Bio-Farming: A holistic approach for Social Upliftment and Better Health

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Abstract

Bio-farming helps the vulnerable farmers to have variability in their source of income at minimal cost sustaining soil health and preventing eco-system from the harmful effect of pesticides and chemical fertilizers. It paves several ways for the farmers through which they generate more income coupled with higher purchasing power. In fact, managements involved in bio- farming confer good prospects to improve soil fertility and minimize soil degradation with the help of natural resource conservation and their recycling. Bio- farming is technique of cultivation which drastically curtails the use of chemicals leading to better quality food products with high nutritive values. At the same time, it includes crop rotation, crop residues, organic waste, green manure and use of bio agents for biological pest control.

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Introduction

Now a day's third world country focuses their attention on the attainment of basic food stock to feed their citizens at a reasonable cost (FAO, 2006). The food productions cost is mounting high by adaption of conventional farming pattern which includes application of inorganic fertilizers, pesticides, modern farming techniques. Conventional farming pattern results in degradation of eco system and contamination of food products which leads to poor health standards. Bio-farming will help the vulnerable farmers to have diversity in their source of income at minimal cost. It helps in sustaining soil health and prevents eco-system from the harmful effect of pesticides and fertilizers. It also helps in development of sustainable agriculture. Bio farming helps in generating employment in farm sector and improves quality of products which yield better market price and results into social and economic upliftment of farmers (Kortbech-Olesen, 2000). Bio- farming minimizes the use of chemicals leads better

quality food products with high nutritive values which maintain better health. Bio-farming is a system of crop and livestock production with the help of crop rotation, crop residues, organic waste, green manure and through biological pest control (Elpiniki *et al.*, 2016). Codex Alimentarius Commission (1999) defines "Organic farming as holistic food production management system, which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity. Bio- farming emphasizes the use of management practices in preference to the use of off-farm input taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system". The other term used for bio farming is Organic Farming, Natural Farming, Green Farming, Eco-Friendly Agriculture, Eco

Farming, Biological Agriculture, Biodynamic Farming etc.

Concept involved in bio-farming

The bio -farming concept is very old, but its limited knowledge as compare to traditional farming, keep society away from this. The bio -farming efficiently using natural and easily available resources and techniques like green manure, natural waste, crop residues, crop rotation, biological pest control, compost and weed management. This farming techniques has potential to maintain the soil fertility for longer period, it maintain nutrient cycle without using any fertilizers or growth regulators. This economic farming process minimizing the crop failure in adverse climatic condition and it helps in maintaining the sustainability of the agriculture. This farming technique converts traditional management to organic management. Crop production is controlled by cultural and biological means. Bio-farming is modern form of agriculture and combination of science, technology and nature. It include following methods which combine to form bio agriculture: soil management, weed management, livestock, genetic modification, crop diversity, compositing, bio-fertilizers, vermin-compost and other green manure.

The basic principles of bio –farming

- Pollution free environment and resilient to climate change
- Free from chemical pesticides and fertilizers
- To maintain fertility of soil through organic farming
- High nutritional value of food
- Healthy environment for sustainable agriculture
- To produce required quantity of food with good quality
- To allow each person who involved in bio-farming production and processing a quality life which meets their basic need and allow an adequate return and

satisfaction from their work, including a safe working environment.

The impact of bio- farming on natural resources favours connection within the agro-ecosystem which is essential for both production and natural preservation. Biological services include soil forming and conditioning, soil stabilization, waste recycling, carbon sequestration, nutrient cycling, predation, pollination and habitats. Bio-farming methods deliver agronomic and environmental profits through structural changes and tactical management of farming system.

Benefits of Bio-farming

- It is eco- friendly and maintaining ecological balance
- Bio farming helps in conserving natural resources
- It produce good quality products with less input cost
- It increases the soil fertility and its texture
- It easily cops up with adverse effect of climate change and reduce risk of crop failure
- Conservation of natural resources
- It minimize the contamination of food products
- It induces self protection mechanism in the plant
- It reduces the water requirement of the plant

Significance of Bio-farming

As per the report of IPCC (Intergovernmental Panel on Climate Change) the climate smart bio-agents makes soil more fertile which yield more crops and greater resilience to droughts and heat (Steenwerth *et al.*, 2014). In addition, bio- farming system sorts out soil erosion which is one of the major problems in various agricultural zones.

The National Mission for Sustainable Agriculture of the country can be achieved in short span of time through bio- farming , which

is utmost need of the hour and equally for better nutrition management as well. Bio-farming helps in cultivation of short rotation energy crop and other social farming. It helps the society in converting the waste land into cultivable land with the use of bio agents and natural manures like; compost manure, bone meal, fish meal and green leaf etc.

Bio- farming approach yields more income to the society because

- It increases the yield in long term in more stable manner
- It is more resilient to the climate change (Temperature, flood, drought and soil erosion)
- Little wastage of the crops through pests by adaption of sustainable pests control methods of bio pest control
- Mixed farming at low cost
- Better quality of food grains yield more income

Hence, bio- farming generates constantly high income at lower cost through easily available resource to the society. Consistent production of crops at lower cost gives farmers regular livelihood. Finally, it helps the society to move towards better quality of life owing to healthy and nutritious food coupled with higher income.

Current production and export status of organic products in India

According to APEDA (2014), the country produces around 1.24 million MT of different certified organic products viz. all varieties of food products namely Sugarcane, Cotton, Oil seeds, Basmati rice, Pulses, Spices, Tea, Fruits, Dry fruits, Vegetables, Coffee and their value added products. Besides, country also produces organic cotton fiber, functional food products etc.

Madhya Pradesh has covered largest area under organic certification followed by Himachal Pradesh and Rajasthan. During 2013-14 India exported 135 products with the total volume of 194088 MT including 16322 MT

organic textiles. The organic agriculture export realization was around 403 million US \$ including 183 US \$ organic textiles registering 7.73% growth over the previous year. Organic products are exported to US, European Union, Canada, Switzerland, Australia, New Zealand, South East Asian countries, Middle East, South Africa etc.

Oil seeds - Soybean (70%) leads to highest among the organic products export followed by cereals and millets other than basmati (6%), processed food products (5%), basmati rice (4%), sugar (3%), tea (2%), pulses and lentils (1%), dry fruits (1%), spices (1%) and others.

Impact on social status and health standards

The food security is the biggest concern for developing countries and their policy related to food production is also unsupportive, it increases the complexity of the situation (IFAD report, 2013). Bio-farming is the right answer to food insecurity, because it increases the food accessibility for population by minimizing the risk of the crop failure. The methods of farming directly or indirectly affect the life of flora and fauna in the ecosystem. In our agricultural system the farmers are low paid, underfed, generally depends upon chemical practices they dangerously degrade land and the food products which is often coated with injurious chemicals, containing little taste and low in vital nutrients (IAASTD Global Report, 2009). Agricultural workers exposed to multiple doses of chemical pesticides on various occasions in conventional farming, which develops many harmful diseases. Leg and hand are the first injured by concentrated chemicals and latter other body parts like eyes, skin, and lungs. In Bio-farming practices avoid the use of concentrated chemical by using bio fertilizers and eco friendly manures which minimize the health problems of agricultural workers. When Bio-farming practiced in the standard manner, it decreases the input cost for their farming, notably improved farmer health and increase the fertility

of their land, tastier, safer and more nutritious produces. In a study conducted at Nigeria by Mofunanya *et al.*, (2015) reported that application of Bio -farming gives significantly superior results in terms of nutrition when compared to inorganic farming (Table 1&2).

A dynamic approach is the necessary of the hour, which focuses on the means to produce healthy food for resource crunch farmers who is leaving in a fragile infrastructure of village with financial scarcity. Bio-farming approaches develop the farmers' position in strata of living cycle through low cost naturally available resource (crop residue, animal waste, bio agents, etc) and generate more income with high quality

food product having good market value. Bio farming encourages and includes identification, use, evaluation, and conservation of locally adapted varieties of plants and animals. Farmers with increased access to resources and services have been able to break out the poverty and move towards prosperity.

Recent studies indicate that in addition to soil and water-borne sources, air-borne toxicant also contaminate crops and vegetables even in areas away from emission sources. By developing appropriate measures, agricultural land may be refrained from irrigation-linked contamination or from wastes release to farmlands.

Table 1: Comparative study of the effect of organic and inorganic fertilizer on proximate composition of *Amaranthus spinosus* L.

Plant part and soil type	Moisture	Ash	Protein	Fat	Fibre	Carbohydrate	Vitamin A	Vitamin C
	(g/100 g dry matter)						(µg/100 g)	
Leaf								
Organic	86.40±0.2	3.10±0.2	7.90±0.01	0.48±0.2	3.20±0.2	89.27±0.02	46.19±0.02	7.80±0.02
Difference (%)	2.5	29.2	64.3	23.1	88.2	0.5	15.9	71.4
Inorganic	85.60±0.2	2.80±0.1	5.60±0.01	0.43±0.1	2.60±0.02	89.06±0.01	42.40±0.1	6.50±0.02
Difference (%)	1.5	16.7	33.3	10.3	52.9	0.2	5.9	42
Control	84.30±0.02	2.40±0.01	4.20±0.01	0.39±0.01	1.70±0.01	88.84±0.02	40.05±0.02	4.55±0.01
Stem								
Organic	79.43±0.1	3.20±0.1	3.40±0.1	0.30±0.1	3.10±0.01	90.82±0.01	45.17±0.02	7.78±0.2
Difference (%)	1.3	28.0	54.5	50.0	10.7	0.5	12.1	54.0
Inorganic	78.50±0.02	2.81±0.1	2.80±0.1	0.24±0.01	2.90±0.2	90.82±0.01	45.17±0.02	7.78±0.2
Difference (%)	0.1	12.4	27.2	20.0	3.6	0.4	9.4	20.8
Control	78.40±0.01	2.50±0.01	2.20±0.2	0.20±0.2	2.80±0.01	90.39±0.01	40.30±0.2	5.05±0.1
Root								
Organic	76.60±0.01	3.30±0.2	3.70±0.02	0.34±0.2	4.50±0.02	89.54±0.02	30.11±0.02	10.40±0.03
Difference (%)	4.4	50.0	27.6	36.0	12.5	1.1	5.6	60.0
Inorganic	75.10±0.2	2.74±0.1	3.20±0.01	0.29±0.1	4.20±0.01	89.54±0.02	29.87±0.02	8.43±0.2
Difference (%)	2.3	24.5	10.3	16.0	5.0	1.0	4.8	29.7
Control	73.40±0.02	2.20±0.01	2.90±0.1	0.25±0.01	4.0±0.1	88.50±0.01	28.50±0.2	6.50±0.2
Inflorescence								
Organic	82.30±0.01	3.40±0.01	1.90±0.02	0.15±0.2	3.20±0.1	91.85±0.02	46.05±0.2	11.08±0.1
Difference (%)	2.8	13.3	26.7	50.0	6.7	1.1	37.5	55.0
Inorganic	80.25±0.01	3.30±0.1	1.60±0.02	0.13±0.2	3.10±0.2	91.54±0.01	41.90±0.2	8.45±0.01
Difference (%)	0.2	10.0	6.7	30.0	3.3	0.8	25.1	18.2
Control	80.05±0.1	3.0±0.01	1.50±0.02	0.10±0.2	3.0±0.2	90.81±0.02	33.50±0.2	7.15±0.02

Values are Mean±SD, n = 3 replicates, p<0.05. Percentage was obtained by expressing the difference between the values for control and organic/inorganic fertilizer as a percentage of the control

Table 2: Comparative study of the effect of organic and inorganic fertilizer on mineral composition of *Amaranthus spinosus* L.

Plant part and soil type	Mineral composition (mg/100 g dry matter)							
	Na	K	Ca	Mg	Fe	Zn	Cu	P
Leaf								
Organic	6.50±0.03	7.60±0.1	2.90±0.4	4.45±0.3	0.12±0.02	0.03±0.2	0.03±0.02	2.10±0.03
Difference (%)	44.2	77.2	45.0	93.5	50.0	100.0	100.0	16.7
Inorganic	5.70±0.01	5.30±0.01	2.80±0.2	3.41±0.1	0.09±0.02	0.02±0.1	0.02±0.01	1.90±0.01
Difference (%)	26.4	23.5	40.0	48.3	12.5	100.0	100.0	5.6
Control	4.30±0.02	4.29±0.1	2.0±0.01	2.30±0.01	0.08±0.1	0.01±0.01	0.01±0.02	1.80±0.01
Stem								
Organic	6.40±0.01	4.20±0.2	2.90±0.1	3.50±0.2	0.07±0.01	0.02±0.01	0.02±0.1	1.90±0.02

Difference (%)	25.5	3.7	29.5	52.8	40.0	100.0	100.0	75.9
Inorganic	5.30±0.01	4.10±0.2	2.50±0.01	2.85±0.01	0.06±0.01	0.02±0.1	0.02±0.01	1.20±0.3
Difference (%)	3.9	1.2	11.6	24.5	20.0	100.0	100.0	11.1
Control	5.10±0.1	4.05±0.1	2.24±0.01	2.29±0.1	0.05±0.1	0.01±0.2	0.01±0.01	1.08±0.01
Root								
Organic	8.62±0.3	4.48±0.3	3.0±0.2	2.25±0.01	0.04±0.01	0.02±0.1	0.04±0.02	1.41±0.02
Difference (%)	51.2	12.0	20.0	12.5	100.0	100.0	100.0	4.4
Inorganic	7.80±0.2	4.45±0.3	2.60±0.1	2.10±0.01	0.03±0.2	0.01±0.01	0.03±0.02	1.36±0.07
Difference (%)	36.8	11.3	4.0	5.0	50.0	-	100.0	0.7
Control	5.70±0.1	4.0±0.1	2.50±0.1	2.0±0.01	0.02±0.1	0.01±0.01	0.02±0.01	1.35±0.01
Inflorescence								
Organic	6.31±0.1	3.90±0.1	2.70±0.01	2.70±0.03	0.09±0.03	0.03±0.01	0.03±0.02	1.70±0.02
Difference (%)	38.4	18.0	17.4	11.1	88.0	100.0	50.0	6.3
Inorganic	5.70±0.2	3.45±0.1	2.61±0.02	2.60±0.03	0.07±0.2	0.02±0.01	0.03±0.02	1.70±0.01
Difference (%)	25.0	4.5	13.4	6.7	40.0	-	50.0	6.3
Control	4.56±0.1	3.30±0.2	2.30	2.43±0.01	0.05±0.01	0.02±0.01	0.02±0.01	1.60±0.01

Values are Mean±SD, n = 3 replicates, p<0.05. Percentage difference was obtained by expressing the difference between the value for control and organic/inorganic fertilizer as a percentage of the control

Conclusions

The bio –farming provides several avenues to the farmers through which they generate more income and higher status in the society. It resulted in better performance per unit area as compared to conventional farming. However, managements involved in bio-farming confer good prospects to improve soil fertility and minimize soil degradation with the help of natural resource conservation and bio agents. The Bio- farming has made a lot of impact in India during last few years, but lack of sector specific policy of the government and research institutions which help in strengthening its position in farm society and spreading know-how across the country, therefore an improvement in policy making issues can further strengthen the country's economy too.

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