ISSN: 2278-4632
Vol-13, Issue-01, No.02, January 2023

SOIL, NUTRITION & ORGANIC FARMING, –A VISION TOWARDS A HEALTHY NATION

Dr. DHARTI H. GAJJAR, Assistant Professor, Homescience Department, Jethiba K. Patel Arts College & B. A. Patel and D. B. Vyas Commerce College, Ruppur-Chanasma, Patan, Gujarat, India : dhartidhruv@gmail.com

Abstract:

In recent years, organic farming as a cultivation process is gaining increasing popularity. Organically grown foods have become one of the best choices for both consumers and farmers. Organically grown foods are part of go green lifestyle.

Objectives: 1 to accrue the benefits of nutrients, 2 direct supports to farming, 3 To conserve agricultural diversity, 4 to prevent antibiotics, drugs and hormones in animal products

Methodology: Collection, compilation of data from different literatures & Census. Information from review article to relate the comparison between Organic farming and conventional farming was used for the completion of the study**.**

Significant results: The Green Revolution and its chemical-based technology are losing its appeal as dividends are falling and returns are unsustainable. Pollution and climate change are other negative externalities caused by use of fossil fuel-based chemicals. In spite of our diet choices, organic food is the best choice means embracing organic farming methods.

Implications: It relies on ecologically balanced agricultural principals like crop rotation, green manure, organic waste, biological pest control, mineral and rock additives.

Key Words: Soil, Organic farming, Nutrition, Ecology

INTRODUCTION:

5th December as World Soil Day which is the birthday of His Majestry King Bhumibol Adulyadej of Thailand. This date was proposed by FAO to honour him for his efforts in promotion of soil science, soil resources conservation and sustainable management & first recipient of the Humanitarian Soil Scientist award.

Figure 1: Soil

Soil can be defined as organic and inorganic materials on surface of earth that provides a medium for plant growth. Lives are sustained in this earth basing on soil. More than 1000 years is required for making a centimetre (1/2 inch) of new soil naturally from parent rock. One gram of soil contains millions of living micro-organisms more than the population of entire world performing innumerable functions inside soil beneficial for growing plants and in turn supporting above ground biodiversity as well. So, soil is considered as a living material by the agricultural scientists. Almost 95% of food comes from soil. Two hectares of soil are sealed in every minute under expanding cities worldwide and 805 million people suffer from malnutrition. Healthy soil contains plant nutrients, natural growth

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stimulants and antibiotics for healthy food production required for healthy life of animal and human beings. It is the only source of most essential 4 Fs i.e. food, fodder, fibre and fuel of the inhabitants nurturing on it, regulating their health and wealth. The soil covering the World's surface is subject to increasing degradation due to erosion and poor management leading to desertification (P.K.Samant, 2015).

Figure: 2 Organic Farming

Food quality and safety are two vital factors that have attained constant attention in common people. Growing environmental awareness and several food hazards (e.g. dioxins, bovine spongy form encephalopathy, and bacterial contamination) have substantially decreased the consumer's trust towards food quality in the last decades. Intensive conventional farming can add contamination to the food chain. For these reasons, consumers are quested for safer and better foods that are produced through more ecologically and authentically by local systems. Organically grown food and food products are believed to meet these demands. In recent years, organic farming as a cultivation process is gaining increasing popularity Organically grown foods have become one of the best choices for both consumers and farmers. Organically grown foods are part of go green lifestyle. But the question is that what is meant by organic farming. The term 'organic was first coined by Northbourne, in 1940, in his book entitled 'Look to the Land'.

Northbourne stated that 'the farm itself should have biological completeness; it must be a living entity; it must be a unit which has within itself a balanced organic life, he also defined organic farming as 'an ecological production management system that promotes and enhance biodiversity, biological cycles and soil biological activity'. It is based on minimal use of off-farm inputs and on management practices that restore, maintain and enhance ecological harmony'. Organic produce is not grown with synthetic pesticides, antibiotics, growth hormones, application of genetic modification techniques (such as genetically modified crops, sewage sludge, or chemical fertilizers). Conventional farming is the cultivation process where synthetic pesticide and chemical fertilizers are applied to gain higher crop yield and profit. Synthetic pesticides and chemicals are able to eliminate insects, weeds, and pests and growth factors such as synthetic hormones and fertilizers increase growth rate. As synthetically produced pesticides and chemical fertilizers are utilized in conventional farming. Consumption of conventionally grown foods is discouraged, and for these reasons, the popularity of organic farming is increasing gradually. It is a technique, which involves cultivation of

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plants and rearing of animals in natural ways. This process involves the use of biological materials, avoiding synthetic substances to maintain soil fertility and ecological balance thereby minimizing pollution and wastage. In other words, organic farming is a farming method that involves growing and nurturing crops without the use of synthetic based fertilizers and pesticides. It relies on ecologically balanced agricultural principals like crop rotation, green manure, organic waste, biological pest control, mineral and rock additives (Yadav, 2020).

Figure: 3 Advantages of organic farming

The growing demand for organically farmed fresh products has created and interest in both consumer and producer regarding the nutritional value of organically and conventionally grown foods. According to study conducted by AFSSA (2003), organically grown foods, especially leafy vegetables and tubers, have higher dry matter as compared to conventionally grown foods. Although organic cereals and their products contain lesser protein than conventional cereals, they have higher quality proteins with better amino acid scores. Lysine content in organic wheat has been reported to be 25%-30% more than conventional wheat. Organically grazed cows and sheep contain less fat and more lean meat as compared to conventional counterparts. In a study observed that organically fed cow's muscle contains fourfold more linolenic acid, which is a recommended cardio-protective ω-3 fatty acid, with accompanying decrease in oleic acid and linoleic acid. The milk produced from the organic farm contains higher polyunsaturated fatty acids and Vitamin E. Vitamin E and carotenoids are found in a nutritionally desirable amount in organic milk. Higher oleic acid has been found in organic virgin olive oil. Organic plants contain significantly more magnesium, iron and phosphorous. They also contain more calcium, sodium and potassium as major elements and potassium as major elements and manganese, iodine, chromium, molybdenum, selenium, boron, copper, vanadium and zinc as trace elements. According to a review of Lairon (2010) which was based on the French Agency for food safety (AFSSA) report, organic products contain more dry matter, minerals, and antioxidants such as polyphenols and salicylic acid. Organic foods (94%-100%) contain no pesticide residues in comparison to conventionally grown foods. Fruits and vegetables contain a wide variety of phytochemicals such as polyphenols.

India is mainly an agricultural country, where agriculture contributes to about 14.6% in gross domestic product (GDP) and support over 58% of nation's population for gross domestic product (GDP) and support over 58 % of nation's population for livelihood. The recent economic and trade liberalization are exerting heavy pressure on India's land resource partitioning in sectors such as forestry. The coupled effect of meeting food demand under limited arable area and toxin – free agricultural produce have become an important forcing factor for countries like ours to explore possibilities for opting' conventional agriculture', the dominant farming approach promoted by most government and agribusiness groups throughout the world or 'organic agriculture' a holistic production management system which is supportive to environment, health and sustainability. Organic farming system emphasis on the use of organic matter for enhancing soil properties, minimizing food chain associated health hazards and attaining closed nutrient cycles, the key factors for sustainable agriculture. The major objectives of organic farming include:

1- Production of high quality food in sufficient quantity in harmony with natural systems and cycles
2- enhancing biological cycles within the farming system involving microorganisms, soil flora and fauna, plants and animals
3- maintaining long-term soil fertility and genetic diversity of the production system and its surroundings including plant and wildlife
4- promoting healthy use with proper care of water resources and all life therein
5- creating harmonious balance between crop production and animal husbandry
6- Minimizing all forms of pollution (Singh, 2012).

SIGNIFICANCE:

Healthy soil contains plant nutrients, natural growth stimulants and antibiotics for healthy food production required for healthy life of animal and human beings. It is the only source of most essential 4 Fs i.e. food, fodder, fibre and fuel of the inhabitants nurturing on it, regulating their health and wealth.

The soil covering the World's surface is subject to increasing degradation due to erosion and poor management leading to desertification apart from loss due to urbanization challenging our future food security. A well managed soil can play a vital role in storing carbon that could mitigate global warming and enhance greater infiltration of rain water in to its profile ultimately recharging ground water thereby increasing irrigation potential and making availability of more drinking water ultimately improving resilience to floods and droughts.

In an era of water scarcity, soils are fundamental for its appropriate storage and distribution. The soil is called as the "Mother Earth" or "Matrubhumi" as evident from ancient Indian Philosophy. According to FAO, at least a quarter of the world's biodiversity lives underground including earthworm which is giant along with micro-organisms such as bacteria, fungi and actinomycetes. Better management can assure that those usually unnoticed organisms boost soil's ability to absorb carbon and mitigate desertification, so that more carbon can be sequestered offsetting agriculture's own emission of greenhouse gases (P.K.Samant, 2015).

The Green Revolution and its chemical-based technology are losing its appeal as dividends are falling and returns are unsustainable. Pollution and climate change are other negative externalities caused by use of fossil fuel-based chemicals. In spite of our diet choices, organic food is the best choice means embracing organic farming methods.

Reasons to take up organic farming methods:

1 to accrue the benefits of nutrients
2 Stay away from GMOs
3 Natural and better taste
4 Direct supports to farming
5 to conserve agricultural diversity
6 to prevent antibiotics, drugs and hormones in animal products (Yadav, 2020).

According to the National Organic Programme implemented by USDA Organic Food Production Act, agriculture needs specific prerequisites for both crop cultivation and animal husbandry. To be acceptable as organic, crops should be cultivated in lands without any synthetic pesticides, chemical fertilizers, and herbicides for 3 years before harvesting with enough buffer zone to lower contamination form the adjacent farms. Genetically engineered products, sewage sludge, and ionizing radiation are strictly prohibited. Fertility and nutrient content of soil are managed primarily by farming practices, with crop rotation, and using cover crops that are boosted with animal and plant waste manures. Pests, diseases, and weeds are mainly controlled with the adaptation of physical and biological control systems without using herbicides and synthetic pesticides. Organic livestock should be reared devoid of scheduled application of growth hormones or antibiotics and they should be provides with enough access to the outdoor. Preventive health practices such as routine vaccination, vitamins and minerals supplementation are also needed.

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OBJECTIVES:

1 To create awareness among the people and decision makers about the enormous importance of soil for living organisms

2 To educate people about the crucial role of soil for food security, climate change adaptation and mitigation, essential ecosystem services, poverty alleviation and sustainable development.

3 To accrue the benefits of nutrients

4 To conserve agricultural diversity

6 To prevent antibiotics, drugs and hormones in animal products

METHODOLOGY:

Collection, compilation of data from different literatures. Information from review article to relate the comparison between Organic farming and conventional farming was used for the completion of the study**.**

RESULT & DISCUSSION:

Starting with classifying soils based on their fitness to grow specific crops or based on the source of water (viz., rain or a river), agriculture has remained the major focus of Indian economy. Healthy soil is critical to human health. India attained self-sufficiency in food production, realising zero hunger, good health, and no poverty remains a challenge. In this research tried to assess Indian soils, their nutrient status and organic farming. The majority of Indian soils are low in major and micronutrients; soil testing in farmer's fields suggests that more than 70% of soils suffer either form soil acidity or soil alkalinity. About 29% of the total geographical area under the process of land degradation, deficiency of several plant nutrients is showing malnutrition in Indian population. Smallholder farms in India need new organic agricultural technology.

Figure 4: Indian Crops

With the net sown area of about 140 Mha, the food grain production of 82 million tonnes (Mt) in 1960-61 before the green revolution period has increased to 308.7 Mt in 2020-21in addition to the production of 36.1 Mt oilseeds, 399.3 Mt sugarcane, and 35.4 million cotton bales. There is a growing concern on our ability to feed Indian population, which is slated to reach as high as 1.65 billion by 2060. Increasing population is decreasing the per capita land availability; the land to human ratio of 0.39 ha in 1950 has indeed changed to 0.10 ha in 2021. Almost 69% of the current 146 M landholdings are marginal farms (< 1 ha area), which makes agricultural mechanization a challenging task. Also an increasing trend in land degradation and deterioration of soil health with the total area under degraded land increased to 96.59 Mha (29.32% of total geographical area) in 2011-13 from about 94.52 Mha in 2003-05.

Erosion is the main pathway of soil degradation in India and estimated 3 billion tonnes of soil gets eroded to the oceans annually. Although India ranks high in terms of total production for several crops, their productivity remains low. There is a concern of possible shortfall in food supply in just a decade ahead casting doubt on meeting the SDG goals of zero hunger. With green revolution,

multidimensional poverty is declining although continue to have malnourished children with 35.5 % stunting and about 19.3 % wasting (National Family Health Survey NFHS-5, 2019-20, 2022). A comprehensive study involving 100 countries has shown that the per capita demand for protein and calorie is slated to increase by 89 and 62% respectively, for the low-income countries such as India by 2050. To address such challenges, there has been double the farm income by 2022 through the adoption of integrated farming system approach, which involves the diversification of cropping system with the integration of different components including arable and horticultural crops, livestock, forage crops, etc. in the farm and integrated nutrient management. Such integration requires a clear understanding of the linkages between food security and soil health.

Intensive agriculture with improved nutrient and water management can increase water and nutrient use efficiency and crop biomass production, thereby increasing plant-mediated C input to soil and reducing the rates of organic matter decomposition. Study showed that the enhanced C sequestration rates resulted from increased productivity of rice and wheat in Punjab (Das, 2022).

Soil nutrient status as 1947, Indian soils were known to be low in N; crops such as Egyptian clover, wheat in parts of Punjab, and crops grown on light textured soils responded to fertilizer P and those grown in lateritic soils responded to fertilize K application. During the green revolution period, deficiencies of several micronutrients emerged because of the cultivation of high yielding crop cultivation of high-yielding crop cultivars, use of micronutrient-free NPK fertilizers, and farmers' access to irrigation water. Adoption of these technologies increased crop productivity form 710 kg ha-1 in 1961-62 to 2300 kg ha-1 in 2020-21, which helped India achieve self-sufficiency in food grain production transforming the country from a "ship to mouth" status to a net food exporter.

Large withdrawal of essential plant nutrients caused micronutrient and secondary nutrient deficiencies in many Indian soils. For example, field-scale Fe deficiency was noticed as early as 1960s and that of P and K during 1970s. Zn deficiency in field soils was observed in 1969-70. In 1979-80, Mn deficiency was observed in wheat and forage berseem (Trifolium alexandrinum) in rice-wheat/berseem rotation in coarse-textured soils.

First reported during 1980-81, S deficiency is now recognized as the fourth major limiting nutrient following N, P, and K. In the 1990s, B deficiency was reported followed by Cu during the last decade. The deficiencies appeared faster in the northern states compared to other parts of the country, which may primarily be attributed to the rapid adoption of Green Revolution technologies in irrigated areas.

For presenting a typical picture of soil nutrient status in Indian soils, the farmer's field data (n=178,037) collected from 12 different Indian states by the ICRISAT and their partners. Soil samples from farmer's fields show a wide variation in soil pH ranging from highly acidic (pH~4.95) to alkaline (pH~9.59) soil reaction. Only 20-40% of soil samples had neutral soil reaction. On an average, 31% soil samples were acidic and 43% of samples were alkaline in nature suggesting that a large fraction of agricultural soils in India require soil amendments (lime or gypsum). This dataset does not include some of the high salinity areas (e.g.., states of Punjab and Haryana) and thus, the EC values range from 0.05-3.76 dS m-1 even with such large proportion of high pH soils. Low SOC and low N contents of Indian soils are also reflected in the high percentages of samples with deficient (low) SOC contents for these 12 states, the occurrences of >60% of samples deficient in SOC contents in states such as Telangana, Jharkhand, and Andhra Pradesh are alarming because there states also have low forest cover suggesting overall low terrestrial SOC stock.

A predictable outcome of soils with low and high pH is reflected in the large proportion of soils (~41%) having P deficiencies. Most of these states have reasonable soil K supply, which has traditionally supported Indian farmers to use less potassic fertilizers. Similar to K, most of the soil samples had sufficient available Mg with less than only 3% samples with alkaline pH showed Fe deficiencies. All India Coordinated Research Project on micro and secondary nutrients and the National Soil Health Card (SHC) mission suggest for Zn, 23-45% for B, 19-31% for Fe, 13-17% for Mn and 5-11% for Cu. Deficiencies for the primary nutrients in Indian soils stand at 96% for N (82% low and 14% medium), 61% FOR p (20% low and 41% medium), and 62% for K (15% low and 47% medium).

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Deficiencies of more than one micronutrient along with primary nutrients in soils have also been reported at several locations in the country. Both primary and micronutrient deficiencies have now become the major constraint in sustaining high crop yields in the present-day intensive agriculture across India. Over six decades of green revolution, the use of fertilizer nutrients has increased from 0.30 Mt in 1960-61 to 32.54 Mt in 2020-21. 20.40 Mt N fertilizers and 8.98 Mt P2O5 fertilizer consumed in India, 13.74 and 4.74 Mt of fertilizer N and P2O5, respectively, are produced in the country and the rest are imported. The entire amount of Muriate of Potash (3.15 Mt K20) and more than half of the urea consumed in the country is imported. Through fertilizer use in India increased significantly, a huge mismatch still exists between the nutrient uptake by the crops and addition through fertilizers. The uptake of primary nutrients (NPK) by crops during 2015/16 was 36.6 Mt whereas the application of fertilizer nutrients was 26.8 Mt leaving a gap of 9.8 Mt. The gap widens to 13 Mt when nutrient use efficiencies are considered. The imbalance could still be higher in many regions because of great disparity in fertilizer use. Currently, 13 states account for 92% of total fertilizer consumption in the country.

The gap in fertilizer use is filled by indigenous soil nutrient supply leading to nutrient mining and degradation of soil fertility, thus rendering the production system unsustainable. Nutrient-wise analyses revealed that the gap between nutrient uptake and application of fertilizer nutrients was largely on account of K, leading to its mining from the soil. It is observed that presence of K- bearing minerals, such as muscovite, biotite and illite in alluvial soils releases substantial amounts of non-exchangeable K in soils. The deterioration of soil fertility is evident from progressively declining fertilizer response ratio from 12.1 kg grain per kg NPK in 1960-69 to 5.1 kg grain per kg NPK in 2010-17. In general, fertilizer use efficiencies in Indian soils are low (N: 30-45%, P: 15-25%, K: 50-60%, S: 8-12%, and micronutrients: 2-5%) as compared to developed countries and the global average of 59%. Low use efficiencies are often attributed to imbalanced nutrient application, the lack of site-specific and integrated nutrient management (INM), and little or no recycling of crop residues. Currently fertilizer consumption in India is clearly skewed towards N: 32.54 Mt of NPK fertilizer use in 2020-21 consists of 20.40 Mt N, 7.66 Mt P (as P2O5), and 3.15 Mt K (as K20) yielding N:P:K use ratio of 6.7:2.4:1.

Fertilizer N is a key factor for increasing productivity provided balanced nutrient approach is adopted else the law of minimum kicks in. Each tonne of fertilizer N consumed in the country enhanced food grain production by 10 tonnes. Fertilizer N efficiency has declined from ~75% in late sixties to ~15% suggesting imbalanced nutrition.

With per capita land availability being already low, any further increase in food grain production will come through efficient management of resources aimed at maintaining or enhancing soil fertility. Researchers in India are developing management practices for enhancing soil health and minimizing nutrient depletions, which inter alia include soil test based balanced fertilizer application, rationalizing P application in a crop sequence, INM, residue recycling, drip and sprinkler irrigation with fetigation in high-value crops, and conservation agriculture. Land is the base for all primary production systems and is a non-renewable resource. The demand for food is increasing with the increasing urbanization, shrinking farm size, development in education and migration to cities in search of better livelihoods. More people in India are taking animal-base food while the population on vegetarian diets(which needs almost 1/3rd water for producing same calories food) is shrinking. Increased food production has to come from the available, finite and limited water and land resources that are declining in quality and quantity.

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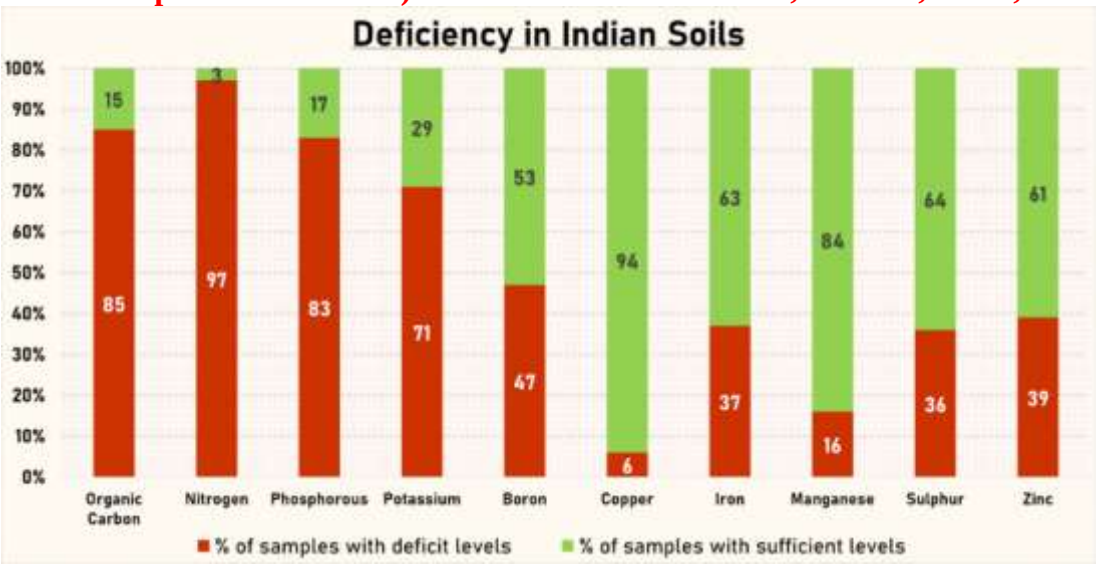

Graph: 1 Deficiency in Indian Soils

The levels of organic carbon and macronutrients in Indian soils are either 'very low', 'low' or 'medium'. According to a recent Centre for Science and Environment (CSE) report, about 85% of soil samples are deficient in organic carbon, 27 states and UTs had nitrogen deficiency in 97% of the samples are deficient in nitrogen—out of these, 45% of the samples show very low levels of nitrogen, 36% low levels of nitrogen and 16% medium levels of nitrogen. The report found that 83% of the samples are deficient in phosphorus—17% reveal very low levels and 35% medium levels. About 71% of the samples are deficient in potassium. Of these samples, about 5% have very low levels of potassium, 14 % low levels and 52% medium levels. Indian soils are also deficient in micronutrients with more samples showing deficit in boron, iron, sulphur and zinc and a lesser number in copper and manganese. As per the Soil Health Card scheme, initiated by the Union ministry of agriculture and farmers welfare in 2014-15, the soil is considered deficient in macronutrients, like nitrogen, organic carbon, phosphorus and potassium if the levels of these macronutrients in the soil are 'very low', 'low' or 'medium' and sufficient if the levels of the macronutrients are 'high' or 'very high'. Similarly, soils containing less than the prescribed level of a micronutrient—boron, copper, iron, manganese, sulphur and zinc, etc. are considered deficient and soils containing equal to or more than the prescribed levels of micronutrients are considered sufficient.

According to the report, organic carbon deficiency is widespread across the country—24 states and Union Territories (UTs) have, at least, half of their soil samples deficient in organic carbon. Out of these, seven states have more than 90% deficient samples. Haryana's soils are the most deficient in organic carbon, followed by those of Punjab, Uttar Pradesh Rajasthan, Tamil Nadu, Mizoram and Andaman and Nicobar Islands. Nitrogen deficiency is also widespread and severe—32 states and UTs have nitrogen deficiency in at, least, half of their soil samples. Of these, 27 states and UTs have more than 90% deficient samples. Fifteen states and UTs have nitrogen deficiency in almost all of their samples—Andaman and Nicobar Islands, Dadara and Nagar Haveli, Daman and Diu, Bihar, Delhi, Haryana, Kerala, Madhya Pradesh, Manipur, Mizoram, Odisha, Puducherry, Rajasthan, TamilNadu, Uttarakhand and Uttar Pradesh (Indian soils extremely deficient in nutrients, 2022).

Because SOC contents may be viewed as a proxy for available soil N, percentage of samples deficient in SOC contents are shown along with the other two primary nutrients of P and K. As expected, soil samples from farmers' fields show a wide variation in soil pH ranging from highly acidic (pH ~ 4.95) to alkaline (pH ~ 9.59) soil reaction. Only 20-40% of soil samples had neutral soil reaction. On an average, 31% soil samples were acidic and 43% of samples were alkaline in nature suggesting that a large fraction of agricultural soils in India require soil amendments (lime or gypsum) (Das, 2022).

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Organic Agriculture Statistics at a Glance in 2020-21

According to TechSci Research report, Global organic food market stood at $ 110.25 billion in 2016 and is projected to grow at a CAGR of 16.15 %, in value terms, during 2017-2022, to reach 262.85 billion by 2022.

Table 1: ORGANIC EXPORTS

Total exports quantity	888179.68 MT
Total Export Value (INR)	707849.52 Lakhs
Total Export Value (US$)	1040.95 million USD

The global organic food market stood at $110.25 billion in 2016 and is projected to develop at a CAGR of 16.15%, in cost terms, throughout 2017-2011, to reach $262.80 five billion with the resource of using 2022. With the Indian Organic Food enterprise developing in double-digit throughout 2013-2017, it might now no longer be incorrect to mention that the enterprise will deliver out nicely in 2019. The purchaser conduct in choice of natural meals seems to have developed to be greater deeply entrenched and ingrained and an element of the purchaser buying for dependency over a long-lasting time horizon.

Table 2:State wise Organic Farm Production for the year 2020-21

S. No.	State Name	Organic Production (In MT)	Conversion Production (In MT)	Total Production (In MT)
1	Madhya Pradesh	1214919.50	177176.43	1392095.93
2	Maharashtra	752176.23	23598.76	775774.99
3	Karnataka	355718.73	0.00	355718.73
4	Rajasthan	237436.69	18949.46	256386.15
5	Uttar Pradesh	183089.90	319.14	183409.04
6	Odisha	128264.72	3587.28	131852.01
7	Gujarat	112797.25	5008.48	117805.73
8	Uttarakhand	46645.41	0.00	46645.41
9	Jammu & Kashmir	41043.93	0.00	41043.93
10	Kerala	27850.11	0.00	27850.11
11	Tamil Nadu	24068.86	0.00	24068.86
12	Meghalaya	21753.32	0.00	21753.32
13	Chhattisgarh	20630.65	0.00	20630.65
14	Andhra Pradesh	20145.27	0.00	20145.27
15	Assam	17839.16	0.00	17839.16
16	West Bengal	17434.79	0.00	17434.79
17	Himachal Pradesh	6368.45	0.00	6368.45
18	Haryana	5439.00	0.00	5439.00
19	Goa	3115.44	0.00	3115.44
20	Telangana	2509.68	0.00	2509.68
21	Sikkim	443.85	3.42	447.27
22	Tripura	348.53	0.00	348.53
23	Punjab	264.63	0.00	264.63
24	Manipur	27.74	0.00	27.74

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25	Bihar	12.59	0.00	12.59
26	Nagaland	3.50	0.00	3.50
27	Arunachal Pradesh	1.09	0.00	1.09
	Total	**3240349.01**	**228642.97**	**3468991.98**

According to APEDA, the name of Indian organic industry merchandise is at steady growth internationally as India exported organic food worth $515 million within the economic 12 months 2017-18, from $ 370 million in 2016-17. India's organic meals intake has grown in current years due to the fact of its superior demographic dividend, progressed shopping power, and accelerated hobby within side the perceived fitness and properly-being blessings of positive natural merchandise. In the marketplace 12 months (MY) 2019, the organic food industry in India retail income reached $ 69 million and is predicted to in addition upward thrust with the resource of using 12% to $ 67 million in MY 2020.

Table 3: State Wise Export during 2020-21

S. No.	State	Exported Qty (In MT)	Total Value (In Crore)	Total Value (In USD Million)
1	Madhya Pradesh	500636.68	2683.58	394.64
2	Maharashtra	126272.80	913.74	134.37
3	Gujarat	65476.39	723.20	106.35
4	Kerala	8610.66	355.34	52.26
5	Haryana	38986.98	348.77	51.29
6	Karnataka	17436.02	321.36	47.26
7	Telangana	7532.38	280.96	41.32
8	Uttar Pradesh	12141.77	278.56	40.96
9	West Bengal	4642.18	269.97	39.70
10	New Delhi	31669.54	235.94	34.70
11	Daman & Diu	42404.62	231.62	34.06
12	Rajasthan	24713.51	217.95	32.05
13	Tamil Nadu	4223.70	108.74	15.99
14	Andhra Pradesh	1828.16	57.68	8.48
15	Goa	303.21	19.79	2.91
16	Uttarakhand	261.62	10.97	1.61
17	Jammu & Kashmir	607.59	10.77	1.58
18	Chhattisgarh	74.40	4.23	0.62
19	Punjab	326.03	2.73	0.40
20	Himachal Pradesh	7.88	1.62	0.24
21	Assam	22.89	0.75	0.11
22	Meghalaya	0.48	0.16	0.02
23	Jharkhand	0.20	0.07	0.01
	Total	**888179.69**	**7078.50**	**1040.96**

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Table 4: **Category Wise Comparative Report of Organic Export-2020-21**

S. NO.	Category Name	Exported Qty (In MT)	Total Value (In INR Lac)	Total Value (In USD Million)	Exported Qty (In MT)	Total Value (In INR Lac)	Total Value (In USD Million)	Growth Quantity	Growth Value (In INR Lac)	Growth Value (In USD Million)
1	Processed Food	405383.99	214932.29	316.08	655986.21	400170.03	588.49	61.82	86.18	86.18
2	Oil Seeds	100815.43	62093.59	91.31	84072.66	63965.50	94.07	-16.61	3.01	3.01
3	Cereals & Millets	48677.64	38382.05	56.44	59907.79	51679.49	76.00	23.07	34.64	34.64
4	Spices & Condiments	8053.30	24369.01	35.84	10022.28	38061.41	55.97	24.45	56.19	56.19
5	Tea	6210.89	33800.64	49.71	6164.24	34512.04	50.75	-0.75	2.10	2.10
6	Medicinal Plant Products	2806.06	17999.76	26.47	4230.57	31935.76	46.96	50.77	77.42	77.42
7	Dry Fruits	3714.48	23372.05	34.37	3658.17	23848.95	35.07	-1.52	2.04	2.04
8	Sugar	41940.89	18344.50	26.98	40541.51	19027.83	27.98	-3.34	3.73	3.73
9	PULSES	4829.61	5989.79	8.81	8781.97	12991.59	19.11	81.84	116.90	116.88
10	Coffee	4584.91	11212.62	16.49	4381.51	11097.37	16.32	-4.44	-1.03	-1.02
11	Essential oil	145.33	4744.08	6.98	219.31	7129.64	10.49	50.91	50.28	50.28
12	FODDER	4999.13	2244.63	3.30	6876.94	4187.90	6.16	37.56	86.57	86.58
13	Others	5429.05	6190.66	9.10	655.78	3328.76	4.90	-87.92	-46.23	-46.23
14	Fresh Fruits & Vegetables	511.29	1327.72	1.95	1404.32	2633.97	3.87	174.66	98.38	98.31
15	Flowers	346.55	2636.33	3.88	190.13	1575.52	2.32	-45.14	-40.24	-40.24
16	Tuber Products	495.95	848.58	1.25	1042.85	1504.50	2.21	110.27	77.30	77.32
17	Oils & Oleoresins	0.44	31.41	0.05	1.44	114.39	0.17	227.50	264.23	265.22
18	Miscellaneous	53.46	71.11	0.11	42.03	84.86	0.13	-21.39	19.34	19.05
	Total	**638998.40**	**468590.81**	**689.11**	**888179.69**	**707849.52**	**1040.96**	**39.00**	**51.06**	**51.06**

The Organic food industry in India commenced to increase in a decade within the past and there was no searching again ever because of the fact then. Rising focus among humans regarding the fact outcomes of synthetic chemical substances in organic meals manufacturing has similarly boosted the future of the organic food industry in India. India's GDP boom of 6.5% in 2017 became sturdy in spite of annoying situations similar to the implementation of GST. The forecast for GDP

ISSN: 2278-4632
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boom in FY2019 is expected to be greater than 7%. This will truly enhance the normal performance of various industries like Organic Foods, Pharmaceuticals, and FMCG.

Graph 2: Global Market Share of Organic Packaged Food

Table 5: Category Wise Comparative Report of Organic Export-2020-21

		2019-2020			2020-2021			Year on Year	Year on Year	Year on Year
S. NO.	Category Name	Exported Qty (In MT)	Total Value (In INR Lac)	Total Value (In USD Million)	Exported Qty (In MT)	Total Value (In INR Lac)	Total Value (In USD Million)	Growth Quantity	Growth Value (In INR Lac)	Growth Value (In USD Million)
1	Processed Food	405383.99	214932.29	316.08	655986.21	400170.03	588.49	61.82	86.18	86.18
2	Oil Seeds	100815.43	62093.59	91.31	84072.66	63965.50	94.07	-16.61	3.01	3.01
3	Cereals & Millets	48677.64	38382.05	56.44	59907.79	51679.49	76.00	23.07	34.64	34.64
4	Spices & Condiments	8053.30	24369.01	35.84	10022.28	38061.41	55.97	24.45	56.19	56.19
5	Tea	6210.89	33800.64	49.71	6164.24	34512.04	50.75	-0.75	2.10	2.10
6	Medicinal Plant Products	2806.06	17999.76	26.47	4230.57	31935.76	46.96	50.77	77.42	77.42
7	Dry Fruits	3714.48	23372.05	34.37	3658.17	23848.95	35.07	-1.52	2.04	2.04
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11	Essential oil	145.33	4744.08	6.98	219.31	7129.64	10.49	50.91	50.28	50.28
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14	Fresh Fruits & Vegetables	511.29	1327.72	1.95	1404.32	2633.97	3.87	174.66	98.38	98.31

There may also be an opportunity of at least a 20-25% compounded growth of the organic food industry in India for the 12 months 2020-21. Taking this estimate into consideration, the Indian marketplace can be foreseen at approximately Rs. 3,000 crore and the International natural marketplace over $100 billion although the worldwide monetary system guidelines proper into a depression.As in accordance with the Agricultural and Processed Food products Export Development Authority (APEDA), India exported organic food truly properly worth Rs. 30 billion in 2017-18, from Rs. 24.77 billion in 2016-17.

More recognition and an upward thrust in the name of natural meals have helped in growing sales. Now customers are greater conscious of a dangerous results of chemical compounds and pesticides. People have commenced looking out for organic food for themselves and in particular for his or her kids. Due to growth in disposable earnings and recognition now households are spending a growing wide variety on their child's health and are equipped to pay a higher/pinnacle class rate in phrases of best of the product.

Land degradation and Soil health

Diminished ability of land to support soil functions or services required for sustainable intensification results in large yield gaps between potential yield and actual yield in farmers' fields. Land is the base for all primary production systems and is a non-renewable resource. The demand for food is increasing with the increasing urbanization, shrinking farm size, development in education and migration to cities in search of better livelihoods. More people in India are taking animal-based food while the population on vegetarian diets (which needs almost 1/3rd water for producing same calories food) is shirking soil through different land degradation process (e.g. water erosion, wind erosion, soil salinity, soil pollution, etc.) pose a major challenge to agricultural production systems.

Table 6: Increasing population, water footprint and freshwater demand

Year	2010	2025	2050
Population in India(Million)	1150	1394	1750
Vegetarian percentage population	60	50	40
Vegetarian Population (Million)	690	697	700
Non-Vegetarian Population (Million)	460	697	1050
Daily water foot print for Vegetarian diet, Litre/day	4500		
Daily water foot print for Non-Vegetarian diet, Litre/day	15,000		
Annual Water requirement for Vegetarian diet (BCM)	1133	1145	1150
Annual Water requirement for Vegetarian diet (BCM)	2519	3816	5749
Total Water requirement (BCM)	3562	4961	6899

Source: Derived from Central Water Commission

Land degradation is inherently linked with soil quality. In general, soil quality assessments are focused on the determination of soil nutrients (i.e., chemical indicators), which fulfils the agronomic requirements and provides management recommendations. Several reports are available on how soil

nutrient deficiencies influence crop productivity. Wide spread deficiencies of Zn, B, and S in addition to known deficiencies of macronutrients such as N and P are apparently holding back the productivity potential resulting in low crop yields for farmers. Sulphur deficiency in Indian soybean growing areas emerged largely due to a shift from single super phosphate (SSP) to di-ammonium phosphate (DAP) by farmers because of subsidies on nitrogenous fertilisers. Another fallout of the fertilizer subsidy is that farmers have moved away from using organic manure preserving food soil health to chemical fertilizers as a cheap source of nutrients. With land degradation, the deteriorating soil quality is manifested through numerous indicators such as reduction in organic C, evidence of multi-nutrients deficiencies, deterioration of soil physical health, and impairment of biological activities among others. In general, chemical and physical indicators are straightforward and easy to determine while methods for biological indicators are more cumbersome. Soil microbes can respond early and rapidly to environmental changes and stresses and it becomes imperative to include them in soil health assessment often even prior to detectable changes in physical or chemical indicators. Under intensive cultivation, as occurs in IGP and some other parts of the country, soil quality issues are triggered with the burning of crop residues aggravation C, N, and S losses and inflicting heat stress to soil living system. Rehabilitating and reverting from degradation on regaining its productive state needs time and expensive corrective measures. These severely degraded soils sometimes even lost their resilience causing a serious dent in the already depleted soil wealth of the Indian nation. A well-focused attention is needed to rehabilitate these soils in the most intensively cultivated areas to strengthen the backbone of national food security. Life on land: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss (Das, 2022).

CONCLUSION:

Inherently low nutrient contents in soils, nutrient depletions and emerging nutrient deficiencies because of crop removal, imbalanced fertilizer use, and declining factor productivity are some of the challenges in Indian agriculture. Second, the interplays between water and nutrients are relatively less attended or are not available in form of specific recommendations that can be delivered to farmers. Healthy soil contains plant nutrients, natural growth stimulants and antibiotics for healthy food production required for healthy life of animal and human beings. A well managed soil can play a vital role in storing carbon that could mitigate global warming and enhance greater infiltration of rain water in to its profile ultimately recharging ground water thereby increasing irrigation potential and making availability of more drinking water ultimately improving resilience to floods and droughts. Organic farming system emphasis on the use of organic matter for enhancing soil properties, minimizing food chain associated health hazards and attaining closed nutrient cycles, the key factors for sustainable agriculture.

Consumption of conventionally grown foods is discouraged, and for these reasons, the popularity of organic farming is increasing gradually. Organic produce is not grown with synthetic pesticides, antibiotics, growth hormones, application of genetic modification techniques. As synthetically produced pesticides and chemical fertilizers are utilized in conventional farming.

Organically grown foods, especially leafy vegetables and tubers, have higher dry matter minerals, and antioxidants such as polyphenols and salicylic acid as compared to conventionally grown foods. Although organic cereals and their products contain higher quality proteins with better amino acid scores specially Lysine content. The milk produced from the organic farm contains higher polyunsaturated fatty acids and Vitamin E and carotenoids. Higher oleic acid has been found in organic virgin olive oil. Organic plants contain significantly more magnesium, iron and phosphorous. They also contain more calcium, sodium and potassium as major elements and potassium as major elements and manganese, iodine, chromium, molybdenum, selenium, boron, copper, vanadium and zinc as trace elements. Organic products contain more dry matter, minerals, and antioxidants such as polyphenols and salicylic acid. Organic foods (94%-100%) contain no pesticide residues in comparison to conventionally grown foods. Fruits and vegetables contain a wide variety of phytochemicals such as polyphenols (Singh, 2012).

Nutrient-wise analyses revealed that the gap between nutrient uptake and application of fertilizer nutrients was largely on account of K, leading to its mining from the soil. Fertilizer N is a key factor for increasing productivity provided balanced nutrient approach is adopted else the law of minimum kicks in. Each tonne of fertilizer N consumed in the country enhanced food grain production by 10 tonnes

Large withdrawal of essential plant nutrients caused micronutrient and secondary nutrient deficiencies in many Indian soils and also deficient in organic carbon and micronutrients. Deficiencies of several micronutrients emerged because of the cultivation of high-yielding crop cultivars, use of micronutrient-free NPK fertilizers, and farmers' access to irrigation water, which may primarily be attributed to the rapid adoption of Green Revolution technologies in irrigated areas.

Maintenance of soil health includes reduction of soil erosion, use of organic, manures, bio fertilizers, crop rotation, management of problematic soils with suitable soil amendments and use of balanced dose of fertilizers and micronutrients for optimum growth of plant. Organic matter is the life of soil responsible for improvement of soil physical condition. Increasing rate of infiltration and water holding capacity, creating a healthy ambient atmosphere for soil microbes and holding plant nutrients firmly with reduced of loss nutrients. The organic matter status of soil needs to be conserved by reducing soil erosion, cover cropping, zero and minimum tillage, residue recycling, institute composting, waste management and vertical cropping. The conservation measures needs to be taken care of for the soils of uncared forest lands, seashore and riverbanks

(Source: Soil Health Card Nutrient Status, union agriculture ministry and India Data Portal)

Awareness and capacity building of the stakeholders are required for maintenance of soil health for production of healthy food and food security of future generation along with development of healthy and wealthy nation. Preserve, protect and produce by maintaining soil health and for future generation.

Organic foods and conventionally grown foods has same benefits in terms of nutrients. Consuming more fresh produce, organic or conventional, such as fruits and vegetables has been a consistent link to weight-loss because they are high in fiber and nutrients, which can help control appetite. Growth in e-commerce sector has acted like a facilitator for the organic food industry to reach out to the potential consumers in Tier II and Tier III cities. Secondly, with free/low-cost access to the Internet, more and more people are getting to learn about the benefits of organic food. Organic food items are gaining popularity for pretty straightforward reasons i.e. GMO-free content, nutrient richness, zero growth hormones, zero antibiotics, fewer pesticides, improved freshness levels, and better environmental stability.

Abbreviation:

The International Federation of Organic Agriculture Movements – IFOAM
Centre for Science and Environment - CSE
National Family Health Survey -NFHS
Sustainable development goals -SDG
Centre for Science and Environment- CSE

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