ACTION RESEARCH REPORT ON SUBHASH PALEKAR'S ZERO BUDGET NATURAL FARMING

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1. Introduction

Our country has been endowed with rich biodiversity, varied types of soil, copious rainfall and abundant sunshine. This immense natural wealth facilitates cultivation of diverse agricultural crops across the length and breadth of the country. During the long period of cultivation of agricultural crops which dates back to the earliest days of civilization, a system of conventional farming based on innate wisdom and experience was practiced until about the period of independence. Since the size of population was less at that time, farming was not aimed at maximizing agricultural production. A system of natural farming which provided for replenishment of soil nutrients and natural regeneration was followed. The package of agricultural practices did not pose any threat to the stability of the ecosystem and the production was also by and large sufficient to meet the requirements of the population.

The infamous Bengal Famine of 1943 severely jolted the food security of our country. An estimated four million people perished because of starvation during the Bengal Famine. The population of the country particularly after independence was also increasing at rapid rate. The paucity of food grain stocks to feed the growing population was amply clear. Deaths due to hunger and starvation were reported from across the country at alarming regularity. The Government was constrained to seek food aid from other countries particularly from USA under PL 480 scheme to stave off hunger and starvation. In this context increasing the food grain production assumed paramount importance and efforts which were stepped up in this direction culminated in the Green Revolution.

2. Green Revolution

The advent of Green Revolution in the latter half of 1960s heralded a new era in the history of Indian agriculture. The Green Revolution technology aimed at stimulating agriculture production primarily by replacing traditional hardy varieties of crops by high response varieties and hybrids, increasing the use of fertilizers and plant protection chemicals, bringing more cultivated area under irrigation particularly by huge investments in major irrigation structures and consolidation of land holdings to make agriculture amenable for mechanization.

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The initial stimulus was provided by introduction of dwarf, short duration and high response varieties of wheat developed by Dr. Norman E Borlaug, a Mexican Plant Breeder who was subsequently awarded Nobel Prize for International Peace. The traditional varieties of paddy which used to lodge in response to fertilizer application were replaced by non-lodging, short duration and high response varieties. The new varieties of crops were provided with liberal quantities of nitrogenous, phosphates and potassic fertilizers to enhance the productivity. This is evident from the fact that the current use of NPK nutrients is 95 kg per hectare.

The increased application of fertilizers rendered the crops more succulent and vulnerable for attack by varied species of insects and diseases. Hence, the new crops were provided with a constant umbrella of plant protection either as prophylactic or as curative measures. The pesticide consumption in our country which was meager 2330 tons during 1950 increased to 1,98,000 tons during 1997-98. Massive investments were made to erect huge water storage structures to bring more cultivated area under irrigation. Institutional support in the form of credit availability to farmers, public procurement of farmers' produce and minimum support price also provided right conditions for increasing agricultural production.

The initial response to these technological innovations was very dramatic and it resulted in quantum jump in agricultural production. The food grain production which was around 50 million tons during 1950 increased to 131 million tons during 1978-79 a year in which green revolution technology was considered to have delivered goods.

The yield per unit area of farm land improved by more than 30 % between 1947 and 1979. During subsequent decades food grain production increased consistently despite periodical droughts and surpassed 212 million tons during 2003-04. Our country not only attained a semblance of self sufficiency in food grains but also started exporting food grain to other countries on small scale. In a span of about five decades our country was transformed from a starving nation to a food exporter. This experiment with green revolution technology was acclaimed as highly successful.

3. Present Agriculture Scenario in the Country

At present the euphoria that was generated by Green Revolution is on the wane and it is increasingly realized that the whole package of technology has left a trail of adverse effects. In our quest for maximizing agricultural production it appears that we lost sight of adverse impact of green revolution technology on the ecosystem. The increased and often indiscriminate use of fertilizers and pesticides immensely harmed biological activity of the soil rendering it almost lifeless in vast areas. It may be pertinent to mention here that ammunition manufacturing units in USA and Europe were converted to fertilizer and pesticide manufacturing plants after the second world war and the produce dumped in Third World countries. 'Agent Orange' an extremely poisonous chemical which was used to clear bushes and find the enemy hideouts during the Vietnam War has found its way in to the developing countries in the form of herbicide. Persistent Pesticides which are not easily degradable have entered the food chain posing numerous

health hazards. A few insecticides including DDT and BHC which have been totally banned in advanced countries are freely marketed in developing countries.

Injudicious application of irrigation water has brought in its wake problems of water logging, salinity and alkalinity in large tracts of command areas. Natural resources like water, soil and forests are being exploited without any concerted action for adequate replenishment. In the words of Bertrand Russell, what we are witnessing is 'frenzied exploitation' of natural resources and it is good to remember an FAO slogan which says that we have not inherited natural resources from our ancestors but we have borrowed them from the posterity.

In this bleak scenario, food grain production has almost hit a plateau in recent years. In any case the production is not commensurate with the increased use of high cost inputs like seeds of hybrid/improved varieties, fertilizers and plant protection chemicals. Agriculture production has tended to remain either stagnant or is declining despite application of high cost inputs in large number of agricultural zones. Agriculture production despite troughs due to drought and aberrant weather conditions showed remarkable resilience but the quantum jump in production is conspicuous by its absence. Experts attribute this stagnation to destruction of soil health due to application of fertilizers and pesticides.

Critics of Green Revolution also point out that it was confined to few crops like wheat, paddy and maize and few areas of the country particularly Punjab, Haryana and western Uttar Pradesh. The small and marginal farmers who constitute the bulk of farm families were precluded from this process of development because of their inherent low investment capacity. The revolution also did not spread to rain fed areas where production continues to be low and uncertain due to vagaries of monsoon.

The high cost of inputs often compels farmers to take loan from money lenders and non-institutional sources and in the event of crop failure they will be forced in to debt trap. A bumper crop also does not necessarily fetch good price. This problem is often compounded by the provisions of WTO which makes it obligatory on signatory nations to allow unrestricted imports to the tune of 5 percent. This often keeps the market prices depressed much to the detriment of indigenous growers. These reasons have been cited as cause for many farmers committing suicide across the country.

Many experts in the field of agriculture have voiced concern that any more efforts to persist with this model of chemical agriculture will only prove counter productive in the long run and cause irreparable damage to soil health and environment. Restoring soil health by reverting to non-chemical agriculture has assumed great importance to attain sustainability in production. In this search for eco friendly and farmer friendly alternate systems of farming, Subhash Palekar's Zero Budget Natural Farming is increasingly becoming popular among the farming community.

4. Subhash Palekar's Zero Budget Natural Farming

Subhash Palekar's Zero Budget Natural Farming is a unique method of farming which requires absolutely no monetary investment for purchase of key inputs like seeds, fertilizers and plant protection chemicals from the market. The farmer can grow hardy local varieties of crops without application of fertilizers and pesticides. Since it is a zero budget farming no institutional credit would be required and dependence on hired labour is also reduced to bare minimum. All that the system requires is native breed of cattle which is any case forms an integral part of farming families in rural areas. It is claimed that one cow is sufficient to take up this method of farming on thirty acres of land.

5. Salient Features of Zero Budget Natural Farming

The salient features of this method of farming are:

1) Zero Budget Farming

In this system of farming no monetary investment on the part of farmer is required for purchase of seeds, fertilizers and plant protection chemicals from the market. The farmer can produce his own seed or he may use seeds that are available with other farmers. More importantly, there is absolutely no place for fertilizers and plant protection chemicals in this scheme of farming. Dependence on hired labour is also reduced to the bare minimum as the system discourages intercultural operations. The whole philosophy behind this system is to make the farmer self-reliant so that he is freed from the clutches of money lenders and market dispensed high cost inputs.

2) Seed Treatment with Beejamrutha

Composition:

a)	Water	20 litres
b)	Desi cow dung	5 kg
c)	Desi cow urine	5 Litres
d)	One handful of soil from the surface of field	
e)	Lime	50 grams

The above mixture termed as 'Beejamnrutha' can be used to treat seeds, seedlings or any planting material. The planting material has to be simply dipped in 'Beejamrutha' taken out and planted. Beejamrutha protects the crop from harmful soil borne and seed borne pathogens during the initial stages of germination and establishment.

3) Treatment with Jeevamrutha

Composition:

1)	Water	200 litres
2)	Desi cow dung	10 kg
3)	Desi cow urine	5 to 10 litres
4)	Jaggery	2 kg
5)	Flour of any pulse	2 kg
6	Handful of soil from farm or forest	-

The above mixture will suffice for one time application on one acre crop. 'Jeevamrutha' is to be provided once in a fortnight or at least once in a month. It promotes immense biological activity in the soil and makes the nutrients available to the crop. Jeevamrutha is not to be considered as nutrient for the crop but only a catalytic agent to promote biological activity in the soil.

4) Mulching

Mulching with organic residues or live mulching reduces tillage and consequently labour requirements, suppresses weeds, promotes humus formation and enhances the water holding capacity of the soil. Mulching enhances the biological activity and replenishes the nutrient base of the soil. Adequate mulching keeps the top and sub soil moist and enhances the water holding capacity of the soil and also reduces water loss due to evaporation so that the crop will be better equipped to tide over drought conditions.

5) Plant Protection

In the event of outbreak of insects and diseases the farmer can himself prepare home made pesticides and use it on the crops.

Fungicide-I

a) Butter milk fermented for five days	5 litres
b) Water	50 litres

Fungicide –II

a) Desi cow milk	5 litres
b) Black Pepper Powder	200 grams
c) Water	200 litres

Insecticide- I

a) Powder of neem seed **or** Neem leaves	20 kg
b) Water	200 litres

Insecticide- II

a) Cow dung	5 kg
b) Cow urine	10 litres
c) Neem leaves	10 kg
d) Water	200 litres

This mixture is particularly effective against aphids, jassids, mealy bugs and white flies.

Insecticide – III

a) Neem leaves	10 kg
b) Tobacco powder	3 kg
c) Garlic paste	3 kg
d) Green chillies paste	4 kg

The above ingredients should be soaked in cow urine for ten days. About 3 litres of this mixture can be mixed with 100 litres of water and sprayed on crops.

The above mentioned fungicides and insecticides can be prepared by the farmer himself and used either as prophylactic or as curative measure for control of crop pests. If the economic injury to crops due to pests is less than five percent, it should be deemed to be 'return to nature' and no plant protection measures should be taken.

6. Mixed Cropping and Crop Rotation

Zero Budget Natural Farming advocates cultivation of diverse species of crops depending on site specific agro climatic conditions. Mixed cropping provides buffer against total failure of single crop and also widens the income source of farmers. There is stress on inclusion of leguminous crops to ensure replenishment of soil fertility. Crop rotation is also emphasized to discourage build up of endemic pests. In the scheme of mixed cropping, cereals, millets, leguminous crops, horticulture crops particularly vegetables and even medicinal plants can be included to make farming more lucrative. The system also advocates wider spacing of crops to facilitate inter cropping. Palekar has

repeatedly stressed that just as diversity is the rule of nature the farm should also have diverse species.

7. Objectives of Action Research*

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 home made 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 make a comparative study of agriculture based on fertilizers and plant protection chemicals and zero budget natural farming.

7) To study the cost of cultivation of crops under this method particularly in the context of cost intensive agriculture this is in vogue.

8) 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.

* Since the objectives require both short and long term study it is intended to focus on only immediate objectives for the present.

8. Methodology of Action Research:

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 methodology does not lay much stress on employing statistical models for collection, analysis and interpretation of data. 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. If necessary field visit to other parts of the state will also be taken up to study the replication of the method in other areas.

The methodology will provide for conclusions regarding feasibility of the method at present and final conclusions regarding sustainability can be drawn only after constant monitoring for a period of two to three years.

9. Observations and Inferences

Visit to fields where Palekar's Zero Budget Natural Farming has been adopted and interaction with farmers whose profile has been furnished in annexure revealed that all of them were raising crops using modern technology of improved seeds, fertilizers and plant protection chemicals before adopting this new method. They found the old method to be very cost intensive and by their own estimates the cost of cultivation of one acre of paddy was Rs.5000/- to Rs. 6000/- and that of sugarcane Rs. 15000/- to Rs. 20000/-. Similarly the cost of cultivation of one acre of banana was Rs. 25,000/- to 30,000/-. This often compelled them to raise loan from conventional and institutional sources. However, the returns were not commensurate with the investments made for raising crops. The produce from field crops generally met the requirements of the family and the marketable surplus was not sufficient to repay the loan. Market forces were also some times detrimental to the interests of the farmers resulting in low price realization. It was evident from interaction with the selected farmers that they practiced a form of subsistence farming.

In this bleak scenario all the farmers selected for study attended orientation courses conducted by Subhash Palekar at different places of Karnataka. They were convinced that zero budget natural farming is farmer friendly, eco friendly and above all extremely cost effective. These reasons were cogent enough for them to give this method a fair trial and hence switched over to this new method. The experience of the practicing farmers and field observations over a period of time lends credence to the following conclusions.

a) The system of zero budget natural farming is eminently suited to the farmers particularly small and marginal farmers because of its simplicity, adoptability and drastic cut in cost of cultivation of crops. The appeal to the farming community lies in the fact that maintaining optimum levels of production and keeping the cost of cultivation to the bare minimum will substantially enlarge the profit margin. All the sample farmers acknowledged it as farmer friendly and financially viable. However during the initial period of transition to new system, the results will not be encouraging because of the lingering effects of chemical farming. The results will become evident only after adequate mulching and restoration of biological activity in the soil. Hence, patience and perseverance are required on the part of farmers.

b) Treatment with Beejamrutha and Jeevamrutha has given extremely encouraging results for successful cultivation of crops. Beejamrutha does provide adequate protection to crops from insects and diseases during the initial stages of germination and establishment. Mortality in case of treated crop is reported to be almost negligible.

The experience of the farmers bears ample testimony to the fact that Jeevamrutha promotes rapid and enormous biological activity in the soil. However, it should be coupled with adequate mulching so that the soil is transformed into humans rich reservoir of nutrients. It is also observed that providing Jeevamrutha once in a fortnight is better than providing it once in a month. It has been the experience of farmers that dispensing with the use of fertilizers has not adversely affected crop yields. The use of home made pesticides has also been found to be effective in managing the crop pests without economic injury to crops.

c) Experience with this method of farming corroborates the fact that adequate mulching promotes humus formation, suppresses weeds and greatly reduces the water requirement of the crops. Live mulching particularly with leguminous crops has been found to be not only a subsidiary source of income but also a safeguard against depletion of nutrients by crops.
d) Mixed cropping particularly with short duration legumes, vegetables and even medicinal plants has certainly expanded the income source of farmers. Vegetables rich in vitamins and minerals are generally marketed after adequately providing for home consumption and this certainly augurs well for over coming malnutrition which is widespread in rural areas. Sri. Bannur Krishnappa obtained an additional income of more than Rs. 15,000/- by planting Ashwagandha and Coleus in one acre as intercrop with sugarcane.

e) All the farmers selected for study have expressed satisfaction that switching over to the new method from chemical agriculture has paid them good dividends. Savings on cost of seeds, fertilizers and plant protection chemicals has been substantial. Almost all the farmers have stopped borrowing crop loan. They are also not depending on hired labour as the family labour is sufficient to carry out all the farming operations. The yields have been optimal with possibly no decline in future, because of continuous incorporation of organic residues and replenishment of soil fertility. The new system of farming has freed the farmers from the debt trap and it has instilled in them a renewed sense of confidence to make farming an economically viable venture. This is a noteworthy feature in the dark horizon of many farmers committing suicide across the country.

10. Prospective Study

An appraisal of the 'Zero Budget Natural Farming' so far clearly points to its eminent feasibility for different agro climatic conditions, for different crops and different category of farmers. It has found favor with the farming community because it perfectly blends with their life style which is dependent on land, vegetation and livestock.

However, as regards its ability to provide sustainable returns year after year, it needs to be monitored over a period of time. The intended prospective study will focus on the sustainability aspects of this method of farming so that definitive conclusions can be drawn before advocating it to other prospective farmers.