Zero Budget Natural Farming (ZBNF) is Key towards Sustainable Agriculture Development

Rajesh V. Wagh, Sharad K. Auti
Dept. of Geography, Arts, Commerce and Science College, Sonai, Tal- Newasa, Dist-Ahmednagar ,MS, India

Abstract

Healthy soil is the foundation upon which sustainable agriculture is built. Farming practices differ mainly based on soil inputs and crop protection measures. In conventional chemical farming practice, indiscriminate use of chemical fertilizers and pesticides destroy the beneficial soil micro flora change the soil nature and also contribute to the high crop production cost. Heavy metals from the polluted soil may enter the food chain in significant amounts and show adverse health effects. The essence of natural farming is to minimize the external inputs to the farm land, and nurture the soil fertility. It was shown that enrichment of soil occurs through propagation of beneficial soil microbes. It encourages the natural symbiosis of soil micro flora and crop plants. Zero Budget Natural Farming (ZBNF) is one such low-input, climate-resilient type of farming that encourages farmers to use low-cost locally-sourced inputs, eliminating the use of artificial fertilizers, and industrial pesticides. Natural farming was first popularized by the Japanese scientist and philosopher, Masanobu Fukuoka, who practiced it on his family farm in the island of Shikoku. In India, noted agriculturist Subhash Palekar has helped popularize ZBNF practices across the country. This paper reviews the concepts of natural farming in the context of its eco-friendly nature and sustainability.

KEYWORDS:-Zero Budget Natural Farming, Soil fertility, eco-friendly, sustainable.

INTRODUCTION:-

Conventional Chemical farming is facing either reduced production or increased costs, or both. Farming monocultures, such as Rice, wheat and Cotton etc., repeated on the same land results in the depletion of topsoil, soil vitality, groundwater purity and beneficial microbes. It is finally making the crop plants vulnerable to parasites and pathogens. Environmental pollution by chemical fertilizers and pesticides is posing a serious threat worldwide. Their continuous usage may destroy the beneficial soil micro flora. Nitrosamines the transformed products of nitrogen fertilizers are dangerous ecological poisons. Nitrosamines isolated from the soil exerted phytotoxic, mutagenic and carcinogenic effects on plants, animals and humans. Intensive use of inorganic chemical fertilizers and pesticides resulted in the contamination of soil, surface and ground water with harmful chemicals and accumulation of heavy metals. Uptake of heavy metals like Cd, Cu, Mn and Zn by plants is proportionate to the increasing level of soil contamination. People who consume these plant products are at risk of adverse health effects. Cadmium and lead are the elements of major concern due to their accumulation potential and toxic effects in the plants and animals. Crops such as spinach, lettuce, carrot, radish can accumulate heavy metals in their tissues. The rhizosphere contains diverse microbes with beneficial effects on crop productivity. The plant growth

promoting rhizobacteria (PGPR), mycorhyza and cyanobacteria promote plant growth and also protect them against pathogens. It was shown by Ayansina and Oso6) who commonly used herbicides trazine and metolachlor decreased the microbial counts of the soil. Increased cost of production of crop lead to the suicides of the farmers in India. Monoculture of rice crop, commercial crops like cotton and capsicum posed a threat to biodiversity and increased the scope for invading pathogens. Alternative low-input farming practices have emerged in pockets across the world promising reduced input costs and higher yields for farmers, chemical-free food for consumers and improved soil fertility. Zero Budget Natural Farming (ZBNF) is one such low-input, climate-resilient type of farming that encourages farmers to use low-cost locally-sourced inputs, eliminating the use of artificial fertilisers, and industrial pesticides.

OBJECTIVES :-

1) To study the feasibility of Zero Budget Natural Farming on small and marginal holdings particularly under purely rainfed conditions.
2) To study the efficacy of 'Beejamrutha' in overcoming seed borne pests and providing adequate protection during the initial stage of germination and establishment.
3) To study the efficacy of 'Jeevamrutha' in promoting biological activity in the soil and providing adequate nutrients to crops for sustainable returns without recourse to fertilizers.
4) To study the effectiveness of homemade pesticides in providing adequate protection to crops from endemic and epidemic pests.
5) To study the effectiveness of mulching in reducing water and labour requirements and also in providing adequate nutrition to crops without manuring.
6) To study the sustainability of this system in the overall context of providing food and nutritional security to the farmer and ensuring decent standard of living.

METHODOLOGY:-

The methodology involves visit to fields where zero budget farming has been adopted and interaction with practicing farmers to gather information on reasons for switching over to this method, crops grown, adoption of technology and its impact, economics of cultivation and returns. About a dozen farmers have been selected for study at present but it is intended to cover more farmers in future. The study is purely empirical in nature with emphasis on frequent field visits, regular field observations and drawing conclusions based on them. Meaningful inferences will be drawn based on personal observations over a period of time. It is also intended to take the trainees who participate in agriculture related courses to these farms so as to facilitate experience sharing regarding its suitability in other areas.

CONCEPT OF ZERO BUDGET NATURAL FARMING (ZBNF):-

Zero Budget Natural Farming (ZBNF) or holistic agriculture is a method of agriculture that counters the commercial expenditure and things required for the growth of plant are present around the root zone.

The vision of Palekar is that, this model eliminates the cost of fertilizers, Pesticides and seeds and greatly reduces the incentive to borrow, one of the chief causes for farmer suicides in the country. Hence its evocative title zeros budget natural farming. He believes in a method of cultvation which makes the already existing nutrients in the soil such as phosphate, potash, zinc and calcium available in absorbable form by the plants.

Natural farming was first popularised by the Japanese scientist and philosopher, Masanobu Fukuoka, who practiced it on his family farm in the island of Shikoku. In India,noted agriculturist SubhashPalekar has helped popularise ZBNF practices across the country. He has identified four aspects that are integral to ZBNF (1) beejamrutham, or microbial coating of seeds using cow dung and urine based formulations; (2) jeevamrutham, or the application of a concoction made with cow dung, cow urine, jaggery, pulse flour, water and soil to multiply soil microbes; (3) mulching, or applying a layer of organic material to the soil surface in order to prevent water evaporation, and to contribute to soil humus formation; and (4) waaphasa, or soil aeration through a favourable microclimate in the soil. For insect and pest management, ZBNF encourages the use of various kashayams(decoctions) made with cow dung, cow urine, lilac and green chillies.

The four-wheels of zero budget natural farming

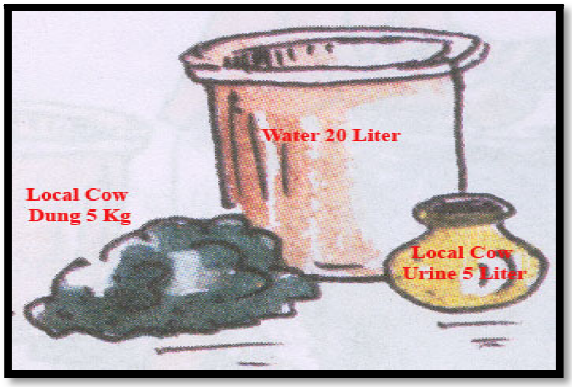
1. **Beejamrutham:-**

Bijamrita/beejamruthais a treatment used for seeds, seedlings or any planting material. Bijamrita is effective in protecting young roots from fungus as well as from soil-borne and seed-borne diseases that commonly affect plants after the monsoon period. It is composed of similar ingredients as jeevamrutha - local cow dung, a powerful natural fungicide, and cow urine, a strong anti-bacterial liquid, lime, soil.

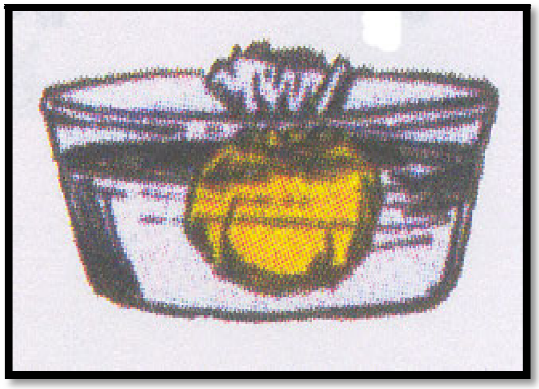
Application as a seed treatment

Add Bijamrita to the seeds of any crop: coat them, mixing by hand; dry them well and use them for sowing. For leguminous seeds, just dip them quickly and let them dry.

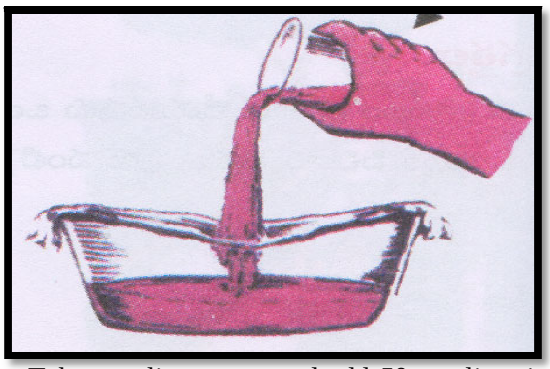
How to Prepare Bijamrita



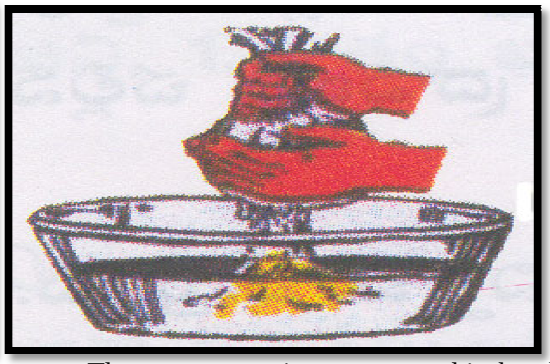
Take 20 liter Water, 5 Kg Local Cow Dung, 5 liter Local Cow Urine, 50 Gram Lime & Handful soil from the bund of the farm



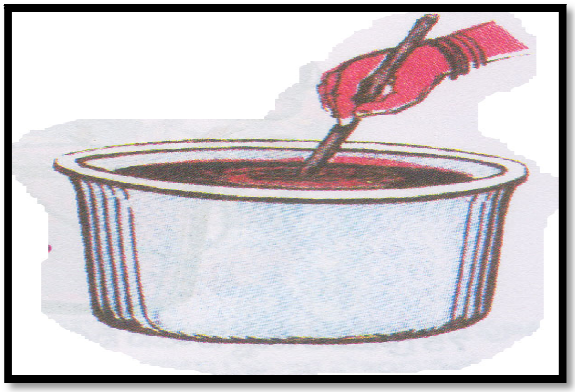
Take 5 Kg Local Cow Dung in a cloth and bound it by tape. Hang this in the 20 Liter water up to 12 hours



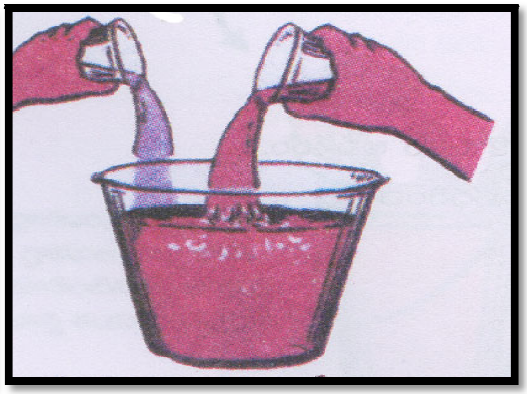
Take one liter water and add 50 gm lime in it, let it stable for a night.



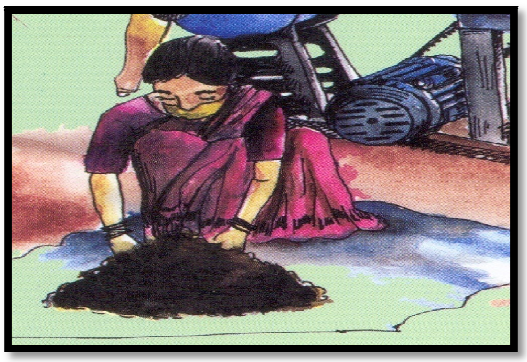
Then next morning, squeeze this bundle of the cow dung in that water thrice continuously, so that all essence of cow dung will accumulate in that water.



Then add a handful of soil in that water solution and stir it well



Then add 5 liter Deshi cow urine or human urine in that solution & add the lime water and stir it well.




Add Bijamrita on the spread seeds of any crops, treat these seeds well by hands, dry it well and use for sowing.

2. Jeevamrutham:-

Jivamrita/jeevamruthais a fermented microbial culture. It provides nutrients, but most importantly, acts as a catalytic agent that promotes the activity of microorganisms in the soil, as well as increases earthworm activity; During the 48 hour fermentation process, the aerobic and anaerobic bacteria present in the cow dung and urine multiply as they eat up organic ingredients (like pulse flour). A handful of undisturbed soil is also added to the preparation, as inoculate of native species of microbes and organisms. Jeevamrutha also helps to prevent fungal and bacterial plant diseases. Palekar suggests that Jeevamrutha is only needed for the first 3 years of the transition, after which the system becomes self-sustaining.

How to prepare jeevamrutha:

Put 200 liters of water in a barrel; Add 10 Kg fresh local cow dung and 5 to 10 liters aged cow urine; Add 2 Kg of Jaggery (a local type of brown sugar), 2 Kg of pulse flour and a handful of soil from the bund of the farm. Stir the solution well and let it ferment for 48 hours in the shade. Now jeevamrut is ready for application. 200 liters of jeevamruta is sufficient for one acre of land. **Jeevamrutha Application**

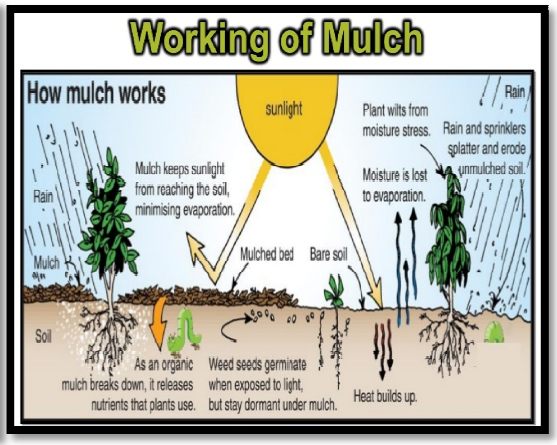
Apply the jeevamrutha to the crops twice a month in the irrigation water or as a 10% foliar spray.

3. Mulching

Acchadana - Mulching. According to Palekar, there are three types of mulching:

a. Soil Mulch: This protects topsoil during cultivation and does not destroy it by tilling. It promotes aeration and water retention in the soil. Palekar suggests avoiding deep ploughing.

b. Straw Mulch: Straw material usually refers to the dried biomass waste of previous crops, but as Palekar suggests, it can be composed of the dead material of any living being (plants, animals, etc). Palekar's approach to soil fertility is very simple – provide dry organic material which will decompose and form humus through the activity of the soil biota which is activated by microbial cultures.



Prepare Jeevamrutha: **Working of Mulch**

c. Live Mulch (symbiotic intercrops and mixed crops): According to Palekar, it is essential to develop multiple cropping patterns of monocotyledons (monocots; Monocotyledons seedlings have one seed leaf) and dicotyledons (dicots; Dicotyledons seedlings have two seed leaves) grown in the same field, to supply all essential elements to the soil and crops. For instance, legumes are of the dicot group and are nitrogen-fixing plants. Monocots such as rice and wheat supply other elements like potash, phosphate and sulphur.

4. Waaphasa :-

Whapasa - moisture: Palekar challenges the idea that plant roots need a lot of water, thus countering the over reliance on irrigation in green revolution farming. According to him, what roots need is water vapor. Whapasais the condition where there are both air molecules and water molecules present in the soil, and he encourages reducing irrigation, irrigating only at noon, in alternate furrows ZBNF farmers report a significant decline in need for irrigation in ZBNF.

OTHER IMPORTANT PRINCIPLES OF ZBNF

1. Intercropping – This is primarily how ZBNF gets its “Zero Budget” name. It doesn’t mean that the farmer is going to have no costs at all, but rather that any costs will be compensated for by income from intercrops, making farming a close to zero budget activity. Palekar explains in detail the crop and tree associations that work well for the south Asian context.

2. Contours and bunds – To preserve rain water, Palekar explains in detail how to make the contours and bunds, which promote maximum efficacy for different crops.

3. Local species of earthworms. Palekar opposes the use of vermicompost. He claims that the revival of local deep soil earthworms through increased organic matter is most recommended.

4. Cow dung- Accroding to Palekar, dung from the Bosindicus(humped cow) is most beneficial and has the highest concentrations of micro-organisms as compared to European cow breeds such as Holstein. The entire ZBNF method is centered on the Indian cow, which historically has been part of Indian rural life.

CONCLUSION:-

Inconsiderate use of chemical fertilizers and pesticides present a threat to the soil and environment. Many investigations have shown their adverse effects of change in soil nature, soil contamination, ground water pollution and decrease in soil micro flora etc. The present paper have shown that natural farming, with the minimum external inputs and by application of supplements like Jeevamrut, improves the soil fertility by increasing the soil micro flora and available nutrients. This method encourages multi cropping and biodiversity of micro and macro flora. Labor and production costs are minimized. Hence it can be seen by many as eco-friendly and sustainable.

REFERENCES:-

1. Barabasz W, Albińska D, Jaśkowska M, Lipiec J (2002) Biological Effects of Mineral Nitrogen Fertilization on Soil Microorganisms. Pol Jour of Envi Stu 11:193-198.
2. Doran JW, Sarrantonio M, Liebieg MA (1996) Soil health and sustainability. Advance in Agronomy 56.
3. Devarinti S. R. (2016) Natural Farming: Eco-Friendly and Sustainable?Agrotechnology5: 147.
4. Fukuoka M (1978) The one straw revolution. Rodale Press, Emmaus, PA, USA. 22. Andow DA, Hidaka K (1998) Yield loss in conventional and natural rice farming systems. Agri Eco and Envi 74: 137–155 70: 151-158.
5. Glick BR (1995) The enhancement of plant growth by free-living bacteria. Can. J. Microbiol 41: 109–117.
6. Hooda PS (1997) Plant availability of heavy metals in soils previously amended with heavy applications of sewage sludge. JSFA 73: 446–454.
7. Neera P, Katano M, Hasegawa T (1992) Rice culture under Nature Farming in Japan. ProcFacAgricKyushuTokaiUnivll: 67-74.
8. Nileema S, Gore, Sreenivasa MN (2011) Influence of liquid organic manures on growth, nutrient content and yield of tomato (Lycopersiconesculentum Mill.) in the sterilized soil. Karnataka J AgricSci 24: 153-157.
9. Palekar S. Undated. The philosophy of spiritual farming: zero budget natural farming.Revised fourth edition. Zero Budget Natural Farming Research, Development & Extension Movement, Amravati, Maharashtra India.
10. Paoletti MG (1999) The role of earthworms for assessment of sustainability and as bioindicators. Agri Eco and Envi 74: 137–155.
11. Raghu K, MacRae IC (1966) Occurrence of phosphate-dissolving microorganisms in the rhizosphere of rice plants and in submerged soils. J ApplBacteriol 29: 582–6.
12. R.YoganandaBabuAction Research Report OnSubhashPalekar's Zero Budget Natural Farming, Faculty (Agriculture), ANSSIRD, Mysore.
13. Sreenivasa MN, Naik NM, Bhat SN (2010) Beejamruth: A source for beneficial bacteria. Karnataka J AgricSci 17: 72-77.
14. Singh, R. (2000). Environmental Consequences of Agricultural Development: A Case Study from the Green. Agriculture, Ecosystems and Environment, Vol.82(No.1-3), 97-103.

15. Singh JS, Pandey VC, Singh DP (2011) Efficient soil microorganisms: A new dimension for sustainable agriculture and environmental development. Agri Eco Envi 140: 339–353.
16. Swaminathan C, Swaminathan V, Vijaylakshmi K (2007) Panchagavya Boon to organic Farming, International Book Distributing Co Lucknow 2165-2175.
17. Shubha S, Devakumar N, Rao GGE, Gowda SB (2014) Effect of Seed treatment, Panchagavya application and Organic Farming Systems on Soil microbial population, Growth and Yield of Maize. Proceedings of the 4th ISOFAR Scientific Conference. 'Building Organic Bridges', at the Organic World Congress. RAHMANN G & AKSOY U (Eds.) 13-15.
18. Sakamoto, H., Horiguchi, H (1981) Philosophy and significance of natural farming (Shizen-noho). In: Studies on Natural Farming. Interdisciplinary Research Institute of Environmental Sciences, Kyoto 3-14.
19. Sarma, Prasada. 2016. "Campaign to Reduce Use of Chemical Fertilizers, Pesticides." The Hindu, May 28. http://bit.ly/1t pq0rT.

Websites:-

1. www.atimysore.gov.in/PDF/action_research1.pdf
2. www.palekarzerobudgetspiritualfarming.org
3. www.youtube.com/watch?v=w-xi2VB9Q6c
4. www.facebook.com/villageinstituteforsustainable
5. www.easycalculation.com/unit-conversion/Bigha_Ibigha-Hectares-hectares.html
6. www.youtube.com/watch?v=NjexVqKxYzM
7. www.downtoearth.org.in/coverage/punjabs-spiritualfarming-6918
8. http://palekarzerobudgetspiritualfarming.org/zbnf.aspx

Books on Zero Budget Spiritual Farming written by Subhash Palekar

1. The Philosophy of Spiritual Farming? (Part 1)
2. The Principles of Spiritual Farming (Part 2)
3. Vegetable crops in Zero Budget Spiritual Farming
4. Spices Plantation in Zero Budget Spiritual Farming