natural farming where Bijamrit, Jeevamrit, Mulching and pest control were followed. The production of Cabbage crop in natural farming plot (T3) was 162.3 q/ha which was 8.2 per cent higher as compared to local practice (T1). Similarly, the yield of French bean in T3 was 55 q/ha, which was 19.5 per cent higher as compared to yield of local practice (T1) (Table 3). Similar findings were reported by Sharma *et al* (2023) where the yield of French bean and paddy increased with application of natural farming components. Duddigan *et al* (2023) also reported significant higher yield where natural farming was practiced in several intercropping series in Andhra Pradesh over 28 farms across six districts spanning over 800 km during three cropping seasons. The cost of cultivation was quite low

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Table 4. **Effect of Natural farming practices on** pH, **Soil Organic Carbon (SOC) and nutrients in post-harvest soil of Cabbage and French bean cultivated fields in Lungzarhtum, Lawngtlai district.**

Parameters	Cabbage			CD @5%	SEm±	French bean			CD @5%	SEm±
	T_1	T_2	T_3			T_1	T_2	T_3		
Soil pH	5.28	5.40	5.44	N/A	0.81	5.43	5.48	5.6	N/A	0.17
SOC (%)	0.93	0.98	1.10	N/A	0.12	0.82	0.87	0.91	N/A	10.78
N (kg/ha)	184	188	193	N/A	5.63	173	198	205	N/A	6.06
P (kg/ha)	11	13	13.5	N/A	1.32	20	23	24	N/A	1.80
K (kg/ha)	240	258	272	N/A	3.25	215	252	267	N/A	7.65

as compared to local practice. The soil fall in strongly acidic range as the soil of Mizoram is acidic due to extensive rainfall (Table 4). The Soil organic carbon was quite high in all the plots. The nitrogen content in the soil was low, soil phosphorus content was high in Cabbage cultivated plots both in natural farming and conventional plot, Potassium content in the soil was higher in natural farming plot however they both were high, this can be attributed to the availability of potassium through ashes from burning crop residue before sowing since the farmers followed slash and burn method. These findings corroborated the research result of Sharma *et al* (2023) where the soil organic carbon, total nitrogen increased in natural farming treated plots. They further reported higher population of bacteria, fungi, actinomycetes, concentration of soil dehydrogenase, acid phosphatase and alkaline phosphatase in natural farming cowpea-fennel cropping system as compared to control.

CONCLUSION

It can be concluded from this study that crop yield and available soil nutrient content in the soil of natural farming practicing plots were higher as compared to farmer's practice and thus natural farming may further be recommended to be followed in the district for better crop yield and soil health.

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