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A way towards sustainable agriculture through zero budget natural farming

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ABSTRACT

Agriculture is an important as well as indispensable sector in India for the sustenance and growth of the Indian economy. Farmers are depended on inorganic or external chemical inputs like fertilizers and pesticides which lead to contamination of groundwater as well as other water associated ecosystems. It also leads to reduction in soil fertility over time. Overuse of pesticides, fertilizers or other chemical inputs is a serious problem for the health of farmers across India. In order to ensuring food security by reviving Indian agriculture in environmentally safe way and to release farmers from debt cycle, zero budget natural farming (ZBNF) can be a viable solution. It discards use of all the chemical inputs and depends on natural way. Zero budget natural farming has mainly four pillars that are 'Jivamrita', 'Bijamrita', 'Acchadana' (mulching) and 'Whapasa'. It means no money is spent to purchase inputs such as fertilizers and pesticides. Zero budget farming promises to exorbitantly reduce production costs. Zero budget farmers relies on mulching, soil conservation techniques, natural pesticides and fertilizers. Due to continuous retention of crop residues replenishment the soil fertility, it helps in maintaining the soil health. Management of pest and diseases is a key component in zero budget natural farming crop production systems. In ZBNF, formulae for fungicides i.e. sour buttermilk (khatti lassi), 'Sonthastra' for pest management i.e. 'Agniastra', 'Brahmastra', 'Neemastra', 'Dashparni ark'. ZBNF allows farmer to grow chemical free as well as healthy and safe food.

Keywords: Crop residue, Mulching, Soil fertility, Zero budget natural farming.

On an average half the country's population today depends on agriculture and allied services for their livelihoods and it contributes around 17 per cent of the gross value added to the national economy (Anonymous, 2017). Continuous as well as overuse of chemical fertilizer, crop residue burning, and pesticide application lead to environmental pollution worldwide. These decreased the soil micro and macrofauna which directly affect C-N ratio and nitrification activity (Shaikh & Gachande, 2015). Most of the farmers in India are marginal and small landholding category, the major problem with them is that if they will invest more money to purchase inputs and not get satisfactory yield due to failure in managing the incidence of pests and diseases or due to unfavourable climatic conditions lead to an increase in production cost. The concept of zero budget natural farming (ZBNF) was given by Shri Subhash Palekar, for which he was honoured with Padma Shri. He met with the Japanese philosopher Fukuoka. They both came with methods of natural farming and encouraged the method of natural farming widely in Karnataka as zero budget natural farming. Zero Budget means without using any credit, and without spending any money on purchasing inputs such as fertilizers and pesticides. It is a natural way of farming without any capital investment. It basically goes back to use of only rich a natural resource on which ancient agriculture was fully depended. Expenditure on purchased inputs is completely excluded

in this system. If some cost is incurred, then it is reimbursed by the profitable production. ZBNF is gaining momentum as it maintains soil health for sustainable crop production through diversification, microbial activities, nutrient recycling, interaction of beneficial microorganisms (Khadse *et al.*, 2019).

Zero budget natural farming

ZBNF is perhaps the most successful agrarian movement in the world in terms of its reach. There are several advantages of shifting modern day agriculture to basic or traditional approach by adopting zero budget natural farming. ZBNF reduces the need of taking loans for farming purpose as it completely depends on the use of internal or naturally available inputs. Therefore, it can be a measure to decrease indebtedness and case of suicide by farmers especially of small and marginal categories. Further, by eliminating chemicals such as fertilizers, pesticides from farming activities, ZBNF can check further degradation and can restore the soil health. It also helps in sovereignty of traditional land races, encourages soil aeration, bunds and top soil mulching, intercropping and less water application which do not bring sudden increase in productivity but helps in increasing farmers' income by developing self-sustaining system after at least 3 years of conversion period. Ecological benefits of zero budgets natural farming have been also reported (Pawar *et al.*, 2013). Besides, in present context of labour crisis ZBNF can be a suitable



option as it does not encourage various intercultural operations and therefore the involvement of hired manual labours.

Pillars of ZBNF

Four main pillars of zero budget natural farming are-

1. Jivamrita/Jeevamrutha

It is a kind of bio-fertilizer which adds nutrients to the soil for proper growth of plants. Application of this fermented microbial culture catalyses soil microbial and earthworm's activities. Plant growth promoting rhizobacteria, cyanobacteria, and phosphate solubilising bacteria, mycorrhizal fungi, and nitrogen-fixing bacteria are some important microorganisms present in the product (Chen *et al.*, 1995). It requires 20 kg cow dung, 5-10 L urine, 2 kg dicot flour are well mixed and these are added in irrigation tank at regular intervals of 15 days till the soil is enriched or spray 200 L of jeevamruth twice in a month.

2. Bijamrita

It is composed of 20 L water, 5 kg cow dung, 5 L urine 50 g lime, and a hand full of soil are profoundly and store in a tank. It is used as a seed treatment, contains naturally occurring beneficial microorganisms. Research studies showed that inoculation with bijamrith protects the crop from harmful soil-borne pathogens and young seedlings roots from fungus and a soil-borne and seed-borne disease also produces IAA and GA3 (Sreenivasa *et al.*, 2010).

3. Acchadana/Mulching

There are several advantages of covering the soil with dust or plant materials (Acchadana/Mulching). It protects the top soil from degradation. Besides, it improves soil aeration and conserves soil moisture by checking water loss through evaporation. Weed emergence is also reduced through mulching.

4. Whapasa/Moisture

ZBNF involves conservation of water and the precise application of water-based on crop water requirement. Whapasa focuses on improving water use efficiency by decreasing the quantity and frequency of irrigation water applied as only a limited amount of water is needed (in form of vapour) for the crop growth. One method is Irrigation during noon in alternate furrows to make air and water molecules to remain in soil.

Benefits of ZBNF

The cost of production in ZBNF is zero as there is no requirement of buying inputs by the farmers.

- It consumes only 10% of the water that crops consume in traditional methods.
- One cow can produce 10-12 kg fresh dung and it is sufficient for 30 acres of land in one month.
- Higher significant yield found under ZBNF in different cash and food crops. E.g. 11 % and 40 % high yields of cotton and gulli ragi in ZBNF plot than in non-ZBNF plots.
- Farm input costs are nearly zero as no fertilizers and pesticides are used.
- ZBNF farms were able to combat a long time under drought and flood situations.
- Planting more crops and border crops on the same piece of land works as nutrient sources.

Other practices of ZBNF

Intercropping and Crop Rotation

Intercropping is cultivation of two or more different crops together on a land at a time. It results in better harvesting of solar radiation, utilization of land and other resources and checking evaporation and erosion etc. It also helps farmers to enhance income or provide subsistence in case of main crop failure. Diversification of cropping system is another important practice of ZBNF as it breaks the habitat and therefore the build-up of pests and diseases.

Plant Protection

Bio-pesticides ('Neemastra', 'Agniastra', 'Bramhastra' etc.) made through natural or organic or bio-products are only permitted to use in zero budget natural farming during the times of pest and disease outbreaks to protect the plants to reach economic injury levels. They are effective in controlling various seed, soil and air borne diseases and insects such as aphids, jassids, mealy bugs, white flies etc.

Bunds and Contours

Bunds and contours are constructed with the aim to decrease water borne erosion of land and conserve rain water for crop production.

Indigenous Earth Worm Species

In ZBNF, addition of vermi-compost in to the soil is not encouraged. According to Palekar, deeper soil has its own indigenous earth worm species which can efficiently enhance soil fertility when any organic matter



is added to the soil and there is no particular need of use of external vermi-compost. He further stated that exotic earth worm species specially, *Eisenia foetida* is threatening as it absorbs toxic metals and contaminates from ground water and soil (Mishra *et al.*, 2018).

Cow Dung

Faeces of local Indian cows (*Bos indicus*) are only recommended in ZBNF activities as Indian species contain more advantageous microbes (around 3-5 crores) as compared to foreign breeds. According to Palekar, lots of harmful bacteria, fungus and other pathogens are present in dung of foreign breeds and Indian breed is found to be effective for crop cultivation. One local indigenous cattle breed can cultivate 30 acres of land. ZBNF promoters therefore suggest not mixing the faeces between Indian and foreign cattle breeds and ask farmers to use dung and urine of local Indian cow in ZBNF and those of foreign breeds for biogas or fuel generation.

Conclusion

Zero budget farming is environmentally friendly as well as cost effective. It leads to savings on the cost of seeds, fertilizers, and plant protection chemicals. Due to continuous retention of crop residues it helps in maintaining the soil health. Other thing is that management of pest and diseases is a key component in zero budget natural farming crop production systems. Regardless the controversies and critics' points of view, there is nothing to contradict the fact that ZBNF has been evolved with very positive mentality to benefit farming community. In fact, it has been able to revitalize many small-scale farmers of the nation. However, before its recommendation, it needs strong scientific evaluation or validation of its claim. For this, multi-locational trials by unbiased, autonomous bodies such as ICAR to study ZBNF's impacts on soil, land and environment health, socioeconomic status of farmers and food security of nation are very much needed.

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