Project Report

Under

Support for Statistical Strengthening

On

Comparative Profit-Cost Analysis of Organic and Conventional Farming (In reference of Haridwar District)

Sponsored By

Directorate of Economics and Statistics, Uttarakhand, Dehradun

Project Coordinator

Dr.Surjeet Singh

Department of Economics, B.S.M.(P.G.) College,
Roorkee (Haridwar), Uttarakhand
Email: surjeetsinghap@gmail.com

INTRODUCTION

Organic Farming has been practiced in India for thousands of years. The great Indian civilization thrived on organic farming. In traditional India, the entire industry of agriculture was practiced using organic techniques, where the fertilizers and pesticides were obtained from plant and animal products.

Although the term organic farming is getting popularity in recent times, but it was initiated in 10000 years back when ancient farmers started cultivation depending on natural sources only. There is brief mention of several organic inputs in our ancient literatures like Rigveda, Ramayana, Mahabharata, Kautilya Arthasashthra etc. In fact, organic agriculture has its roots in traditional agricultural practices that evolved in countless villages and farming communities over the millennium. Organic farming was the backbone of the Indian economy and cow's dung was used as a fertilizer.

During the 1950s and 1960s, the ever-increasing population of India, along with several natural calamities, led to a severe food scarcity in the country. Millions of poor Indians would die of hunger in the mid 1970s. As a result, the government was forced to import food grains from foreign countries. To increase food security, the government had to drastically increase food production in India. Therefore government introduced Green Revolution in the 1960s under the supervision of S.S. Swaminathan. Several hectares of land were brought under cultivation. Hybrid seeds were introduced. Natural and organic fertilizers were replaced by chemical fertilizers and locally made pesticides were replaced by chemical pesticides.

It is no doubt that the greatest challenge of today's agriculture is to feed the growing population and restore the natural resources. Global food production needs to be doubled by 2020 and just to maintain the present precipitate food consumption. Uncontrolled population growth in developing countries accelerated the imbalance between human needs and sustainable use of land. Though by virtue

of chemical fertilizers the production and productivity of crops has increased, the increased use of pesticides has posed many environmental and health problems. The chemical fertilizers and pesticides used over a long period of time have adverse toxic effects on the production potential of the land and the ultimate consumers of the products. Therefore Indian farmers are gradually increasing fertilizers for more and more production of agriculture. According to **department of agriculture and co-operation** the actual N: P: K (Nitrogenous, Phosphate and Potash) ratio being used in India over the years has been around 7.8:3.2:1. The N: P: K ratio considered ideal for Indian soil stands at 4:2:1.

Excessive use of chemical fertilizers causes environmental pollution. When water soluble nitrogen fertilizers are applied to the soil, a good portion of added nutrients does not become available to the plants, but is lost to the ground water through leaching or run off. The excess nitrate leached in to rivers or ponds encourages the growth of organisms and thus a lot of organic matter produced which on decomposition lead to bad smell, which has an adverse effect on health. Foods grown with chemical fertilizers caused various deteriorating health hazards in animals as well as human beings as herbicides affect the central nervous system, respiratory and gastro intestinal system, nausea, depression, insomnia, cancer, asthama, alzeimers and bone diseases.

The indiscriminate use of pesticide concerns the presence of pesticide residues in our foods. According to WHO, 14000 people die every year in the third world countries due to pesticide poisoning. Its immediate effect has appeared on environment and ecosystem also. Large scale death of birds is reported every year. According to study by CCS Haryana Agricultural University, the pesticide residue persistence in agricultural produce, food commodities, animal, feed, fodder, animal products, irrigation water are matter of serious concern.

Organic Farming

Organic production is a holistic system designed to optimize the productivity and fitness of diverse communities within the agro-ecosystem, including soil organisms, plants, livestock and people. The principal goal of organic production is to develop enterprises that are sustainable and harmonious with the environment. Protect the environment, minimize soil degradation and erosion, decrease pollution, optimize biological productivity and promote a sound state of health.

Organic agriculture has triggered a controversial debate in the last decades, most importantly because it shed light on the darker sides of chemical-intensive conventional farming by offering an alternative. By now, there is a strong body of evidence showing that organic farming is more environmentally friendly: potential benefits from organic production arise from improved soil fertility, organic matter content and biological activity; better soil structure and reduced susceptibility to erosion; reduced pollution from nutrient leaching and pesticides; and improved plant and animal biodiversity. As more and more attention has been put on determining whether organic systems are environmentally better or not, it is not clear whether organic agriculture could be economically attractive enough to trigger wide spread adoption. If organic farming offered a better environmental quality, and potentially healthier foods, but not sufficient economic returns to the majority of farmers, it would obviously remain a luxury way of food production available to a very tiny fraction of farmers. However, the continued growth of organically managed lands worldwide, especially in developing countries, does not support this hypothesis. The number of studies devoted to the question of how profitable organic agriculture is when compared to conventional management is over hundred; however long-term studies analyzing the development of profits in comparative studies are much less numerous.

The aim of this paper is to analyze existing literature on the economic performance of organic versus conventional (defined as conventional) farms, to

determine the critical factors for success in the evaluation of organic agriculture in different socio-political settings, and to offer some critical insights into how comparative studies differ. Studies evaluating yields, certain production costs and analyzing profits were considered.

Objectives of the Study

- Comparative analysis of cost and profit of organic and conventional farming in selected areas by taking selected farmers.
- Comparative analysis of the use of fertilizers on organic and conventional farming on health.
- Analysis of organic and conventional farming on water, land and environment.

Hypothesis

- There is no difference in profitability of organic and conventional farming.
- Standardization, marketing and trade of the products of organic and conventional family are treated equivalent.
- Soil science is not included in this study.

Methodology

Two blocks (Narsan and Bhagwanpur) out of six (Narsan, Bhagwanpur, Khanpur, Bhadarabad, Laksar and Roorkee) are taken for study because according to the statistics list of farmers of **Uttarakhand State Organic Certification Agency (USOCA),** of the organic farming is done in Narsan and Bhagwanpur. According to USOCA statistics, in Bhagwanpur 110 farmers are doing organic farming in 15 villages, out of which 42 farmers cultivate organic paddy and 25 farmers cultivate organic wheat and 43 farmers cultivate organic sugarcane and gram etc. 50 farmers were our sample of the project in which 19 farmers were producing paddy, 11 farmers were producing wheat and 20 farmers were producing sugarcane in Bhagwanpur block. Sunethi Alampur,

Qadarpur, Delana and Kunja Bhadurpur villages will be the sample village of Bhagwanpur block as in these villages organic farming is done in large scale by the farmers. In the same way, according to the statistics of USOCA 162 farmers in 11 villages of Narsran block are doing organic farming. Out of which 55 farmers are producing organic paddy, 45 farmers are cultivating organic wheat and remaining 62 are producing organic sugarcane and chickpea. 75 farmers were our sample of the project in which 25 farmers were producing organic paddy, 21 farmers were producing organic wheat and 29 farmers were producing organic sugarcane in Narsan block. Sherpur Khelmau, Bhagtowali Majra, Jhabreri Kalan and Susada villages will be the sample village of Narsan block where organic farming is done in abundance mainly wheat, paddy and sugarcane. In initial stage 20-20 organic and conventional farmers were taken as sample from both the blocks. After the presentation on 30th May 2017 in Head Office, DSTO, Dehradun samples increased in Bhagwanpur block and in the same way in Narsan block.

Table 1.1: Status of sample villages of Bhagwanpur block

Villages of Bhagwanpur block	Total area of the village (in hectares rounded up to one decimal place)	Total population (2011 census)	Number of households (2011 census)
Sunethi Alampur	318	1526	274
Qadarpur	68	110	23
Kunja Bahadurpur	408	2304	418
Delana	175.4	1951	340

Source: Census Report 2011

Table 1.2: Status of sample villages of Narsan block

Villages of Narsan block	Total area of the village (in hectares rounded up to one decimal place)	Total population (2011 census)	Number of households (2011 census)
Jhabreri Kalan	418.3	1865	322
Sherpur Khelmau	544.1	4419	765
Susada	177.9	369	57
Bhagtowali Majra	845.1	4247	739

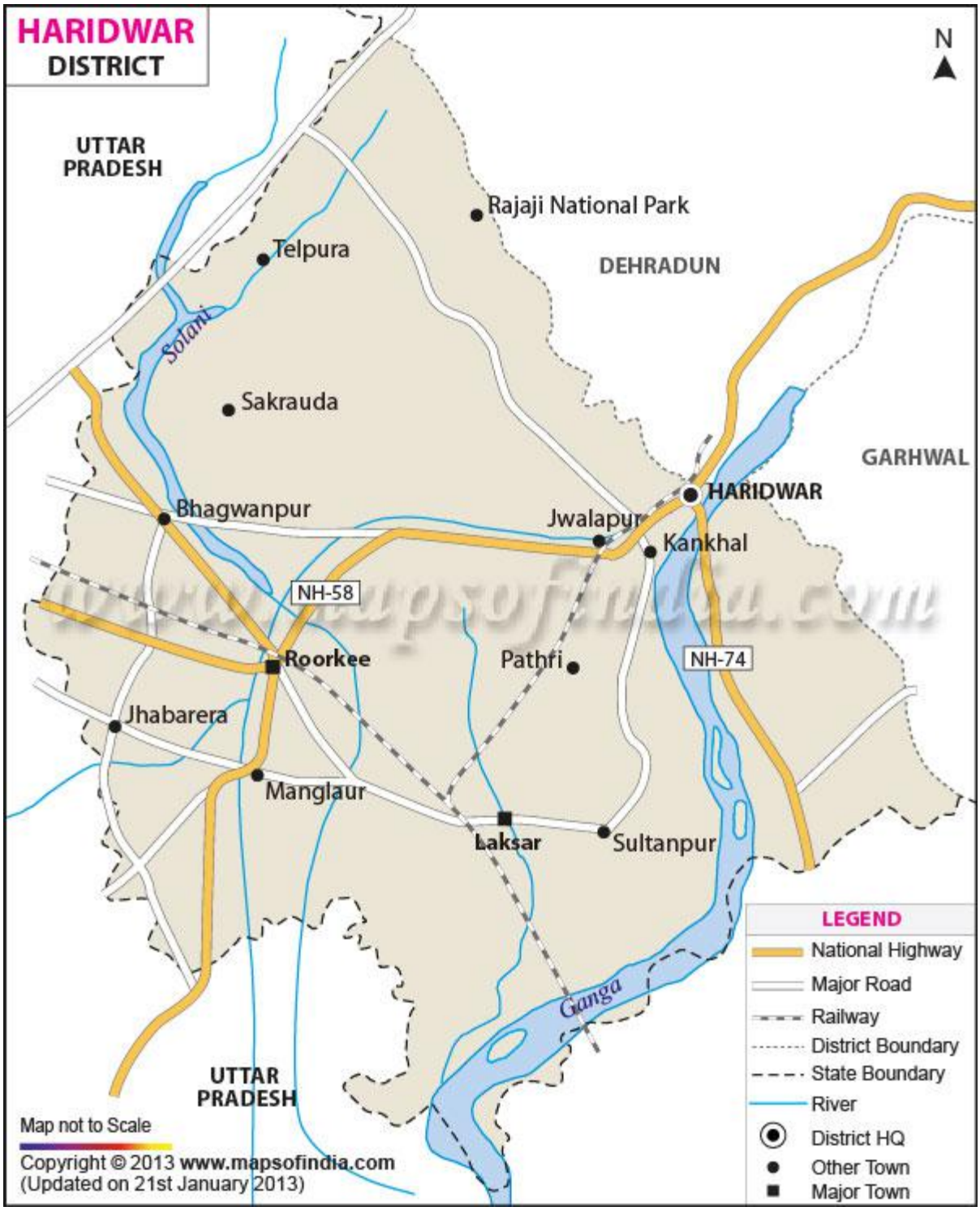
Source: Census Report 2011

To develop the quantitative questionnaire the research used multiple techniques. The qualitative open ending questions were framed strategically to reveal the current status of organic farming in Bhagwanpur and Narsan block. The open questions were related to economic of organic and conventional farming, constraints and opportunities of organic farming etc. For primary data collection, a questionnaire passed by DSTO office was prepared to intervene the farmers. The following steps were involved in qualitative to quantitative questionnaire presentation.

The systematic walk in the village helped the investigator to familiarize him with village and villagers to meet many farmers who they would not have otherwise met. During the walk investigator observed the area, talked with farmers, listened their views relating to economics of organic and conventional farming, discussed profitability of organic farming, identified constraints and opportunities of organic farming and their problems and solutions.

Location and Geographcal Area

Haridwar district, covering an area of about 2360 sq.km is in the western part of Uttarakhand state of India. Its latitude and longitude are 29.58 degree north and 78.13 degree east respectively. The height from the sea level is 249.7 mts. The district came into existence on 28th Dec. 1988. Prior to its inclusion in the newly created state of Uttarakhand, this district was a part of Saharanpur Divisional Commissionary. The district is ringed by Saharanpur in the west, Dehradun in the north and east, Pauri Garhwal in the east, Muzzaffar Nagar and Bijnor in the south. The district headquarter is situated in the Roshnabad, at a distance of about 12 kms from railway station. The district is administratively subdivided into three tehsils i.e. Haridwar, Roorkee and Laksar and six development blocks i.e. Bhagwanpur, Roorkee, Narsan, Bahadrabad, Laksar and Khanpur and comprises 622 villages. The administrative map of Haridwar district is given at Fig.



Haridwar is one of the first towns where Ganga emerges from the mountains to touch the planes. Haridwar district has been very well connected with the

network of metalled roads and railway lines. The major towns of Haridwar district are connected by railways.

As of 2011 it is the most populous district of Uttarakhand (out of 13). According to the 2011 census Haridwar district has a population of 1,927,029, roughly equal to the nation of Lesotho or the US state of West Virginia. This gives it a ranking of 244th in India (out of a total of 640). The district has a population density of 817 inhabitants per square kilometre (2,120 /sq mi). Its population growth rate over the decade 2001-2011 was 33.16 %. Haridwar has a sex ratio of 879 females for every 1000 males, and a literacy rate of 74.62.

Bhagwanpur Block

Bhagwanpur block is one of the sample blocks. Bhagwanpur is a Block positioned in Haridwar district in Uttarakhand. Bhagwanpur Tehsil Head Quarters is Bhagwanpur town. It is located 39 KM towards west from District head quarters Haridwar. 54 KM from State capital Dehradun towards North. Bhagwanpur Tehsil is bounded by by Roorkee Tehsil towards South , Puwarka Tehsil towards west , Muzaffarabad Tehsil towards North , Ballia Kheri Tehsil towards west . Roorkee City , Manglaur City , Saharanpur City , Purquazi City are the nearby Cities to Bhagwanpur. It is Commercial centre of Ghad Chhetra. The block has 87 villages and there are total 39359 homes in this Block. Population of this block is 2, 28,583 in which male population is 1,21,600 and women population is 1,06,983. Total worker is 68,525 in Bhagwanpur block in which male worker is 59,424 and female worker is 9,101. Total cultivator in this block is 14,041 in which male and female cultivators are respectively 13,341 and 700.

As per Census 2011, Bhagwanpur's population is 228583. Out of this, Males constitute 52% of the population and females 48%. This block has 38230 kids in the age group of 0-6 years. Out of this 20253 are boys and 17977 are girls.

Literacy rate in Bhagwanpur block is 67.76%. In males the literacy rate is 76.82% and female literacy rate is 58.05% in this Block. The count of employed

individual of Bhagwanpur block is 68525 still 160058 are un-employed. And out of 68525 working individual 14041 individuals are fully dependent on farming.

Table 1.3: Number and percentage of main workers, marginal workers and non-workers by sex

	Bhagwanpur block		
	Males	Females	Total
Persons	114627	100699	215326
Main workers	47112	5121	52233
Marginal workers	8877	3244	12121
Total workers (Main and marginal workers)	**55989**	**8365**	**64354**
Non workers	58638	92334	150972
Cultivators	13868	980	14848
Agricultural Labourers	19803	2509	22312

Source: Census Report 2011

Narsan Block

Narsan is another sample block of our project. Narsan is a City in Haridwar District of Uttarakhand State, India. 74 KM from State capital Dehradun towards North. Narsan City is bounded by by Roorkee Tehsil towards North , Purkaji Tehsil towards South , Khanpur Tehsil towards East , Laksar Tehsil towards East . Manglaur City, Purquazi City, RoorkeeCity, MuzaffarnagarCity are the nearby Cities to Narsan. It is in the 261 m elevation (altitude). This Place is on the border of the Haridwar District and Muzaffarnagar District. Muzaffarnagar District Purkaji is South towards this place. Also it is in the Border of other district Saharanpur. It is near to the Uttar Pradesh State Border. Narsan is a village panchayat located in the Haridwar district of Uttarakhand state,India. The latitude 30.19 and longitude 78.04 are the geocoordinate of the Narsan.

Table 1.4: Number and percentage of main workers, marginal workers and non-workers by sex

	Narsan block		
	Males	Females	Total
Persons	109198	95609	204807
Main workers	47249	7782	55031
Marginal workers	6745	2776	9521
Total workers (Main and marginal workers)	**53994**	**10558**	**64552**
Non workers	55204	85051	140255
Cultivators	16701	1309	18010
Agricultural Labourers	14468	2445	16913

Source: Census Report 2011

Climate and Rainfall

District Haridwar experiences moderate subtropical to humid climate with three distinct seasons viz. summer followed by rainy and winter seasons. Temperature begins to rise from March (29.1 degree Celsius) and reaches to its maximum in May (39.2 degree Celsius), with the commencement of monsoon season by mid-June, the temperature begins to fall. During the winter season in the month of November to February the temperature ranges between 10.5 degree C and 6.1degree Celsius. The average normal annual rainfall in Hardwar district is 1174.3 mm, out of which 84% is received during monsoon season and only 16% occurs during non-monsoon period. The monthly distribution of rainfall during the monsoon season over the district shows that July and August are the wettest month in the district having a rainfall 329.3 and 393.8 mm, respectively.

Geomorphology and Soil

The topography is undulating in the northern part and more or less plain towards south. The altitude ranges from 869 to 232 m. In the vicinity of Siwalik Hills, the gradient is steep. Geomorphologically Hardwar district can be divided into four geomorphic units. These are flood plain, lower piedmont plain, upper piedmont plain and structural hills. The flood plain area is relatively flat, low lying and adjacent to Solani River. It comprises unconsolidated, coarse to fine sand with

silt and clay. The area is repeatedly inundated during the floods. The lower piedmont plain is flat to undulating with gradient towards southwest having micro relief. The sediments vary from fine clastic to coarse clastic manifesting in variable runoff and infiltration.

Soils play an important role in ground water recharge and the agriculture production of the area. The land of Bhagwanpur block is highly fertile. The northern part, paleochannels and active floodplain of rivers have soils of sandy loam, where as remaining part of the block is covered by silty loam soils. Important soils are Ultisoils, which are the brown hill soil, occurring all through the northern part of the block. These are the soils with a horizon of clay accumulation and low base supply. Entisols are the soils (also called the Bhabar soil) occurring all along the foothills of Siwaliks and extends up to Terai. These soils are without pedogenic horizons. Though these soils consist of boulders, pebbles, sand, silt and clay, they are highly fertile. Mollisols, also called the Terai soil, occur in the southern part of the block. They consist mainly of fine-grained sand, silt and clay. These are the soils with a nearly black, organic-rich surface horizon and high base supply. These three types of soils are mineral soils with organic matter less than 25%. These are the most fertile soils of the block.

Geology

Geologically the area may de divided into three zones viz. Siwaliks, Bhabar and Gangetic Alluvial Plains from North to South.

Siwalik Range: This forms the outermost part of Himalaya and comprise Tertiary Group of rocks. In Bhagwanpur block only Upper and Middle Siwaliks are exposed. The Upper Siwaliks is constituted of boulders, pebbles, sand and clay. The boulders and pebbles are mostly of quartzites. Middle Siwaliks comprises mainly grey micaceous sandstone and siltstone.

Older Alluvium (Piedmont Plains or Bhabar): The Piedmont Plains are formed along the foothills of Siwaliks. It is formed by flooding hill torrents and nallahs

(locally termed as 'Rao'). Alluvial fans in the piedmont zones are wider and longer when formed along mature streams. The Older Alluvium consist of polycyclic sequence of brown to grey silt, clay with boulders and pebbles.

Gangetic Alluvial Plains: The region south of the piedmont plains occupied by Gangetic Alluvial Plains, forms major part of the Bhagwanpur block. Lithologically, the alluvium is formed of unconsolidated to semi-consolidated deposits of sand, silt, clay and kankar.

Ground Water Scenario

Hardwar district comes under Ganga river system. The main tributaries of Ganges like Solani, Ratmau Rao and Banganga and their feeding nallahs drain the area. These tributaries are ephemeral in nature. As far as canal irrigation is concerned, western part of the district is well covered with 300 km length canal network. Bhagwanpur block comes under non-command area. Hence, there is an immense pressure on ground water due to which water levels are declining at faster pace. There are 225 State Government tubewells and 32930 private tubewells. The ground water abstraction for drinking, domestic and agriculture purposes is higher in Bhagwanpur block as compared to other blocks. Most of the tubewells are drilled in central and southern part of the block. The northern part of the block has less number of tubewells.

Land and Land use pattern

Out of the total reported area of the district forest covered 84537 Hectare, cultivable waste land 1716 Hectare, present fallows 2761 Hectare, other fallows 3780 Hectare, usar and uncultivable land 2773 Hectare, land use other than agriculture 27395 and net area sown 243162. The number of land holdings of the size of less than 2 to 4 hectare was 33193.13 Hectare of the total land holdings. The land holdings of the size of 4 to 10 hectares covered the proportion of 24647.21 Hectare which is covered in 4462 numbers. The land holdings are, therefore, generally small in size.

Agriculture and Crop Pattern

The district has a place of importance in the state for good harvest of wheat, paddy sugarcane and potato, out of the total main workers of the district 54.8 per cent are engaged in cultivation. This proportion is 75.1 per cent for rural areas. Thus agriculture is the mainstay of rural economy. For augmentation of agricultural products besides providing financial assistance, fairs are organized which provide knowledge about modern techniques and equipments. High 5 yielding seeds, fertilizers and insecticides are provided by the government agencies. Main crops of the district are paddy, wheat, maize, pulses like masoor, urad and gram. The commercial crops chiefly produced are groundnut, potato, tobacco and sugarcane. During 2008-09 the district produced 172 thousand m. ton of cereals out of which 133 thousand m. ton was wheat, 37 thousand m. ton paddy and 1.86 thousand m. ton maize. Other crops produced during the same period were 638 m ton of pulses and 2.3 thousand m. ton oilseeds. Among commercial crops 3569 thousand m. ton sugarcane and 2.6 thousand m. ton potato was produced. The crop density in the district was 142.58 per cent.

Irrigation

Irrigation is an important investment for improved agricultural production. Tube wells and canals are the major sources of irrigation in the district. In the submontane belt owing to the immense depth of the water level, the construction of wells is impossible. Considering the sources of irrigation, it may be stated that during 2008-09 16.48 (13097 hectare) per cent land was irrigated through canals and 92818 Hectares land by tube wells. Irrigation by canals is done mainly in areas under Narsan and Bahadrabad C.D. blocks. A canal network of 279.51 km. is available in the district.

Work

Work is defined as participation in any eco-nomically productive activity with or without compensation, wages or profit. Such participation may be physical and/or mental in nature. Work involves not only actual work but also includes

effective supervision and direction of work. It even includes part time help or unpaid work on farm, family enterprise or in any other economic activity. All persons engaged in 'work' as defined above are workers. Persons who are engaged in cultivation or milk production even solely for domestic consumption are also treated as workers. Reference period for determining a person as worker and non-worker is one year preceding the date of enumeration.

Main worker

A person who has worked for major part of the reference period (i.e. six months or more during the last one year preceding the date of enumeration) in any economically productive activity is termed as 'Main worker'.

Marginal worker

A person who worked for less than six months of the reference period (i.e. in the last one year preceding the date of enumeration) in any economic activity is termed as 'Marginal worker'.

Non worker

A person who has not worked at all in any economically productive activity during the reference period (i.e. last one year preceding the date of enumeration) is termer as non worker.

Cultivator

For purposes of the Census a person is classified as cultivator if he or she is engaged in cultivation on land owned or held from government or held from private persons or institutions for payment in money, kind or share. Cultivation includes effective supervision or direction in cultivation.

A person, who has given out her/his land to another person or persons or institution(s) for cultivation for money, kind or share of crop and who does not even supervise or direct cultivation in exchange of land, is not treated as cultivator. Similarly, a person working on another person's land for wages in cash or kind or a combination of both (agricultural labourer) is not treated as cultivator.

Cultivation involves ploughing, sowing, harvesting and production of cereals and millet crops such as wheat, paddy, jowar, bajra, ragi, etc. and other crops such as sugarcane, tobacco, groundnuts, tapioca, etc. and pulses, raw jute and kindred fiber crop, cotton, cinchona and other medicinal plants, fruit growing, vegetable growing or keeping orchards or groves, etc. Cultivation does not include the following plantation crops – tea, coffee, rubber, coconut and betel nuts (areca).

Agricultural labour

A person who works on another person's land for wages in money or kind or share is regarded as an agricultural labourer. She/he has no risk in the cultivation, but merely works on another person's land for wages. An agricultural labourer has no right of lease or contract on land on which she/he works. Household industry worker

Household industry is defined as an industry conducted by the head of the household herself/himself and or by the members of the household at home or within the village in rural areas and only within the precincts of the house where the household lives in urban areas. The larger proportion of workers in household industry should consist of members of the household including the head. The industry should not be run on the scale of a registered factory which would qualify or has to be registered under the Indian Factories Act and should be engaged in manufacturing, processing, servicing and repairs of goods. It does not include professions such as a pleader, Doctor, Musician, Dancer, Waterman, Astrologer, Dhobi, Barber, etc. or merely trade or business, even if such professions, trade or services are run at home by members of the household.

Other worker

A person who has been engaged in some economic activity during the reference period but not as a cultivator or agricultural labourer or in Household Industry is termed as a 'Other Worker (OW)'. The type of workers that come under this category of 'OW' include all government servants, municipal employees, teachers, factory workers, plantation workers, those engaged in trade,

commerce, business, transport, banking, mining, construction, political or social work, priests, entertainment artists, etc. In effect, all those workers other than cultivators or agricultural labourers or household industry workers are 'Other Workers'.

Work Participation Rate

In the total population of the district of 1,890,422 as much as 30.6 per cent are workers and rest of 69.4 per cent are non-worker. Among workers 85.6 per cent are main workers and rest of 14.4 per cent are marginal workers. In absolute terms females outnumber males as main worker and marginal workers as well. The extent of main workers is highest at 256318 in Roorkee tahsil and lowest at 59895 in Laksar. In case of marginal workers the proportion is highest in Roorkee tahsil as 41345 in comparison to only 32862 in Hardwar tahsil and 10753 in Laksar. The extent of non-workers in urban parts is higher than rural areas. In the district among workers about 16.2 per cent are cultivators and 62.6 per cent other workers. Over 62.51 per cent of female workers are engaged as other workers.

CHAPTER TWO

REVIEW OF LITERATURE

Review of literature is an essential part of any investigation as it not only gives an idea of the work completed in the past, but also provides the basis for interpretation and discussion of the findings. Following Studies investigating employment and income on individual farms have following results.

Erik Van Der Wcrf (1990) has made a comparative study of ecological farming with conventional farming in South India and observed that one of the most important characteristics in which natural ecosystems differed from conventional agriculture is the continuous presence of vegetative cover on the land.

Gunjal S.S. (1991) impressed that organic farming promised a better and balanced environment, better food and much better living standard to masses in India. It also promised better long-term agriculture because of its low cost.

Nagarajan (1992) presented the case of a progressive farmer of Hosahalli in Shimoga Taluk of Karnataka who raised sugarcane varieties on his farm without loss in yields or soil fertility by using the trash as manure without burning it, which is the common practice followed by farmer. Burning of cane fields leads to irreparable environmental damage and helps to increase the atmospheric temperature of the areas which is not desirable. The leaf trash mulched into the soil without burning, on complete decomposition supplies about 100 kg of Nitrogen and 100 kg of K20 per hectare. In this novel method, the farmer has been getting an average yield of 135 to 140 tonnes per hectare for the past 25 years when compared to national yield of cane per hectare (40 tonnes). It is very high.

Rahudkar and Phate (1992) narrate the experiences of organic farming in Maharashtra. Individual farmers growing sugarcane and grapes, after using vermi compost, saw the soil fertility increased, irrigation decreased by 45 per cent and sugarcane quality improved. The authors say that net profits from both the sugarcane and grape crops are high in organic farms.

Regi Thames (1993), from his case study found that transition from conventional to ecological agriculture yielded more. In the first year, the result was poor, yields were still less. The second year onwards, yields and soil began to improve. By the third year, yields started showing significant improvement. Coconut yielded 240 per cent increase along with the increased yield of 480 per cent from inter crop. In rubber, the yield came down by 20 per cent, but when compared with the profit, it was remaining the same. He also concluded in his research that the alternative ecological practices were found to be superior to conventional agriculture.

Kannan (1995) impressed that he has raised Basmati variety of paddy of 120 days duration during rabi season (January to April) on three hectares and harvested an average of more than five tonnes per hectare. The crop was grown entirely on the basis of organic manure and bio-fertilizers and for plant protection eco-friendly botanical pesticides were used. Liberal quantities of farm yard manure, green leaf manure and neem cake formed the bulk of the basic application. The total cost of cultivation per hectare was about Rs. 9303.50 and a net profit of about Rs. 40,000.00 could easily he realised per hectare of basmati.

Magasagayam (1995) conducted a comparative study of modern farming and natural farming in Pudukottai district in Tamil Nadu and reported that there was less occurrence of pest incidence in natural farming because of the absence of fertilizer and pesticide applications. Six natural farmers claimed to have achieved yields on a par with modern farming and others were confident that they would attain the break-even point within another few years.

Prakash (2003) analysed the inappropriateness of the cost and return accounting methods adopted to find out the economics of the organic farming. An economic evaluation of the bad effects of inorganic agriculture and their internalization through environmental taxes is proposed for a market based approach to promote organic farming in India.

Aulakh C.S, Singh Surjit, Walia S.S, Kaur Gurpreet, Farmers' perceptions on organic farming in Punjab, Journal of Research, vol.46, Issue 1 pp.9- 13 (2009) has made a survey of forty seven organic growers during 2007-08 to get information on crops being grown and organic manures being used by the organic growers and to know the farmers' perception about organic farming and constraints in its adoption. The survey indicated that 38.3 per cent of the organic growers were large farmers, 23.4 per cent medium and semi-medium each and 14.9 per cent small. Paddy, wheat, pulses and vegetables were the prominent crops being grown under organic farming using organic manures like farm yard manure and vermi-compost. Most of the organic growers were managing insect pest and diseases by using neem based pesticides. Though the productivity level of organic crops was low yet the majority of organic farmers (62 per cent) were satisfied with organic farming and practicing it mainly due to the perception that organic farming improves the soil health, environment and human health (69.5 per cent). The improved market infrastructure for organic foods and the availability of quality bio-pesticides to farmers can help in adoption of organic farming as lack of market facilities (67.1 per cent) and difficulty in control of insect pest and disease (60.2 per cent) were the top most constraints expressed by the organic growers.

Surabhi Singh (2012) found that agriculture sector contributes a major portion in gross production of India. In spite of this, agriculture today is finding itself in increasing difficulties. The adverse impact of agriculture based on synthetic fertilisers and herbicides is visible in the degradation of soil fertility, quality of food, taste of food and so on. Organic agriculture may prove to be a boon to curb these adverse effects. The present study was conceived with the broad objective of building authentic database on demographic profile of farmers pursuing organic farming, their belief and awareness regarding organic farming in Uttarakhand, a hill state of North India. The study was conducted in plain and hills regions of Uttarakhand. The results showed that the farmers carried out organic farming in a relatively smaller proportion of their land holding. While the

respondents were cognizant about some basic facts of organic farming, they were not aware of all the aspects related to certification and standards given by the different agencies. Respondents of the study were inclined to have favourable beliefs towards organic farming. The respondents, by and large, revealed good faith in organic farming. To promote organic farming, government should make policies and plan training and educational modules for farmers.

Following Studies investigating employment and income on individual farms have conflicting results.

Zerger and Padel (1993) suggest that the number of farms and the numbers employed in agriculture will continue to decline, but at a slower rate if an ecological approach that is low input farming and organic farming was adopted.

Braun (1990) suggests that farm incomes would fall significantly, assuming no premium paddys and maintenance of the existing number of farms and distribution by size and type.

Kaushik (1997) analysis the issues and policy implications in the adoption of sustainable agriculture. The concept of trades off has a forceful role to pay organic farming both at the individual and national decision making levels. Public vis-à-vis private benefits, current vis-à-vis future incomes, current consumption and future growths, etc. are very pertinent issues be determined. The author also lists a host of other issues. Which the study makes a contribution at the conceptual level, it has not attempted to answer the practical questions in the minds of the farmers and other section of the people.

Bemward Geier (1999) is of the opinion that there is no other farming method so clearly regulated by standards and rules as organic agriculture. The organic movement has decades of experience through practicing ecologically sound agriculture and also in establishing inspection and certification schemes to give the consumers the guarantee ad confidence in actually. Organic farming reduces external inputs and it is based on a holistic approach to farming. He describes the world wide success stories of organic farming based on the

performance of important countries in the west. The magnitude of world trade in organic farming products is also mentioned. To the question of whether the organic farming can feed the world, he says that neither chemical nor organic farming can do it, but the farmers can.

Veeresh (1999) opines that both high technology and sustainable environment can not go together. Organic farming is conceived as one of the alternatives to conventional agriculture in order to sustain production without seriously harming the environment and ecology. However, he says that in different countries organic farming is perceived differently. While in the advanced countries, its focus is on prevention of chemical contamination we, in countries like India are concerned at the low soil. The principles of organic farming are more scientific than those of the conventional. India's productivity of many crops is the lowest in the world in spite of the increase in the conventional input use. The decline in soil nutrients, particularly in areas where the chemical inputs are increasingly being used in the absence of adequate organic matter as is cited as a reason for low productivity. Doubts about the availability of massive sources of organic inputs also exist. He advocates an advance to organic farming at a reasonable peace and conversion of only 70% of total cultivable area where un-irrigated farming is in vogue. This 70% supplies only 40% of our food production. While the analysis has several merits, it is more addressed to the policy makers and less to the farmers.

Sankaram Ayala (2001) is of the opinion that almost all benefits of high yielding varieties based farming accrue mostly in the short term and in the long term they cause adverse effects. There is an urgent need for a corrective action. The author rules out organic farming based on absolute exclusion of fertilizers and chemicals, not only for the present, but also for the foreseeable future. There ought to be an appropriate blend of conventional farming system and its alternatives. The average yields under organic and conventional practices are almost the same and the declining yield rate over time is slightly lower in organic farming. The

economic model, which shows substantial decreased yields on the widespread adoption of organic farming. Decreased aggregate outputs, increased farm income and increased consumer paddy are other results, the model gives. While the details about this US analysis are not known, its relevance to India where we already have the lowest yields of a number of crops under the conventional system appears to be open.

Singh and Others (2001), recording the experiments on paddy – chickpea cropping sequences using organic manure, found the yield substantially higher compared to the control group. Similar results were obtained for paddy, ginger, sunflower, soybean and sesame.

Ahn Jongsung opines that organic agriculture is economically viable. The author gives emphasis on marketing the organic products on the basis of reputation and creditability. In Japan, the farmers sell the produce directly to the consumers. The Kenyan farmers have seen that in organic farming, costs go down and profit increases. A farmer from U.P. who allotted a portion of his land exclusively for organic farming found that the yields of sugarcane, paddy, wheat and vegetables were lower than these under chemical farming. An Englishman, settled in Tamil Naidu, who runs an organic farm in 70 acres planted with coffee and citrus, other fruits, paddy pepper and vegetables says that he does not earn a profit and does not have confidence in organic farming.

Wanish Somkuwar (2002) suggested that Organic farming should be used as a benefitting environment – friendly mechanism to check further degradation of the environment. The constant use of pesticides not only pollutes the basic formative components of ecology but also the human and cattle health. The consumption of chemical fertilizers per hectare has increased from less than one kg in 1951-52 to 95 kg at present. The NPK consumption has also increased from 0.7 lakh to 167 lakh million tonnes since 1951-52. The point is that the fertilizer industry will have to overhaul its infrastructure set-up to meet the demand of bio-fertilizers. For instance, spraying of Endosulphan used on cashew crops in

Kasaragod district in Kerala caused mental disorders among the local communities. The fertilizer industry consumes harmful raw materials like rock phosphate, gypsum, sulphur and naphtha to produce nitrogenous, phosphatic and mixed fertilizers. The toxic wastes – solid or liquid – concentrate in soil and gradually distil into the ground water. This phenomenon goes on for years unnoticed and often ignored by the profit maniac industries. The dire effect on future generations could be well imagined. The Indian Council of Agriculture Research information that productivity in Punjab and Haryana is coming down fast and vegetables grown in some parts of India contain heavy metals like cadmium, lead and other toxic elements which cause blood pressure and kindly trouble. India offers tremendous scope for bio-farming as it has local market potential for organic. Absence of local markets for organic products in many of the Asian countries brightens India's chances for exporting organic food. Why organic farming ? The answer is simple. Every year 5.33 million tonnes of soil erodes in India and with it 53.3 lakh tonnes of NPK flows away. The three major components of bio-farming are integrated plant protection, integrated pest control and soil and water management. The total area under organic agriculture in the world is 17.16 million-hectares. The organic food movement is gaining ground in Europe and America where populations have accorded preference for organic food. The reason for the growing preference for organically grown food is simple. It reduces serious health problems. The New Scientist reports that the consumption of organic food may reduce the risk of heart attacks and cancer.

Thus, several studies have focused on the socio-economic factors underlying the adoption of modern techniques. Trends in the productivity of different crops on the basic of the adoption of improved practices have been assessed many attempts. Several studies have focused study about the extent and productivity of high yielding varieties of the crops. The foregoing overview of the literature makes it clear that opinions about organic farming are divided both among the farmers and experts. Disputes about the profitability and yield increases

in organic farming are acute, but there is a consensus on its eco-friendly nature and inherent ability to protect human health. There are strong views for and against organic farming (the latter, mainly on the grounds of practicability of feeding a billion people, financial and economic viability, availability of organic inputs and the know-how). Those who are totally against it are prepared to ignore the ill effects of the conventional farming system. There are many who while approving organic agriculture, want a mixture of both the systems or advocate a careful approach by proceeding slowly towards the conversion of the conventional farms into organic. The questions about the yield and financial viability are crucial from the point of view of farmers; but they remain unanswered to a large extent. The study of a geographical area in the country endowed with a large number of resources for organic farming, but has not made any significant stride towards it, is also not found in the literature overview.

CHAPTER THREE

ORGANIC FARMING

Organic farming known as traditional agriculture, sustainable agriculture, Jaivik Krishi etc, are organic farming. In narrow meaning, the use of organic manures and natural methods of plant protection instead of using synthetic fertililsers/ pesticides are organic farming.

In the broad way, a comprehensive management approach to improve the health of underlying productivity of the soil. Earlier Lampkin mentioned that organic agriculture is a production system which avoids or largely excludes the use of synthetic compounded fertilizers, pesticides, growth regulators and livestock feed additives. It relies on crop rotation, crop residues, animal manure, legumes, green manure, off farming organic waste and aspects of biological pest control. But the most recognized definition is as below:

The term "organic" is best thought of as referring not to the type of inputs used, but to the concept of the farm as an organism, in which all the components - the soil minerals, organic matter, microorganisms, insects, plants, animal and human being interact to create coherent, self-regulating and stable whole. Reliance on external inputs, whether chemical or organic, is reduced as far as possible. Organic farming is holistic production system.

International Federation of Organic Agriculture Movements (IFOAM), defines the organic farming as follows: “Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good life for all involved.”

National Programme for Organic Production (NPOP) defines as –“Organic products are grown under a system of agriculture without the use of chemical fertilizers and pesticides with an environmentally and socially responsible approach. This is a method of farming that works at grass root level preserving the

reproductive and regenerative capacity of the soil, good plant nutrition, and sound soil management, produces nutritious food rich in vitality which has resistance to diseases."

Organic farming is similar to the other sustainable farming systems e.g., perm culture, eco-farming etc., which are based on harmony with nature or near to nature approach. The only distinguishing character is the certification of production in organic farming; Certification is a procedure in which certain rules and regulation have to be followed. This agency certifies that the product is produced strictly with organic methods. Population and environment emphasized the ultimate need for eco friendly technologies.

Organic agriculture is viable alternative to conventional agriculture. It protects the soil from erosion, strengthens natural resources base and sustains biological production at levels commensurate with the carrying capacity of managed agro-ecosystem because of reduced dependence of fertilizers and plant protection chemicals; problem of environmental pollution are greatly reduced if not totally avoided. The practice leads to regeneration of ecosystem. There is now a demand worldwide for organically frown foods, which command a premium in export markets. The demand for such safe foods is increasing annually and this opportunity needs to be exploited.

Main Principal of Organic Farming

The main principles of organic farming are the followings:

The International Federation for Organic Agriculture Movement's (IFOAM) definition of Organic agriculture is based on:

1. The principle of health
2. The principle of ecology
3. The principle of fairness and
4. The principle of care

Each principle is articulated through a statement followed by an explanation. The principles are to be used as a whole. They are composed as ethical principles to inspire action.

1. Principle of health

Organic Agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible. This principle points out that the health of individuals and communities cannot be separated from the health of ecosystems - healthy soils produce healthy crops that foster the health of animals and people. Health is the wholeness and integrity of living systems. It is not simply the absence of illness, but the maintenance of physical, mental, social and ecological well-being. Immunity, resilience and regeneration are key characteristics of health. The role of organic agriculture, whether in farming, processing, distribution, or consumption, is to sustain and enhance the health of ecosystems and organisms from the smallest in the soil to human beings. In particular, organic agriculture is intended to produce high quality, nutritious food that contributes to preventive health care and well-being. In view of this it should avoid the use of fertilizers, pesticides, animal drugs and food additives that may have adverse health effects.

2. Principle of ecology

Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them. This principle roots organic agriculture within living ecological systems. It states that production is to be based on ecological processes, and recycling. Nourishment and well-being are achieved through the ecology of the specific production environment. For example, in the case of crops this is the living soil; for animals it is the farm ecosystem; for fish and marine organisms, the aquatic environment. Organic farming, pastoral and wild harvest systems should fit the cycles and ecological balances in nature. These cycles are universal but their operation is site-specific. Organic management must be adapted to local conditions, ecology, culture and scale.

Inputs should be reduced by reuse, recycling and efficient management of materials and energy in order to maintain and improve environmental quality and conserve resources. Organic agriculture should attain ecological balance through the design of farming systems, establishment of habitats and maintenance of genetic and agricultural diversity. Those who produce, process, trade, or consume organic products should protect and benefit the common environment including landscapes, climate, habitats, biodiversity, air and water.

3. **Principle of fairness**

Organic Agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities. Fairness is characterized by equity, respect, justice and stewardship of the shared world, both among people and in their relations to other living beings. This principle emphasizes that those involved in organic agriculture should conduct human relationships in a manner that ensures fairness at all levels and to all parties - farmers, workers, processors, distributors, traders and consumers. Organic agriculture should provide everyone involved with a good quality of life, and contribute to food sovereignty and reduction of poverty. It aims to produce a sufficient supply of good quality food and other products. This principle insists that animals should be provided with the conditions and opportunities of life that accord with their physiology, natural behavior and wellbeing. Natural and environmental resources that are used for production and consumption should be managed in a way that is socially and ecologically just and should be held in trust for future generations. Fairness requires systems of production, distribution and trade that are open and equitable and account for real environmental and social costs

4. Principle of care

Organic Agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and

the environment. Organic agriculture is a living and dynamic system that responds to internal and external demands and conditions. Practitioners of organic agriculture can enhance efficiency and increase productivity, but this should not be at the risk of jeopardizing health and well-being. Consequently, new technologies need to be assessed and existing methods reviewed. Given the incomplete understanding of ecosystems and agriculture, care must be taken. This principle states that precaution and responsibility are the key concerns in management, development and technology choices in organic agriculture. Science is necessary to ensure that organic agriculture is healthy, safe and ecologically sound. However, scientific knowledge alone is not sufficient. Practical experience, accumulated wisdom and traditional and indigenous knowledge offer valid solutions, tested by time. Organic agriculture should prevent significant risks by adopting appropriate technologies and rejecting unpredictable ones, such as genetic engineering. Decisions should reflect the values and needs of all who might be affected, through transparent and participatory processes.

In totality organic agriculture aims at a sustainable production system based on natural processes. Organic agriculture is also a sustainable and environmentally friendly production method, which has particular advantages for small-scale farmers. Available evidence indicates the appropriateness of organic agriculture for small farmers in developing countries like India. Organic agriculture contributes to poverty alleviation and food security by a combination of many features.

The four pillars of organic farming are:

1) Organic standards

2) Certification/Regulatory mechanism

3) Technology packages

4) Market network

Standard and Certification

The most important aspect in modern era of organic farming is certification programmes which consist of standards (rule), inspection (checking whether the rules are implemented) and certification (judgment). Only by this certification programme, organic farming can be distinguished from other methods of sustainable agriculture. These standards define what can be labeled 'certified organic' and sold commercially as such.

Technology Packages

Conventional practices cannot be followed for growing crops organically. It includes land preparation, selection of variety, organic fertilisation, biological control of pest- diseases-weed, harvest, storage etc.

Market Network

Organic farming has a place where there is a market to accept the produce at a higher paddy as the growing interest in organic farming practice is due to an expectation of higher premium for organically produced farm commodities. The basic focus of Organic farming should be first to produce a farm products for the home (domestic) market and second for the export market.

Organic Farming in India

Organic farming was practiced in India since thousands of years. The great Indian civilization thrived on organic farming and was one of the most prosperous countries in the world, till the British ruled it. In traditional India, the entire agriculture was practiced using organic techniques where the fertilizers pesticides etc., were obtained from plant and animal products. Organic farming was the backbone of the Indian economy and cow was worshipped as a God. The cow, not only provided milk, but also provided bullocks for farming and dung which was used as fertilizers.

The Indian Agriculture is traditionally organic and farmers were following organic cultivation till the middle of the last century (1950). The Green Revolution was ushered in India during sixty and it has been the cornerstone of India's

agricultural achievement, transforming the country from the stage of food deficiency to self-sufficiency. During the period, the production of food grains has increased four folds, from 50.82 mt in 1950-51 to 273.38 mt on 2016-17. But indiscriminate and excessive use of chemicals during this period has put forth a question mark on sustainability of agriculture in the long run calling attention for sustainable production which will address soil health, human health and environmental health and eco-friendly agriculture. Organic farming appears to be one of the options for sustainability.

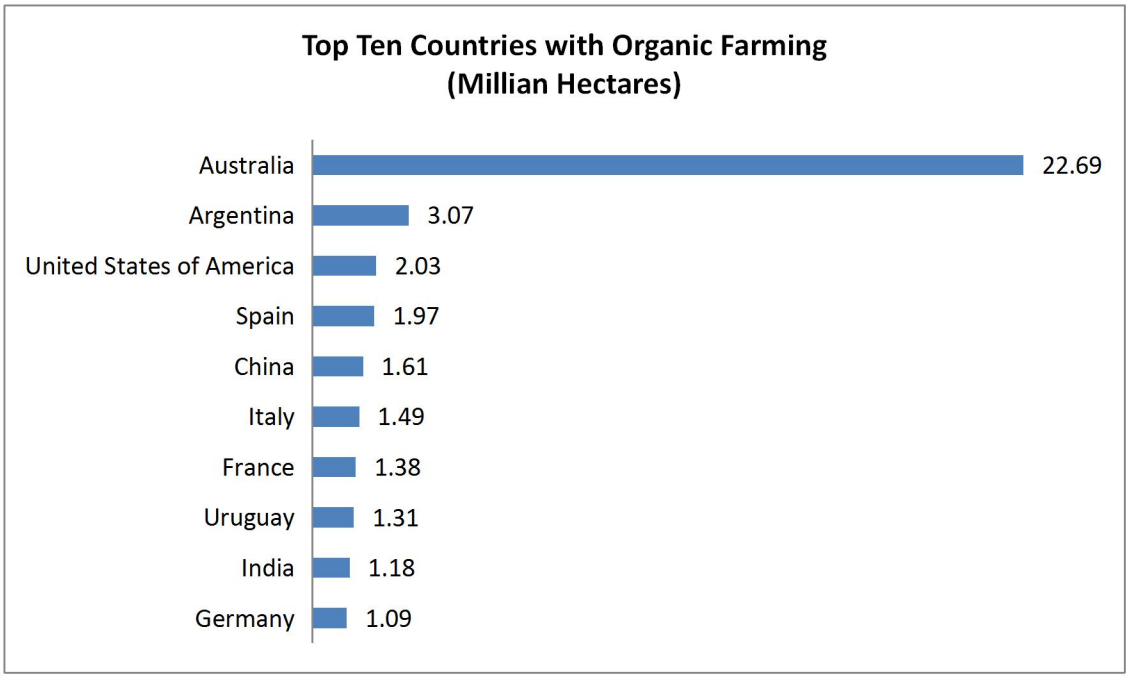
The year 2000 is very important year for India from organic point of view. The four major happenings were made during the year 2000. These are:

- The Planning Commission constituted (2000) a steer in group on agriculture who identified organic farming as National challenge and suggested it should be taken in the form of a project as major thrust area for 10th-plan. The group recommended organic farming in NE Region, rain fed areas and in the areas where the consumption of agro chemicals is low or negligible.
- The National Agricultural Policy (2000) recommended promotion of traditional knowledge of agriculture relating to organic farming and its scientific up gradation.
- The Department of Agriculture and Cooperation (DAC), Ministry of Agriculture constituted (2000) a Taskforce on organic farming under the chairmanship of Shri Kunwar Ji Bhai Yadav and this task force recommended promotion of organic farming.
- The Ministry of Commerce launched the National Organic Programme in April 2000 and Agricultural and Processed Food Products Export Development Authority (APEDA) is implementing the National Programme for Organic Production (NPOP). Under the NPOP, documents like National standards, accreditation criteria for accrediting inspection and certification

agencies, Accreditation procedure, inspection and certification procedures have been prepared and approved by National Steering Committee (NSC). Both consumer and farmers are now gradually shifting back to organic farming in India. It is believed by many that organic farming is healthier. Though the health benefits of organic food are yet to be proved, consumers are willing to pay higher premium for the same. Many farmers in India are shifting to organic farming due to the domestic and international demand for organic food. Organic farming, therefore, provides a better alternative to chemical farming.

The International Federation of Organic Agriculture Movements (IFOAM) estimates that an area of about **5.71million Hectare** (2015-16). This includes 26% cultivable area with 1.49 million Hectare and rest 74% (4.22 million Hectare) forest and wild area for collection of minor forest produces and 44,926 farmers in India are under organic farming representing about 0.29% of the world organic acreage.

Diagram 3.1: Top ten countries with organic farming (million hectares), 2015-16

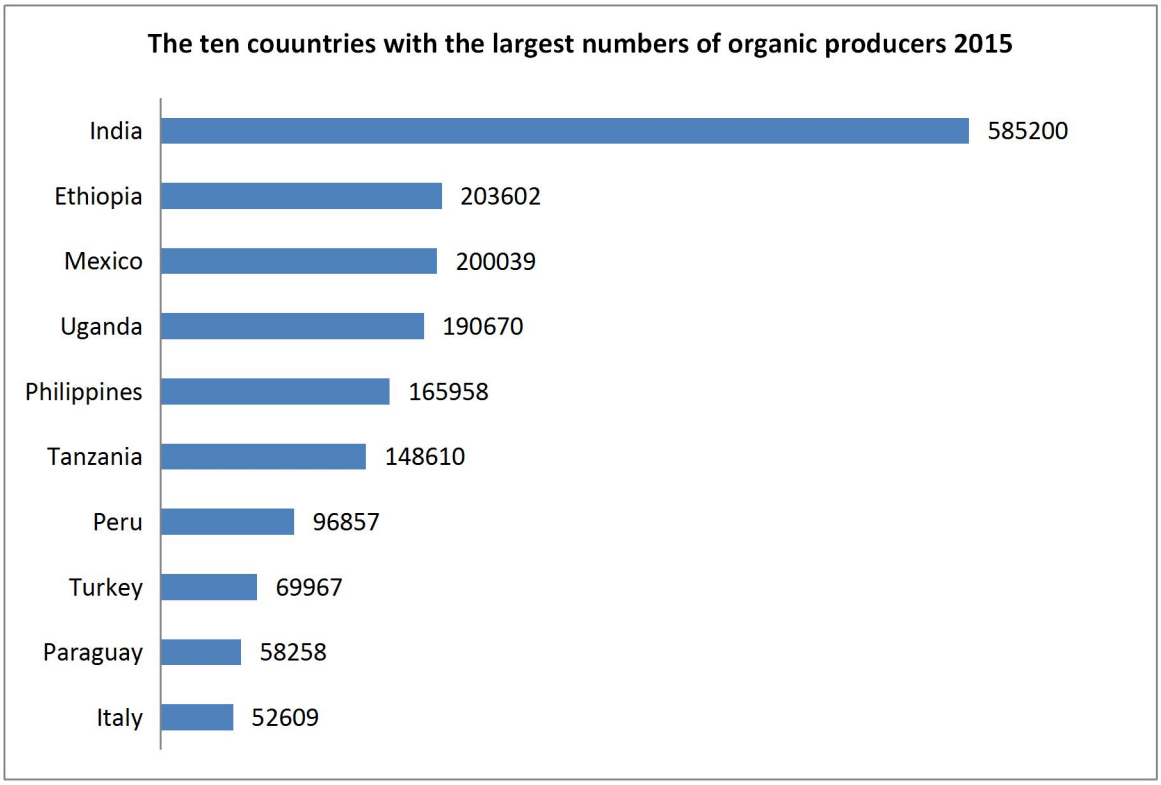


Source: FiBL survey 2017

It also reveals that the percentage of organic area to the total cultivated area comes to only about 0.03 percent and the total number of farms comes to about 5,661. Australia (22.69 million ha). Argentina (3.07 million ha), USA (2.03 million ha), Italy (1.49 million ha) and India (1.18 million ha) clearly indicates that organic farming in India has to go very far even to catch up with that of the leading nations of the world.

According to FIBL survey 2017, India has the largest number of organic producer of the ten countries with the largest number of organic producer in the world. Second and third rank got Ethiopia with 203602 and Mexico with 200039 respectively of organic producer.

Diagram 3.2: Top ten countries with largest numbers of organic producers, 2015



Source: FiBL survey 2017

According the Agricultural and Processed Food Products Export Development Authority (APEDA), India produced around **1.335 million MT** (2015-16) of certified organic products which includes all varieties of food

products namely Sugarcane, Oil Seeds, Cereals & Millets, Cotton, Pulses, Medicinal Plants, Tea, Fruits, Spices, Dry Fruits, Vegetables, Coffee etc. The production is not limited to the edible sector but also produces organic cotton fiber, functional food products etc.

Table 3.1:Category- wise Production of organic products under NPOP for the year 2015-16

Category	**Organic Production (in MT)**
Sugarcane	532364.32
Oil Seeds	252104.01
Cereals & Millets	205805.22
Cotton	163609.83
Pulses	39248.63
Medicinal Products	37221.56
Tea	27078.67
Fruits	24730.51
Spices & Condiments	24137.96
Dry Fruits	8614.32
Vegetables	8530.06
Coffee	6025.59
Coconut	4219.50
Others	2262.12
TOTAL	**1335952.29**

Source: Information provided by the accredited certification Bodies under NPOP

The total volume of export during 2015-16 was **263687 MT.** The organic food export realization was around **298 million USD.** Organic products are exported to European Union, US, Canada, Switzerland, Korea, Australia, New Zealand, South East Asian countries, Middle East, South Africa etc. Oil seeds (50%) lead among the products exported followed by processed food products

(25%), Cereals & Millets (17%), Tea (2%), Pulses (2%), Spices (1%), Dry fruits (1%), and others.

Organic Farming in Uttarakhand

According to the Ministry of Agriculture Government of India, the country is divided in three categories. Uttarakhand, Jharkhand, Rajasthan and Northeastern states are placed under first category. These are the states in which consumption of chemical fertilizer is least in comparison to other states. Thus government has decided to convert these states into organic agriculture state.

In Uttarakhand most so the hill farmers are resource-poor, and therefore apply very low level of chemical, fertilizers and pesticides. As a result, hill soils are almost free from residues of pesticides and chemical fertilizers. This is a very strong point in favor of Uttarakhand for becoming a successful 'organic state'. Uttarakhand is a border state in India's mountainous northwest region where agriculture is the primary form of both subsistence and income. Part of the organic focus is on often poor and marginal.

The landholdings under organic farming in various organic projects range between 0.1 ha to 5 ha. In many cases organics has first been targeted for adoption among the poorest and thus organic farmers tend to have land area that is three to five times smaller than their convention neighbors. In the mountainous areas women play a very important role in agriculture. To a large extent men plough the land, while women carry out most other operations like planting, weeding, fertilization and harvesting. According to report of National Centre of Organic Farming, Ghaziabad, in 2015-16, 31065.61 hectare area in Uttarakhand and 47,179 farmers engaged in organic farming in Uttarakhand.

Table 3.2: Total area and total number of farmers under organic Certification process

	Total Area in ha			Total No. of farmers		
	Organic	In-conversion	Total	Organic	In-conversion	Total
Uttarakhand	16158.86	14906.75	31065.61	20695	26484	47179
India	757978.71	327669.749	1085648.459	351297	246576	597873

Source: APEDA

The Government of Uttarakhand is implementing policies that could encourage and incorporate organic methods in all government supported endeavors. This includes research, training of extension services, incentives and marketing and promotion. Government commitment has extended to rural youth training programs and the concept of bio-villages has been adopted and promulgated in several areas. To facilitate coordination and promotion of organic agricultural activities in the state, in July 2003 the Uttarakhand Organic Commodity Board (UOCB) was formed. In 2008-09, 475villages with 33689 farmers are involved in the organic agriculture projects of the state. The products produced under the various initiatives are mainly commodities. These are led by finger millet, kidney and paddy but also include wheat maize, ginger, soybeans and several pulses.

Issues Related With Organic Farming

Although Organic agriculture is being promoted for its agro-economic, environmental and social benefits and consequences but there are so many following issues which are not giving way for promotion for organic farming.

- The most important constraint felt in the progress of organic farming is the inability of the government policy making level to take a firm decision to promote organic agriculture.

- The small number of organic farmers cannot supply sufficient, regular product to enable much further development of markets.
- Organic farming requires a greater awareness and understanding of biological and ecological processes and interaction and a longer term approach to making the system work without depending on chemical remedies.
- The new science funding structure in India does not encourage the multidisciplinary, systems approach needed for organic farming research.
- Many submissions cited a lack of information for farmers about organic methods and potential returns.
- Supply to the export markets, producers must meet overseas certification requirements, including overcoming the difficult phtosanitary and storage requirements.
- There is uncertainty of the future demand of organic products by farmers, marketers and processors
- Use of bio-fertilizers and bio pesticides requires awareness and willingness on the part of the farming community. Knowledge about the availability and usefulness of supplementary nutrients to enrich the soil is also vital to increase productivity.
- Farmers lack knowledge of compost making use of the modern techniques and also its application.
- It is found that before the beginning of the cultivation of organic crops, their marketability and that too at a premium over the conventional produce has to be assured inability to obtain a premium paddy, at least during the period required to achieve the productivity levels of the conventional crop will be a setback.
- The available organic matter is not simply enough to meet the requirement.

- High labour cost with regard to organic production processes, the organic farmers noted that many problems could occur, such as growth of weeds, especially in the rainy season.
- The certifying agencies are inadequate, the recognized green markets are nonexistent, the trade channels are yet to be formed and the infrastructure facilities for verification leading to certification of the farms are inadequate.
- The costs of the organic inputs are higher than those of industrially produced chemical fertilizers and pesticides including other inputs used in the conventional farming system.
- There is a lack of marketing and distribution network for them because the retailers are not interested to deal in these products, as the demand is low.
- Many governments do not have an explicit policy or strategy for the development of the organic sector. Formulation of an appropriate agriculture policy taking care of these complexities is essential organic agriculture in a big way.
- No financial assistance which is extended to the conventional farming method is absent for the promotion of organic farming in India.
- About three-fourth number of farmer's visualized problem of certification of farm products as no so serious and only rest one-fourth of the respondents expressed some doubts of the certification problems.
- Research conducted at government research stations, agricultural Colleges and Universities concentrates on conventional solution to agricultural problem. Increasing demand from organic producers could help to change this.
- Hybrid seeds are designed to respond to fertilizers and chemicals. The seed, fertilizer and pesticide industry as also the importers of these inputs to the country have stake in the conventional farming. Their opposition to organic farming stems from these interests.

- Most farmers are still unaware of the differences between bio manure and bio-fertilizer, it is point out. While bio manure contains organic matter, which improves the soil quality, bio-fertilizers, are nutritional additives separated from the organic material, which could be added to the soil, much like taking vitamin pills. Bio-fertilizers are nutritional additives separated from the organic material, which could be added to the soil, much like taking vitamin pills. Bio-fertilizers do nothing to enhance soil quality while the loss of soil quality has been the major problem faced by farmers these days.
- Government departments and many marketing institutions lack knowledge about organic farming and its potential contribution to sustainability.
- It was a cause of concern of about 6% respondents that the organic inputs are not available in time. On the reverse side, nearly 16% stated that the risk of non-availability of such inputs was lesser. Most of the farmers keep a part of produce as seed.

A country like India can enjoy a number of benefits from the adoption of organic farming. The paddy premiums for the products, conservation of the natural resources in terms of improved soil fertility and water quality, prevention of soil erosion, preservation of natural and agro biodiversity are major benefits. Economic and social benefits like generation of rural employment, lower urban migration, improved household nutrition, local food security and reduced dependence on external inputs will be large gains in the Indian conditions. The protection of environment and the consequent increase in the quality of human life will be other contributions of farming.

CHAPTER FOUR

MEASURES OF SOCIO - ECONOMICS STATUS
(In Reference of the Sample Groups)

Socio-economic status (SES) is a measure of a family's economic and social position in the society. The present study is designed to study the socio-economic status of the farmers of conventional and organic farming families of selected blocks of Bhagwanpur and Narsan in Haridwar Distric. The total sample of the study related with 250 farmers in which 125 were organic and 125 were conventional farmers. This study related of the organic and conventional farming families with respect to education, possession of land holdings, annual income, farming experience, and livestock possession etc. of both the blocks.

Crops for organic foods reflect many of the same (approximately) costs as conventional food in terms of growing, harvesting, transportation and storage. Organically produced food must meet strict regulation governing all these steps so process is often more labour and management intensive and farming tends to be on a smaller scale. There is also mounting evidence that if all the indirect costs of conventional food product production (clean up of polluted water, replacement of eroded soils, costs of health care for farmers and their workers) were factored into the crops of food, organic food would cost the same or more likely be cheaper.

The yield decline due to switching over to organic farming was on all farms but the crops intensive could not compensate entirely. The cost in terms of no use of conventional fertilizer and pesticides did decline but labour cost in terms of preparing manures, organic pesticides went up almost by the same level. The farmers have been organized into federations at different levels for bargaining with the procurement agencies but need to be made more effective to develop market linkages for the benefit of the farmers. They should also create awareness among local consumers about the importance of organic produce.

For the purpose of project study two blocks of Haridwar district were selected four villages from each block (Bhagwanpur and Narsan). These villages were selected from the schedule of USOCA. Samples of 125 organic farmers and 125 conventional farmers were taken from 8 selected villages (Table 4.1). The information collected with the help of questionnaire (Appendix I) from the farmers by personal interview method pertained to brief socio-economic profile of household and farm, farm size, source of draft power, irrigation system, crop pattern, agronomic practices of organic crops, crop yield, organic manures and pesticides used by farmers and their impact on yield, cost, profit etc.

Table-4.1: Sample size of farmers

Sample villages of Bhagwanpur Block	**Number of Organic Farmers**			
	Paddy	**Wheat**	**Sugarcane**	**Total**
Sunethi Alampur	04	03	05	12
Qadarpur	04	04	05	13
Delana	06	02	06	14
Kunja Bhadurpur	05	02	04	11
Total	19	11	20	50
Sample villages of Narsan Block	**Number of Organic Farmers**			
	Paddy	**Wheat**	**Sugarcane**	**Total**
Sherpur Khelmau	06	07	08	21
Bhagtowali Majra	04	05	07	16
Jhabreri Kalan	07	04	06	17
Susada	08	05	08	21
Total	25	21	29	75

Source: Household survey

Support from secondary data is taken from various published sources to compare the result of primary data. The data mostly pertained to the year 2016-17.

Table 4.2 gives summary information of the farmers in the study area. Mostly farmers are male and 57% were over 51 years old. 72.5% owning fields less than one hectare in size. Farming is the main source of income for (87.5%) the farmers whilst 12.5% have other sources.

Table 4.2: Status of organic farmers in study area

Variable	Bhagwanpur Block (in %)	Narsan Block (in %)	Average (in %)
More than 51 years old	59	55	57
Between 41-50 years old	15	24	19.5
Between 20-40 years old	26	21	23.5
Field size less than 1 ha.	71	74	72.5
Field size between 2-3 ha.	29	26	27.5
Organic farming as main source of income	89	86	87.5
Other sources as main source income	11	14	12.5

Source: Household Survey

Socio-economic profile of farmers

A broad view of socio-economic parameters of the respondents is studied here included age, education, family size and composition. Farm size, source of power, irrigation status, livestock herd kept and trend followed are some other variables studies as they have significant impact on decision making of the farmers.

- **Age of respondents**

Age of the farmer is a major determined in taking innovative decision by him. The farmers do gain experience with age but younger ones are generally expected to respond react and adapt faster than elder counterparts. The average age of the sample farmers come out to be 46 years.

- **Family Size**

The major human resource in agriculture comes from the family itself. 1055 rural households of sample villages in Bagwanpur block and 1883 rural households of sample villages in Narsan block. 5891 population of sample villages in Bhagwanpur block and 10900 populations of sample villages in Narsan block. On an average of which 75% population are in farming and the rest 25% have to depend upon off-farm employments.

Table 4.3: Population and Household

Villages of Bhagwanpur block	**Total population (2011 census)**	**Number of households (2011 census)**
Sunethi Alampur	1526	274
Qadarpur	110	23
Kunja Bahadurpur	2304	418
Delana	1951	340
Villages of Narsan block		
Jhabreri Kalan	1865	322
Sherpur Khelmau	4419	765
Susada	369	57
Bhagtowali Majra	4247	739

Source: Census Report 2011

A glance at family size and composition of sample respondents is essential. As may be seen from Table 4.4, a wide variation in family structure is discernible.

Typically larger family sizes have higher proportion of children. On an average, a family comprised 7.84 members (2.9 adult male, 2.3 adult female and 2.7 children). About three-fourth of the number of adult male and fourth-fifth of female family members stay on agriculture for their main source of livelihood while the rest one-fourth move to alternative employments (Table 4.5).

Table 4.4: Average employment in agriculture

Block	Village	Family labour force engaged in agriculture (Number/farms)				% employed in agriculture	
		Men	Women	Children	Total	Men	Women
Bhagwanpur	Sunethi Alampur	1.8	1.7	0.3	3.7	59	63
	Qadarpur	1.8	1.5	0.2	3.5	73	85
	Kunja Bahadurpur	2.4	2.0	0.9	5.3	79	85
	Delana	2.1	1.7	1.1	4.8	80	89
Narsan	Jhabreri Kalan	2.5	1.9	0.7	5.2	83	97
	Sherpur Khelmau	2.1	1.8	0.5	4.4	75	82
	Susada	2.4	1.9	0,3	4.6	62	64
	Bhagtowali Majra	2.2	1.7	0.3	4.3	75	66
Overall		2.2	1.8	0.5	4.5	73.3	78.9

Source: Household survey

Educational level

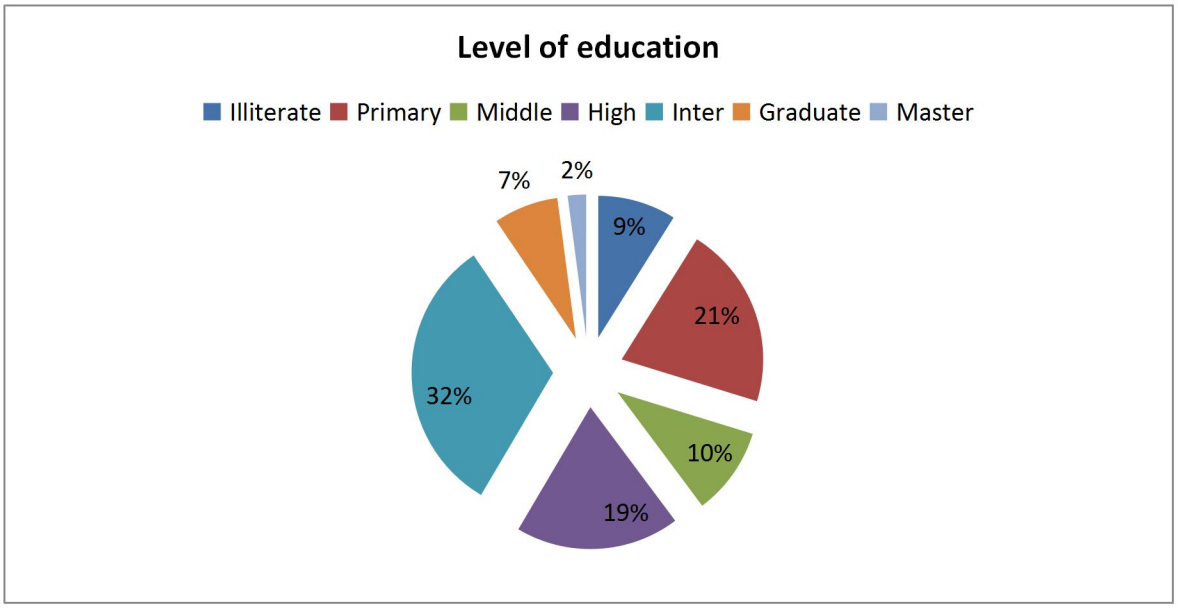
The distribution of farmers on the basis of their formal educational qualification is presented in Table 4.6. Nearly 60% of them are educated either up to high school or intermediate level. Another 7.33% of them are graduates and 2.34% are qualified up to master's level. Only 9.33% are illiterate. 14% qualified primary school and 9.67% up to middle standard.

Table 4.5: Distribution of respondents according to their level of education

Block	Illiterate	Primary	Middle	High	Inter	Graduate	Master
Bhagwanpur	8.95	20.87	10.05	18.77	32.10	7.40	2.10
Narsan	9.71	21.81	9.29	18.55	30.56	7.26	2.58
Average	9.33	21.34	9.67	18.66	31.33	7.33	2.34

Source: Household survey

Diagram 4.1: Level of Education



Source: Household survey

Quality Control and Product Certification

Certification is a process of verification that the products are organic and produced in accordance with specified criteria. All the farmers claimed to be well aware of the procedure of certification and invariably reported that UOCB officials visit their farm regularly and check and cross cheek if any one of the selected farmer is using inorganic fertilizers or chemicals. Immediate action is taken in case of default. Generally 1-2 visits are paid in every crop season for this purpose. No additional supervision fee is charged from the farmers. Visit by external agency Uttaranchal State Organic Certification Agency (USOCA) officials were reported to be paid on about 8% selected farms. Visit of field staff is mostly one to two times in the crop year depending upon the farm location. The possibility of less number of visits in the remote area cannot be rules out. A farmer selected under the project must be visited at least the paddy: at the sowing time, peak time of plant protection and at the time of harvest.

None in the sample reported about orders have come through the e-commerce route, as against those come through direct buyers meets.

Consumer's Awareness

The produce ultimately ends with consumption. The consumers preference surveys of different organic products are thus of great importance and need to be carried out regularly. Based on general question, it are brought out here that consumers are ready to pay higher paddy for the organic produce by about 5-10% but not significantly higher. The health angle or better quality and improved taste of organic products are the two major reasons for their preference. For some products such as paddy, wheat, other cereals, pulses, spices etc., it is possible to pack and certify in suitable packets after certification while some highly perishable products like fruits and vegetables, the farmers and consumers face the problem to pack in suitable consumer packets or certify each small item. Although some sale points dealing with organic products have been initiated but the process has to be made foolproof for the satisfaction of the consumers.

Awareness about Organic Inputs

As noticed from the survey that most of the respondents are aware of the organic inputs. About 68% of these farmers are made aware by Uttarakhand Organic Commodity Board (UOCB).

Farm Size Distribution

The pattern of land ownership is unlike than found in rest of India. In most of the Uttarakhand and both the blocks (Bhagwanpur and Narsan) of Haridwar district farmers are owner-cultivators. Tenant farming and sharecropping are rare, and land holdings ever generally small and limited to family farms (Approximately 50% of all landholdings are less than 0.5 hectares in size, and 70% under one hectare).

Table 4.6: Average farm size of selected farmers

Block	Village	Average farm size (hac)		
		Organic	Conventional	Total
Bhagwanpur	Sunethi Alampur	0.3	0.8	1.1
	Qadarpur	0.4	0.9	1.3
	Kunja Bahadurpur	0.5	0.8	1.3
	Delana	0.4	0.5	0.9
Narsan	Jhabreri Kalan	0.5	0.7	1.2
	Sherpur Khelmau	0.4	1.0	1.4
	Susada	0.3	0.7	1.0
	Bhagtowali Majra	0.5	0.8	1.3
Overall		0.41	0.77	1.18

Source: Household survey

The average farm size of respondents in different blocks is presented in Table 4.6. The average operational holding averaged to 3.52 acres of which 3.47 acres are owned and 0.05 acres as leased in. There are no cases of leasing out of land in the sample. Farm size is also comparatively larger in this area.

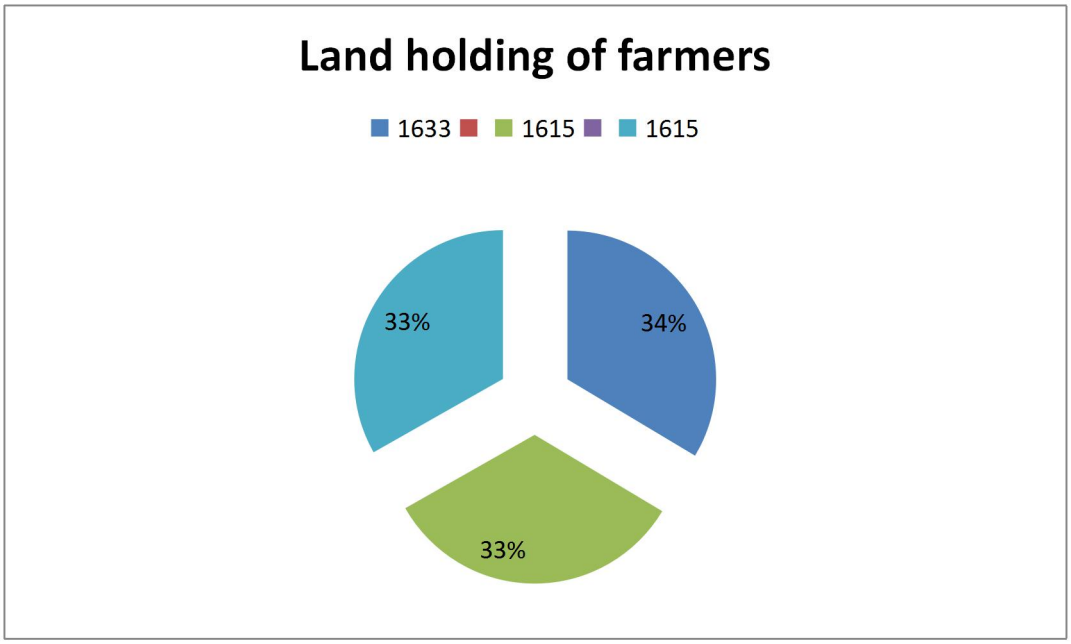
Table 4.7: percent distribution of farmers on the basis of owned holding

Block	Village	<2.5 acres	2.5-5 acres	5-10 acres	10-20 acres	>20 acres	All farmers
Bhagwanpur	Sunethi Alampur	58.7	25.7	3.5	2.1	0.0	100
	Qadarpur	60.0	20.0	16.0	4.0	0.0	100
	Kunja Bahadurpur	58.5	21.7	17.3	2.5	0.0	100
	Delana	67.8	16.1	21.3	4.8	0.0	100
Narsan	Jhabreri Kalan	67.3	14.8	7.3	6.5	4.1	100
	Sherpur Khelmau	59.4	19.7	16.5	4.4	0.0	100
	Susada	53.6	24.7	18.2	3.5	0.0	100
	Bhagtowali Majra	61.1	25.3	7.2	4.1	2.3	100
Overall		60.8	21.0	13.4	3.98	0.8	

Source: Household survey

Based on the distribution of respondents on the basis of owned land holdings, it is clear that about 61% farmers were marginal with less than 2.5 acre area and 21% could be categorized as small farmers having area of 2.5 to 5.0 acres (Table 4.6). Another 13% are semi-medium (5-10 acres) and 4% as medium farmers. Only 0.8% could be rated as large farmers in the study sample. Based on this one can infer that a vast majority of farmers covered under the study are small and marginal but picture is somewhat better than the reality.

Diagram 4.2: Land holding of farmers in sample villages



Source: Household survey

Source of Power

In spite of small farm size owned and operated by large percentage of farmers, they have their own tractors. 79 percent farmers of both blocks have their own tractors. Although many of them having small farm holdings are having pooled tractors i.e. 3-4 small farmers owned one tractors to ascertain, the availability of machine in time of need and avoid dependence on hired one. Moreover, maintaining a pair a bullock is considered to be uneconomical by them apart from low operational efficiency. Yet 27% farmers are having a pair of

bullock for cultivation of crops (Table 4.8). Very small percentages of farmers depend on custom hiring services of tractors to carry out farm operations.

Table 4.8: Source of power of respondent farmers

Block	Village	Percentage farmers having	
		Tractor owned	Pair of bullock
Bhagwanpur	Sunethi Alampur	74.9	21.2
	Qadarpur	84.7	36.4
	Kunja Bahadurpur	69.8	31.7
	Delana	78.7	21.4
Narsan	Jhabreri Kalan	82.2	23.7
	Sherpur Khelmau	76.6	23.8
	Susada	83.3	32.4
	Bhagtowali Majra	79.5	23.8
Overall		78.7	26.8

Source: Household survey

Level and Source of Irrigation

Both blocks (Bhagwanpur and Narsan) of Haridwar district tubewell accompanied by canal with nulkoop irrigated farm land to a large extent. Mostly area is irrigated with tubewell and/or by canal.

Crop-Livestock Interactions

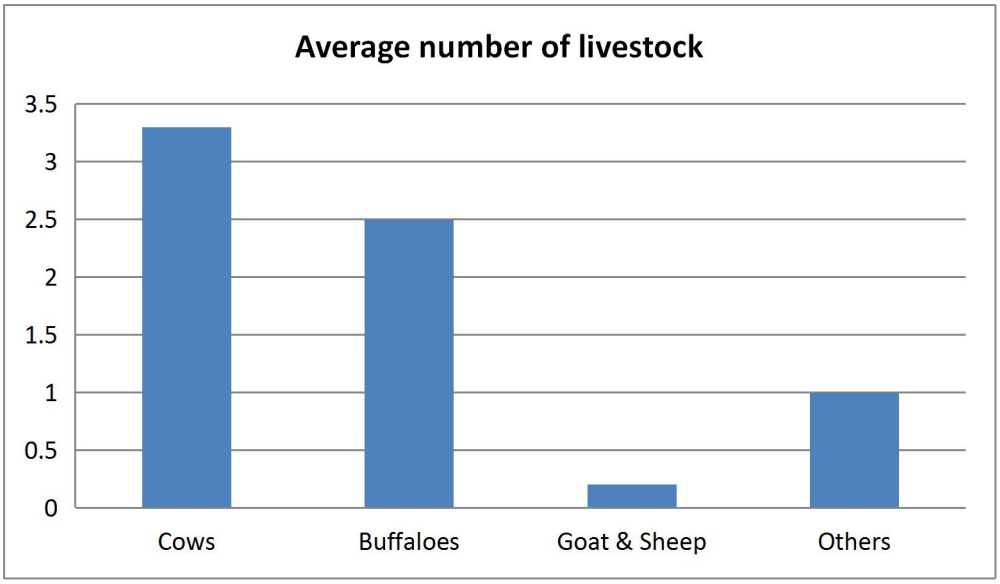
The main source of power is bullock. Therefore, the farmers maintain at least a pair of bullock for cultivation and transport. Dairy is another supplementary source of occupation of the respondents. The number of milch animals, particularly cows, buffaloes and goats are an essential feature of farming in the both blocks. As presented in Table 4.9, a farmer on an average had 3.3 cows, 2.5 buffaloes, 0.2 goats, apart from 1.0 other animal, mainly draught animals. These together came out to 6.9 animals.

Table 4.9: Livestock maintained by farmers

Block	Village	Number of Livestock				
		Cows	Buffaloes	Goat & Sheep	Others	Total
Bhagwanpur	Sunethi Alampur	3.5	1.7	0.2	0.7	6.1
	Qadarpur	3.1	2.6	0.0	1.1	6.8
	Kunja Bahadurpur	3.0	2.1	0.4	1.8	7.3
	Delana	3.1	2.1	0.1	1.6	6.9
Narsan	Jhabreri Kalan	2.9	2.6	0.4	1.4	7.3
	Sherpur Khelmau	3.8	2.6	0.2	0.5	7.1
	Susada	3.5	3.0	0.0	0.5	7.0
	Bhagtowali Majra	3.7	2.9	0.1	0.6	7.3
Overall		3.3	2.5	0.2	1.0	6.9

Source: Household survey

Diagram 4.3: Average number of livestock of sample villages



Source: Household survey

Kunja Bahadurpur, Jhabreri Kalan and Bhagtowali Majra villages of Bhagwanpur and Narsan block of Haridwar district showed an average of 7.3 animals. Viewing at larger livestock herds maintained by the farmers, suitable crop-livestock interactions can be planned for improving the livelihood of the households. Even female and hired labour, having low opportunity cost, get gainful employment in rearing of livestock. The crop residue gets recycled through livestock nutrition to improve the soil health. For this purpose, some efforts are already being made to demonstrate about scientific composting but intensive efforts in this direction can help in saving fertilizer cost, improve soil health and encourage organic farming. Efforts are also needed for genetic improvement of animals, streamline livestock product marketing and improving veterinary services in the area.

The farmers' perceptions about trend in size of livestock herd as consequence of organic farming are also taken. It is brought out that 69.33% respondents have increased or intend to increase livestock, another 30.33% indicated no change while only 0.34% farmers expressed that livestock number has decreased due to physical overwork in organic farming.

Source of Credit

It is a sensitive matter about which information is difficult to extract in a brief interview with the farmers. Particularly, data on credit availed from non-institutional sources and conditions settled with them lack reliability. But brief information obtained indicated the changing scenario of rural credit where the role of private money lenders and other non-institutional agencies is rapidly declining and the comparative role of institutional sources is increasing. The sole reasons for this could be softer loans frequent writing- off of loans by government, reluctance of advances by private sources due to problem of recovery from areas more prone to farmers' suicides and increasing education and general awareness. The trend, however, has strong impact on the cost of credit and other exploitative

malpractices of private agencies. However, increase in misuse of borrowed funds cannot be ruled out.

The data collected from the sample farmers indicate that the commercial banks appear to be catering to the needs of majority of farmers. About 93% of farmers express satisfaction with credit availability from different commercial banks of the area but 27% have not borrowed from any source and are depended upon own funds. Even the All-India survey on indebtedness indicate that only 7.2% farmers of the state are indebted.

The Crop Pattern

The crop pattern indicates that wheat, paddy, other cereals (such as finger millet, maize) and sugarcane are the major crops accounting for about 80% of the crop area. On the basis of sample respondents it is clear that in Bhagwanpur and Narsan blocks, paddy-wheat rotation was most commonly followed with some area allocated to sugarcane and fodders in rabi as well as kharif season. Villages of these blocks under study showed highly diversified farming systems with stress on vegetable crops. As many as 29 organic crops were reported by the respondents Table 4.10). Paddy, mainly basmati was raised by about three-fourth the number of respondents covering about 37.5% of the total cultivated area. Triveni and Pusa 1 varieties of paddy are important crops amongst farmers in both blocks. Overall 79% farmers adopted this enterprise on about 37.5% of their cultivated area. WL 227, WL 242, W75, HD502 and UP292 were some varieties of wheat important crops amongst farmers. The overall average yield realized was 11.4 Sq/acre. Therefore, major crop rotation followed by farmers was paddy-wheat and sugarcane planted sugarcane ratoon. Some other major crop rotations followed by respondents were

- Basmati-Wheat/potato-Kharif fodders/moong
- Paddy-wheat (+ coriander)
- Ginger-Fresh beans-Wheat/potato

- Cauliflower-Onion-Potato
- Rajma-Potato-pea
- Potato-Cauliflower-pea
- Basmati-Potato

Table 4.10: Crops grown by farmers with average yield and price

Crop	Farmers (in %)	Average Yield (q/hec)	Average farm get price (Rs/q)
Paddy (Basmati)	76.7	22.87	3000-3400
Paddy (Non Basmati)	21.3	43.5	1350
Wheat	81.7	25.91	1625
Sugarcane	41.6	619	320

Source: Household survey

Area under basmati is increasing in the potential belt due to higher market paddy and more so due to market contract of organic basmati at still higher paddy. However, major crop rotation paddy-wheat does not gain much due to decline in yield of wheat and lack of adequate buyback arrangement.

Organic Farming Operation

The common argue against organic agriculture regarding 'food security issue' needs to be addressed here too. The state has typically two distinct areas; two plain districts with high potential agriculture using high level of agro-chemicals while the rest area of the state is hilly having poor irrigation base, low crop yields and by default organic in nature having relatively low use of agro-chemicals. It is quite easy to convince and even follow organic agriculture in the latter belt. It is relatively an arduous task to bring the former one in its fold. Yet the concerted efforts of UOCB and other agencies have yielded good results but remains, by and large, a mixed blessing.

Most of the farmers prepare manures and bio-pesticides themselves. The labour requirement goes up significantly. Gainful employment is also provided for

such families having positive impact on their livelihood. Mutual arrangement of labour by organic groups of farmers at certain places was made to avoid dependence on hired labour and carrying out operations in time. Availability of animal waste and crop and forest biomass, less susceptible varieties, suitable crop rotations and natural support of clinic factors has also important bearing on organic farming. The market conditions do not favor the organic farming due to lake of market owing to small scale of production and marketable surplus and high transport and handling cost. The following operations have witnessed major changes by way of shift from in conventional to organic farming.

Ploughing /Sowing/Transplanting

The general observation was that the soil becomes better workable due to organic matter. The drudgery of bullock and human labour gets reduced while performing these operations. Due to transplanting paddy by family labour, dense plant population is kept which is helpful in getting higher yield of the crop and keeps the weeds under control. Before sowing, seeds are treated with Trichhoderma. Seed rate of wheat is also kept on higher side for the same reason.

Weeding

Generally weedicides were used in the plain areas. With this change, apart from mechanical measures, mustard oil mixed with saw dust is being used in case of paddy crop as pre-emergence control of herbs. Post-emergence control is done by employing manual labour. Manual labour is used in case of wheat and sugarcane too. Thus the use of human labour in organic farming has gone up by 20-30%.

Irrigation

It was reported by many respondents that they preferred tubewell irrigation rather than canal to avoid percolation of inorganic weedicides and fertilizers from other fields of the area. However, if the entire area is in the fold of organic agriculture, then even canal water can be used without much problem.

Soil Nutrition

Farmers selected stopped using inorganic fertilizers and in place were using vermin-compost, green manure, farm yard manure, cow urine and vermin-wash. Daincha seed was available at Rs100/kg and was sown for green manuring before transplanting paddy crop. Composting the animal dung and waste, crop residue and grasses was done in pits dug for this purpose. It was prepared in layers for early decomposition of the matter. Vermi-compound was prepared by some farmers by decomposing earthworms with animal waste and used in the soil as a rich source of nutrients and organic matter. Recycling of livestock, crop and forest biomass to enrich the soil was appreciable.

Triveni variety of basmati was common as it requires less soil nutrients, particularly nitrogen otherwise the crop lodges. Therefore, it was preferred over other basmati varieties. Kailbahar is used as growth promoter in wheat. Rhizobium culture was used for seed treatment in case of leguminous crops mainly pulses. However, zinc deficiency was commonly realized in paddy which was corrected by application of zinc sulphate.

Bio-pesticides

Neem oil, trichoderma, Sydermonash, Calbahar, Camistrong (Amono acids) in Auderma formation (Trichderma WP) Rs200/kg used for pulses and other crops. To control other pests, trichdermapredomonas @500g/acre is sprayed or mixed with compost or used for seed treatment. Dehradun variety of basmati suffers from lodging from blast against which turmeric and gur are mixed in water and sprayed on the crop. A mixture of 10 lit of cow urine, 1 kg of green chilies, 10 kg of neem leaves and one kg of garlic is prepared and is kept for 7-10 days. Then it is filtered and is used against a large variety of pests. It was stated to be a good source of soil fertility as well. Another such practice was marigold plus cow urine plus buttermilk (lassi) were mixed, kept for a few days and sprayed to control pests. Yet Bacterial Leaf Blight (BLB) and leaf blight of paddy and rusts of wheat were

quite common diseases not properly controlled by such pesticides. Most of these bio-inputs are used on ad-hoc basis but need to be standardized through research trials.

The research on the economic feasibility of organic farming at the farm level can be grouped into two categories;

- Comparison of socio-economic parameters between organic and conventional farm.
- Analysis of economic return based on selected plot yield data.

There are two approaches to study economic of organic farming. The first is the enterprise level study and the second is the farm level study. The second method is used under which comparison is aimed to analyse the farm as a whole without paying more attention to each enterprise. We approached the sample villages and discussed the above socio-economic aspects with the farmers individually. The information was gathered through questionnaires.

CHAPTER FIVE

ECONOMICS OF ORGANIC Vs CONVENTIONAL FARMING

Organic farming is a production system, which avoids or largely excludes the use of synthetically compounded fertilizers; pesticides growth regulators and livestock feed additives. To the maximum extent feasible, organic wastes, mechanical cultivations, mineral bearings rocks and aspects of biological pest control to maintain soil productivity and tilth, to supply plant nutrients and to control insects, weeds and other pests. In conventional farming, chemical plant protection, chemical fertilizers and intensive mass animal farming are common. IPM (Integrated Pest Management) belongs to conventional farming, although it applies some principles of organic farming.

Organic and conventional farming belong to two different paradigms. The fundamental difference between the two competing agricultural paradigms is as follows.

Table 5.1: Difference between organic and conventional farming

Organic Farming	**Conventional Farming**
Decentralization	Centralization
Independence	Dependence
Community	Competition
Harmony with nature	Domination of nature
Diversity	Specialization
Restraint	Exploitation

According to table 5.1, we can see that both the farmings are entirely opposite. The basic characteristics are quite contradictory to each other. Organic agriculture is a production system that sustains the health of soils and ecosystems whereas conventional farming is based on chemical and fossil intensive inputs.

There are following differences on the behalf of practices under organic and conventional farming.

Table 5.2 Practices under organic and conventional farming-

Organic Farming	**Conventional Farming**
Ecological orientation.	Chemical and fossil intensive inputs.
Fossil fuel emits less green house gases	There is emission of green house gasses such as, CO2,NO2 and CH4
Cycle of nutrient produced within the farm.	Off farm inputs
Weed control by crop rotation and cultural practices.	Weed control by herbicides.
Pest control based on bio pesticides and bio control agent.	Pest control by chemical pesticides.
No pollution	Considerable pollution
Conservation of soil health, flora and fauna	Deterioration of soil health, adverse impact on flora and fauna

Organic agriculture is often associated with low yields. The demand for products of organic agriculture is growing. As low yields are expected, the market's ability to pay a paddy premium is a key determinant of sustainable growth of organic agriculture.

Profit- Cost Ratio (PCR)

The analysis of PCR is an important test to assess economics of farming as practiced by farmers. It is the ratio of net value of the crop produce (minus cost of inputs) to the cost of input. It indicates the rate of net returns from the use of an input.

$$PCR = \frac{\text{Value of crop production} - \text{Cost of inputs}}{\text{Cost of inputs}}$$

Cost Components

The following components are considered for cost estimation.

- **Fixed Cost**: This includes land rent (cost of land or cost of rent), land revenue, depreciation of farm implements and interest on fixed capital.
- **Variable cost (Direct)**: It includes cost of seed/planting materials and organic inputs.

There are other costs like marketing cost which includes freight and transportation cost, cost of power consumption against irrigation, cost of storage, cost of bagging, marketing margin etc. **In fact, the cost components in the analysis of Profit - Cost Ratio** (PCR) mainly depend on inputs costs. Here the input cost is estimated as the sum total of expenditure towards:

a) Cost of seeds purchased
b) Cost of manures, bio fertilizers etc.
c) Cost of bio pesticides etc.
d) Cost of irrigation
e) Cost of bullock
f) Cost of tractor
g) Cost of labour for tilling, manuring, sowing, transplanting, weeding, threshing etc.

After household survey we analyzed that what is use pattern human labour and machine labour in organic and conventional farming. It is also finding out the significance by t test of human labour and machine labour in organic and conventional farming by taking tests.

Costing of human labour

It is clear from the Table 5.3 that nursery raising utilized 22.350 hours in organic farming and 23.125 hours in conventional farming. Land preparation utilized 12.415 hours in organic farming and 13.465 hours in conventional farming. Whereas labour for transplantation utilized 105.120 hours in organic farming and 107.245 hours in conventional farming. Fertilization in biology is the process during reproduction of both plants and animals, involving the union of two unlike sex cells (gametes), the sperm and the ovum, followed by the joining of their

nuclei, utilized 83.340 hours in organic farming and 8.665 hours in conventional farming. The labour utilized for fertilization is much more in organic farming than conventional farming because organic manures like farm yard manure, term used in the United States to refer to excreta of animals, with or without added bedding; also called barnyard manure. Although used chiefly in regions with annual rainfall of less than 20 in. (51 cm), it is also used in wetter areas to grow certain crops, e.g., paddy, utilized 190.220 hours in organic farming and 236.320 hours in conventional farming. Plant protection utilized 110.875 hours in organic farming and 14.200 hours in conventional farming. Harvesting and threshing separation of grain from the stalk on which it grows and from the chaff or pod that covers it. The first known method was by striking the reaped ears of grain with a flail, utilized 81.675 hours and 65.975 hours in organic farming whereas 81.925 hours and 69.475 hours in conventional farming respectively.

Table 5.3: Human labour use pattern on different steps in organic and conventional paddy (Hours/hectare)

Process Steps	**Organic**	**Conventional**	**t-value**
Nursery Raising	22.350	23.125	0.30
Land Preparation	12.415	13.465	1.38
Transplantation	105.120	107.245	0.09
Fertilization	83.340	8.665	10.78
Irrigation	190.220	236.320	2.49
Plant Protection	110.875	14.200	5.47
Harvesting	81.675	81.925	0.04
Threshing	65.975	69.475	1.59
Total	671.970	554.420	1.71

Source: Household Survey

It is clear from the above discussion that the difference in the labour utilized for different operations like nursery raising, land preparation, transplantation, harvesting and threshing is **insignificant** in organic and conventional farming,

whereas the difference in labour utilized for fertilization, irrigation and plant protection is highly **significant** in organic and conventional farming. The table reveals that difference in total labour utilized for organic and conventional farming is also highly **significant**. It means that organic farming utilized more labour than conventional farming.

If we will analyse the difference in machine labour utilized for various operations like nursery raising, land preparation, harvesting and threshing was insignificant in organic and conventional farming in table 5.4. Whereas the difference in machine labour utilized for irrigation was highly significant in organic and conventional farming. It is concluded that machine labour utilization was less in organic farming than conventional farming. The difference in total machine labour utilized for organic and conventional farming is highly significant.

Table 5.4: Machine labour use pattern on different steps in organic and conventional paddy (Hours/hectare)

Process Steps	**Organic**	**Conventional**	**t-value**
Nursery Raising	1.845	1.745	0.01
Land Preparation	13.548	14.223	0.66
Irrigation	209.675	261.125	3.87
Harvesting & Threshing	0.812	1.037	0.61
Total	225.880	278.13	3.54

Source: Household Survey

Method to estimate the Cultivation of Crops

The cost of cultivation of major crops was estimated using the cost defined by Commission of Agricultural Costs and paddy (CACP). These cost concepts are explained below:

Cost A1 = All actual expenses in cash and kind incurred in production by the produce. The items covered in cost A1 are costs on:

(i) hired human labour,

(ii) hired bullock labour,

(iii) owned bullock labour,

(iv) home produced/purchased seed,

(v) plant protection chemicals,

(vi) home produced/purchased manure,

(vii) fertilizers,

(viii) insecticides and pesticides,

(ix) depreciation on farm machinery, equipment and farm building,

(x) irrigation,

(xi) land revenue, land development tax and other taxes,

(xii) interest on working capital,

(xiii) interest on crop loan, and

(xiv) miscellaneous expenses.

Cost A2 = Cost A1 + Rent paid for leased-in land

Cost B = Cost A1 + interest on value of owned capital assests (excluding land)

Cost B2 = Cost B1 + rental value of owned land (net of land revenue) and rent paid for Leased-in land

Cost C1 = Cost B1 + imputed value of family labour

Cost C2 = Cost B2 + imputed value of family labour

Cost C2* = Cost C2 estimated by taking into account statutory or actual wage rate which ever is higher.

Cost C3 = Cost C2* + 10 percent of Cost C3 to (on account of managerial functions Performed by farmer).

Economics of Paddy Cultivation

Cropping pattern of the sample farmers revealed that paddy were the main crops in *kharif* and *rabi* seasons, respectively among both the groups. During the study year (2016-17), area under paddy was about 15 per cent of the total operational area of sample organic and about 85 per cent of the total operational

area of sample conventional growers. Cost, returns and profit cost ratio is calculated under economics of cultivation.

Cost of cultivation of paddy

The input-use and cost pattern of organic and conventional paddy was studied and is presented in Table 5.5. The organic pesticides used in organic paddy were prepared by the mixture of many products like awk, sambola, onion, chilli, neem, etc. Its average cost was about 117 / acre. The jeev amrit was prepared by mixing the urine (10 litres) of cows, especially of indigenous varieties, with dung (10 kg) and was applied with irrigation to the crops after a week. In the case of conventional paddy, a considerable amount was spent on urea, DAP (diammonium phosphate, is a widely applied phosphorous fertilizer), herbicides and their applications to the crop. As organic growers developed their inclination towards resource conservation, used even less amount of urea, DAP and tractor hours, etc. on their organic paddy as compared to the total conventional paddy growers in the study area. The average cost on marketing of organic paddy was more than of conventional paddy, it was because of less number of organic paddy buyers which led to an increase in marketing hours and consequently marketing cost.

Table 5.5: Cost (Rs/hec) of paddy (basmati) of organic and conventional farming (2016-17)

Input Cost	**Organic Cost (Rs./ha)**	**Conventional Cost (Rs./ha)**
Seed	1633	1615
FYM+ jeev amrit (q)+ Vermi compost (q)+Organic pesticides	3310	-
Total fertilizer and FYM	-	5442.80
Machinery used	4457.64	5268.74
Nursery	880.28	1591.32
Irrigation	797.5	998.24
Plant Protection	1315.0	1957.0
Human Labour	18779.25	14793
Harvesting & Threshing	1692	1692
Total	32864.67	33358.1

Source: Household Survey

The cost of cultivation of paddy under organic and conventional farming is given in Table 5.6. Only cost B2 was found higher for organic than conventional paddy, which was due to higher cost of working assets in adopting organic mode. There is very less difference between B1 of organic and conventional paddy. All the other costs, viz., A1/A2, C1, C2, C2* and C3 were higher for conventional paddy because of higher costs on fertilizers, plant protection chemicals and machine. Similarly, cost C1 and Cost C2 were also higher because of high imputed value of irrigation for conventional paddy. The shares of expenses like human labour, value of seeds, etc. where also higher for organic paddy.

Table 5.6: Consolidated cost of paddy (basmati) organic and conventional farming (2016-17)

	Cost of Organic farming (Rs/hec)	**Cost of Conventional farming (Rs/hec)**
A1=A2	32864.67	33358.1
B1	36388.08	35226.97
B2	44097.94	42936.83
C1	37422.74	39720.28
C2	45132.61	47445.57
C2*	48264.35	54287.3
C3	53090.78	59326.46

Source: Household Survey

Returns of cultivation of paddy

Although the yield was relatively low for organic (22.78 q/ha) than conventional (25.92 q/ha) paddy, the price received by the farmers was considerably higher for organic (Rs 3000/q) paddy. This higher price favored to compensate the difference in the yield. The gross returns were Rs. 72115/ha from organic and Rs. 76861/ha from Conventional paddy. If we compare the total cost (C3) of farming of paddy conventional has considerably higher cost (Rs.59326.46/hec) than organic farming (Rs.53090.78/hec). On comparison with

the total cost, the net return of organic farming (Rs.19024.22/hec) is higher than conventional farming (Rs.17534.54 /hec) of paddy.

Table 5.7: Returns of paddy (basmati) of organic and conventional farming

	Organic Yield (q/ha)	**Conventional Yield (q/ha)**
Main product	22.78	25.92
By Product	37.75	42.85
Paddy (Rs/q)		
Main product	3000	2800
By Product	100	100
Returns (Rs/q)		
Main product	68340	72576
By Product	3775	4285
Gross Returns (Rs/ha)	72115	76861

Source: Household Survey

Profit Cost Ratio (PCR) of paddy

By the analysis of profit cost ratio in organic and conventional paddy production we see as that the gross returns of organic and conventional are 72115Rs/ha and 76861Rs/ha respectively.

Table 5.8: PCR of paddy (basmati) of organic and conventional farming

S.No.		**Organic (Rs/ha)**	**Conventional (Rs/ha)**
1.	Gross Returns	72115	76861
2.	Gross Cost	53090.78	59326.46
3.	Net Returns (1-2)	19024.22	17534.54
4.	PCR (1/2)	1:1.36	1:1.29

Source: Household Survey

Net returns is more in organic (Rs.19024.22/ha) than conventional (Rs.17534.54/ha). It indicates that organic farming is profitable. From the study, the average profit cost ratio was found to be 1:1.36 in organic whereas in

conventional it is 1:1.29 which indicates that organic farming is profitable and the farmers are getting 1.36 average over their investment of one rupee .

Economics of Cultivation of wheat

Cropping pattern of the sample farmers revealed that wheat is the main crop in *rabi* seasons, respectively among both the groups. During the study year (2016-17), area under wheat was about 15 per cent of the total operational area of sample organic and about 85 per cent of the total operational area of sample conventional growers. During the *rabi* season, of the total operational area about 5 per cent of the sample organic growers remained engaged under sugarcane followed by fodder (4%) and vegetables (5%), while for sample conventional growers, about 4.19 per cent of the total operational area was under fodder crop, followed by vegetables (4%). The percentage of the total operational area under fodder, sugarcane, vegetables and cotton was more in organic growers than conventional growers. The area under organic farming was about 27 per cent of the total operational area in *kharif* as well as *rabi* seasons. The major share of organic area was under wheat crop, each of which accounted for about 15 per cent of the total operational area of sample organic growers.

Cost of cultivation of wheat

By the analysis of Table 5.9 the total fertilizers, machinery, nursery, plant protection, etc. is higher for conventional wheat than organic. Although, cost of seeds is almost equal for both organic and conventional wheat. The cost incurred for human labor, harvesting and threshing is higher in organic wheat. On the basis of data analysis collected from the samples the cost of conventional wheat is higher than organic wheat i.e. 25-33%.

Table 5.9: Cost (Rs/hec) of organic and conventional wheat in 2016-17

Input Cost	Organic Cost	Conventional Cost
Seed	1435	1435
FYM+ jeev amrit (q)+ Vermi compost (q)+Organic pesticides	1610	-
Total fertilizer and FYM	-	4755.71
Machinery used	3320.24	3478.40
Nursery	680.88	875.22
Irrigation	377.5	585.30
Plant Protection	351.0	838.49
Human Labour	6753.69	6650.20
Harvesting & Threshing	1240	1125
Total	15768.31	19743.32

Source: Household Survey

A analysis of Table 5.10 reveals that the cost of cultivation of organic wheat (Rs.29834.52/ha) was lower than conventional wheat (Rs.34748.13/ha) over cost C3. All the costs, viz. A1/A2, B1, B2, C1, C2, and C3 were found to be lower for organic wheat than conventional wheat.

Table 5.10: Consolidated cost of organic and conventional wheat (Rs/hec)

	Cost of organic farming (Rs/ha)	Cost of conventional farming (Rs/hac)
A1	15768.31	19743.32
B1	16878.00	21413.21
B2	24607.70	33938.41
C1	17916.87	23682.34
C2	25646.57	30782.22
C2*	27339.37	31993.47
C3	29834.52	34748.13

Source: Household Survey

The cultivation of organic wheat was more labour-intensive (46 mandays/ha) than that of conventional wheat (45 mandays/ha). Cost on fertilizers and chemicals, interests on working capital and imputed value of family labour and other expenses incurred accounted for the higher cost of conventional wheat.

Returns of cultivation of wheat

It was also observed that net returns were higher for conventional wheat, although net returns over all costs, viz. A1/A2, B1, B2, C1, C2, C2* and C3 were found to be positive for organic and conventional wheat. The reason for lower net returns over different costs despite lower cost of cultivation of organic wheat was its lower yield (25.98q/ha) as compared to conventional wheat (33.18 q/ha). Also, price of organic wheat (Rs. 1700/q) was not much higher than that of conventional wheat (Rs.1525/q), hence the lower yield in the case of organic wheat was not compensated fully by its higher price. Therefore, growing wheat organically was not a profitable venture for the farmers in the study area. Thus, conventional wheat was relatively more profitable than wheat when produced organically.

Table 5.11: Returns of wheat of organic and conventional farming in 2016-17

	Organic Yield (q/ha)	**Conventional Yield (q/ha)**
Main product	25.98	33.18
By Product	18.68	25.70
Wheat (Rs/q)		
Main product	1700	1525
By Product	165	165
Returns (Rs/q)		
Main product	44166	50599.5
By Product	3082	4240.5
Gross Returns (Rs/ha)	47248	54840

Source: Household Survey

Profit Cost Ratio (PCR) of wheat

By the analysis of profit cost ratio in organic and conventional wheat production we see that as follows gross returns of organic and conventional are 47248 Rs/ha and 54840 Rs/ha respectively. From the study, the average profit cost ratio was found to be 1:1.58 in organic whereas in conventional it is 1:1.57 which indicates that organic farming is profitable and the farmers are getting 1.58 average over their investment of one rupee. But this is a very negligible advantage from organic farming for the farmers.

Table 5.12: PCR of wheat of organic and conventional farming

S.No.		**Organic (Rs/ha)**	**Conventional (Rs/ha)**
1.	Gross Returns (Rs/ha)	47248	54840
2.	Gross Cost (Rs/ha)	29834.52	34748.13
3.	Net Returns (1-2)	17413.48	20091.87
4.	PCR (1/2)	1:1.58	1:1.57

Source: Household Survey

Economics of Sugarcane

The per hectare economics of sugarcane cultivation in sample blocks (Bhagwanpur & Narsan) both under organic and conventional farming is presented in table 5.13. Most of the sample organic farmers in this region are following the concept of Natural farming. The cost of production (variable) per quintal of sugarcane is Rs.52273/hec under organic farming where as Rs.53268/hec in conventional farming. It is higher in conventional farming than organic farming. The total cost of cultivation of sugarcane in organic farming is Rs.109822 per hectare while the same in conventional farming is Rs.111016 per hectare.

The cost of cultivation is nearly higher in conventional farming when compared to organic farming. Average yield per hectare of sugarcane is 556.30 and 573.65 quintals respectively in organic farming and conventional farming. The absolute difference between the yield levels was 13.35 quintal per hectare. But, the

unit price of sugarcane is higher (Rs. 10/q only) in organic farming relative to conventional farming. However, the differences between the gross returns per hectare of these farming are negligible. Among different cost break-ups, the actual costs on nursery and labor are significantly higher in organic farming when compared to conventional farming. It clearly indicates the more labor incentive nature of organic farming than conventional farming. The relative costs on fertilizer application, plant protection, etc. are higher in conventional farming. Since, many organic farmers have started practicing organic methods from last two or three years, it takes some more time to stabilize or increase the yields further under organic farming. The premium prices for sugarcane help the organic farmers to cover their higher costs to some extent.

Table 5.13: Cost (Rs/ha) of sugarcane of organic and conventional in 2016-17

Input Cost	**Organic Cost (Rs/ha)**	**Conventional Cost (Rs/ha)**
Seed	5219.21	6243.65
FYM+ jeev amrit (q)+ Vermi compost (q)+Organic pesticides	11904.38	-
Total fertilizer and FYM	-	12907.0
Machinery used	3320.24	3378.40
Nursery	5824.74	5173.28
Irrigation	6030.43	7397.93
Plant Protection	1980.31	3268.09
Human Labour	16423.69	13274.65
Harvesting & Threshing	1570	1625
Total	52273	53268

Source: Household Survey

Cost of cultivation of Sugarcane

The cost of cultivation refers to cost A2 plus family labour which includes all actual expenses in cash and kind incurred in production by the owner plus rent paid for leased-in land plus imputed value of family labour as has been defined by the Commission for Agricultural Costs and Prices, Government of India. The results presented in Table 5.14 indicate that total cost of cultivation of organic sugarcane crop is Rs. 109822 per ha as against Rs. 111016 per ha for conventional crop, reflecting the lower cost on organic sugarcane farms. The lower cost of cultivation on organic sugarcane farms is because of non-use of chemical fertilizers and less cost incurred on irrigation. The increased cost of cultivation due to increased input prices has also increased the requirement of credit for agriculture. However, several studies have concluded that the inability to payback the credit is one of the important reasons for creating distress among farmers (Mishra, 2006; TISS, 2005). The foregoing results indicate that organic sugarcane farming reduces the cost of cultivation of a crop implying reduced requirement of credit for crop production.

Table 5.14: Consolidated cost of sugarcane of organic and conventional (Rs/ha)

	Cost of organic farming (Rs/ha)	**Cost of conventional farming (Rs/ha)**
A1=A2	52273	53268
B1	56668	60563
B2	85500	86495
C1	75763	79758
C2	104595	105690
C2*	5227	5326
C3	109822	111016

Source: Household Survey

Returns of cultivation of Sugarcane

Organic sugarcane (Rs.330/q) was not much higher than that of conventional sugarcane (Rs.320/q), hence the lower yield in the case of organic sugarcane was not compensated fully by its higher sugarcane. Therefore, growing sugarcane organically was not a profitable venture for the farmers in the study area. Thus, sugarcane was relatively more profitable than conventional sugarcane when produced organically.

Table 5.15: Returns of sugarcane of organic and conventional farming

	Organic Yield (q/ha)	**Conventional Yield (q/ha)**
Main product	556.30	573.65
By Product	---	---
Sugarcane (Rs/q)		
Main product	330	320
By Product	---	---
Returns (Rs/q)		
Main product	183579	183568
By Product	---	---
Gross Returns (Rs/ha)	183579	183568

Source: Household Survey

Profit Cost Ratio (PCR) of sugarcane

By analysis of profit cost ratio the gross returns are higher for organic than conventional. The difference of gross returns and gross cost then obtained net returns are also higher for organic sugarcane.

Table 5.16: Economics of sugarcane of organic and conventional farming

S.No.		**Organic (Rs/ha)**	**Conventional (Rs/ha)**
1.	Gross Returns	183579	183568
2.	Gross Cost	109822	111016
3.	Net Returns (1-2)	73757	72552
4.	Profit Cost Ratio (1/2)	1:1.67	1:1.65

Source: Household Survey

The analysis of profit cost ratio in organic and conventional sugarcane production is as follows- gross returns of organic and conventional are Rs. 18357 /ha and Rs.183568/ha respectively. From the study, the average PCR was found to be 1:1.67 in organic whereas in conventional it is 1:1.65 which indicates that organic farming is profitable and the farmers are getting 1.67 average over their investment of one rupee.

Summary of the findings

It is pertinent to examine the impact of organic farming on economy of farmers and landless labour classes, social fabric, ecology of the area etc. In this section an effort has been made to pinpoint some such effects based on the survey.

Impact on Yield & Paddy

In general, it was reported that due to shifting from conventional to organic farming, the yield of basmati paddy declined by about 25%, wheat by 28%, and sugarcane by 21.4%. In case of major vegetable crops, yield decline was observed to be 20-25%. The general observation/perception of the farmers was that initially yield declined significantly but later covered up to some extent. Most of the minor crops such as pulses, oilseeds, coriander, and finger millet do not require much fertilizer. Therefore, significant decline in their yield was not reported.

Table 5.17: Impact on Average Yield (q/ha) of various crops

Crop	Organic		Conventional		% increase	
	Yield (q/ha)	Rs/q	Yield (q/ha)	Rs/q	Yield (q/ha)	Rs/q
Basmati	22.78	3000	25.92	2800	-13.78	6.67
Non Basmati	31.2	1250	34.32	1250	-10.00	00
Wheat	25.98	1700	33.18	1525	-27.71	10.29
Sugarcane	556.30	330	573	320	-3.00	3.03

Source: Household Survey

As may be seen from Table 5.17 that by switching over from conventional to organic farming resulted in significant decline (more than 10%) in average yield of major crops such as basmati and non-basmati paddy, wheat and sugarcane. The other crops which witnessed fall in yield were tomato, mustard, peas and sugarcane. As stated above, initially, the yield went down by shifting from conventional to organic farming but it is stated to cover up in about 4-5years. However, it needs scientific authentication about stability and sustainability of each crop yield.

The paddy of organic basmati paddy was higher by about 13.78% and that of wheat by about 10% as compared to conventional. For wheat no sizable paddy incentive was recorded. In case of sugarcane all farmers did not shift to organic due to inadequate demand by Green Fiesta which paid paddy incentive of 30% to compensate the decline in yield. Except for basmati, only a small part of the produce was procured by a few roped in agencies. This parameter needs to be stressed upon for making the farmers realize the larger benefits. It is not out of place to mention here that the increase in farm gate paddy was not as sizable as the paddy paid by the consumers. Thus benefit derived by market middlemen did not percolate to the farmers.

Cost of Cultivation

Another parameter having significant impact on the crop profitability is the cost of cultivation per hectare. As most of the input parameters are qualitative and have varied impact on different sets of farmers depending upon the cropping pattern and interventions made, it is very difficult to exactly measure the impact. Still as a case of basmati crop, wheat and sugarcane some estimation is made in Table 5.18. It was estimated that a net saving in terms of cost reduction was by switching over to organic cultivation from conventional which took duration of three years. The gain could be still higher if family labour which gets employment on farms may get it otherwise.

Table: 5.18 Cost of cultivation under organic and conventional crops (Rs/ha)

Crops	Organic	Conventional	% increase
Basmati	32864.67	33358.1	1.50
Non basmati	29208.65	29956.39	2.56
Wheat	15768.31	19743.32	25.20
Sugarcane	52273	53268	1.90

Source: Household Survey

Due to use of organic products in place of conventional inputs, the cost of cultivation showed decline in most of the crops (Table 5.18). The higher cost of labour offset the other cost savings in case of peas, ginger, turmeric, mustard and onion crops.

Conclusions

The study has revealed that a major share of the organic area was under paddy, wheat and sugarcane crops which are very less of the total operational area of sample organic growers. The total variable costs on per hectare basis for the cultivation of organic paddy, wheat and sugarcane have been found less as compared to inorganic wheat, paddy and sugarcane. The net returns over variable cost have been found higher for organic than inorganic paddy, wheat and sugarcane for organic growers. The lower crop yield in organic wheat was well compensated by the higher price it fetched in the market. A wider varietal distribution has been observed for organic than inorganic paddy, wheat and sugarcane cultivation. The study has further revealed that with one per cent increase in expenditure on farmyard manure + jeev amrit, biodynamic and machine labour would increase the value productivity of organic paddy, wheat and sugarcane. Other variables, viz. seed, irrigation, organic pesticide, and human labour have not shown any significant impact on the value productivity of the organic paddy, wheat and sugarcane. In the case of inorganic crops cultivation, one per cent increase in cost of seed treatment and machine labour, would increase the value productivity. The study has clearly brought out that though, the organic

crops cultivation has been found much more profitable for the growers in the study area, a significant reduction in its productivity level poses a serious challenge in terms of food security of the nation.

Emerging Constraints

There are following emerging constraints related with organic farming:

- **Conversion to Organic Farming**

The sample farmers reported that the period involved in conversion from conventional farming to organic farming is the most difficult one. This is mainly because

(a) Lack of knowledge about the principles of organic farming,

(b) Shift to organic farming brings in several significant changes in agricultural practices,

(c) At least it takes three years to complete the conversion successfully,

(d) Decrease in sugarcane yield with the beginning of the conversion period,

(e) No premium prices, and

(f) There is reduction in farmers income during the conversion period, and

(g) Non-cooperation from neighboring farmers who practice conventional agriculture.

These factors form the major hurdle in the adoption and spread of organic farming. Therefore, it is recommended that the beginners should receive not only the training but also the support in organic production methods certification and marketing during this period. If feasible, the beginners should shift to organic in stages rather than trying to convert all the landholding at once. It is suggested that the beginners themselves should also prepare for transition period in terms of time required, crops to be taken, inputs management, financial provision, etc. to pass the period of transition rather smoothly. Moreover, all the farmers having contiguous fields should be encouraged to shift to organic methods to avoid problems related to leaching and or contamination of chemical fertilizers and pesticides.

- **Certified Organic Inputs**

  The use of manures, organic fertilizers, bio-fertilizers, vermi-compost, bio-pesticides, etc. is very high in organic farming compared to conventional farming as organic farmers substitute chemical fertilizers and pesticides with these organic inputs. The demand for these crucial organic inputs is likely to increase with the expansion of area under organic farming. Therefore, it is most essential to ensure the smooth flow of these inputs so that they do not become the hurdle in the spread of organic farming in the state. In this context, the involvement of Self-Help Groups (SHGs) of landless households for production of certified bio-fertilizers, vermi-compost, as well as, the bio-pesticides would be most useful. Therefore, it is recommended that specific schemes may be developed for involvement of SHGs in production of certified inputs required for organic farming. The transfer of technology for production of certified organic inputs along with training, financial assistance, facilities for distribution and marketing should form the major components of such schemes for the SHGs. This may help in smooth supply of quality organic inputs at a reasonable price to organic farmers at the same time it may also help in providing employment opportunities to the landless people in their own area.

- **Low Yields**

  The yield on organic farms was observed to be 6.79 per cent lower than the conventional farms. It is thus necessary to resolve the yield limiting issues in organic farming on priority basis. A fairly well developed infrastructure for agricultural research, training, and education exists. The use of this infrastructure can be made effectively to resurrect the productivity by developing and spreading package of practices for soil nutrient and water management, as well as, biotic and abiotic stress management in organic farming. Focus on development and transfer of new technologies that are most suited for high sugarcane yield in general and organic yield in particular, may help revive productivity. In addition, involvement

of farmers, where possible, in research should prove beneficial for developing and transferring the new technologies within the shortest possible time.

- **Certification**

The certification of organic products is essential to distinguish it from those produced by conventional methods, and to get an appropriate price for the organic product in the market. It is also a pre-requisite for its acceptability by the consumers. The association (Bhatiya Kisan Club) facilitated the certification of their organic produce through an internationally recognized certification agency. The association obtained the organic certification under the group certification programme. Thus, the association made organic certification easy, less costly and beneficial for its member farmers. The important constraints reported by sample farmers include high cost of certification, complicated process and non-availability of certification services in their own area. These constraints can be resolved through coordinated and concerted efforts of public and private agencies, NGOs, certification agencies and farmers.

- **Other Constraints**

The organic sample farmers were successful in going through the difficult period of conversion and managing the organic certification and post harvest operations very efficiently due to able support from their association. Some organic sample farmers complained of being deceived by traders by selling them spurious organic inputs. This resulted in heavy losses to victimized farmers. Therefore, efforts may be made to enhance the awareness among the organic farmers and strict vigilance by the quality control and regulatory authorities to prevent such malpractices involving pseudo organic inputs. Therefore, it is essential to impart scientific training not only to farmers but also to other stakeholders to make them knowledgeable, skilled and efficient in production, processing and marketing of organic products. The organic farming does have social benefits in terms of resources and benefits to human health and environment. Therefore, it is suggested that the social benefits of organic farming may be

properly measured and quantified to get an idea about the extent of subsidy that could be justified for promotion of organic farming. In this context, the state Government may form a high level committee comprising of representative of all the stakeholders to help identify the high potential regions, as well as, the high potential crops and to formulate and priorities the policies and strategies in order to promote the organic farming to reap the benefits of a rapidly growing national and international market for organic products.

CHAPTER SIX

IMPACT OF FERTILIZERS ON HEALTH AND ENVIRONMENT

Today fertilizers have become an essential part of modern agriculture to feed the growing population. Chemical fertilizers are used extensively in modern agriculture, in order to improve crop yield. Urea is the most popular and widely used dry Nitrogen fertilizer. Increased crop production largely relies on the type of fertilizers used to supplement essential nutrients for plants. Fertilizer application is required to replace crop land nutrients that have been consumed by previous plant growth with the ultimate goal of maximizing productivity and economic returns. Now a day, there is increased emphasis on the impact on soil environment due to continuous use of chemical fertilizers. The impact of chemical fertilizer application on agricultural land is seen not only in terms of the soil quality but also on the survival of soil organisms dwelling there in. Earthworms are major components of soil fauna in a wide variety of soils and climates and are involved directly or indirectly in biodegradation, stabilization through humus formation and various soil processes. Earthworms represent the greater fraction of biomass of invertebrate in the soil as soil macro fauna and play a vital role in structuring and enhancing plant nutrients and hence they can be successfully used as bio indicators for the evaluation of toxic risks of xenobiotic in terrestrial ecosystems. Earthworm populations are influenced by various factors (soil, temperature, moisture, and pH) and the availability of organic matter for food, which may come from plant residues and animal or human waste applied to the land. The abundance of earthworms in soils represents the health of soil ecosystems and the level of environmental safety.

In literature, some researchers have concluded the chemical fertilizers to be harmful for soil organisms but on the contradictory they have been supported too

to be beneficial as far as their food supply is concern. The inorganic fertilizers may also contribute indirectly to an increase in earthworm populations by increasing the quantity of crop residues returned to the soils, although the long-term use of inorganic nitrogen fertilizers may sometimes cause a decrease in earthworm abundance and biomass, particularly if it is ammonia-based.

Agriculture sector in India has undergone significant structural changes. Inorganic farming has made the farmers of today searching for something better, in addition, farmers are pursuing chemical supplements to push crop yield, which is only harming the earth. Farmers and communities faced many socio-economic problems, particularly small farmers who found themselves increasingly marginalized due to lack of access to external inputs (Yasin 2007). Their soil is depleted from the constant application of harsh and harmful chemicals. This is particularly true in its heavy reliance on chemical fertilizers and pesticides, it depends upon subsidies and price support and external costs such as threat to other species, environmental pollution, habitat destruction and risks to human health and welfare. Besides, increasing incidence of miscarriage, birth malfunctions, still births and delayed pregnancy have been documented among women agricultural workers and wives of men employed in pesticide mixing and spraying.

India is the second largest consumer of fertilizers after China. India also ranks second in the production of nitrogenous fertilizers and third in phosphatic fertilizers whereas the requirement of potash is met through imports since there are limited reserves of potash in the country.

Organic agriculture in general is a system of crop and livestock production that promotes and enhances the health of agricultural ecosystem while providing healthy food and reflects the profound inter relationship that exists between farm biota, its production and the overall environment. Therefore, the extensive use of chemicals and anti-biotic in inorganic food production technology has compelled the health conscious people to explore and support organic farming methods in agriculture. It is generally believed that organic farming with its central focus on

maintaining and improving soil health, its avoidance of pollutants, and its reliance on local inputs and labour could materially advance the economic and ecological health. Organic farming can contribute to sustainable food security by improving nutrition intake, supporting livelihoods in rural areas and enhancing biodiversity while simultaneously reducing vulnerability to climate change. From the following table, we see that the total fertilizer used in 2001-02 is 291.8 LMT whereas in 2015-16 it is 365.63 LMT.

Table: Production of Urea, DAP and Complex of Fertilizers (in LMT)

Year	Urea	DAP	Complex Fertilizer	Total
2001-02	191.7	50.95	49.09	291.8
2002-03	187.26	52.41	48.59	288.26
2003-04	192.03	47.32	45.14	284.49
2004-05	202.63	51.85	53.67	308.15
2005-06	200.98	46.28	67.66	314.92
2006-07	203.08	48.52	74.64	326.24
2007-08	198.57	42.12	58.50	299.19
2008-09	199.22	29.93	68.48	297.63
2009-10	211.12	42.47	80.38	333.97
2010-11	218.80	35.37	87.27	341.44
2011-12	219.84	39.63	77.70	337.17
2012-13	225.75	36.47	61.80	324.02
2013-14	227.15	36.11	69.13	332.39
2014-15	225.85	34.44	78.32	338.61
2015-16	244.75	37.87	83.01	365.63

Ministry of Chemical & Fertilizer

This increasing use of fertilizers is harmful for the environment, human and animal health, water resources and is also the reason for greenhouse gas emission etc.

Fertilizer Use and Environmental Concerns:

Suitable use of fertilizers based upon soil test would have certainly helped the sample farmers to harvest bumper crops without associated negative effects. However, farmers are not interested to check the soil test facility. Farmers are not educated about the indiscriminate use of Nitrogen fertilizers which has led to multiple problems affecting soil health and overall environment. The Department

of Agricultural Research and Education in their background note submitted to the Committee the following negative effects of improper use of fertilizers:-

Human and animal health disorders:

Inadequate use of micronutrient fertilizers is aggravating deficiencies in soils in many areas. The crops grown on these soils are, generally, deficient in micro nutrients. These deficiencies are linked with malnutrition and health disorders in humans and animals. The problem is more serious in young children, women of child bearing age and livestock. The zinc deficiency has become a big public health issue in India. Its deficiency impairs the immune system and increases the incidence of infectious diseases such as diarrhea and pneumonia. It also causes dwarfism, hypogonadism, anaemia, geophagia, anorexia, skin lesions, rough and dry skin and loss of taste etc. During the survey we got to know that pregnant women in the families of sample farmers are facing various difficulties due to deficiency in zinc based on low serum zinc concentration.

Along with human beings, animals are also affected with the deficiency of zinc. The zinc deficiency related disorders like parakeratosis disease, associated with bone and joint disorders and thickening of skin, have been reported in animals feeding continuously on forages deficient in zinc. Iron malnutrition is yet another problem in many parts of India, where poor people depend largely for their food on cereals containing low iron. Iron deficiency is associated with anemia, fatigue, nervousness, reduced appetite, lower weight gain, sore tongue and memory loss etc.

Pollution of water resources:

A concern is being voiced, of late, regarding pollution of groundwater with nitrates due to more use of nitrogenous fertilizers. The problem is thought to be more in areas having light textured soils consuming higher doses of nitrogen followed by heavy irrigations. There are reports of nitrate pollution of ground water above the permissible levels (10 mg NO3-N/L of water as safe limit in

drinking waters) in agriculturally intensive areas. Pollution of surface/river water due to flow of applied fertilizers and pesticides have also been reported.

Hence, there is an immense pressure on ground water due to which water levels are declining at faster pace. There are 225 State Government tube wells and 32930 private tube wells. The ground water abstraction for drinking, domestic and agriculture purposes is higher in Bhagwanpur block as compared to other blocks. Most of the tube wells are drilled in central and southern part of the block. The northern part of the block has less number of tube wells.

Split application synchronizing the demand of growing plant instead of one time heavy dose, placement of fertilizer, use of slow releasing nitrogen fertilizers and nitrification inhibitors, inclusion of leguminous crops with deep and extensive root system in crop rotation with shallow rooted crops are some of the measures recommended to mitigate such problems.

Greenhouse Gas Emission:

Nitrous oxide (N2O) is a potent greenhouse gas which had 298 times the global warming potential of CO2 over a 100 year period. Fertilizer is the largest source contributing around 77% of the total direct nitrous oxide emissions from agricultural soils. The most efficient management practices to reduce nitrous oxide emission are site specific integrated nutrient management, use of nitrification inhibitors, supplementation of nitrogenous fertilizers by bio fertilizers, organic manures, demand driven N application using Leaf Colour Chart (LCC), intercropping with legumes and use of deep embedded urea super granules. The mitigation strategies have twin benefits; first, raising nitrogen use efficiency thus reducing the consumption of nitrogenous fertilizers and secondly, lowering the nitrous oxide gas emission vis-à-vis global warming.

Conclusion

Increased use of chemicals, under intensive cultivation has disturbed the harmony existing among soil, plants and animals and human health. The extensive use of chemicals and antibiotics in conventional food production technology has

compelled the health conscious people to explore and support organic farming. The food produced using organic methods taste better and contains a better balance of vitamins and minerals than inorganically grown food. The eating of organic food considerably reduces the heart attacks, strokes, cancer, bowel cancer, and many other diseases. Hence, importance of organic farming has increased due to its environmental friendly methods and growing consumer awareness of food safety. The role of the Government is critical in motivating the farmers switching over from inorganic farming system to organic farming system where organic farming is economically viable in the country. Besides, the government has to take appropriate measures like the separate market for organic products; announcement of support price, creation of demand by more awareness programmes, subsidy for organic inputs producers, subsidies for encouraging organic farmers; certification of farms and increase in investment on research and development activities in organic farming practices.

CHAPTER SEVEN

SUGGESTIONS AND POLICY RECOMMENDATIONS

Before giving the suggestion we should be aware about the problems of the organic farming. The following are found to be the major problem areas for the growth of organic farming:

Lack of Awareness

It is a fact that many farmers have only vague ideas about organic farming and its advantages as against the conventional farming methods. Use of bio-fertilizers and bio pesticides requires awareness and willingness on the part of the farming community. Knowledge about the availability and usefulness of supplementary nutrients to enrich the soil is also vital to increase productivity.

Farmers lack knowledge of compost making using the modern techniques and also its application. The maximum they do is making a pit and fill it with small quantities of wastes. Often the pit is flooded with rainwater and result is the top of the compost remains under composted the bottom becomes like a hard cake. Proper training to the farmers will be necessary to make vermi-compost on the modern lines. Attention on the application of composts/organic manure is also lacking. The organic matter is spread during the months when the right moisture level is absent on the soil. The whole manure turns into wastes in the process. The required operation is of course labour intensive and costly, but it is necessary to obtain the desired results.

Output Marketing Problems

It is found that before the beginning of the cultivation of organic crops, their marketability and that too at a premium over the conventional produce has to be assured. Inability to obtain a premium price, at least during the period required to achieve the productivity levels of the conventional crop will be a setback. It was found that the cost of marketing of both types of products was also same and the

buyers of wheat were not prepared to pay higher prices to the organic variety (Rao, 2003).

Shortage of Bio-Mass

Many experts and well informed farmers are not sure whether all the nutrients with the required quantities can be made available by the organic materials. Even if this problem can be surmounted, they are of the view that the available organic matter is not simply enough to meet the requirements. The crop residues useful to prepare vermi-compost are removed after harvest from the farms and they are used as fodder and fuel. Even if some are left out on the farms termites, etc destroy them. Experiments have shown that the crop residues ploughed back into soil will increase productivity and a better alternative is conversion into compost.

The small and marginal cultivators have difficulties in getting the organic manures compared to the chemical fertilizers, which can be bought easily, of course if they have the financial ability. But they have to either produce the organic manures by utilizing the bio-mass they have or they have to be collected from the locality with a minimum effort and cost. Increasing pressure of population and the disappearance of the common lands including the wastes and government lands make the task difficult.

High Input Costs

The small and marginal farmers have been practicing a sort of organic farming in the form of the traditional farming system. They use local or own farm renewable resources and carry on the agricultural practices in an ecologically friendly environment. However, now the costs of the organic inputs are higher than those of industrially produced chemical fertilizers and pesticides including other inputs used in the conventional farming system. The groundnut cake, neem seed and cake, vermi-compost, silt, cow dung, other manures, etc. applied as organic manure are increasingly becoming costly making them unaffordable to the small cultivators.

Marketing Problems of Organic Inputs

Bio-fertilizers and bio-pesticides are yet to become popular in the country. There is a lack of marketing and distribution network for them because the retailers are not interested to deal in these products, as the demand is low. The erratic supplies and the low level of awareness of the cultivators also add to the problem. Higher margins of profit for chemical fertilizers and pesticides for retailing, heavy advertisement campaigns by the manufacturers and dealers are other major problems affecting the markets for organic inputs in India.

Absence of an Appropriate Agriculture Policy

Promotion of organic agriculture both for export and domestic consumption, the requirements of food security for millions of the poor, national self-sufficiency in food production, product and input supplies, etc. are vital issues which will have to be dealt with in an appropriate agriculture policy of India. These are serious issues the solution for which hard and consistent efforts along with a national consensus will be essential to go forward. Formulation of an appropriate agriculture policy taking care of these complexities is essential to promote organic agriculture in a big way.

Lack of Financial Support

The developing countries like India have to design a plethora of national and regional standards in attune with those of the developed countries. The adoption and maintenance of such a regulatory framework and its implementation will be costly. The cost of certification, a major component of which is the periodical inspections carried out by the certifying agencies, which have freedom to fix the timings, type and number of such inspections appears to be burdensome for the small and marginal farmers.

Low Yield

In many cases the farmers experience some loss in yields on discarding synthetic inputs on conversion of their farming method from conventional to organic. Restoration of full biological activity in terms of growth of beneficial

insect populations, nitrogen fixation from legumes, pest suppression and fertility problems will take some time and the reduction in the yield rates is the result in the interregnum. It may also be possible that it will take years to make organic production possible on the farm. Small and marginal farmers cannot take the risk of low jaeds for the initial 2-3 years on the conversion to organic farming. There are no schemes to compensate them during the gestation period. The price premiums on the organic products will not be much of help, as they will disappear once significant quantities of organic farm products are made available.

Inability to Meet the Export Demand

The demand for organic products is high in the advanced countries of the west like USA, European Union and Japan. It is reported that the US consumers are ready to pay a premium price of 60 to 100 per cent for the organic products. The upper classes in India are also following this trend as elsewhere. The market survey done by the International Trade Centre (ITC) during 2000 indicates that the demand for organic products is growing rapidly in many of the world markets while the supply is unable to match it. India is known in the world organic market as a tea supplier and there is a good potential to export coffee, vegetables, sugar, herbs, spices, rice and vanilla.

Lack of Quality Standards for Bio-Manures

The need for fixing standards and quality parameters for bio-fertilizers and bio manures has arisen with the increasing popularity of organic farming in the country. There are a very large number of brands of organic manures, claiming the high levels of natural nutrients and essential elements. But most farmers are not aware of the pitfalls of using the commercially available bio manure products. While the concept of organic farming itself lays great stress on the manures produced on the farm and the farmers' household, many of the branded products available in the market may not be really organic. Elements of chemicals slipping into the manures through faulty production methods could make the product not certifiable as organic. The process of composting which is a major activity to be

carefully done is achieved usually by one of the two methods, vermi-composting or microbe composting. While the former is ideal for segregated waste material without foreign matter, microbe composting is suitable for large scale management of solid wastes, especially in cities and metres. Even though the farmers are using manure produced by different methods, proper parameters for bio manure are yet to be finalized. Most farmers are still unaware of the difference between bio manure and bio-fertilizer, it is point out. While bio manure contains organic matter, which improves the soil quality, bio-fertilizers are nutritional additives separated from the organic material, which could be added to the soil, much like taking vitamin pills. Bio-fertilizers do nothing to enhance soil quality while the loss of soil quality has been the major problem faced by farmers these days.

Improper Accounting Method

An understanding of the real costs of erosion of soil and human health, the loss of welfare of both humans and other living things and the computation of these costs are necessary to evaluate the benefits of organic farming. These costs will have to be integrated to a plan for the implementation of organic agriculture. A recent study shows the inappropriateness of the cost and return accounting methods adopted to find out the economics of the organic farming (Prakash, 2003). An economic evaluation of the bad effects of inorganic agriculture and their internalization through environmental taxes is proposed for a market based approach to promote organic farming in India.

Political and Social Factors

Agriculture in India is subject to political interventions with the objectives of dispensing favours for electoral benefits. Subsidies and other supports from both the Central and state governments, government controlled prices of inputs like chemical fertilizers, the public sector units' dominant role in the production of fertilizers, government support/floor prices for many agricultural products, supply of inputs like power and water either free of cost or at a subsidized rate, etc. are

the tools often used to achieve political objectives. Any movement for the promotion of organic farming in India will have to counter opposition from the sections who benefit from such policies in the conventional farming system. The political system in a democracy like India is likely to evade the formulation of policies, which affect the interests of the voting blocks unless there are more powerful counter forces demanding changes.

In the absence of alternative employment opportunities and other considerations, the organized workforce particularly in the public sector fertilizer, pesticide and seed industries is also likely to oppose moves on the part of the government to promote organic farming on a large scale.

SUGGESTIONS

Following suggestions should be taken by farmers to promote organic farming-

Need to Create Awareness among Customers and Farmers

It encouraged livestock enterprise for better recycling of biomass and thus drudgery as well empowerment of women increased. A strong need was felt to create consumers' awareness for boosting demand for organic products, rope in marketing agencies, capacity building of farmers and their federations in value addition, arranging more exposure visits and supply of standard organic inputs.

Need for Training and Information

Perhaps the single most important factor for successful organic adoption is the availability of a reliable institutional support system that can initially facilitate the access to the many components that farmers find difficult to reach. These include technology, initial financing for certification and input production, and marketing. Capacity-building at the farmer level (local farmers associations, local training and advisory services) should be a central aspect of any strategy aimed at using organic agriculture as a tool for poverty alleviation. Training programs require more involvement of women, more exposure visits, highlighting the

success stories. Exhibiting the products in national and international fairs, external certification from national agencies like APEDA would be useful to attain the objectives.

Beneficial for Cluster Approach

In many cases, the extent to which farmers benefit from the opportunities provided by organic agriculture can be correlated with the extent to which they are permitted or helped to develop and strengthen their own local farmer associations. These can facilitate the exchange of knowledge, support farmers through the early conversion processes, improve production and post-harvest controls, achieve scale economics, improve farmers' bargaining position, and play an important role in organic product marketing.

Further growth and meeting the demands for certification, quality and consistency of increasingly mainstream distribution channels, like supermarkets, will be difficult for most producers and will require the organization of small farmers and a combination of public and private support. Local farmer associations can facilitate the exchange of knowledge, support farmers through the early conversion processes, improve production and post-harvest controls, achieve economies of scale, improve farmers' bargaining position and play an important role in marketing of organic products. For small farmers, external private firms or NGOs can fill some of the gaps but may not be an ideal permanent substitute for farmer associations.

The farmers have been organized into federations at different levels for bargaining with procurement agencies but need to be made more effective to develop market linkages for the benefit of the farmers. They should also create awareness among local consumers about the importance of organic produce.

Organic farming could be much more successful in cluster approach rather than for individual farmers, otherwise, in undulating and canal irrigated systems, use of inorganic inputs by other can distort all efforts.

Availability of Seeds and Organic Inputs

Seed is the basic input, of which quality has to be maintained. Under the existing setup, most of the farmers keep their own seeds and the others procurement agencies through farmers' federations at a high price. It would be relevant if some farmers are trained in seed production for supply to other farmers. Similarly, some farmers can get specialized in organic input (e.g., vermin-compost, seed of green manure crops) production at commercial level.

Government Initiative and Appropriate Policy Formulation

A policy should be developed that would take into consideration different types of organic farming, such as self-reliance and commercial organic farming. In self-reliance farming, food safety and the reduction of household expenditures should be highlighted. In addition to the existing indigenous knowledge, the dissemination of new agricultural innovations and technologies should also be priorities, as farmers require such innovation in order to produce higher yields. Farming and household accounts should also be established, as they are necessary financial management tools.

For trade-oriented or commercial organic farming, a price policy should be established, as this is necessary to guarantee that the price of organic produce is higher than the price of conventional products.

Moreover, promotional campaigns should be intensified to raise consumer awareness of the harmful effects of chemical residue in farm produce and the positive effects of organic products. Such actions will encourage more consumers to purchase organic products, leading to increased demand and a greater likelihood that they will accept the higher prices charged for organic products.

Certification

Furthermore, organic certification should be split into two levels; local and national. Local certification, with lower costs, should be developed as a requirement for self-reliance farming wishing to sell their organic products in local organic markets. Such certification could increase the confidence of local

consumers in the organic products. Certification at the national level should also be established as a requirement for products from commercial organic farming that are sold in domestic markets as well as those that are exported. Facilitating Internal Control Systems will enable small farmer groups to have their own certification and thereby greatly improve their market position. This would make organic products more competitive.

Although only 9% of farmers report facing problems in documentation for certification, a majority is not aware of certification process. More efforts are needed to familiarize farmers with certification process.

Long Transitional Periods

Transitional periods can mean a decline in yields and uncertainties for those farmers that employ intensive agricultural methods and are dependent on external inputs. Organic methods can be more cost-effective and even more profitable in the long run, but only if properly applied. In most cases overall farm incomes – though not always yields – soon recover. However, the transition process and Transitional periods can mean a decline in yields and uncertainties for those farmers that employ intensive agricultural methods and are dependent on external inputs. Organic methods can be more cost-effective and even more profitable in the long run, but only if properly applied. In most cases overall farm incomes – though not always yields – soon recover. However, the transition process and the time it takes are a barrier to many farmers, and they require various types of support. These can be including reliable production technology, temporary support for inputs, and modest subsidies for the conversion process. The benefits of organics are not often immediate. While some markets offer a price premium for crops in transition, many do not. There are examples of effective support for farmers during transition periods. Most involved good technical support and transitional incentives such as certification subsidy, but cautions must be exercised so as not to create perverse incentives that may induce temporary conversion simply because of poorly designed subsides.

Premium Price of Organic Produce

Receiving greater income is by far the most important reason given by farmers for converting to organic agriculture. Price is a primary issue for most farmers, and it is clear that many organic farmers are no different in this regard. While some convert for ideological or health reasons, most make changes because they expect to improve their income. Environmental or other reasons are important but they are often listed as secondary. While some regions enjoy socio-cultural characteristics that might encourage the adoption or refinement of organic practices, most of the case studies noted that the economic component typically prevailed.

Organic production requirements, the sometimes lengthy conversion process and the realities of sometimes shallow organic markets can surprise farmers and development professionals alike. Those farmers that adopt a holistic understanding of organics and are focused on local benefits such as improved soils, fewer toxic chemicals and self-reliance in inputs, rather than just on the premium price for the crop, are likely to better withstand setbacks, reduced premiums and difficult periods, especially during the conversion stages. It is risky for a project to work with farmers that convert only because of the promise of higher prices, since such price premiums may not be readily available.

Some other suggestions:

- The markets for organic wheat (and other crops) need to be developed so that the overall profitability of organic farming is increased.
- Farmers should be shown that organic farming is more profitable than conventional farming. Presently, there is a misunderstanding among many farmers that the profitability of organic is lower than conventional farming. Presently, there is a misunderstanding among many farmers that the profitability of organic is lower than conventional farming.

- Farmers should be provided with better technical support to control pests and diseases. Presently, their ability to control some of the pests such as them borer is very limited.
- Various biocontrol agents should be made available to farmers on credit. This can be done either by the Board or the Federations. If Federations are given this responsibility, they should be provided with funds for this purpose. The farmers' awareness of the certification process should be increased. Also, their capability to fill documents etc. necessary for the ICS programme should be enhanced.
- Communication between the Board, federations and farmers need to be improved. Farmers are most interested in market and price related matters. Especial care needs to be taken to ensure that farmers are kept informed of these matters.
- The delays in procurement of paddy, after it has been harvested, need to be removed. Similarly, delays in making payment to the farmers needs to reduced.
- More exposure trips and highlighting the success stories of organic farming can prove to be helpful.
- Regular monitoring of level of adoption of new research outcomes and reasons for partial adoption or non-adoption; market and consumers' survey on acceptance of organic products.
- It should be mandatory that except on-farm testing of new bio-fertilizers and bio-pesticides at the center, it should not be recommended. Further, many of the manures and bio-pesticides are un-standardized in terms of their ingredients which are essentially required.
- Since women are the major component in providing labour and management in hill agriculture, their involvement in training has to be increased.

- Much more efforts in terms of exhibiting the organic products at national and international level through various means would be highly useful.
- Training and capacity building is of utmost importance for organic farming. The benefit of training was rated as 'very much' by only 26% farmers, 'somewhat' by 68% farmers while the remaining 6% were not satisfied with the training component that they did not learn anything new.
- There seems to be good success in basmati, less success in wheat, spices and millets but for success in perishables much more systematic efforts are required. In the wake of above observations, extension set up has to be strengthened and farmers should be organized, particularly in marketing of highly perishable farm products to make the system more effective, economical and efficient.
- Regular monitoring and evaluation regarding operation, physical and financial performace of the project with well laid down indicators are of utmost importance.

Policy recommendations

This policy brief concludes that organic agriculture can provide important contributions to sustainable agricultural development. To get the most out of an organic agriculture strategy, CIDA should:

- Contribute to capacity building of organic farmer cooperatives.
- Promote the development and integration of organic markets.
- Help in developing domestic organic markets.
- Support the development of participatory guarantee systems (PGS).
- Concentrate policies on countries and regions where organic agriculture has the most potential.
- Support research on organic agriculture in developing countries.

Future prospects

Although, commercial organic agriculture with its rigorous quality assurance system is a new market controlled, consumer-centric agriculture system world over, but it has grown almost 25-30% per year during last 10 years. In spite of recession fears the growth of organic is going unaffected. The movement started with developed world is gradually picking up in developing countries. But demand is still concentrated in developed and most affluent countries. Local demand for organic food is growing. India is poised for faster growth with growing domestic market. Success of organic movement in India depends upon the growth of its own domestic markets.

India has traditionally been a country of organic agriculture, but the growth of modern scientific, input intensive agriculture has pushed it to wall. But with the increasing awareness about the safety and quality of foods, long term sustainability of the system and accumulating evidences of being equally productive, the organic farming has emerged as an alternative system of farming which not only address the quality and sustainability concerns, but also ensures a debt free, profitable livelihood option.

Conclusions

The ill effects of the conventional farming system are felt in India in terms of the unsustainability of agricultural production, environmental degradation, health and sanitation problems, etc. Organic agriculture is gaining momentum as an alternative method to the modern system. Many countries have been able to convert 2-10 per cent of their cultivated areas into organic farming. The demand for organic products is growing fast (at the rate of 20 per cent per annum in the major developed countries).

The most important is that the progress of organic farming is the inability of the government policy making level to take a firm decision to promote organic agriculture.

So, it can be concluded that in terms of health and environment and soil, natural farming, in future, may play a leading role. But this is possible when government promotes it more and for this government has to give economic protection to the farmers. If any technique or measure is developed to differentiate between organic and conventional yield, then it would have more prospects in future market and separate market should be there. In this way we can move towards the future of eating healthy and living healthy.

Reference-

1. Erick van Der werf, (1990), "Ecological way of soil Fertility Management". A Seminar on Ecological Agriculture, Edited by Agriculture- Man - Ecology, Pondicherry, Pp. 19, 20, 23.
2. Gunjal S.S. (1991), "Organic and Natural Farming : Principles of Organic Fanning", Kisan World, June 1991, P. 10.
3. Nagarajan, (1992), "A racoon miracle of Organic Farming in Sugarcane Cultivation", Indian Express, September 19
4. Rahudkar, WB and Phate, PB, 1992, Organic Farming: Experiences of Farmers in Maharashtra, in Proceedings of National Seminar on Natural Farming, Rajasthan College of Agriculture, Udaipur, 1992.
5. Regi Thames, (1993), "National Agriculture Policy Impact Analysis and Policy Options for Sustainable Agriculture", M.Phil (Futurology) Dissertation (Unpublished), Gandhigram Rural University, Gandhigram, Dindigul, Tamil Nadu, India.
6. Kannan (1995), "Organically grown Basrnati Paddy", The Hindu, May 31.
7. Magasagayam, N. (1995), "The Waste Management and Recycling in Agriculture", Home Seminar Proceeding, GRS, Gandhigram.
8. Veeresh, GK, 1999, Organic Farming Ecologically Sound and Economically Sustainable, Plant Horti Tech, 1(3), Nov-Dec.
9. Sankaram, Ayala, 2001, Organic Farming : Eco-Technological Focus for Stability and Sustainability, Indian Farming, June, pp. 7-11.
10. Dahama, A.K. (2002), Organic Farming for Sustainable Agriculture, Agrobios (India), Jodhpur.
11. Das, S. and B.C. Biswas (2002), Organic Farming-Prospects and Problems, Fertilizer News, December, 47(12): 105-118.
12. EXIM BANK (2003), Export of Organic Products from India: Prospects and Challenges, Occasional Paper No. 97, Export-Import Bank of India, Mumbai.
13. Prakash, TN, 2003, A Theoretical Framework To Promote Organic Produce Marketing in India, Indian Journal of Agriculture Marketing, Conference Number Special pp. 1-16.

14. Chhonkar, P.K.and Dwivedi, B.S., Organic farming and its implications on India's food security. Fertilizer News, 2004, 49, 15-38.
15. Marwaha, B.C., Is India in a position to switchover to organic farming in tatality? Indian J.Fertilizers, 2005,1, 47-52
16. Ramesh, P., Singh, Mohan and Rao, A.S. (2005) Organic farming: Its relevance to the Indian context. Current Science, **88**:561-68.
17. Thakur,D. S. and Sharma, K. D. (2005) Organic farming for sustainable agriculture and meeting the challenges of food security in 21th century : An economic analysis. Indian Journal of Agricultural Economics, **60:** 205-19.
18. IFAD (2005), Organic Agriculture and Poverty Reduction in Asia: China and India Focus, International Fund for Agricultural Development, March.
19. GOI (2005), Reports of the Commission for Agricultural Costs and Prices, Commission for Agricultural Costs and prices, Ministry of Agriculture, Government of India, New Delhi.
20. Bhattacharyya, P. and G. Chakraborty (2005), Current Status of Organic Farming in India and Other Countries, Indian Journal of Fertilizers, December, 1(9):111-123.
21. Blaise, D. (2006), Yield, Boll Distribution and Fibre Quality of Hybrid Cotton (Gossypium hirsutum L.) as Influenced by Organic and Modern Methods of Cultivation, Journal of Agronomy and Crop Science, 192: 248-256.
22. Aulakh C.S, Singh Surjit, Walia S.S, Kaur Gurpreet, Farmers' perceptions on organic farming in Punjab, Journal of Research, vol.46, Issue 1 pp.9- 13
23. Surabhi Singh and Rachel George, OrganicFarming: Awareness and beliefs of farmers in Uttarakhand, India, Journal of Human Ecology, 37(2), pp. 139- 149.
24. Shirsagar KG 2008 Impact of organic farming on economics of sugarcane cultivation in Maharashtra, Working paper no.15, Gokhale Institute of Politics and Economics, Pune
25. APEDA (2015) www.apeda.com accessed on 20th Jan, 2015
26. APEDA, National Programme for Organic Production (NPOP), Present status in India; www.apeda.com/organic.hmt

Abbreviations

APEDA: Agricultural and Processed Food Products Export Development Authority

CE: Cost Efficiency

CF: Conventional Farming

COP: Cost of Production

EE: Economic Efficiency

EIC: Export Inspection Council of India

FAO: Food and Agriculture Organization

FiBL: Research Institute of Organic Agriculture, Switzerland

FTDR: Foreign Trade Development and Regulation

GCA: Gross Cropped Area

GDP: Gross Domestic Production

GM: Genetically Modified

HYV: High Yielding Varieties

IFFCO: Indian Farmers Fertilizer Cooperative Limited

IFOAM: The International Federation of Organic Agriculture Movements

Kg: Kilo-gram

KVK: Krishi Vigyan Kendra

Appendix-1

अनुसूची क.सं.

जैविक कृषि का लागत–लाभ विश्लेषण
(हरिद्वार जिले के संदर्भ में)

(I) व्यक्तिगत एवं परिवार सम्बंधी जानकारी

1.1 गांव ☐ 1.2 ब्लॉक ☐

1.3 जिला ☐ 1.4 राज्य ☐

1.5 उत्तरदाता/कृषक का नाम : .....

1.6 शैक्षणिक योग्यता. : .....

1.7 मोबाईल नम्बर : .....

1.8 आयु (वर्ष में) ☐ 1.9 लिंगः (पुरूष–1,महिला–2) ☐

1.9 वैवाहिक स्थिति (अविवाहित–1, विवाहित–2,विवाहित–2,विधवा–3, तलाकशुदा–4 ☐

1.10 धर्म :–

वर्ग	हिन्दू	मुस्लिम	सिक्ख	ईसाई
सामान्य				
पिछड़ा जाति				
अनुसूचित				
अन्य				

2. परिवार में सदस्यों की संख्या :–

(II) भूमिः–स्वयं की या लीज पर

2.1 भू–जोत का विवरण :–

क्र.सं.	भूमि का विवरण	कुल भूमि (हेक्टेयर में)	सिंचित भूमि (हेक्टेयर में)
1.	स्वयं की भूमि		

2.	लीज पर भूमि		
3.	लीज के अलावा भूमि		
4.	**कुल जोत भूमि**		

2.2 यदि भूमि लीज पर है, तो लीज की समयावधिः–

एक वर्ष से कम (एक फसल के लिए)–1, 1 से 2 वर्ष–2, 2 से 5 वर्ष के लिए–3, अन्य–4

2.3 कृषि उपयोग का प्रतिमान

क्र.सं.	विवरण	क्षेत्र (हेक्टेयर में)
1	जोत क्षेत्र	
2	फलोधान/पौधारोपड़	
3	परती भूमि	
4	बंजर भूमि	
6	कुल भूमि	

2.4 सिचाई के स्रोत (क्षेत्र हेक्टेयर में)

क्र.सं.	स्रोत	स्वयं के	किराये पर	यदि किराये के हैं तो किराया
1.	नहर			
2.	ट्यूबेल			
3.	पम्पिंग सेट			
4.	कुआ/तालाब			
5.	अन्य			

(III) स्वयं की सम्पत्ति

3.1.पशुधनः–

क्र.सं.	पशु के प्रकार	संख्या	मूल्य (रू0 में)
1.	दुधारू पशु (गाय)		
2.	दुधारू पशु (भैंस)		

3.	बैल		
4.	भैंसा		
5.	अन्य		
	कुल		

3.2. कृषि उपकरण एवं मशीनरीः–

क्र.सं.	संपत्ति	संख्या	मूल्य (रू0 में)
1	बैल		
2	बैलगाड़ी/बुग्गी		
3	ट्रेक्टर		
4	ट्राली		
5	कल्टीवेटर		
6	थ्रेसर		
7	फसल काटने वाला यंत्र/हारवेस्टर/कम्बाईन		
8	पम्पिंग सेट/ट्बेल		
9	अन्य		

3.3 निवास सम्बन्धी सम्पत्ति

3.3.1 मकान स्वयं का है–1, या किराये का–2 ☐

3.3.2 मकान किस प्रकार का है ☐
झोपड़ी–1, कच्चा–2, कुछ पक्का–3, पक्का–4, अन्य–5

(IV) आय, उपभोग खर्च और ऋण

4.1 परिवार की वार्षिक आय (सभी स्रोतो से)

क्र.सं.	स्रोत	शुद्ध आय (रू0 में)
1	कृषि	
2	पशु–पालन	

3	गैर कृषि मजदूरी	
4	कृषि मजदूरी	
5	व्यापार / कारोबार	
6	अन्य	
	कुल आय	

4.2 ऋण :

क्र.सं.	ऋण का स्रोत	ऋण का उद्देश्य	धनराशि	ब्याजदर	समयावधि
1	वाणिज्य बैंक				
2	सहकारी बैंक				
3	साहूकार				
4	व्यापारी				
5	रिस्तेदार / दोस्त				
6	अन्य				
	कुल				

ऋण का उद्देश्य– कृषि पूंजी खरीदने के लिए–1, कृषि के वर्तमान व्यय को पूरा करने के–2, गैर कृषि व्यय के लिए–3, उपभोग खर्च–4, शादी–5, शिक्षा–6 चिकित्सा–7, अन्य–8

ऋण की समयावधिः– 3 माह तक के लिए–1, 3 से 6 माह–2, 6 माह से 1 वर्ष–3, 1 वर्ष से 2 वर्ष –4, 2 वर्ष से 5 वर्ष–5, 5 वर्ष से अधिक–6

(V) आर्थिक–कृषि

5.1 कृषि पद्वति एवं उत्पादन

क्र.सं.	फसल	फसल के अर्न्तगत प्रयोग भूमि (हेक्टेयर)		कुल उत्पादन (कु0)	स्वयं उपभोग	अवशेष (कु0)	कीमत प्रति कुन्तल	कुल उत्पादन का मूल्य	कुल अवशेष उत्पादन की कीमत	सहायक सामग्री की कीमत
		जैविक	अजैविक							
	1	2	3	4	5	6	7	8	9	10
खरीफ										
1	धान									

2	गन्ना									
रबी										
1	गेहूँ									

5.2 लागत का प्रारूप

क्र.सं.	संचालन लागत				मूल्य
			पुरूष	महिला	
1	मानव–श्रम	अस्थाई मजदूर			
		स्थाई मजदूर			
2	पशुश्रम (बैल)	स्वयं रख रखाव पर खर्च			
		किराये पर			
3	मशीन–श्रम	स्वयं रख रखाव पर खर्च			
		किराये पर			
4	सिंचाई शुल्क	स्वयं रख रखाव पर खर्च			
		किराये पर			
5	बीज				
6	उर्वरक	जैविक उर्वरक			
		रासायनिक उर्वरक			
7	कीटनाशक दवा	जैविक			
		रासायनिक			
8	ब्याज (कृषि पूंजी पर)				
9	लगान (लीज पर ली गयी भूमि पर)				
10	परिवहन				
	कुल लागत				

5.3 फसल का विपणनः

क्र.सं.	साधन	उत्पाद की बिक्री में हिस्सेदारी
1	ग्रामीण व्यापारी	
2	उपभोक्ता	
3	साहूकार	
4	थोक–व्यापारी	
5	सहकारी समिति	

6	किसान मण्डी	
7	सहकारी ऐजन्सी	
8	एग्रो प्रोसेसिंग यूनिट	

(VI) जीवन निर्वाह विकल्प

6.1 यदि आप कृषि से सहबद्ध अन्य कार्य करते है तो विवरण दीजिए–

क्र.सं.	सहबद्ध कार्य	कुल वार्षिक आय	क्या आपने कोई प्रशिक्षण प्राप्त किया है हॉ–1, नहीं–2	यदि हॉ तो किसने प्रशिक्षण दिया है	सहायता प्राप्त है
1	डेयरी				
2	मुर्गी पालन				
3	मधुमक्खी पालन				
4	सुअर पालन				
5	मछली पालन				
6	बकरी पालन				
7	भेड़ पालन				
8	अन्य				

प्रशिक्षण देने वाली संस्था का कोड– सरकारी विभाग–1, कृषि विश्वविद्यालय–2, निजी संस्था–3, एन0जी0ओ0–4, अन्य–5

सहायता/कोड– निवेष–1, अनुदान–2, ऋण–2, अन्य–3

6.2 यदि आप कृषि से सहबद्ध अन्य कार्य नही करते हैं तो क्या कारण है दीजिए–

(क) तकनीकी ज्ञान का अभाव है–1

(ख) स्थानीय क्षेत्र पर मॉग का अभाव है–2

(ग) धनराशि का अभाव है–3

(घ) संस्कृतिक कारण–5

(ड.) मानव श्रम का अभाव–6

(च) अन्य–7

6.3 यदि आप गैर–कृषि कार्य करते हैं तो विवरण दीजिए–

6.4 क्या आप कृषि को लाभदायक व्यवसाय मानते हैं? हॉ–1, नहीं–2

6.5 यदि नही तो आप की नजर में कृषि लाभदायक नहीं होने के क्या कारण है–

क्र.सं.	कारण	महत्वपूर्ण कारण है–1, महत्वपूर्ण नही है–3, विचारणीय कारण –2
1	उच्च लागत वाला निवेश	
2	प्रतिफल का कम होना	
3	श्रमिक की समस्या	
4	उच्च मजदूरी लागत	
5	सिचाई सुविधा का अभाव	
6	निम्न मृदा उत्पादकता	
7	अन्य	

6.6 क्या आप अपने बच्चों से खेती करवाना चाहते है, हॉ–1, नहीं–2

(V11) समूह एवं संस्था की सदस्यता

7.1 क्या आप किसी किसान समूह/संस्था के सदस्य है– **हॉ–1, नहीं–2**

7.2 यदि हॉ, तोः–

क्र.सं.	संस्था	हॉ–1 नहीं–2	लाभ प्राप्त किया	समस्या का सामना किया
1	प्राथमिक सहकारी कृषि समिति			
2	किसान समूह			
3	स्वयं सहायता समूह			
4	अन्य सहायता समूह			
5	अन्य			

लाभदायकता कोड– नहीं–1, कुछ सीमा तक–2, बहुत ज्यादा–3,
समस्या कोड– केवल बडे किसान के लिए लाभदायक–1, ऋण देने में पक्षपात, सीमित साधन–3, भ्रष्टाचार–4

7.3 पर्यावरण पर प्रभावः–

1 खेत में मधुमक्खी तितली केंचुए आदि जीवों संख्या में कोई प्रभाव पडा है।

2 खेत के जल स्तर पर प्रभाव

3 चिकित्सा पर कुल वार्षिक व्ययः–

7.4 छोटे एवं सीमान्त किसानों की दशा सुधारने के लिए सुझावः–

दिनॉकः.....


जैविक खेती
स्वस्थ मानव
जीवामृत आर्गेनिक
फार्मर प्रोडयूशर क.
मो. न.: 9997988558


स्वस्थ मानव
जीवामृत आर्गेनिक फार्मर प्रोडयूशर क.
पता: शेरपुर खलमओ जिला : हरिद्वार (उत्तराखण्ड)
के. जैविक क्रान्ति ग्रामोद्योग

THANKS