Working Group Report
on
Promotion of Organic Farming
in
Haryana







Haryana Kisan & Agricultural Costs and Prices Commission
Government of Haryana

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on

Promotion of Organic Farming in Haryana

Haryana Kisan & Agricultural Costs and Prices Commission
(Government of Haryana)
Anaj Mandi, Sector-20, Panchkula-134 116

2019

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Working Group Report on 'Promotion of Organic Farming in Haryana'

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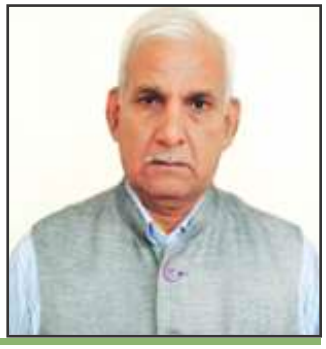

Foreword

The science of cultivating crops and management of livestock, now termed as organic farming, is fast catching up with modern tenets of technology, innovations, standards and certifications and promising a future with safe and healthy food, sustainable production systems, fertile and healthy soils, intact resource pool and economic prosperity to its producers and handlers. It is believed to play a pertinent role in safeguarding biodiversity, improving the soil health and the inclusive & sustainable development of farming community.

Growing awareness among consumers has created a premium segment of organic foods and presently the demand is many folds as compared to what producers are able to supply. Enabling policies and support structures are needed to fill the gaps. Haryana being the closest neighbor to Delhi has an ideal niche for catering to the emerging need of consumers both from crop and livestock sectors.

For understanding the current scenario, potential of the state, how other states have excelled on this path, and how the state can capitalize on the consumers demand *vis*-à-*vis* ensuring profitability for its farmers and what policies, support structures and technologies are needed for systematic promotion of organic farming, the Haryana Kisan & Agricultural Costs and Prices Commission constituted a Working Group of experts comprising from concerned fields to suggest ways, means and a way forward to take organic farming in Haryana to next level and its place of pride in organic farming on the map of world.

I am happy to note that the Working Group while interacting with various stakeholders and policy planners has also given prime importance to interaction with the farmers and taken their feedback as the basis for the recommendation in this document. The working group in its report has touched practically all the aspects of organic farming starting from institutional necessities for research, teaching, extension, seeds development and production, integrated end-to-end value chain and finally to empowerment of farmers through their own institutions

I congratulate Dr. A.K. Yadav, Chairman, Working Group and other members Dr. I.S. Hooda, Dr. A.S. Sangwan and Dr. Ravindra Kumar for their efforts in bringing out this report in time. The expert group deserves all the appreciation for their sincere efforts in finalization of this report. I am confident that this report will turn a new leaf and put a Way Forward for the promotion of organic farming as a beneficial farming occupation in Haryana. I believe that this important publication will be of immense use to the planners, administrators, researchers, farmers and other stakeholders. I hope that the implementation of various recommendations will accelerate the growth of organic farming in Haryana.

October 2019

(Ramesh Kumar Yadava)

Dr A.K. Yadav

Chairman,
Working Group
Advisor (NAB), APEDA,
3 Siri Institutional Area,
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Preface

The modern organic agriculture, as we notice today, is markedly different from our ancient traditional agriculture. It underlines incorporation of modern science with traditional acumen to create an integrated system of the crop production and livestock management. The present day organic farming is not only sustainable, resource conserving, maintaining soil health and fertility but also assures comparable productivity along with better profitability to the farmers.

Systematic support from Central and State Governments through various schemes has added to wider acceptance of organic farming. At the same time, the certification systems supported with enabling regulatory framework has helped establishing the credibility of organic products both in national and international markets. India is probably the only country in the world, supporting organic farming through policy and schemes from public funds. Studies conducted over a decade by the research institutions have dispelled the myths about its production potential and reinforced creditability that organic systems can give the yield at par with the conventional farming. It has also been demonstrated that organic agriculture stands as a suitable alternative for rainfed and water stressed areas performing 15-20% over the conventional systems.

Sikkim, a small state of north-eastern region in the country, has rendered its entire agricultural land into certified organic and is reaping more benefits through increased tourism. States of Karnataka, Madhya Pradesh and Maharashtra are the major contributors to the export kitty of organic foods. Keeping in view the growing demand for organically grown foods in the domestic market many states have taken systematic initiatives for promoting organic farming through focussed area and targeted commodities approaches. Haryana, situated in NCR- the close vicinity of Delhi, is best fortuned to capitalize on the demand of organic foods, especially the fresh fruits, vegetables, medicinal and herbal plants besides the staples such as rice, wheat, pulses and oilseeds.

Any agricultural promotion activity nowadays not only depends upon the institutional and policy support through technologies and inputs from the Government but also relies on the market linkages. In view of the emerging market demands, local climatic conditions and growing inclination of farmers towards sustainable practices in general and organic farming in particular, it is the high time that necessary policies and enabling support structures are put in place in Haryana to harvest the potential for production, promotion and marketing of organic foods.

Keeping in view of the potential, Haryana Kisan & Agricultural Costs and Prices Commission (HKACPC) constituted a Working Group (WG) on “Promotion of Organic Farming in Haryana” to assess the potential of the state and suggest necessary measures to give Haryana a rightful place in the organic farming map of the country. The Terms of Reference (TOR) assigned for the report to be submitted were as per the notification shown in this document (see the Notification).

WG assessed the preliminary scenario from primary and secondary data available with the state and other agencies. Policies developed by 13 states were also considered with their strengths and weaknesses during implementation and the lessons learnt.

While preparing the report the WG members not only interacted with the policy planners, scientists, extension specialists and industry leaders from Haryana and other states but also had series of interactions with practicing organic farmers. Majority of the WG members having long experience in implementation of various government schemes for the promotion of organic farming and exposure to national and international marketing scenario have made good efforts to suggest the strategies for promotion of organic farming in an integrated manner with well knit institutional network for research, teaching, extension, input development, production, regulation, value addition and finally the marketing.

On behalf of the WG members I express my sincere gratitude and thanks to Haryana Kisan & Agricultural Costs and Prices Commission and specifically to the Chairman, HKACPC, Dr. Ramesh Kumar Yadava for reposing faith in the members and for encouraging the team to analyse the situation keeping the Haryana farmers in focus. I also thank Dr. Randhir Singh Dalal, former Member Secretary, Dr. Rajender Singh Balyan, Member Secretary and staff of the HKACPC for necessary coordination and facilitating the interaction meetings.

As a Chairman of the Working Group I also thank my colleagues Dr. I.S. Hooda, Dr. A.S. Sangwan, and Dr. Ravindra Kumar for their contribution and help in drafting this report. Last but not the least I extend my sincere thanks to the practicing organic farmers of Haryana for providing their necessary suggestions and inputs for the purpose of incorporating in the report.

I was amazed with the confidence of organic farmers of Haryana towards the productive potential and profitability this system can accrue to farmers, and potentiality of the State in harvesting best benefits of the agriculture of future, "*The Organic Farming*".

October 2019 (**A.K. Yadav**)

Dr R. S. Balyan
Member Secretary,
Haryana Kisan & Agricultural
Costs and Prices Commission, Panchkula
(Government of Haryana)

Acknowledgements

In the changing global scenario with the excessive use of chemical fertilizers there is loss of organic carbon level in the soil resulting in the continuous decline of soil as well as human health. Conservation agriculture-cum-organic farming is the only option to overcome this problem. It is rapidly progressing in developing countries like India, but wider adoption of organic farming for sustainable agriculture and human health is a challenge. There is extensive requirement of research, extension and awareness programmes for faster transfer of organic farming technologies to the farming community. However, in Haryana the number of organic producers has increased significantly during the last decade.

The Haryana Kisan & Agricultural Costs and Prices Commission constituted a working Group (WG) on 'Promotion of Organic Farming in Haryana' involving Dr. A.K Yadav as Chairman, Dr. I.S Hooda, Dr. Ravinder Kumar and Dr. A.S Sangwan as members. The expert group deserves all the appreciation for their sincere efforts in finalization of this report. I am confident that this report will turn a new leaf and 'Way Forward' in the promotion of organic farming in Haryana to make it an eco-friendly and beneficial farming system. This valuable publication will be of immense use to the planners, administrators, researchers, farmers and other stakeholders. I am confident that the implementation of various recommendations by the government will accelerate the growth of organic farming in Haryana.

I feel glad to thank Dr. Ramesh Kumar Yadava, Chairman and Dr. Shyam Bhaskar, Member, Haryana Kisan & Agricultural Costs and Prices Commission for their guidance and support during the functioning of the working group. I also thankful to Dr. Partap Singh, Dr. Ishwar Singh, Consultants, Dr. Sanjay Yadav, Dr. Gajender Singh, Mrs Vandana, Research Fellows and other staff members of HKACPC for their constructive assistance in the preparation of this document. Finally, I am thankful to the all stakeholders and farmers of the state who put forward their valuable suggestions in the preparation of this report.

October 2019

(**Rajender Singh Balyan**)

HARYANA KISAN AYOG
(Government of Haryana)
Anaj Mandi, Sector – 20, Panchkula-134116

NOTIFICATION

No. HKA/WG-16/2017/ **Dated: 12th September, 2017**

The Chairman, Haryana Kisan Ayog is pleased to constitute the following working group on, **"Promotion of Organic Farming in Haryana":**

1. Dr. A.K.Yadav, Advisor (NAB), APEDA, Siri Institutional Area, August Kranti Marg, New Delhi — Chairman
2. Dr. I.S.Hooda, Professor (Retd.) Department of Agronomy, CCSHAU, Hisar — Member
3. Dr. Ravinder Kumar, Deputy Director, Regional Centre for Organic Farming, Panchkula — Member
4. Dr.A.S.Sangwan, Expert (Organic Farming) Centre of Excellence in Vegetable Cultivation (Indo-Israeli Project), Gharaunda, Karnal — Member

Terms of Reference:

1. To review the current status of organic farming in the State and to analyze the current support (inputs, schemes, policies, technical and infrastructure support) for organic farming from the state/central government and suggest measures for further improvement of organic farming in the State.
2. To analyze the status of available organic resources and to review the research and development activities for organic inputs (bio-fertilizers and pesticides) and suggest measures to address current gaps as per the specific needs of the State.
3. To examine the current status of specific varieties/hybrids suitable for organic farming in agriculture particularly horticulture, vegetables and floriculture and to propose actions for development of crop varieties suitable for organic farming.
4. To assess the present status of training programs and extension facilities for promotion of organic farming in the State and suggest measures for motivation of farmers in adoption of organic farming practices.
5. To review the current status of present marketing system, available infrastructure and policies for organic produce and find out measures for further improvement in linking farmer to the market.
6. To study the problems of farmers in organic farming and to propose most appropriate strategy and policy interventions for promotion and overall growth of organic farming in the State.
7. To examine the problem of straw burning (rice, wheat and sugarcane trash) in Haryana and suggest remedial measures for economic use of straw.

Other Terms and Conditions (Administrative):

1. On submission of report, the members will be entitled for a lump sum honorarium of Rs. 25000/- each, whereas the chairman will be paid an honorarium of Rs.50000/-.
2. Members of working group will be paid only TA for attending meetings on actual basis and an honorarium of Rs. 2000/- for each meeting. Local hospitality will be arranged by the Ayog.
3. The working group may invite one or more special invitees to seek their views in specific meetings. Such special invitees will also be paid honorarium and other expenses by the Ayog, as per norms for other members, for their participation and contribution, only for that particular meeting.
4. The Commission will bear the cost on conducting the meetings and printing of the report.
5. The working group should submit its report preferably in six months from the date of this notification.

Note: From Commission side, Dr. Sandeep Kumar, Research Fellow will be the nodal person providing needed Technical backstopping, whereas Dr. R.S. Dalal, Member-Secretary will extend required administrative support.

MEMBER SECRETARY
HARYANA KISAN AYOG

Endst No. HKA/WG-16/2017/3887-3900 **Dated: 13.09.2017**

1. Dr. A.K.Yadav, Advisor (NAB), APEDA, Siri Institutional Area, August Kranti Marg, New Delhi
2. Dr. I.S.Hooda, Professor (Retd.), Department of Agronomy, CCSHAU, Hisar
3. Dr. Ravinder Kumar, Deputy Director, Regional Centre for Organic Farming, Panchkula
4. Dr.A.S.Sangwan, Expert (Organic Farming), Centre of Excellence in Vegetable Cultivation (Indo-Israeli Project), Gharaunda, Karnal
5. The Principal Secretary Govt of Haryana, Agriculture & Farmers' Welfare Department, Chandigarh.
6. Vice-Chancellor, CCSHAU, Hisar
7. PS to Chairman, HKA, Pkl
8. Accounts Officer, HKA, Pkl

MEMBER SECRETARY
HARYANA KISAN AYOG

CONTENTS

SECTION-1

Organic Agriculture

1.1 A Futuristic and Sustainable Approach

Green revolution technologies catalyzed by high yielding varieties, fueled by synthetic chemical inputs and supported by increased irrigation has no doubt transformed the Indian agriculture from subsistence farming to surplus generating enterprise. But now it is being realized that the success was mostly on the cost of resources, environment and sustainability. Depleting natural resources, especially the ground water, deteriorating soil health and fertility, increasing dependence on synthetic inputs from non-renewable sources, ever-growing costs of cultivation and diminishing returns have raised many questions on the long-term sustainability of the technologies. Scientists and policy makers are now increasingly diverting their attention in search of alternative technologies, which are not only productive and meeting today's requirements but are also resource conserving, environment friendly and ensuring safe and healthy food with long term sustainability promise.

Organic agriculture, a mainstay of farming since centuries is fast emerging as the viable option to fulfill all the sought after requirements. Growing awareness among consumers for safe and healthy food and supporting organic farming technologies for ensuring higher productivity with quality has boosted the confidence of policy planning processes for its adoption as a viable system of food production in the country.

Initial hiccups on its suitability and fears of low productivity are being dispelled with the results of long term experimentation and it is being accepted that if appropriate technologies are brought in and adopted, the organic agriculture can give the same yields in resource rich areas and can give much higher productivity in less endowed resource poor areas.

1.2 Concept and Principles of Organic Agriculture

The concept of organic agriculture builds on the idea of efficient use of locally available resources as well as the usage of adapted technologies (e.g. soil fertility management, closing of nutrient cycles as far as possible, control of pests and diseases through management and natural antagonists). It is based on a system-oriented approach and can be a promising option for sustainable agricultural intensification in the tropics, as it may offer several potential benefits such as:

- A greater yield stability, especially in risk-prone tropical ecosystems,
- Higher yields and incomes in traditional farming systems, once they are improved and the adapted technologies are introduced,
- An improved soil fertility and long-term sustainability of farming systems,
- Reduced dependence of farmers on external inputs,
- Restoration of degraded or abandoned lands,
- Access to attractive markets through certified products, and new partnerships

Organic agriculture is not just the replacement of synthetic inputs with organic inputs but is a system approach where all farm components starting from soil, soil's organisms, natural resources, natural plants and livestock diversity, animals and human beings are all connected to each other and work for each other. As per IFOAM's definition:

"Organic Agriculture is a production system that sustains health of soil, ecosystem and the people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs having adverse effects. Organic Agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved". This definition is based on following four principles:

- **Principle of health -** Organic Agriculture should sustain and enhance the health of soil, plants, animals, human being and planet as one and indivisible.
- **Principle of ecology -** Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help to sustain them.
- **Principle of fairness -** Organic Agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities.
- **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.

1.3 Status of Organic Agriculture in the World

▪ Overall Area Scenario

According to latest FiBL-IFOAM survey (World of Organic Agriculture - Statistics and Emerging Trends 2019) on certified organic agriculture worldwide, nearly 69.8 million ha land is being certified as organic in 181 countries (as on end of 2017), constituting 1.4% of the total agricultural land of the countries under study. Apart from the organic agriculture land, there is 42.4 million ha land certified as organic and dedicated to other activities. Mostly these are for wild collections and Beekeeping. Other areas also include aquaculture, forests, and grazing areas on non-agricultural land.

▪ The Producers

There were at least 2.9 million organic producers in 2017. Forty percent of the world's organic producers are in Asia, followed by Africa (28 percent) and Latin America (16 percent). The countries with the most producers are India (835'000), Uganda (210'352), and Mexico (210'352).

▪ Major Crop Groups

Land use and crop details are available for over 90 percent of the organic agricultural land. Unfortunately, some countries with very large organic areas, such as Australia, Brazil, and India, have little or no information on their land use. Over two-thirds of the agricultural land is grassland/grazing areas. With a total of almost 12 million hectare, arable land constitutes 17 percent of the organic agricultural land. Most of this category of land was used for cereals including rice (4.5 million hectare), followed by green fodder from arable land (2.8 million hectare), oilseeds (1.2 million hectare), dry pulses and vegetable crops. Permanent crops account for seven percent of the organic agricultural land, amounting to 4.9 million hectare. Detailed information on organic cotton as provided by Textile Exchange indicates that during the 2015/16 growing season, 107'980 metric tons of organic cotton fibre was produced globally by 219'947 farmers on 302'562 ha land. There are currently 18 countries producing certified organic cotton, but 97 percent of the global supply comes from just seven countries. India remains by far the largest producer, accounting for almost two-thirds of total production, followed by China, Kyrgyzstan, Turkey, and Tajikistan.

▪ The Global Market

Organic food & drink sales have increased from less than 15 to almost 97 billion US dollar in over two decades according to Ecovia Intelligence. Although organic food sales are growing at healthy pace, there are still persistent challenges, these include demand concentration (about 90 percent of sales are in North America and Europe), proliferating standards, supply shortfalls and competing eco-labels, to name a few.

1.4 Organic Agriculture in India

Although, India had been traditionally organic and its farmers are 40 century farmers with large pool of traditional wisdom on best practices in organic agriculture, the modern standards based organic agriculture started only recently with the growing demand for organic foods and fibres in the western world. National Programme for Organic production (NPOP) launched during 2001 laid the foundation for systematic development of organic agriculture sector in the country. Setting up of National Centre of Organic Farming under Ministry of Agriculture, Cooperation and Farmers Welfare and launching of ICAR-Network Project on Organic Farming during 2004 provided the much-needed drive to organic farming movement in the country. Right from beginning, the reliable data on area under organic farming remained a big issue and in the absence of any mechanism for area determination, only the area registered under certification systems has been taken as the area under organic farming. Starting with 42,000 ha area during 2004-05 (registered under NPOP certification), organic farming has spread to over 20.67 lakh ha (a growth of 49 fold), out of which 17.67 lakh ha is registered under NPOP and nearly 3.0 lakh ha under PGS certification.

▪ Organic Farming under National Programme for Organic Production (NPOP)

By the end of March 2018, India has brought more than 3.56 million ha area under organic certification, comprising of 1.78 million ha (50%) under cultivation and 1.78 million ha (50%) under wild harvest collection. Overall status of cultivated farm area under organic certification process and total commercial quantity available for sale in some states of India is given in Table 1. Commodity wise production of important crop categories under organic certification process is given in Table 2. Share of different states in total area and total commercial production is shown in Fig 1 and Fig 2.

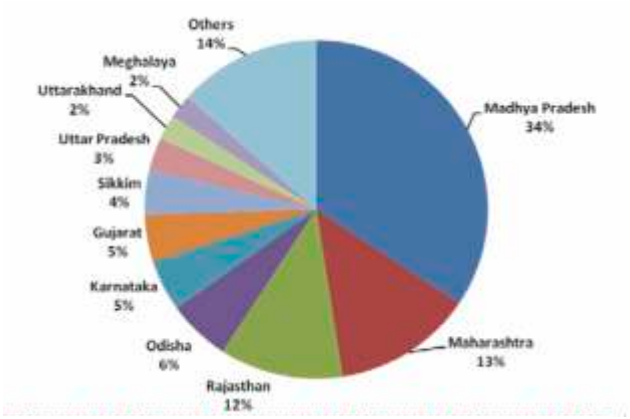

Fig 1: Percent share of different states in total area under certification process

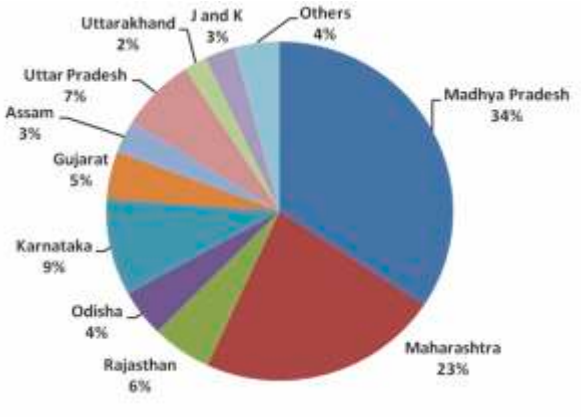

Fig 2: Percent share of different states in total commercial production under certification process

Table 1: Total area and commercial quantity released for sale in some important states of India

Rank	State	Cultivated Area (lakh hectare)	Quantity for sale in (lakh MT*)
1	Madhya Pradesh	613395.4	575346.3
2	Maharashtra	235690.5	377308.2
3	Rajasthan	208571.1	94029.2
4	Odisha	105616.2	74642.1
5	Karnataka	86945.9	154922.9
6	Gujarat	81268.9	75304.6
7	Sikkim	76076.2	435.1
8	Uttar Pradesh	55197.5	117358.6
9	Uttarakhand	42304.6	35644.3
10	Meghalaya	40335.6	612.8
11	Kerala	31660.1	16134.3
12	Andhra Pradesh	29748.6	8516.6
13	Assam	28011.8	52846.6
14	Jammu & Kashmir	22870.3	47214.9
15	Chhattisgarh	20530.7	6265.4
16	Jharkhand	17387.9	2.4
17	Tamil Nadu	17247.2	15893.3
18	Himachal Pradesh	14153.4	2620.6
19	Goa	11900.2	2875.6
20	Telangana	8919.8	1381.4
21	Nagaland	8839.8	1369.6
22	Haryana	6872.1	4245.5
23	Others	16500.0	10589.3
	Total	1786494	1675560

(Source – http://apeda.gov.in/apedawebsite/organic/data.htm, 2017-18)

Although export was the main driver for the growth of organic agriculture in the country for almost one decade, but now domestic market has also started to show strength and is growing at a CAGR of about 12-15%. But still the exports account for major revenue realization by the growers, processors and traders (growing at a CAGR of 20% during last six years). As per the estimates Indian export kitty for organic food products is about US$ 515 million. Domestic market accounts for approximately US$ 368 million (ASSOCHEM study, 2016). Important commodities exported during the year 2017-18 and major export destinations are given in Table 3 and 4. Growth in exports of total organic food products during last six years is depicted in Fig 3.

Table 2: Crop category wise total quantity released for sale as certified organic in India

Sr. No.	Crop Category	Quantity for sale (in MT)
1	Oil Seeds	539109.9
2	Sugar crops	318405.3
3	Cereals & Millets	284314.7
4	Fiber Crops	247437.9
5	Pulses	67050.7
6	Medicinal/Herbal/Aromatic Plants	46558.4
7	Spices and Condiments	45641.1
8	Plantation Crops (tea/coffee/coconut)	43707.2
9	Fruits	33448.6
10	Vegetables	20628.7
11	Dry fruits	8127.5
12	Ornamental Plants (Flowers)	6977.0
13	Fodder seeds/Crops	2868.0
14	Tuber crop	239.2
15	Others	11045.3
	Total Certified production	1675560.0

(Source – http://apeda.gov.in/apedawebsite/organic/data.htm, 2017-18)

Table 3: Commodity wise export of some important food categories from India (2017-18)

Sr. No.	Crop Category	Quantity (Tons)	Value (INR lakh)	Value (US$ million)
1	Oil seeds including soybean	343936.9	164563.7	245.6
2	Cereals & Millets	52964.7	36088.5	53.8
3	Sugar and sweeteners	15950.7	7444.3	11.1
4	Fruit Juice/Fruit Products	10383.1	9975.5	14.8
5	Plantation Crops	8414.2	31236.4	46.6
6	Spices and Condiments	5656.8	26801.9	40.0
7	Pulses	5617.9	6441.4	9.6
8	Dry fruits	4270.3	30686.4	45.8
9	Others	3614.1	4825.1	7.2
10	Vegetable products	2060.6	7664.9	11.4

Table 4: Important export destinations, quantity and value of exports in INR and US$ (2017-18)

Sr. No.	Destination	Quantity Exported (MT)	Value (INR crore)	Value (US$ million)
1	USA	223853.6	157173.5	234.6
2	European Union	129546.2	131852.8	196.8
3	Canada	82132.7	34710.3	51.8
4	Switzerland	8925.1	7485.9	11.1
5	Australia	2690.1	4154.5	6.2
6	Israel	1974.2	1418.3	2.1
7	Korea Republic	1611.7	704.3	1.0
8	Vietnam	1446.9	730.5	1.0
9	New Zealand	1282.2	995.8	1.4

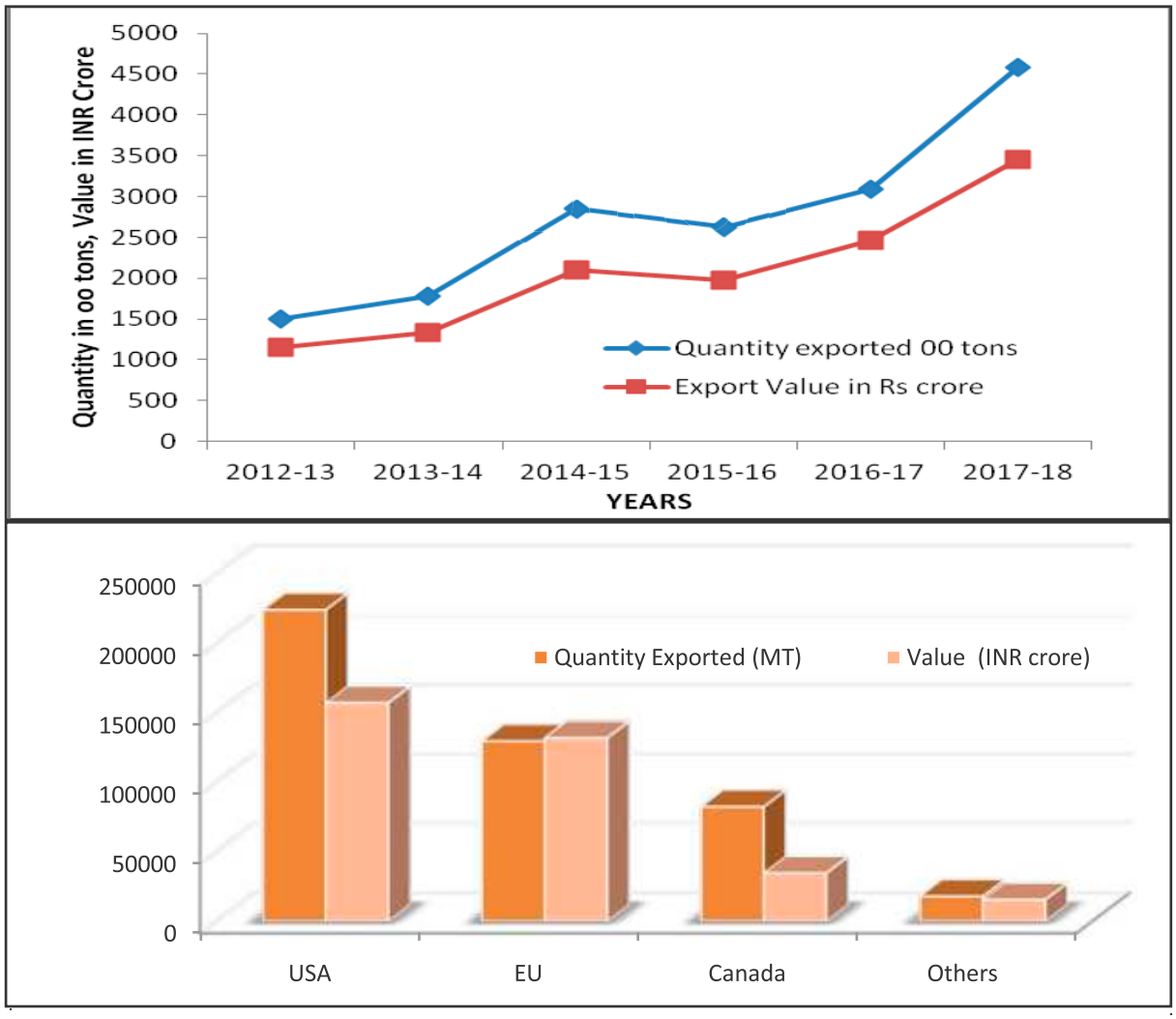

Fig 3: Growth in Exports of Organic Food Products from India during 2012-13 to 2017-18 to countries

▪ Organic Farming under PGS-India

Keeping in mind the complex documentation system needed for third party certification under NPOP, prohibitive cost and institutional management requirement for internal control system under grower groups which is beyond the reach of small and marginal farmers without any external support, Ministry of Agriculture and Farmers Welfare launched a farmer group centric certification, the decentralized Organic Farming Certification system named as Participatory Guarantee System (PGS) under PGS-India programme.

PGS certification system requires a group of minimum five members within the village or from nearby villages. Documentation systems have been kept limited to just peer appraisal reports twice a year and inspection and decision making is collectively by the group. Regional Councils, authorized by the PGS-National Advisory Committee provide necessary technical support and endorse group decisions. As on December 2018, PGS-India system has registered more than 4.0 lakh farmers with 2.99 lakh ha area under certification process. These farmers are grouped under 13,369 groups and are being catered by 326 Regional Councils for data management and certificate generation.

PGS-India certification system has following benefits over third party certification:

- Documentations are simple
- No third part intervention
- Farmers are owners of the group without any institutional requirements
- Entire activity is done by the group members.
- Size of the groups is kept small and members know each other
- Certificate is granted to each and every farmer.

1.5 Government Initiatives

Institutional promotion of organic agriculture started with the launching of "National Programme on Organic Production" (NPOP) by the Ministry of Commerce during 2001, which defined the National Standards for Organic Production (NSOP) and the procedure for accreditation and certification. India now has 29 accredited certification agencies for facilitating the certification to growers. For area expansion and technology transfer, Ministry of Agriculture, Govt. of India launched a National Project on Promotion of Organic Farming (NPOF-DAC) and earmarked funds for setting up of organic and biological input production units, vermin-compost production units and for organic adoption and certification under various schemes such as NHM (now MIDH), NMSA and RKVY.

To empower farmers through participation in certification process and to make the certification affordable for domestic and local markets, Ministry of Agriculture has also launched a farmer group centric organic Participatory Guarantee System (PGS) under PGS-India programme. To give domestic organic agriculture a push, the Ministry of Agriculture has launched a new scheme under NMSA entitled *Paramparagat Kheti VikasYojna* (PKVY). Recently under Prime Minister's special initiative for North Eastern states a scheme "Development of Organic Value Chain in North Eastern Region" has been launched with an initial allocation of Rs.300crore. To address research needs, ICAR launched a Network Project on Organic Farming during 2004 and started taking up research activities through its 13 collaborating centers across the country. Recently ICAR has increased the number of collaborating centres to 20 and launched an additional Network Project on Organic Horticulture. Many state Governments have also put in their efforts for the promotion of the organic agriculture.

Efforts initiated by the Government of Sikkim in converting the entire state into organic and Government of Uttarakhand of converting their hill districts into organic are some noteworthy developments. The area brought under certified organic farming by these states as on March 2018 stands at 76,076 hectare in Sikkim and 42,304 hectare in Uttarakhand. Launching of organic farming in Mission mode by the Government of Karnataka was also an initiative in the right direction through which more than 86,945 hectare area has been brought under organic certification process. State Governments of, Rajasthan, Gujarat, Odisha and Uttar Pradesh have also been able to bring 208,571, 81,268, 105,616 and 55197 hectare area, respectively under NPOP organic certification process. Initiatives by the industry and export houses have led to the growth of organic farming in the states of Madhya Pradesh and Maharashtra. Introduction of *Paramparagat Kheti Vikas Yojna* has also added more than 3,00,000 hectare area under PGS certification system, which is in addition to the overall area described above under NPOP certification.

1.6 Quality Assurance and Regulatory Systems

National Programme for Organic Production (NPOP) launched during 2001 by the Ministry of Commerce and Industry with APEDA as the secretariat was the first milestone in the history of organic agriculture in India and laid the foundation stone for systematic institutionalization of quality assurance system. NPOP is now a widely acclaimed system accepted world over. It enjoys equivalence with organic certification systems of European Union and Switzerland and has conformity assessment recognition agreement with USDA. NPOP was launched with export markets in focus and is better known as third party certification system. To make the certification system affordable and making farmers as stakeholders in quality guarantee, Ministry of Agriculture and Farmers Welfare launched "Participatory Guarantee System" (PGS) a farmer group centric certification system under PGS-India programme. PGS is applicable for group of farmers and is valid for domestic markets.

Recently in December 2017, Food Safety and Standards Authority of India (FSSAI) has brought organic foods under the ambit of Food Safety and Standards Act 2006 and mandated that any food to be sold as organic in India needs to be certified under NPOP or PGS certification system. The domestic regulation under FSS Act 2006 has been implemented since July, 2018. The impressive logos of NPOP and PGS certification systems and unified quality assurance launched by the *FSSAI* are given below:

Logos of NPOP and PGS certification systems and unified quality assurance launched by the *FSSAI*

1.7 Developments in Policy Framework

▪ The Way Ahead

First ever attempt to define a policy frame work was initiated with the constitution of Task Force on Organic Farming by the Government of India during 2001 which was headed by Shri Kunwarji Bhai Jadhav, Member Parliament. This was followed by a working group on Organic and Biodynamic Farming by the Planning Commission during 2004, Expert Panel on Organic Farming during 2007 and Task Force on Organic Farming during 2015. Many states have also embarked upon developing their own state specific policy documents. So far 13 states, namely Sikkim, Nagaland, Mizoram, Uttarakhand, Karnataka, Kerala, Andhra Pradesh, Madhya Pradesh, Maharashtra, Himachal Pradesh, Tamil Nadu, Gujarat and Chhattisgarh have developed policies for systematic promotion of organic farming. Out of these, although 3 states namely Sikkim, Nagaland and Mizoram declared their intention to go 100% organic and Uttarakhand declared to convert their all hill districts to organic, but it is only the Sikkim state, which has been able to successfully convert their dream into reality.

▪ The Constraints faced and Lessons learnt

As organic farming was introduced in response to growing demands in the western world, export expectation was the main driver for its wider acceptance among farmers. Introduction of NPOP based certification system, which was again intended for facilitation of certification for export added to the fuel. Government support for adoption and export oriented certification also added to the expectation of growers of better price realization. However, in spite of continuous growth in demand for exports and domestic markets, the growers are struggling to maintain the enthusiasm on account of following reasons:

- No level playing field in terms of Government support which was available to conventional farming (such as subsidies) and nothing for organic farming
- Inadequate quality assurance and approval system for organic inputs. Existing system of approval under FCO and CIB is not organic-inputs friendly and deterrent to growth of organic innovations
- Absence of the institutions in support services for technology, package of practices, research, seeds and quality inputs etc.
- Growing complexities in management of documentation for certification
- Absence of technologies for production optimization and pest management
- Absence of planning for technology, commodity selection and efforts for their linkages with the value chain
- Thinly distributed growers over large area with low produce, making it difficult to aggregate at affordable costs
- Absence of organically compatible value addition and processing facilities and
- Absence of support for marketing and no direct access to the markets

SECTION-2

Haryana at a Glance

2.1 Food Bowl of the Nation

Haryana, a land locked state in the northern part of India with just 1.4% (4.4 million hectare) of the total geographical area of the country, is second largest contributor of food grains to the Central Pool. Apparently, growth rates in production have not varied significantly before and after green revolution. However, increase in food grain output, during the pre-green revolution era was contributed both by expansion in area and rise in yield. In contrast, the output growth following green revolution was primarily due to improvement in yield. Among the crops, maximum production gain happened 57% with wheat, followed by 43% in rice. Both these crops thus, shared very high credit as far as overall output is concerned. In Haryana, production per unit area for both the crops is very high but at what cost? The reduction of oilseeds, pulses, coarse cereals etc with dominance of rice-wheat rotation is consequently leading to deficiency of multiple nutrients. The agricultural statistics of Haryana are depicted in the Table 5 given below.

Table 5: The Agricultural Statistics of Haryana at a Glance

Sr. No.	Parameters	Values
1.	Geographical area	4421 ('000 ha)
2.	Area under forests	41 ('000 ha)
3.	Cultivable area	3676 ('000 ha)
4.	Percentage cultivable area	83.1%
5.	Net sown area	3520 ('000 ha)
6.	Area sown more than once	2982 ('000 ha)
7.	Gross cropped area	6502 ('000 ha)
8.	Cropping intensity	184.7%
9.	Net area irrigated (Total)	2974 ('000 ha)
	a. By canals	1153 '000 ha) (38.8%)
	b. By tube wells	1821 '000 ha) (61.2%)
	c. Gross irrigated area	5763 ('000 ha)
10.	Percent net irrigated area	84.5%
11.	Fertilizer consumption 2014-15	205 (kg/ha)
12.	Average rainfall (2015)	456.3 mm
13.	Number of holdings	16.1 lakh
14.	Number of farmers as per land sizes	
	a. Marginal farmers (< 1 ha)	7.7 lakh (48.1%)
	b. Small farmers (1-2 ha)	3.1 lakh (19.5%)
	c. Others (> 2 ha)	5.2 lakh (32.4%)
15.	Food grain production 2016-17	180.0 lakh tons
16.	Procurement of food grains 2015-16	110.1 lakh tons
17.	Purchasing centres in the state (number)	
	a. Principal yards	106
	a. Sub yards	178
	b. Purchase centres	192

The Physiography

Except the hills of the Shivalik system in the Panchkula and Yamunanagar districts in the north east and those of the Aravalli system in the south in Mahendergarh, Rewari, Gurugram, Nuh and Faridabad districts, the Haryana state is a plain area at about 200 to 300 m above mean sea level. The Yamuna River in the east, Ghaggar River in the north-northwest and Aravalli in the south bind it. Yamuna is the only perennial river. The important streams draining the northern uplands of Haryana flowing towards west are the Markanda, Saraswati and Chautang. The northern part of Haryana slopes generally from northeast to the southwest.

The southern part is undulating due to a number of small hills of the Aravalli system and also due to the sand dunes. Much of this part has slope from south and southwest to north and northeast. A number of rainy season streams of which the Sahibi, the Kansawati and the Dohan are more important, rise in Rajasthan and drain in Gurugram, Mahendergarh, Rewari and Jhajjar districts of Haryana. A number of small lakes like the Najafgarh, the Sarmathala, the Khalilpur, the Chandaini and the Kotla Jheel are formed in the Gurugram and Faridabad districts, in between the Aravalli ridges. The discharge of all these rivers is subject to wide fluctuation from year to year and season to season. Most of these, except the Ghaggar are the small rivers flooded when it rains heavily and with little water in the dry season. Only the Yamuna gets snowmelt water and so it is perennial.

The Climate

The state of Haryana owes its climate to its continental location, being over 1600 km away from the Arabian Sea, and between the Thar Desert on the west and the Himalaya in the north. It can be classified as sub-tropical, arid to semi-arid, continental and monsoonal climate. Haryana is represented by the three Agro-ecosystems. A very small portion in the North hilly fringe of Shivaliks along the northern boundary of the state has Sub-humid Agro-ecosystem mainly in the Panchkula and Yamunanagar districts. It is hot sub-humid (dry) ecological region having alluvium-derived soils with a growing period of 150-180 days. It is undulating and sloppy and mainly rainfed.The parts of the districts of Panchkula and Yamunanagar and the districts of Ambala, Kurukshetra, Kaithal, Karnal, Jind, Panipat, Rohtak, Sonepat, Jhajjar, Rewari, Gurugram, Nuh and Faridabad fall in Semi-arid ecosystem. It is northern plain including the Aravalli having semi-arid eco region with alluvium-derived soils with a growing period of 90 to 150 days. The annual rainfall in this part varies from 550 to 1100 mm, with 25 to 55 rainy days and 25 to 45% coefficient of variation. The annual potential evapo-transpiration ranges from 1250 to 1500 mm. Remaining south-western part of the state in falls in arid ecosystem. It comprises of the districts Mahendergarh, Bhiwani, Hisar, Fatehabad and Sirsa. It is hot arid eco-region having desert soils with problem of salinity and with a growing period of less than 90 days. The annual rainfall varies from 300 to 550 mm with a coefficient of variation of more than 45% with less than 25 rainy days and 1500 to 1600 mm of annual potential evapo-transpiration. It encompasses almost all the desert and drought prone areas of the state.

The Soil Resources

The state soils are developed from alluvium in the plains, the detrital and alluvial materials in northern sub-mountain tracks, an aeolian material in the extreme western fringe and an alluvium modified by aeolian activity in southern and south western part of the state. Taxonomically, Inceptisols are dominant soils occupying about 58% of the area followed by Entisols (28%), Ardisols (9%) and Alfisols (2%). Texturally, fine loamy soils are dominant and cover 43% of the area, coarse loamy soils cover 34% and sandy soils 23% of the total area. In the state soils are also prone to

degradation like erosion by wind and water up to about 20 per cent. The organic matter content and productivity of the soils are low thus requirement of exogenous application of the same is must to compensate. Degradation of soils due to redistribution of salts in the profile have further aggravated the scenario and as such current agricultural practices are proving unsustainable and challenge to natural resources in the state. The pattern of land utilization is depicted in Table 6 below.

Table 6: Changing pattern of land use in Haryana (Area in '000 ha) during 1993-94 to 2013-14

Sr. No.	Particulars	1993-94	..1998-99	2003-04	.2008-09	2013-14
1	Net area sown	3513 (80.3)	3628 (82.9)	3534 (80.7)	3576 (81.7)	3497 (79.9)
2	Area sown more than once	2302 (52.6)	2692 (61.5)	2854 (65.2)	2924 (66.8)	2974 (67.9)
3	Total cropped area	5815	6320	6388	6500	6471
4	Forest	167 (3.8)	115 (2.6)	45 (1.0)	.39 (0.9)	35 (0.8)
5	Land put to non- agricultural uses	322 (7.3)	350 (8.0)	432 (9.8)	470 (10.7)	537 (12.2)
6	Barren and uncultivable land	91 (2.1)	89 (2.0)	100 (2.3)	103 (2.4)	125 (2.9)
7	Current fallows	209 (4.7)	143 (3.2)	192 (4.4)	105 (2.4)	101 (2.3)

Note: Figures in parentheses are in percentages except total cropped area as it is more than total area.

2.2 Water Resources and Availability in Haryana

Availability and utilization of the water resources play a key role in improving and sustaining the agricultural production, especially in the regions of arid and semi-arid climate. By nature, Haryana state is in a disadvantageous position with regard to rainfall, surface water quantum and ground water quality. About 50 % of the area in the state has a semi-arid climate in the eastern zone while the other 50% has an arid climate in the western zone.

On an average, Haryana receives 545 mm rainfall annually, against the evaporative demand of 1550 mm. This rainfall is highly erratic both in quantity and in distribution and about 80-85% of it is received during the monsoon months of July to September. At present the potential utilizable surface and ground water resources has been estimated at 2.75 million hectare m; surface 1.51 and ground water, including marginal quality, 1.24 million hectare m. Beside this, effective rainfall for meeting the consumptive use demand has been estimated at about 1.0 million hectare m.

In 2000, gross irrigation requirement (excluding effective rainfall) for the projected cropping pattern and a total cropped area of almost 6.2 million ha (including double cropping) has been estimated at 4.6 million hectare m. In addition to agricultural water requirements, the demand for other uses such as municipalities, industries, forestry and livestock is expected to be about 0.2 million hectare m. The total potential availability is, therefore, only 60% of the future water requirement of the state.

The quality of ground water in more than 66% area is brackish. Under such situations, good crop yields without supplementary canal irrigation are rarely possible even in *Kharif* monsoon season. In spite of all these, since 1966 the net irrigated area has increased from 1.3 to 2.89 million ha (i.e. 1.44

million ha from canal + 1.45 million ha from ground water) and number of shallow tube-wells from 25 thousand to 5.89 lakhs. In the process of exploiting various resources certain imbalances and anomalies are emerging. Two such major problems are:

(i) In the central and south-western region having brackish ground water and no natural drainage outlets, canal irrigation has led to the problem of water table rise, water logging and flooding and secondary soil salinization and

(ii) In the eastern region and other areas with good quality ground water with deficient canal irrigation; the water table is continuously declining. Major problems of the region are scarce canal water availability and its uncertain and erratic supply, poorly distributed and highly undependable rainfall pattern. Inadequate natural drainage and lack of gravity outlet rise in water table of brackish ground water in canal irrigated areas and falling water table in some part of the region are other major problems. In addition to these, some areas of the region have highly permeable soil and undulating topography. Poor irrigation efficiency, higher seepage losses from conveyance system, poor land development and unscientific utilization of irrigation water are the other problems.

The major irrigation water requirements of the region are met from the surface and ground water resources, in addition to the effective rainfall received during the crop season. The surface water supply is made through canal networks, which receive water from storage reservoirs, or through diversion headwork. The two major irrigation systems, West Yamuna and Bhakra canal supply surface water to canal system in Haryana. The ground water is exploited through a battery of mainly shallow tube wells. Out of total 2.50 m hectare m foreseeable water, the present utilization is 1.80 M hectare m. The amount in cm/hectare of water ground water usage is substantially less compared to canal water giving higher efficiencies.

Water Availability

Haryana has made significant strides in bringing its cultivable area under irrigation. Now more than 86% area is being irrigated either by the canals or by Tube Wells. Tube-well irrigation is predominant in Ambala, Faridabad, Gurugram, Karnal, Kurukshetra, Kaithal, Mahendragarh, Panipat, Rewari, Sonepat and Yamunagar districts. The flow of ground water in Haryana is from Northeast to southwest and in further southwest, the flow is from South to northwest indicating the convergence of ground water flow in the inland drainage basin. Limited exploitation of brackish ground waters is aggravating the problem of water table rise and secondary soil salinization in the central and western parts of the state. The ground water level situation during the last 25 years has changed drastically depending upon its exploitation and recharge. In 1976 ground water level was shallowest (4.5 m) in Sonepat districts followed by Panipat and Karnal and the deepest (22.9 m) in Bhiwani followed by Mahendragarh and Sirsa. Presently it is shallowest (2.64 m) in Rohtak followed by Ambala, Jhajjar and Sonepat, while deepest (23.55 m) levels in Mahendragarh followed by Bhiwani and Kurukshetra.

Ground Water Issues

Ground water is the second main source of irrigation water in Haryana and is pumped out though a battery of nearly 6 lakh tube-wells. In spite of the fact that about two third of the ground water is brackish, about 50% (1.44 M hectare) of the total irrigated agriculture is dependent on tube-well irrigation (Table 7). The present ground water development in the state is > 90% and the average number of tube-wells is 15 per km^2. Presently the development of ground water resources (as a percentage of recharge) ranges from 30% in Rohtak to 105% in Yamunanagar district in eastern zone

Table 7: Water resource availability and irrigation demands in Haryana

Components	Eastern zone	Western Zone	State
Geographical area, m hectare	2.13 (48.4%)	2.26 (51.6%)	4.39
Annual rainfall, mm	550-1100	300-550	545
Annual PET, mm	1250-1550	1500-1600	1450
Aridity index, PET-RF/RF	<0.66	>0.66	
Net irrigated area, m hectare	1.48	1.40	2.89
Canals	0.512	0.93	1.44
Tube wells	0.97	0.46	1.44
Consumptive use, m hectare-m	2.16	1.29	3.45
Effective rainfall, m hectare-m	0.58	0.39	0.98
Net irrigation requirement, m hectare-m	1.64	0.91	2.55
Gross irrigation requirement, M hectare-m	2.14	1.61	3.75
Present availability, m hectare-m	0.81	1.03	1.84
Surface water	0.36	0.72	1.09
Ground water	0.43	0.28	0.70
Irrigation water deficit, m hectare-m	1.30	0.52	1.82
Ground water quality	Fresh	Brackish	-
Water table, cm/year	(-) 6-56 fall	(+) 3-28 rise	-

with an average value of 77%. In the western zone it ranges from 30% in Sirsa to 85% in Rewari district with an average value of 52%. According to Central Groundwater Board (CGB) out of a total of 108 blocks in the state, in 46 blocks the ground water development exceeds the 85% limit. These areas exhibit a declining trend in ground water table. In the central and western parts comprising Hisar, Sirsa, Bhiwani and parts of Rohtak and Jind districts, the exploitation of ground water is less than 50% mainly due to its brackishness and sufficient canal water supplies; the water table is rising at a faster rate. The ground water quality in the state has been classified into (a) good 37%, (b) marginal 8% and (c) poor 55%. About 20% of the poor quality water is saline, 35% is sodic and 45% is saline sodic. This ground water is being exploited through deep (3100) and shallow (5.86 lakhs) tube-wells. As a result of this the net irrigated area has increased to 2.89 million hectare, which is 81.4% of the net area sown.

Tube-well irrigation is predominant in Ambala, Faridabad, Gurugram, Karnal, Kurukshetra, Kaithal, Mahendragarh, Panipat, Rewari, Sonepat and Yamunagar districts. The flow of ground water in Haryana is from Northeast to southwest and in further southwest, the flow is from South to northwest indicating the convergence of ground water flow in the inland drainage basin. Limited exploitation of brackish ground waters is aggravating the problem of water table rise and secondary soil salinization in the central and western parts of the state. The ground water level situation during the last 25 years has changed drastically depending upon its exploitation and recharge. In 1976 ground water level was shallowest (4.5 m) in Sonepat districts followed by Panipat and Karnal and the deepest (22.9 m) in Bhiwani followed by Mahendragarh and Sirsa. At present it is shallowest (2.64 m) in Rohtak followed by Ambala, Jhajjar and Sonepat and the deepest (23.55 m) levels in Mahendragarh followed by Bhiwani and Kurukshetra.

▪ Demand and Supply of Irrigation Water

The present use of surface water is to the tune of 0.94 M hectare-m and the ground water is 0.65 M hectare-m (Table 8). Thus, the total availability of the irrigation water is 1.59 M hectare-m at the source. Besides this, the state receives about 0.98 M hectare m of effective rainfall. The total consumptive use of the state for the prevalent cropping pattern has been estimated to be 3.39 M hectare-m and the net irrigation requirement at the field level comes out to 2.40 M hectare-m. Availability of canal water
and ground water at field head is 0.6507 and 0.6813 M hectare-m, respectively. Accordingly, the net deficit of water at field head comes out to be 1.07M hectare-m. This huge deficit can only be met partly when state's share of Ravi-Beas water of 0.42 m hectare becomes available and by increasing the conjunctive use of marginal quality ground waters. The water deficit in Hisar, Sirsa and Rohtak districts is <20%, whereas, Mahendragarh, Bhiwani, Rewari, Panipat, Kurukshetra and Ambala districts it is >70%. The overall deficit of irrigation water in Haryana has been estimated to be 52%. Realizing that exploitable water is scarce and its development is very costly hence, to derive the full benefits from the irrigation potential there is an urgent need to utilize the water judiciously through appropriate irrigation water management, for sustainable crop production and maintaining soil health.

Table 8: Crop water requirement, effective rainfall, irrigation requirement, canal and ground water availability, and water deficit in Haryana (million cubic meters)

Districts	Crop water requirement	Effective rainfall	Irrigation requirement	Water availability		Deficit (%)
				Ground	Canal	
Ambala	1680	560	1120	213	11.7	895 (79)
Yamunanagar	1493	581	911	270	10.8	630 (69)
Kurukshetra	1929	775	1154	192	67.5	895 (77)
Kaithal	2572	159	2413	549	583.2	1281 (53)
Karnal	2371	820	1550	846	97.2	608 (39)
Panipat	1806	603	128	277	151.2	855 (75)
Sonepat	1245	362	882	365	144.9	372 (42)
Rohtak	1669	587	1082	318	664	100 (09)
Jhajjar	1256	370	886	213	398	275 (31)
Faridabad	4361	510	850	334	162.0	354 (41)
Gurugram	1286	531	754	315	21.6	417 (55)
Rewari	1054	322	731	171	24.3	538 (73)
Mahendergarh	1153	403	749	191	270.0	534 (71)
Bhiwani	2618	702	1916	262	540.0	1384 (72)
Jind	2504	667	1836	648	2362.5	648 (35)
Hisar	4909	1293	3616	767	1262.5	487 (13)
Fatehabad	1245	322	923	216	524	183 (20)
Sirsa	1648	292	1356	360	758	238 (18)
TOTAL	33886	9816	24019	6507	6813.0	10692(52)

As in organic farming soil cover is advocated as mulching, the requirement of water is substantially reduced. Brackish water can be portable if rainwater harvested is used as recharging the profile and the strategy has been successfully demonstrated in Sirsa, Hisar and Fatehabad districts. Use of dung mixing in brackish water and irrigating the field with spiral power machine has found good for the

grain and flower crops. The use of pressure irrigation in undulating topography and sand dune areas found viable technology in terms of higher water use efficiency and saving of energy for almost all the cropping system. Other methods such as in-situ conservation, use of ridge and furrow methods, alternate furrow method and paired row has been found more economical over the flood irrigation. Even rice can be grown on wet and dry method. Application of water at critical stages of crops is also a viable option but it has some technicalities

2.3 Cropping Systems

As per the data compiled by the Haryana Agricultural University (Sunita *et al*. 2017) wheat, barley, jowar, bajra, maize, cotton, pulses and oilseeds were the dominant crops but with the passage of time, there has been a substantial change in the cropping pattern of the state. Area has increased only in case of rice, wheat and barley while the area under other crops like jowar, bajra, maize, cotton, sugarcane, pulses, oilseeds etc are in declining trend (Table 9). The area under total pulses declined sharply from 440.5 thousand ha in the period 1993-98 to 133.68 thousand ha during 2003-13. With the expansion of irrigation facilities, extensive use of improved high yielding variety (HYV) seeds, fertilizers, plant protection chemicals and mechanical power, there had been a shift of area in favour of more remunerative and less risky crops like wheat and paddy.

Contrarily, the area under coarse cereals (jowar, maize and barley) had declined during the same period. Sugarcane and cotton showed overall negative growth rate in area significantly during the same period (Table 9). The decrease in area of other crops like bajra, maize, gram, sugarcane, sunflower, etc was due to risks associated with them, may be due to fluctuating production and prices. Enhanced pay-off from superior cereals (rice and wheat) as a result of popularization of yield raising technologies coupled with the policy of assured market clearance at remunerative price pursued during that time is responsible for the diversion of area towards these crops from technologically lagging coarse cereals and pulses. Total food grains showed a positive growth rate of 0.56%, even though this group includes pulses also which showed a negative growth rate but contribution of cereals was more than pulses thus, overall food grains had a positive growth rate (Table 9).

Table 9: Compound growth rates of Area of major crops (%/ annum) in two decades 1993-2013

Crops	1993-2003	2003-13	1993-2013
Rice	2.64*	2.43*	2.10
Jowar	-1.97*	-5.74	-3.97
Bajra	0.03	-3.51	-0.75
Maize	-6.54*	-6.79*	-5.56
Wheat	2.12*	0.97	1.27
Barley	-5.54*	4.92	0.19
Total cereals	.1.70*	0.68	1.05
Gram	-18.10*	-6.59*	-8.40
Total Pulses	.-14.07*	-6.68	-6.71
Total Food grains	0.48	0.46	0.56*
Rapeseed and Mustard	.-0.42	-2.70*	-0.08
Total Oilseeds	-1.09	-2.88*	-0.34
Cotton	-1.65	0.07	-0.76*
Sugarcane	2.81*	-4.43*	-2.65*

Note: *Significant at 5% level of probability

2.4 Production Patterns

Haryana has witnessed remarkable increase in food grains production since 1993-94 (Table 10). The compound growth rate of paddy was 2.94% during the time period 1993-2003 and 2.80% during 2003-13. The compound growth rate of wheat was almost same in both the time periods. Although, the total production of food grains is increasing continuously, in case of pulses it is declining. A negative growth rate is shown in case of jowar, maize, barley, gram, total pulses and cotton during the time period 1993-2003, while there has been a negative growth rate in case of maize, gram and sugarcane in the second decade, i.e., 2003-2013. The overall positive growth rate in production, i.e., from 1993-94 to 2013-14 has been noticed in almost all the crops except maize, gram, total pulses and sugarcane. Some crops showed increased production irrespective of change in area such as cotton, rapeseed mustard, jowar, bajra, etc. In case of cotton this change has occurred due to introduction of Bt cotton while in jowar the reason was its property of extreme drought tolerance. In case of bajra, hybrids played a major role in increasing production.

Table 10: Compound growth rate of Production of major crops (% / annum) during 1993-2013

Crops	1993-2003	2003-13	1993-2013
Rice	2.94*	2.80*	3.45
Jowar	-2.78*	.1.99	.1.87*
Bajra	2.41*	1.58	3.24*
Maize	-2.85	.-5.08*	.-3.80
Wheat	3.33	3.38*	2.51
Barley	-5.07*	8.96*	2.09*
Total cereals	3.14*	3.22*	2.80
Gram	-20.94*	-2.40	-8.23*
Total Pulses	-17.94*	1.33	-5.20*
Total Food grains	2.59*	3.16*	2.56
Rapeseed and Mustard	1.23	1.76	1.81*
Total Oilseeds	0.16	1.52	1.40
Cotton	-2.31	2.86	4.0*
Sugarcane	3.03*	-2.24	-0.96

Note:* Significant at 5% level of probability

2.5 Growth in Yields

Compound growth rate in yield of different crops in Haryana are shown in (Table 11). The productivity of each crop has increased during the time period till 2013-14. It will be worthwhile to mention that yield of jowar, gram and ultimately total pulses have shown a mixed trend of increase and decrease. For example, jowar has negative growth rate, i.e., -1.44% during 1993-2003 while the same crop has a positive growth rate of 8.63% during 2003-13. This crop has an overall positive growth rate of 5.89% during the whole study period. Similarly, gram has -3.46% growth rate during first decade and a positive growth of 4.45% in the next decade and overall 0.17% during the study period.

Table 11: Compound growth rates of Yields of major crops (% /annum) during 1993-2013

Crops	1993-2003	2003-13	1993-2013
Rice	0.29	0.36	1.32*
Jowar	-1.44	8.63	5.89
Bajra	2.38	5.29	4.03
Maize	3.97*	1.57	1.96*
Wheat	1.18*	2.38	1.22
Barley	0.49	3.76	1.87
Total Cereals	1.41	1.76	1.48
Gram	-3.46	4.45	0.17
Total Pulses	-4.51*	1.34	-0.45
Total Food grains	2.10*	2.50*	1.93
Rapeseed and Mustard	2.16	4.62*	,2.07*
Total Oilseeds	.1.27	4.51*	1.75*
Cotton	6.82*	1.94	6.96
Sugarcane	0.21	2.26*	1.72

Note:* Significant at 5% level of probability

2.6 Status of Production, Supply and Utilization of Organic Resources

▪ Crop Residue Management

As per National Policy on Crop Residue Management, Haryana generates 27.83 million tons of crop residue. Out of which 11.22 million tons is surplus and prone for burning. As per broad estimates nearly 81% of the surplus residue is burned. To curb the menace Government of Haryana adopted two-pronged strategy and (a) notified prohibition of agri-residue burning and as per state administration, this has been effective and (b) public awareness drives, education campaigns and enforcement through village-level officials. The state is considering to setup paddy-straw-based biomass power project, along with procurement market and supply chain and promotion of bio-fertilizer plants using biomass. As a result in Haryana about 29.5 percent reductions in stubble burning practices observed in 2018 as compared to 2017.

▪ Bio-fertilizers and Bio-pesticides

Although there is no reliable data on quantum of biofertilizers and biopesticides being produced and utilized in the state, but state has adequate supply resource for biofertilizers and biopesticides from its own production units and from nearby states. Bio-fertilizers are available in all the four forms viz: moist powdered carrier based, liquid, granulated and lyophilized dry powder. Carrier based and liquid formulations are most popular and widely used. Biofertilizers being used are Rhizobium, Azotobacter, Phosphate solubilizers (PSB), potash mobilizer (KMB), zinc solubilizers and Consortia of Azotobacter+PSB+KMB. PSB and consortia biofertilizers are most predominant. Among bio-pesticides, *Bacillus thuringensis, Trichoderma viride, Pseudomonas fluorescens, Metarhizium anisopliae, Bauveria bassiana, Verticillium lecanii* and *Paeciliomyces lilacinous* are most predominant and are being used widely. But compared their chemical counterparts their use is very small and may be limited to 3-4% of available potential.

▪ Bio-fertilizers and Bio-pesticides Production and Research at Agricultural University

Bio-fertilizers- Department of Microbiology, CCS Haryana Agricultural University has one of the oldest biofertilizer production unit in the country with an installed capacity of 50,000 lit/ annum and is supplying quality liquid biofertilizers to the farmers. All type of biofertilizers are being produced.

Bio-pesticide- Department of Entomology, CCS Haryana Agricultural University has established a biopesticide laboratory for mass culture of entomopathogenic fungi, *Beauvaria bassiana* and *Lecanicillium lecanii.* Farmers are being provided these biopesticides on demand from farmers and institutions.

▪ Organic Manures/ Organic Fertilizers

Production and supply of organic manures and organic fertilizers is insignificant and mainly restricted to us of FYM by farmers from their own resources. Vegetable farmers are also using manures generated by Gaushalas. Department of Agronomy, CCS Haryana Agricultural University, Hisar has established a demonstration Vermicompost Production with a production capacity of 100 Quintals. This production unit is being used for research purpose and for demonstration of the production technology to entrepreneurs and farmers.

2.7 Institutions for Quality Assurance

▪ Certification Bodies

For certification of farm, livestock and food processing, 29 certification bodies have been accredited under National Programme for Organic Production being operated by APEDA. All these certification bodies are authorised to operate Pan-India. Out of them two certification bodies namely Ecocert India Pvt Ltd and SGS India Pvt Ltd are located in Haryana.

▪ PGS India Regional Councils

As per PGS-India website, there are 11 active Regional Councils in Haryana and all of them are under Department of Agriculture and Farmers Welfare of Haryana. Besides, there are seven private Regional Councils having their jurisdiction in Haryana. Interestingly out of total 45 PGS groups registered on website only five are serviced by Departmental RCs while remaining are being managed by private RCs. List of groups and RCs is attached at Annexure 1.

▪ Testing Laboratories

Haryana is having good network (No.) of food testing laboratories :

- Laboratories authorised for food quality testing by FSSAI : 14
- NABL accredited laboratories for food and pesticide residue : 03
- Laboratories approved by APEDA : 03
- Government Laboratories for pesticide residue testing : 03

In Haryana there is no APEDA approved laboratory for organic food products testing. Government residue testing laboratories viz: Central Insecticides Lab at Faridabad, Institute of Pesticide Formulation Laboratory, Gurugram and Pesticide Residue Testing Laboratory at CCS HAU Hisar are being used pesticide residue monitoring in crops. List of food testing laboratories located across India in Annexure 2 and in Haryana and approved by FSSAI, NABL and APEDA is given at Annexure 3.

2.8 Institutions for Research on Organic Farming

▪ Deen Dayal Upadhyay Centre of Excellence for Organic Farming

Chaudhary Charan Singh Haryana Agricultural University, Hisar has established "Deen Dayal Upadhyay Centre of Excellence for Organic Farming" on 31 October, 2017. The centre has been setup with the objective to popularize organic farming in the state. This organic farm spreads over approximately 150 acres of land, where farmers will be trained in organic farming as incubate and they will be extended scientific information on organic farming, marketing, storage and post-harvest technology. The sub-surface drainage, automated micro-irrigation, organic orchard, bio-agent production, incubation programme, organic certification facilities and infrastructures are under developmental stage at the centre.

▪ Organic Vegetable Farm at Centre of Excellence on Vegetables

Department of Horticulture, Government of Haryana has established an organic vegetable production farm at Centre of Excellence on Vegetables at Gharaunda, Distt. Karnal. Seven vegetables in rabi and six vegetables in kharif season are being successfully cultivated on this farm with comparable productivity. This farm is also being used as a training centre for farmers of Haryana and other states on organic vegetable production. Package of practices developed at this centre for 13 vegetable crops are given at Annexure 5.

2.9 Area and Production under Certification Systems in Haryana

▪ Under National Programme for Organic Production (NPOP)

As per the data compiled by APEDA the area under organic certification process in Haryana was as follows during the last six years:

2012-13	7562.16 ha	2015-16	4889.20 ha
2013-14	3865.33 ha	2016-17	5031.76 ha
2014-15	6783.21 ha	2017-18	6872.14 ha

Important crops being managed organically are Basmati and non-basmati rice, wheat, vegetables, and some herbal and medicinal plants. Category wise production of different crops under organic certification is shown in Table 11.

Table 12: Production of some important commodities during 2016-17 and 2017-18

S.No.	Commodity	Quantity (Tons)	
		2016-17	2017-18
1.	Basmati rice	675.3	1242.4
2.	Non-Basmati rice	210.0	514.8
3.	Wheat	191.6	0.0
4.	Medicinal and Herbal (mainly Mentha and Tulsi)	3998.8	1379.0
5.	Spices and Condiments	3022.8	1099.2
6.	Pulses	48.5	15.0
7.	Millets	0.5	10.0

- **Under PGS-India Programme**

Under *Paramparagat Krishi Vikas Yojna* (PKVY) 20 hectare clusters are being developed through PGS certification. In first phase 20 clusters are being developed (Table 12). The identified commodities and potential districts for organic production in Haryana are shown in Table 13.

Table 13: Details of clusters and villages under PGS India Programme

Sr. No.	Name of district	Number of Clusters	Name of Villages
1	Gurugram	2	Farruknagar, Pataudi
2	Hisar	2	Ladwa, Muklan, Kumbha, Kumbha Khera
3	Jind	2	Shahpur, kaliramana, Igrah, Rajpura, Kharak Ramji, Alewa, Chuhadpur, Bhongra, Mohangarh Chhapra, Baroda, Nidana, Julhera, Rajgarh Dobi, Narwanna, Frain Kalan, Belarakha, Nepewala, Badanpur Jamni, Gangoli, Kharak Gagar, Pillu Khera, Dhatrath, Bhombheva, Hadwa, Budhakhera, Bahadurgarh, Jaipur, Nimnabad, Kurar, Malikpur, Sillakhera, Haat
4	Jhajjar	2	Shelanga, Chhara
5	Kaithal	1	Kheri, Sikandar
6	Kurukshetra	2	Mirzapur, Salempur, Ladwa, Barahan, Mehra, Budha, Haripur, Niwarsi
7	Nuh	2	Sangel, Ujina
8	Mahendergarh	2	DonghraAhir, RuthalGarhi
9	Panchkula	1	BhurjKotia
10	Palwal	2	Rajupur Khadar, Tikari Gujjar
11	Sirsa	2	Dabri, Thedi Baba Sawan Singh, Sikanderpur, Rasulpur, Sangar Sarista, Kharian, Bhuna, Jodhpuria, Shottar, Peerkhera

Table14. Identified commodities and potential districts for organic production

Cropping system/ Crop commodities	Districts
Sugarcane + garlic/ onion + mustard/ wheat	Sonepat, Panipat, Rohtak, Karnal, Yamunanagar
Rice-wheat	Yamunanagar, Ambala, Kurukshetra, Panipat, Karnal, Sonepat, Rohtak, Jind
Maize-wheat-vegetable	Karnal, Yamunanagar, Panchkula
Cotton+ moong- wheat	Sirsa, Fatehabad, Hisar, Bhiwani
Bajra+moong+moth-wheat/ barley	Rewari, Gurugram, Mahendergarh, Nuh
Jowar-wheat	Rohtak, Sonepat, Jhajjar
Kharif vegetables	Rohtak, Sonepat, Panipat, Faridabad, Jhajjar, Gurugram and Palwal

SECTION 3

Organic Farming in Haryana

3.1 Need from the National Perspective

With the growing awareness among consumers for safe and healthy food, the demand for organic products is growing world over and consumers are demanding organically grown products. This consumer driven market has created the present-day standards based organic farming. To ensure the credibility and infuse confidence about the quality in consumers, certification systems have come in to play prominent roles. Off-late growing concerns for declining soil health and fertility, depleting natural resources such as water and growing contamination in food and water bodies have also created global alarm and scientists and policy makers are searching for alternatives to address the problems.

Organic agriculture is fast emerging as one of the viable and practicable solution to all such ills and is promising sustainability of systems with resource conservation and optimum productivity with quality. Many states have defined policies for promotion of organic farming and systematically promoted their farmers to popularize the organic methods of cultivation not only to address the concerns of sustainability and health but also to benefit from growing market demands promising premium prices.

3.2 Need from the Haryana State Perspective

The ecological foundations essential for sustained advances in agricultural productivity, such as soil, water, biodiversity and forests are under severe anthropogenic threats in Haryana. The capacity of ecosystem to support the human and farm animal population has been exceeded in many parts of the state. The quantity and quality of groundwater, which is now the dominant source of irrigation water, is fast deteriorating. Fodder and feed production are also not adequate. Free grazing of animals is almost nil in most of the districts. Compounding current problems, the possibility of adverse changes in rainfall, temperature and sea level due to global warming and climate change is now serious challenges.

In the area of farm economics, resource flow to the agriculture sector is declining, and indebtedness of small and marginal farm families is rising which constitute about 68% of the total farming community in the state. Input costs are increasing, while factor of productivity is declining. The cost-risk-return structure of farming is becoming adverse, farming families operating small holdings, sharecroppers, since the resource-poor families cultivating 1 to 2 hectares (hectare) or less are unable to benefit from the power of scale at either the production or post-harvest phases of farming. Both meteorological and marketing factors influence the well-being of small farm families, who lack the capacity to withstand the shock of either crop failures or uneconomic market prices for their produce.

A technology “fatigue” has further aggravated farmers’ problems, since the smaller the farm the greater is the need for sustained marketable surplus, in order to have cash income. Linkages between the laboratory and the field have weakened and extension services have often little to extend by way of specific information and advice on the basis of location, time and farming system. Good quality seeds at affordable prices are in short supply and spurious formulated pesticides and bio-fertilizers are being sold in the absence of effective quality control systems. Input supply is in disarray, particularly in dry farming areas.

Micronutrient deficiencies in the soil as well as problems relating to soil physics are crying for attention. Farmers have no way of getting proactive advice on land use, based on meteorological and

marketing factors. The serious attempts are yet to be made in rural areas to launch movements for quality literacy (sanitary and phytosanitary measures and Codex Alimentarius standards of food safety, now FSSAI), trade literacy (likely demand-supply and price situation), legal literacy (IPR, Farmers' Rights), and genetic literacy. On food quality front frequent reports of increasing chemical residues in food is indication of growing menace of indiscriminate chemical usage for higher productivity. Surprisingly, it is not that the farmers are not aware, but the greed for higher returns on the cost of highly subsidized fertilizers are compelling them to close their eyes for produce that they are producing for market.

Ironically, realizing the problems of chemical residues in food many of the farmers have started cultivating about half to one acre of land using traditional non-chemical practices for their own consumption. Many of the farmers have also embraced the organic farming and have not only became the role model for replication but have also started reaping the benefits by linking with premium market chains.

3.3 Can Organic Farming be a Solution?

No wonder the myth prevailing in the mind that gap in yield between conventional and organic produce is very wide, is keeping most of the farmers, scientists and planners away from the organic approach. But fact is that organic research never been planned before, therefore, the myths are premature and just an assumption. India is fighting tough battle at WTO against subsidies in conventional farming which can be easily overcome if organic farming is advocated. Therefore, state like Haryana is having very high potential for various crops (basmati rice, wheat, cotton, oilseed, sugarcane, fodder crops, legumes, medicinal herbs, vegetables, floriculture, fruits and agroforestry) to be cultivated under organic farming. Adoption of organic farming will leave no burden of financial crises like NPA and will be healthy and happy family opportunity both for producers and consumers.

In view of it, now is the high time that Government define appropriate policy for systematic promotion of organic farming to achieve twin goals of sustainability and economical profitability. Delhi-NCR being the largest market for organic food is ready to accept bulk supplies. Haryana being the closest neighbor, can be the ideal supplier for non-perishable and perishable commodities. But this will require government intervention to plan for production, processing and supply chain development. Therefore, to put in place an enabling policy framework for promoting organic farming in the state, there is an urgent need to bring out a policy document to launch concerted efforts in a systematic manner for the effective, sustainable and profitable promotion of organic farming strategies in a value chain development mode.

3.4 Constraints in Adoption of Organic Farming

Based upon large number of opinions and feedback from practicing organic farmers and farmers having inclination to switch over to organic farming, following constraints have been identified:

- **General Constraints**
  - ❖ Fear of low productivity
  - ❖ Being costly have limited demand in market and limited consumers
  - ❖ Being labour intensive cost of production is high
  - ❖ No processing and value addition infrastructure

- ❖ Small land holdings not suitable for organic farming
- ❖ Small and marginal farmers can not adopt due to habitat and other diversified production system requirement

- **Input constraints**

- ❖ On-farm input production is cumbersome and handling difficult
- ❖ Quality inputs are not available
- ❖ Non-availability of organic seeds biggest limitation
- ❖ Non availability of weed management tools
- ❖ Green manuring practices not viable in economic terms
- ❖ Risk of pests and diseases
- ❖ Regulatory systems inhibit the trade of organic and bio-inputs
- ❖ Fraudulent and malpractices by input producers in the absence of effective quality control
- ❖ Biofertilizers and biopesticides not very effective and not available

- **Technical constraints**

- ❖ No defined technology and package of practices on farming system mode
- ❖ Extension machinery is not trained for organic systems
- ❖ Practically no research and development support
- ❖ Organic certification systems suggest many don'ts but provide no solutions
- ❖ Weed and pest management biggest challenges
- ❖ Lack of proven technologies and no documentation on indigenous knowledge

- **Marketing and economic constraints**

- ❖ Organic farmers being thinly distributed have no access to markets
- ❖ No dedicated markets
- ❖ APMC acts also deterrent for direct marketing
- ❖ Lack of market intelligence and connectivity with bulk buyers and exporters
- ❖ Consumers are being charged hefty premiums but farmers are not getting due to middlemen
- ❖ Organic industry is still at infancy, needs lot of support from Governments

- **Technology related constraints**

- ❖ No organic management compatible breeding programmes, seeds and varieties
- ❖ Entire technology spred system is not friendly and lack confidence in organic practices
- ❖ Lack of master trainers and model organic farms
- ❖ Institutional systems are either absent or are very weak
- ❖ Organic farming schemes are being managed without foresight and no long term goals

- **Regulatory and certification related constraints**

- ❖ Compulsory requirement of certification under FSS Act 2006
- ❖ Certification is costly and mandates complex documentation and inspection protocols
- ❖ PGS certification is also not simple and excludes individual farmers
- ❖ Lack of knowledge about certification process

- **Constraints in accessing financial services such as subsidies, credits and insurance**

  - ❖ Credit is generally available only for improved technologies like hybrid crops, crossbred cows, etc., and not for sustainable farming practices
  - ❖ Organic farmer being self-reliant in inputs unable to access credits
  - ❖ Not benefitting from loan waivers
  - ❖ Huge subsidies available for conventional farmers (fertilizer subsidy) but no subsidies for organic farming, hence no level playing field

3.5 Suggested Strategy for Organic Farming Integration

- ❖ Developing self-sustainable, self-generating, local resource-based farming systems
- ❖ Ensuring efficient use of natural resources such as sunlight, on-farm biomass, rain-water, soil life and natural nutrient cycles
- ❖ Restoration and maintenance of soil health and fertility
- ❖ Restoration of diversity in all its life forms
- ❖ Prohibition of synthetic external inputs and genetically modified organisms
- ❖ Promoting local resource based environment friendly inputs and installing state specific quality assurance system
- ❖ Ensuring crop, livestock & other allied activities as integral part of overall farming enterprise
- ❖ Targeting development of commodity based, commercially viable clusters for production, aggregation, postharvest, value addition and processing in shortest possible value chain
- ❖ Empowering farmers with institutional development
- ❖ Linking farmers/ farmers' institutions with markets supported with state supported awareness campaigns, brand building and exposure to national and international markets

3.6 Need for Creating of a Policy Framework

Government should define organic farming promotion policy for Haryana which can be founded on following parameters

- ❖ Based on national vision, mission and objectives
- ❖ Building on the achievements and successes
- ❖ Learning lessons from the shortcomings and failures in past in the state and in other states
- ❖ Realizing the potential of dedicated institutions
- ❖ Creating new institutions for emerging challenges
- ❖ Assessing the requirements necessary for the development
- ❖ Targeting all aspects necessary for development
- ❖ Integrating traditional, scientific and farmer innovations
- ❖ Realizing the need for development in value chain mode
- ❖ Making all stakeholders, partner in the growth story
- ❖ Targeting step-by-step conversion with all support infrastructure in phased manner
- ❖ Creating a scenario where awareness is created for gradual elimination of usage of chemicals and integration of sustainable practices
- ❖ Providing necessary financial support for implementation of policy

SECTION 4

A. The Policy, Mission Objectives and Implementation Strategies

4.1 Policy Vision, Mission and Goals to Achieve Objectives

The organic farming policy should aim to provide an enabling environment for the growth of science-based environment friendly organic farming practices for the benefit of farmers, soils, resource pool, environment and citizens.

"Embracing organic farming to move towards sustainability, ensure resource conservation, instil long term soil health and fertility, provide safe and residue free food to citizens and provide rewarding opportunities for the farmers to reap the benefits of growing commercial prospects".

- Organic farming is accepted as mainstream agriculture with concomitant benefits to all its participating components and stakeholders
- At least 10% of the states' total agricultural land be targeted for transformation to organic by 2025
- Usage of synthetic agro-inputs is gradually reduced and potential of local on-farm resources is harnessed for sustenance of soil health, fertility and intact soil nutrient pool.
- Crop residue leading to environment pollution through burning must be effectively utilized for nutrient recycling
- Increasing area under organic farming contributes to sustainability with gradual buildup of soil health and fertility and reduces risks of food contamination.
- State becomes a role model for replication of value chain based commercially profitable organic production and processing clusters
- State becomes hub for organic food supplies, especially in vegetables, rice, millets, pulses and dairy products for Delhi and NCR
- Farmers are empowered through institutional development and become partners of the overall organic growth story
- Increased activities through farmer institutions, rural value chains and direct marketing, ensures increased employment opportunities
- "Haryana Organic" brand gets value in national and international markets
- State encourages investments for establishment of infrastructure facilities to process and market
- Appropriate regulatory mechanism to ensure quality and facilitate traceability, accountability and transparency across the value chain
- State contributing to national and global goals of sustainability, climate change mitigation, environment preservation and ensuring safe food to its citizens

4.2 Fundamental Policy Initiatives

To meet the overall goals of organic agriculture and sustainability it is essential that all the parallel and linked schemes and financial incentive of central and state Government are properly realigned to ensure planned implementation for (a) natural resource based organic agriculture (b) keeping soil

health, sustainability and productivity in focus (c) promoting resource conservation, (d) allocating adequate financial resources for supporting farmers for conversion and for level playing field (e) facilitating and supporting investments in quality, value addition and market linked infrastructure (f) supporting and creating infrastructure for certification, traceability, transparency and accountability (g) supporting setting up of farmers institutions and finally setting up of institutions for research, teaching, education, extension and market facilitation. To meet the goals many policies of other sectors, such as animal husbandry, dairy, poultry, fisheries, water resources etc may also need to be re-aligned and integrated with the organic farming policy.

4.3 Goals to Achieve the Mission Objectives

- Promotion of natural resource based organic agriculture to reduce debt burden of farmers
- Re-orientation of institutions to ensure continuous support through research, teaching & extension
- Maximization of production and productivity in concentrated clusters through suitable technologies and quality input facilitation
- Setting up of new institutions for single window coordination, scheme implementation, certification, value addition and market facilitation
- Promotion of resource conserving technologies and mechanization for biomass recycling, water use optimization, soil fertility management and energy generation
- Supporting organic input production infrastructure including seeds, manures, organic fertilizers, bio-fertilizers, bio-pesticides, growth promoters and pest management tools
- Ensuring crop & farm diversification for maximization of farm productivity and pest management
- Empowerment of farmers through cluster development and farmer institutions such as Farmer Producer Companies/Organizations
- Supporting farmer institutions for setting up of end-to-end postharvest value chain
- Developing model organic production clusters, model organic villages and model organic farms with end-to-end value chain up to marketing for replication
- Planned production to meet continuous market demand
- Development and promotion of “Haryana Organic” brand through print and electronic media
- Setting up of regulatory frame work and necessary digital platforms for certification, traceability, transparency and market connectivity
- Setting up of promotion and regulatory framework for innovation, assessment, quality control and evaluation of organic and biological inputs
- Enabling environment and support schemes for attracting investments in contract production, pack houses, organic ware houses, cold chain, processing facilities, controlled environment transportation and dedicated organic retails
- Enabling policies including changes in APMC act to facilitate direct marketing away from main market
- Enabling environment for investments in quality and residue testing laboratories to ensure flow of high-quality organic produce as per national and international standards for maintenance of integrity and credibility of “Haryana Organic Brand”

4.4 Setting up of State Organic Lead Agency

To spearhead the entire organic farming promotion program in the state and to create an institutional mechanism, that can act as nodal institute for all activities of organic farming promotion and development, State Government may consider setting up of a state level dedicated agency as State Organic Agriculture Mission (similar to State Horticulture Mission) or State Organic Agriculture Board (on the pattern of Uttarakhand Organic Commodity Board). The State Organic Agriculture Mission/ Board should have following (but not limited to) roles and responsibilities:

- Nodal agency for all organic farming activities
- Coordinate research and service institutions
- Facilitate transfer of technology and inputs
- Planning and implementation of all organic farming promotion activities including various schemes of central Government such as PKVY etc
- Technology transfer and capacity building through trainings, demonstrations and farmer field schools
- Input facilitation including seeds/ planting material, biofertilizers, bio-pesticides etc
- Internal control system management for third party certifications
- Nodal Regional Council for PGS certification
- Capacity building and networking of stakeholders for collection, aggregation, postharvest, value addition and processing of certified produce
- Facilitating partnerships and marketing tie ups for market linkages
- Facilitating and coordinating all regulatory issues for implementation of the programs
- Brand building, publicity, seminars/ conferences/ buyer-seller meets, auction meets and other market linked promotional activities.

4.5 Strengthening Institutions for Education, Research and Extension

Lack of technologies, various myths associated with organic farming for lower yields and lack of research and extension professionals is the biggest bottleneck in its promotion. Therefore, State Government should embark upon strengthening some of the existing institutions, creating new institutions and modifying the mandates of existing institutions to create first generation researchers, teachers and extension professionals

▪ Educational Course on Organic Farming

To create first generation extension professionals, state Government should explore possibilities for starting a post graduate/ graduate diploma course in organic farming under State Agricultural University and State Veterinary University. State government may also explore possibilities of including organic farming as one of the subjects in undergraduate course in the Agriculture University/ Horticulture University/ Veterinary University.

State Government may also introduce a chapter on organic/traditional farming in school curriculum for awareness on sustainability issues, resource conservation and safe food production. For skill development in farming systems, input production, postharvest processes, value addition, entrepreneurship development, certification systems and ICS management and trainings skill development. “University for Skill Development” may be considered for launching short term certificate and diploma courses

- **Centre of Excellence on Organic Farming Research**

Research is the backbone for continuous flow of technologies. State government may embark upon setting up of dedicated "Centre of Excellence on Organic Farming Research" with dedicated research farm and dedicated scientists with in-situ provisions of their career progression within their area of organic specialization under:

a. State Agricultural University
b. State Horticultural University
c. State Veterinary University

State may also launch few research fellowships exclusively for undertaking Ph.D. studies on various aspects of organic farming.

- **Identifying Research Strategies for Continuous Technology Support**

Some of the most important issues (but not limited to) requiring research support and technology protocol development that require immediate attention to kick start the organic farming strategies in the state are listed below.

- Development of cropping systems based production protocols, based upon on-farm and local resources
- Selection of organic management compatible varieties & planting material from the available germplasm
- Breeding of new varieties fit for organic production systems
- Development of agronomic protocols for organic management including raised beds, seed rates, planting densities and managing nutrient recycling under multiple cropping system mode including methodologies for use of crop residues as surface mulch
- Development of nutrient management protocols under diversified/ mixed farming systems with major focus on exploitation of natural and biological processes
- Development of diversified cropping systems for effective control of pests and diseases
- Improvement in organic inputs quality and production systems with major focus on on-farm production technologies
- Development of appropriate machines/ tools for organic farming operations
- Collection and documentation of successful practices developed by practicing organic farmers in the state and from outside the state
- Validation of soil enrichment and plant protection formulations developed by practising organic farmers/ NGOs and institutions.
- Validation of various systems of organic farming (such as natural farming, homa-farming, biodynamic farming etc) for their proper integration into integrated organic farming approaches with best productivity prospects.
- Identification, development and documentation of suitable post-harvest management and post-harvest storage practices.

- **Action Points for Research and Technology Development**

- Long term, medium term and short term projects targeted on scientific validation of organic farming practices, protocols, innovations
- Integration and consolidation of scientific manpower in organic agriculture that is capable of undertaking research on critical issues of technology validation, refinement and innovations.
- Agricultural/ Horticultural and Veterinary universities of the state should be encouraged to focus on research in organic agriculture.
- State Government may support projects on documentation, validation and refinement of technologies and practices for preparing package of practices, organic crop guides, organic agricultural systems guides etc
- State universities, including Skill Development university should be encouraged to launch diploma and certificate courses in organic agriculture, specially covering areas like input management, certification and inspection, supply chain management, retail marketing etc.

4.6 Creating Organic Krishi Vigyan Kendra

State Government may reorient the capabilities of some of its existing Krishi Vigyan Kendra to facilitate and strengthen the organic farming extension services. Such KVKs can also act as repository of Indian traditional knowledge systems (ITKS)

- **Documentation and Dissemination of Traditional Knowledge**

State Government may identify an institute for documentation of traditional knowledge developed by the practicing organic farmers across the country. Such document will be the repository of traditional wisdom, developed over centuries and will serve as guiding tool to achieve sustainable productivity.
State Government may also identify an institution to document and disseminate ethno-veterinary practices, including use of Ayurveda, Siddha and Homeopathy in animal health care system.

- **Development of Model Demonstrational Organic Farms, Organic/Bio-village and Organic Seed Production Centre**

For demonstration of technologies and ensuring easy availability of organic seeds state may convert one or two of its farms under SAU/SHU or under Department of Agriculture/ Horticulture as seed production-cum-demonstrational farms on organic agriculture.

Haryana state is proud of having many outstanding organic farmers, practicing organic farming. Farmers are known for their skills in technology development for high productivity in different crops. Strength of such farmers and farms can be exploited to transform them into model organic farms. On the similar lines state may also explore possibilities to convert some of the villages into eco/bio villages. This will also help to attract tourists from other parts of the country that will in turn help generation of additional revenue

SECTION-5

B. Promotion of Sustainable Organic Production Practices

5.1 Installation of Bio-diversity

- **Bio-diversity Initiatives at State Level**

As organic farming is multi-cropping system based, it will encourage multiple cropping system based integrated farming approach and help in instilling overall diversity. State Government should integrate multi-cropping system based organic farming in its priority extension activities and design appropriate strategies to incentivize farmers adopting integrated organic farming models. Universities and research institutions will be advised to develop compatible multi crop model, depending upon market requirements and local climatic conditions.

- **Bio-diversity Initiatives on Individual Farms**

Farmers should be advised and supported for creation and management of biodiversity. It can be permanent diversity through diversified plantation including nitrogen fixing plants such as *Gliricidia, Leucaena* etc as hedge rows or on the bunds and seasonal diversity by practicing multi-cropping, intercropping, strip cropping etc. This will not only increase farm productivity, harness nitrogen from air and micronutrients from deeper soil layers but will also contain the menace of insect pests and diseases. Government may also promote planting of pesticidal value plants under biodiversity programme for easy availability of raw material for botanical plant protection inputs

Diversity both in time and space (using both vertical and horizontal organization of crops) enable farmers to make use of the full range of micro-environment (which differ in soil, water, temperature, altitude, slope, fertility etc.) within field or region. Complexity is created by using a farm element to its optimum and wherever possible by way of informal cycling and recycling. Waste of one element or function will become input for another and consequently it will create a web of functional (symbiotic) interrelations.

- **Cropping System**

As organic farming is a cropping system based appropriate practices need to be developed for successful cropping systems. The crops like, pearl millet + moth bean + wild cucumber (medicinal) combination was found to be most beneficial in districts of Rewari, Mahendergarh, Charkhi Dadri, Bhiwani, Hisar and Sirsa. Similarly, sorghum + pigeon pea + cowpea was also found to be good crop combination, with minimum pest (pod borer) attack in pigeon pea. Selected examples of some successful cropping system are:

- Cabbage + red clover regulates Cabbage aphids
- Cotton + forage cowpea repels boll weevil
- Cotton + sorghum/maize repels boll worm
- Corn + sweet potatoes repels leaf hopers
- Peanut + maize repels corn borer.

5.2 Integration of Livestock and Allied Activities

Organic agriculture is a farming system approach comprising of agri/ horti/ agro-forestry crops, livestock, fisheries, poultry, apiculture and other activities, where each activity is supplementing and complementing the need of other. Farmers should be advised and supported for integration of all such activities.

- **Promoting Organic Livestock Farming**

Organic dairy products are the much-sought commodities as organic products. Keeping closeness to Delhi and NCR where there is ready market for such products, efforts should be made to promote organic dairies, organic poultry, organic goateries etc in the organic farming clusters. Local breeds should be specifically targeted for such programme as they fetch much higher prices.

Haryana is known for its Goshalas where huge cattle resource is available for production of cow urine and dung. Organic clusters can be developed along these Goshalas for supplementing and complementing each-others activities.

- **Promoting On-farm Production of Inputs**

Government should encourage and support creation of on-farm input production infrastructure for production of vermin-compost, compost, CPP, liquid manures, panchgavya and botanical pest management inputs etc.

5.3 Promoting Sustainable Practices and Resource Conservation Measures

State Government should promote and support sustainable practices such as no-till practices, biomass mulching, plastic mulching, use of happy seeders etc and any other practices leading to soil fertility buildup and conservation of resources such as crop biomass.

Government may also promote and support resource conservation measures such as rain water conservation and harvesting measures. Use of plastic pipes and sprinklers and drip irrigation systems should also be promoted.

Management of crop residue for soil health, fertility and nutrient recycling should be accorded high priority. Besides general crop residue management policies and support schemes such as subsidies on procurement of zero-till seeders, happy seeders, straw choppers, hay rakes, straw reapers, balers and super straw management systems, government should also emphasize on following organic farming friendly strategies to ensure that nutrients absorbed from the soil is returned back to the soil in the organic and biological form:

- Promotion of community compost production units
- Promotion of individual composting units in organic clusters
- Disseminating technologies for effective utilization of crop residue as surface mulch, especially in vegetables and crops taken on raised beds
- Promoting use of microorganisms such as waste-decomposers etc along with dung-urine slurries for quick degradation of residue

5.4 Promoting Renewable Energy Sources on Organic Farms

To make the organic farms/ clusters fully self-supporting, self-generating and self-sustaining, Government may support use of renewable energy sources such as solar energy for irrigation, drying, postharvest processing etc. Major emphasis o be given to renewable energy technologies like Biogas Plants, Solar Photovoltaic Technology, Biomass Gasification, Mini Hydro Power and Biofuel Technologies. The availability of energy is also essential for non-farm enterprises including Agro-processing. Government of Haryana has already introduced soft schemes for exploiting solar power as green energy for various uses. The construction of biogas plants needs to be promoted in large scale to have energy and fuel like CNG. Even bricks are can be prepared with biogas in Haryana.

5.5 Organic Management Practices developed at Centre of Excellence on Vegetables, Gharaunda, Haryana for selected Vegetable Crops

A. Package of Practices for some *Rabi* Vegetable Crops

a) Radish and carrot

Activity/ parameters	Package of practices
Land Preparation	Prepare raised beds after ploughing (two times) and harrowing (once)
Sowing time	Radish— last week of August to September Carrot – Mid September
Number of beds per acre	44 Beds length wise and 59 meter Bed Width wise, L-220 ft, W- 198 ft (Beds at base 110cm top 100cm), Distance between two beds 40 cm)
Distance	Between row to row and plant to plant 30 cm x 10 cm
Seed rate per acre	2.5 to 3.0 kg
Irrigation schedule	First irrigation just after sowing, then 30 minute irrigation daily through drip. In winter irrigate crop at 5-7 days with micro-irrigation
Nutrient management	• Manure 60q (or Vermicompost 30q) + neem cake 2.5q, Azotobacter 250 to 500 ml + PSB 250 to 500 ml at the time of last ploughing • Spray of 10 % Vermi wash two time at the interval of 10 days when crop is one month.
Seed treatment	*Trichoderma viride* @ 10g/kg seed or dip the seedling for 5 minutes before transplanting
Weed management	2-3 hoeings and weeding manually

b) Peas, Methi, Cabbage, Cauliflower and Tomato

Activity/ parameters	Package of practices
Land Preparation	Prepare raised beds after ploughing (two times), harrowing (once) and rotavator (once)
Sowing time	Peas – Mid September to November Cabbage – September to first week of November Cauliflower – Mid September to October Methi – Mid September to November Tomato – Last week of August to September
Number of beds per acre	44 Beds length wise and 59 meter Bed Width wise, L-220 ft, W- 198 ft (Beds at base 110cm top 100cm), Distance between two beds 40 cm)
Distance	Between row to row and plant to plant Peas and Methi – 30 x 10 cm; Cabbage and Cauliflower – 60 x 30 cm
Seed rate/ number of plants per acre	Peas – 25-30 kg Methi – 8-10 kg Cabbage and cauliflower – 150 to 200g/ 17336 plants Tomato – 50-60g/ 11537 plants
Irrigation schedule	First irrigation just after sowing/planting then 30 minute irrigation daily through drip for 30 days. In winter irrigate crop at 5-7 days with micro-irrigation
Nutrient Management, Seed/seedling treatment & Weed Management	Same as in case of Radish and carrot crops

c) Pest management in *Rabi* vegetable crops

Insect/Pests	Remedies
Aphids and jassids; Leaf minor and white fly	Spray *Verticillium lecanii* 5 to 7 ml + 3ml Neem oil/l of water
Pod borer and Semilooper	Spray *Beauveria bassiana* 10g + Neem oil 3 ml/l water, 2-3 times at the interval of 7 to 10 days or Neem leaf-garlic-chilly extract 25ml + 3ml Neem oil /l water
Powdery mildew	Spray Bio-dewcon 5 to 7 ml/l water 2-3 time at 10 to 15 day interval
Root rot/ stem rot and wilt	Drenching with *Trichoderma* 10g + *Pseudomonas* 10g/l of water
Anthracnose	Spray *Trichoderma* 10g + *Pseudomonas* 10g/l of water at the interval of 7 to 10 days 2-3 time
Early blight	Spray conblights 2 ml/l water or micro bloq 2ml /l water or bacterimoicim 1ml/l water 2-3 time at an interval of 5 to 7 days
Leaf curling virus	Spray kurax 2 to 3 ml /l water 2-3 time at an interval of 10 to 15 days

B. Package of Practices for some *Kharif* Vegetable Crops

a) Bhindi (Okra)

Activity/ parameters	Package of practices
Land Preparation	Prepare raised beds after ploughing (two times), harrowing (once) followed by rotavator (once)
Sowing time	February to April
Number of beds per acre	42 Beds, at base 110cm top 100cm, Distance between beds 40 cm
Distance	Between row to row and plant to plant 30 cm x 15cm
Seed rate per acre	4.5 kg/acre
Irrigation schedule	First irrigation just after sowing, then 1 hour irrigation daily through drip in May-June.
Nutrient management	• Manure 60q (or Vermicompost 30q) + neem cake 2.5q, Azotobacter 250 to 500 ml + PSB 250 to 500 ml at the time of last ploughing • Spray of 10 % Vermi wash two time at the interval of 10 days when crop is one month old
Seed treatment	*Trichoderma viride* @ 10g/kg seed
Weed management	2-3 hoeings and weeding manually

b) Watermelon, Muskmelon

Activity/ parameters	Package of practices
Land Preparation	Prepare raised beds after ploughing (two times), harrowing (once) followed by rotavator (once)
Sowing time	February to March
Number of beds per acre	42 Beds, at base 110cm top 100cm, Distance between beds 40 cm
Distance	Between row to row and plant to plant 150 cm x 60 cm
Seed rate per acre	Water melon 400-500 gm and muskmelon 200-300 gm/acre
Irrigation schedule	First irrigation just after sowing, then 30 min irrigation daily through drip for one month. After that 30 minutes at an interval of 2-3 days

Nutrient Management, Seed/seedling treatment & Weed Management	Same as in case of Bhindi crop

c) Bottle Gourd, Sponge Gourd, Tinda

Activity/ parameters	Package of practices
Land Preparation	Prepare raised beds after ploughing (two times), harrowing (once) followed by rotavator (once)
Sowing time	• Bottle gourd and sponge gourd - February to April • Tinda – February to March
Number of beds per acre	42 Beds, at base 110cm top 100cm, Distance between beds 40 cm
Distance	Between row to row and plant to plant • Bottle gourd 150 cm x 75 cm • Sponge gourd – 150 x 60 cm • Tinda – 140 x 45 cm
Seed rate per acre	• Bottle gourd – 500-600g for hybrid and 1.502.0 kg for OP • Sponge gourd – 500-600g • Tinda – 1.5-2.0 kg
Irrigation schedule	First irrigation just after sowing, then 30 minute irrigation daily through drip for one month. In May-June crop one hour drip irrigation daily
Nutrient Management, Seed/seedling treatment & Weed Management	Same as in case of Bhindi, watermelon and muskmelon crops
Seed treatment	*Trichoderma viride* @ 10g/kg seed
Weed management	2-3 hoeings and weeding manually

d) Pest management in *Kharif* vegetable crops

Insect/Pests	Remedies
White fly, aphids, Jassids, mite and leaf hopper	Spray *Verticillium lecanii* 5-7 ml + neem oil 3 ml/litre water 2-3 time at the interval of 7-10 days
Fruit borer	Spray *Beauveria bassiana* 10 gm + Neem oil 3 ml/l water 2-3 times at the interval of 7 to 10 days or Neem leaf + garlic + chilly extract 25 ml + 3 ml Neem oil/l of water 2-3 times at the interval of 7-10 day
Red pumpkin beetle	Spray *Beauveria bassiana* 10g + Neem oil 3 ml/ 1 water 2-3 times at the interval of 10 to 15 days
Yellow vein mosaic virus in bhindi	Spray Staines- Kurax 2-3 ml/l water.2-3 spray at the interval of 7-10 days
Root rot/ wilt	Drenching with *Trichoderma* 10 gm + *Pseudomonas* 10g/l water 2 times at the interval of 10 days.
Gummy colour rot	Drench/Spray with *Pseudomonas* 20 ml/l water 2-3 times at the interval of 10-15 day
Downy/ powdery mildew	Spray biodewcon 5-7 ml/l water. Spray 2-3 time at 10-15 day interval
Anthracnose	Spray *Trichoderma* 10g + *Pseudomonas* 10g/l water 2-3 times at the interval of 7-10 days

SECTION-6

C. The Policy Approach

6.1 Adoption of Commodity Specific Concentrated Cluster Approach

Thinly distribution of organic farmers over large area has been found to be one of the major constraints in getting productivity, input facilitation and market linkages. Therefore, the State Government should focus on development of commodity specific concentrated clusters for effective technology transfer, planned commodity production as per marketing needs and production in quantity and quality for ease of marketing.

- **Area and crop specific approach –** Initially the organic clusters should be developed in identified areas with selected crop commodities that have commercial value
- **Concentrated cluster approach –** For ease in technology transfer, trainings, input facilitation and collection and aggregation, organic clusters to be developed in concentrated mode.
- **Support services in concentrated mode –** State Government may ensure that selected areas are supported with full infrastructure, needed for input production, support services like organic Agri-clinics, organic input-outlets, value addition facilities and market linkages
- **Farmer institutions –** Farmer producer Organizations may also be developed in concentrated mode with adequate members and area of operation to ensure the commercial viability for all its operations. SFAC guidelines on formation of farmer producer organizations can be taken up as operation strategy guidance.

- **Adoption of Participatory Approach**

State Government should promote and support participatory approach in such clusters for trainings, production of inputs, production of organic seeds, collective problem solutions, management of participatory guarantee system and production planning. The concept of seed village and seed banks may also be integrated in such approach

- **Transformation of Clusters into Farmer Institutions**

State Government should support transformation of such clusters into Farmer Producer Organizations (FPO) or Farmer Producer Companies/ Cooperatives (FPC) to enable them to access credit, to create value addition infrastructure and for direct marketing of their produce. Existing FPO/ FPC in such areas can also be re-oriented to fit into the requirements

- **Entrusting Farmer Institutions with Responsibilities**

Activities such as planning for production, dealing with market forces, operation of postharvest processing facilities, documentation for certification systems, traceability etc will also be entrusted to farmers institutions after necessary capacity building through state Government programme.

6.2 Facilitating Creation of Clusters under Value Chain Mode

Marketing is the key to any production initiative and organic is no exception. With the time it is being realized that agriculture can be profitable for growers only, if they are also the partners in the overall value chain and undertake some value addition before the disposal of produce.

State Government should identify the value chain models and may offer support services and finances for the creation of such replicable models for specific commodities. This could be achieved under farmer institutions or under entrepreneur mode or under private-farmer institution partnerships.

Value chain model developed under Ministry of Agriculture and Farmers Welfare for North Eastern Region (under Mission Organic Value Chain Development for North Eastern Region – MOVCDNER) can be replicated in the state with location specific changes. Such Value Chain Models can have following components:

- Development of commodity specific concentrated clusters (each having 250-500 hectare area)
- Conversion of clusters into Farmer Producer Companies (FPCs)
- Supporting cluster farmers for conversion and organic certification
- Creation of post harvest infrastructure such as collection and aggregation centers, cold stores, pack house, reefer vans, ware houses with organically compatible storage infrastructure and commodity specific processing facilities
- Supporting FPCs for marketing, brand building, national and international market exposure
- Supporting FPCs for opening their own market outlets in major towns and cities

In value chain model, organic inputs may also be taken into account and partnerships should be explored and promoted for manure production, waste management and value added manure production under Public-Private-Community-Partnerships.

- **Supporting Creation of end-to-end Value Chain**

State Government should formulate a scheme to support farmer institutions for creation of end-to-end value chain (similar to Mission Organic Value Chain Development for North Eastern Region scheme-MOVCNER of Ministry of Agriculture and Farmers Welfare)

- **Assisting Farmer Institutions with Working Capital/ Revolving Funds**

State Government may formulate a scheme or re-orient existing schemes to address the problems of working capital/ revolving funds for farmer institutions to facilitate purchase of organic produce from farmers, undertake value addition, storage and then marketing at appropriate time.

- **Promotion of Contract Farming**

State Government may create facilitating environment for private players to enter into contract farming with such clusters/ farmer institutions for production, processing and marketing.

6.3 Ensuring Remunerative Market and Prices

Market Intervention Schemes (MIS) in the case of organic farming is the need of hour and may go a long way in promotion of sustainable practices in the state. Establishment of organic Kisan markets in selected cities can boost prospects for organic farmers. The use of information technology for better market returns and daily upgradation is the need of the hour. It should be provided up to village level so as to have on-farm trading activities.

- **Facilitating branding, labelling, domestic marketing and export**

State Government through its lead agency should formulate facilitating scheme/program to promote "Haryana Organic" brand in national and international markets through following interventions:

- **Haryana Organic Brand**

Designing and registration of "Haryana Organic" Brand and "Haryana Organic" Logo

- **Uniform labelling**

Organic farmers, organic entrepreneurs and farmer institutions should be encouraged to adopt uniform labelling developed by the state lead agency for clear identity of produce in the market.

- **Encouraging dedicated retail outlets and designated shelves in existing retails**

State Government may facilitate setting up of dedicated organic outlets in some important cities of state and in some other states through Organic Farmers Institutions. Government may also encourage existing retails under public-private partnerships to create dedicated shelves for Haryana Organic brand products.

- **Encouraging consumption of organic products**

State Government should explore possibilities for encouraging consumption of organic products in schools, mid-day meals, hostels, hospitals, public sector canteen and corporate food points.

- **Promoting export of Haryana organic products**

State Government in cooperation of central agencies like commodity boards and APEDA may identify exportable commodities and extend support for development of export-oriented commodities production and for necessary export infrastructure such as pack houses, cold stores, refer vans, in-house quality checking laboratories/ equipment etc. Financial assistance schemes available from APEDA for creation of export infrastructure can also be exploited (see www.apeda.gov.in).
State Government in cooperation with central agencies such as APEDA may also support and incentivize development of shipment protocols, packaging, branding, labelling and transportation for export facilitation of Haryana Organic brand products.

- **Publicity and market facilitation**

State Government through its lead agency may draw appropriate strategies for publicity of Haryana Organic products through organization of Trade fairs, buyer-seller meets, through participation in national/international trade fairs & facilitating its organic entrepreneurs for participation in such fairs.

- **Haryana Organic Trade Fair**

State Govt may start its own "Organic Trade Fair" on annual basis to demonstrate the strength of Haryana organic and invite investors and market forces to participate in Haryana organic value chain.

- **The Financial Implication**

Policy may be implemented through convergence of different central sector and state plan schemes of different departments (Agriculture, Horticulture, Animal Husbandry, Water resources etc) in an integrated approach. If required state may allocate additional financial resources to achieve time bound targets. The policy should be subject to review from time to time as per the need with prior approval of the Government.

6.4 Government Support to Organic Sector and Financial Implications

Throughout the country there is no level playing field for organic farmers compared to conventional agriculture farmers, in terms of incentives and subsidies for various farming operations and inputs. For example conventional farmers all along get fertilizer subsidy to the tune of Rs. 2500 to 6000 per hectare per year depending upon the fertilizer usage and are also supported with quality seed supply for better rate of seed replacement. But organic farmers do not get any such support. Through policy,

State Government should identify and facilitate support services with reference to organic seeds, organic inputs and knowledge to enhance skills on organic practices.

- **Financial Incentive to Organic Farmers**

State Government may create necessary environment and financial support to facilitate and subsidize input services such as organic seeds and planting material, support for setting up of individual and community composting/ vermicomposting units, biogas and biogas-slurry production facilities, subsidy on biofertilizers, bio-pesticides, botanical pest control formulations, physical and mechanical devices etc. Additional financial support may also be ensured for farmers opting for certification and shall be going under organic conversion.

State Government may formulate policies and financial incentives for farmers who offer their entire land holding for conversion to organic, to discourage parallel and split production.

- **Rewarding Innovations in Organic Farming**

State Government should formulate appropriate policy and allocate financial resources for rewarding innovations in organic farming. Three separate categories may be initially launched as follows:

a. Innovations by farmers
b. Innovations by research experts
c Innovations in value chain & marketing by individuals/ farmer institutions and private players
d Contributions by institutions

6.5 Certification and Quality Assurance

The state should adopt dual quality assurance system involving both third party certification (NPOP) and participatory guarantee system (PGS-India).

- **Haryana State Organic Certification Agency**

For third party certification, State may develop its own organic certification agency. Only high value commercial crops with distant market, and export potential crops should be targeted under this system

- **Facilitating PGS**

State Government through its lead agency may create or rope in competent Regional Councils for facilitating PGS-India organic certification. Functioning and monitoring of such Regional Councils under State Lead Agency will instil credibility in consumers. State should ensure that the entire area brought under organic conversion process is brought under one or the other certification process to ensure quality, real organic status, full database and end-to-end traceability.

6.6 Creating Regulatory Framework for Organic Inputs

Through innovations and research many innovative inputs have been developed by the civil society organizations, farmers and input industry. Many of such inputs are not covered under Fertilizer Control Order (FCO) or Central Insecticides Act (CIA). There is an urgent need to develop state specific regulatory mechanism for assessment, evaluation and standardization of such inputs. State Agricultural Universities or other such institutions can be entrusted with the task and give recommendations. Based on recommendations Government can allow their usage subject to fulfilment of determined standardized protocols.

6.7 Awareness and Publicity

State Government should formulate appropriate awareness creation and publicity strategies for promotion of organic farming among producers and for consumption of organic produce among consumers and may emphasize on:

- ❖ Promotion of organic farming as movement by involving public representatives, local/ civic representatives, civil society organizations and social activists
- ❖ Promoting organic farming practices to mitigate climate change issues
- ❖ Promoting organic products in cities and towns
- ❖ Promoting Haryana Organic brand in premium markets through hiring of spaces for limited period of time
- ❖ Encourage Eco-Organic Tourism through publicity by Haryana Tourism department in organic clusters.

6.8 Administrative set up for Planning, Implementation and Monitoring of Policy

- ➢ State Government through Government orders may direct the existing institutions to take up the mandated activities through the proposed policy and may provide necessary financial support for implementation
- ➢ For overall implementation and coordination state may create a state lead agency under the name Haryana Organic Agriculture Mission or Haryana Organic Commodity Board with dedicated team of professionals, drawn from different sectors.
- ➢ The State Level Empowered Committee (SLEC) in consultation with the state Advisory Committee should evolve guidelines and finalize the quantum of resources to be allocated.

A. Functions and Responsibilities of State Level Empowered Committee (SLEC) shall -

1. Be the apex decision making body on all aspects related to implementation of organic farming policies, schemes, programmes including approving guidelines
2. Be the single window implementation authority for all schemes form central and state Governments across various line Departments for focused development
3. Coordinate all related Departments/ sectors, institutions, agencies involved in organic farming and Government for effective implementation
4. Review the State policy for organic farming with the advice of Advisory Committee in the State
5. Decide quantum of assistance/subsidies to various components of organic farming as per policy
5. Advise Government to formulate legislative measures if any, relating to organic farming
6. Constitute sub-committees as necessary for focused action and guide and issue directions to them
7. Review implementation progress of organic farming program by various agencies as per policy
8. Look into any other issues related to organic farming in the State
9. Meet at least once in three months

B. The Functions and Responsibilities of State Advisory Committee (SAC) on Organic Farming shall-

1. Be constituted by SLEC and comprise of technical experts, drawn from related Departments, institutions and agencies working in the field of organic farming. SAC shall also have some members of repute in the field of organic farming as advisors
2. Prepare annual action plans with budgetary allocations for different sectors and put up for approval from Empowered Committee. It will develop guidelines, oversee implementation of programmes through single window approach to facilitate implementation of the programs in a convergent manner among different implementing departments/organisations
3. Screen and recommend project proposals received/invited to formulate programmes and operational guidelines for promotion of organic farming
4. Recommend release of grants for implementation of programmes and to oversee implementation of organic farming programmes
5. Appraise State Level Empowered Committee on various projects/ schemes
6. Suggest subsidy/assistance for promotion of organic farming & recommend to SLEC for approval
8. Formulate guidelines of quality control, production and marketing of organic inputs, establishment of quality control labs for detection of pesticide, nitrate and heavy metal residues.
9. Advise SLEC and Government for creation of state-level quality control and certification system for bio-inputs not covered under FCO / CIA.
10. Coordinate with NGOs, farmers organizations, federations, processing industries, marketing agencies, export organizations, certification agencies in promoting organic farming in the state
11. Draw action plans in relation to transfer of technologies on organic farming, organic certification, quality control of organic input and related matters
12. See any other tasks assigned by SLEC from time to time for promotion of organic farming

SECTION 7

D. Organic Farming Management Approach in Haryana Perspective

7.1 The Philosophy and Management Principles

Organic farming management is an integrated approach, where all farm activities are interlinked with each other and work for each other. A healthy biologically active living soil is the source of crop nutrition, on-farm biodiversity controls pests, crop rotation and multiple cropping maintains the system's health and on-farm resource management with integration of cattle ensure productivity and sustainability. Organic management stresses on optimization of resource use and productivity, rather than maximization of productivity and over exploitation of resources on the cost of resources meant for future generations.

All organic management approached are driven by the desire to develop a method of production, capable of generating safe and healthy food and fibre, with minimum or no adverse effects on the environment and resources. With the emerging scientific evidences and long-term experiments, it has been proven beyond doubt that organic farming systems are productive and environment-friendly system of growing crops, promising environmental preservation, protection of variety and species, protecting the soil, keeping the water clean and reducing the impact of agriculture on the atmosphere. In organic agriculture soil is considered as a living organism. A live, healthy soil with proper cropping patterns, crop residue management and effective crop rotation can sustain optimum productivity. A living soil can be maintained by continuous incorporation of crop and weed biomass, use of animal dung, dung-urine based manures, bio-fertilizers and bio-enhancers, special liquid formulations (like *Jivamrit, Panchgavya*, vermin-wash, compost tea etc) during a crop's duration.

7.2. Fundamental Approaches for Organic Farming Management- involve the

- Protection of soil from erosion
- Conservation of rainwater and its optimum use
- Maintaining the soil as living entity and ensuring its health and fertility
- Maintenance of diversity in species and varieties
- Creation of surrounding habitat and eco-climate for sustenance of life forms
- Strategies leading to nutrient re-cycling (from farm, village, region)
- Intensive use of legume crops/leguminous trees to ensure nitrogen supply
- Biological plant protection through diversity and prevention
- Site and species/ varieties appropriate crop and animal husbandry
- Prohibition of Genetic Engineering and products thereof
- Minimum use of non-renewable energy and resources and
- Complete prohibition on use of synthetic inputs such as chemical fertilizers, pesticides, hormones, growth promoters and antibiotics etc.

7.3 Important Steps towards Organic System

While turning towards organic it is essential that the basic requirements of the system and the area are properly understood and long-term strategies are addressed first. In most part of the state poor soil health due to loss of organic matter and soil microbial load is a major problem. Reducing water availability and increasing temperature is further adding to the problems. Too much dependence on market for supply of inputs and energy has made the agriculture a cost intensive high input enterprise with diminishing returns. We need to address all these concerns and develop a system which is not

only productive and low cost but also resource conserving and sustainable for centuries to come. To start with following strategies need to be addressed in the first stage:

- **Enrichment of soil –** Abandon use of chemicals, use crop residue as mulch, use organic and biological fertilizers, adopt crop rotation and multiple cropping, avoid excessive tilling and keep soil covered with green cover or biological mulch.
- **Management of temperature -** Keep soil covered, plant trees and bushes on farm boundary and on internal bunds
- **Conservation of soil and rain water –** Create rainwater harvesting and conservation structures, maintain contour bunds in sloppy land & adopt contour row cultivation, maintain low height plantation on bunds.
- **Harvesting of sun energy –** Maintain green stand throughout the year through combination of different crops and plantation schedules.
- **Self-reliance in inputs –** develop own seed, on-farm production of compost, vermicompost, vermiwash, liquid manures such as Jivamrit and panchgavya and botanical extracts.
- **Maintenance of life forms –** Develop habitat for sustenance of life forms, ensure complete prohibition on use of synthetic pesticides and create enough diversity.
- **Integration of animals –** Animals are important components of organic management and not only provide animal products but also provide enough dung and urine for use in soil.
- **Use of renewable energy –** Use solar energy, bio-gas and other renewable energy sources to the extent possible.

Developing an Organic Farm

As organic management is an integrated approach, manipulation and adoption of one or few steps may not yield significant results. For optimization of productivity all the essential components need to be developed in a systematic manner. These steps include:

- Habitat development,
- On-farm facilities for input production
- Cropping sequence and combination planning,
- 3-4 year rotation plan and
- Growing of crops suiting to the region, soil and climate

Habitat and Biodiversity

Management of an appropriate habitat for sustenance of different life forms is an essential component of organic farming. This can be achieved by ensuring crop diversity and by maintaining a wide variety of trees and bushes as per climatic suitability. These trees and bushes will not only ensure the nutrients from air and deep soil layers to surface layer but also attract the birds and predators, friendly insects and also provide the food and shelter. There may be some loss of productivity due to shading effect but that loss can be compensated with increased nutrient availability, reduced pest problems and natural biological pest control system.

Management of Soil Fertility

Organic management approaches emphasize on good soil fertility management for optimum productivity and long-term sustainability. Organic farmers manage their soil fertility by conserving and protecting their soils from sun, rain and wind, and feeding it with organic matter. A well-fed soil

from its reserve, from the biomass it is receiving and the microbial life thriving in it can take care of the requirements of crops in perpetuity. As per the protocols developed by the IFOAM and FiBL, a three-step approach to soil fertility management is ideal for long term fertility management.

▪ Three-step Approach for Soil Fertility Management

Organic soil fertility management can be seen as a three-step approach with a range of tools to manage soil fertility and plant nutrition.

Step 1 The first step consists of conserving the soil, soil organic matter and soil water from loss. Applied measures aim at protecting the soil surface from being exposed to the sun and drying out, and from being carried away by wind or washed down by rain. The aim is to establish a stable and less vulnerable soil as the foundation to managing its fertility.

Step 2 The second step consists of improving organic matter content and enhancing biological activity in the soil. The aim here is to identify appropriate organic resources that can build an active soil with good structure which can hold water and supply plant nutrients.

Step 3 The third step consists of supplementing the nutrient requirement as well as improving the growing conditions by applying some soil amendments.

Each step of this three-step approach builds the foundation for the next one. The aim is to optimize steps 1 and 2 that encourage natural rejuvenation of the soil and to minimize application of foreign fertilizers, soil amendments and irrigation water (step 3). Proper and efficient application of steps 1 and 2 saves on costs for fertilizers and other supplements and prevents possible negative impacts on the farm ecosystem.

▪ Maintenance of Diversity

Management and maintenance of diversity is a key to the success of organic management. Diversity need to be maintained in the overall habitat and local eco-climate, on the farm, within the crops and also with variety within one single crop. Diversity can be managed by adopting following strategies in suitable combinations as per the requirement of the area, climate and farm.

- Diversity plantation on farm boundary, utility spaces and on farm bunds
- Integration of nitrogen fixing trees/ bushes along with fruit and wild trees/ plants
- Intercropping, multiple cropping, strip cropping or mixed cropping
- Trap crops and relay cropping
- Crop rotations
- Use of widely different varieties within the crop

▪ Biomass Recycling

As a thumb rule, crop residues, weed biomass and lopping of trees and bushes growing on and around farm should be returned to the field, directly or indirectly. Cattle droppings may be returned to the field as compost. As a strategy, the quantity of biomass removed for human food and fibre, cattle feed or firewood from an organic farm should be replaced with any other bio-waste on the farm or from the surrounding area. It is important to account for the input and output of biomass being added and harvested for preparing the balance sheet of nutrients for each crop being cultivated on the farm. Important strategies for soil enrichment, ensuring recycling of nutrients are as follows:

- Growing of deep-rooted trees and shallow rooted tress in combination on bunds and harvesting of their lopping at repeated intervals for mulching.
- Returning weed biomass as mulch or used for making compost
- Entire crop residue is returned back to the field directly as mulch or indirectly as compost (a solution to stubble burning)
- Intercropping with legumes for biological nitrogen fixation
- Green manuring
- Cattle dung as FYM, biogas slurry as compost

Integration of legumes

Legumes are valuable sources of biologically fixed nitrogen. All efforts must be made to integrate legume cultivation with crops either as mixed crops, intercrops or as boundary plantations. *Gliricidia* (a tropical N-fixing tree) grown on bunds serves as excellent source of biologically fixed nitrogen. A 400 meter long strip around 1 hectare farm can yield up to 77 kg N/year.

In crop fields legume crops must find place as intercrops. As a thumb rule 30% space should always be reserved for legume crops. Selection of legume crop is very crucial and due attention need to be paid while selecting the legume intercrop. High nutrient demanding crops must precede or followed by legume crops.

7.4 Seeds and Planting Material

Under organic farming first and foremost important input is seed/seedling/planting material and should be preferred from known organic source, if not then own seed be stored for next generation. Efforts should be made to use locally adapted variety/crop using self-prepared seed (selection method still holds good). To prepare the crop for seed to conserve, one should learn from the group training being organized by the extension experts. Seed soaking and treatment before sowing with Cow dung, bio-fertilizers, Neem, Moringa, Eucalyptus, Lemon grass, Marigold, Bel trees extract can be done as per availability. Conventional seeds including hybrid seeds (Genetically modified seeds not allowed) without any chemical treatment can also be used but high yielding hybrids may require intensive nutrient management which may not be sustainable and economical. As a fundamental rule of organic farming, mono-cropping is discouraged and multi or mixed cropping system is encouraged.

7.5 Strategies for Nutrient Management

- Get soil testing done for all macro, micro and other nutrients along with pH, EC & organic carbon
- Identify deficiencies for specific crops for particular nutrients.
- Adjust soil pH if needed.
- Plan for replenishment of depleted soil nutrient reserves.
- Once soil quality is restored, and nutrient and pH levels are near optimum, organic fertilizer inputs can be reduced. The farmer then adjusts annual inputs to:

- Replenish nutrients removed in harvest
- Meet nutrient demands of heavy-feeders
- Maintain soil life, active organic matter and humus and soil quality
- Avoid building up nutrient excesses

- **Nutrient Budgeting**

In organic management as majority of the N comes from organic sources, accompanied with other minerals such as P, K and micronutrients, generally, N is considered as the index element for calculation. Organic N management requires careful consideration of the role of soil life and of carbon to nitrogen (C:N) ratios. Due attention required for ensuring that only the material having C:N ratio below 25 be incorporated with the soil and the material having C:N ratio above 25 to 35 are used as surface mulch. In cases where crop residue to be used as surface mulch is having wider C:N ratio then it needs to be mixed with either legume residue or be treated with dung-urine based liquid manures (such as *Jivamrit*) and allowed to decompose for about 7-10 days before application as surface mulch.

As biological processes regulate N release from organic materials, organic farms need a different approach to N budgeting from the formula "X kg of N per hectare for Y quintals yield per hectare crop" under conventional systems. An organic farmer, who uses manure or cover crops/ mulches as source of N need to calculate "N credits" from these sources to save on precious organic resources. In biologically active soils, the soil organic matter (SOM) itself is a significant N source for the crop. Soils having about 1% SOM can release up to 10-12kg of N per hectare/year in warm climates. Nitrogen fixing microorganisms present in soil also assist in increasing N availability to the tune of 15-25kg/hectare /crop cycle.

Based up on long term studies it is understood that, the percent of total N that is available to the current crop can be estimated at 70% for concentrated manures (having C:N ratio below 10:1), 50% for manure and cover crops (having C:N ratio below 25), and just 10-25% for other material having C:N ratio above 30:1. Remaining N, gets incorporated into the soil organic N pool, which is a vital long-term source of N. Some manure-N may leach or volatilize, and some may enter the organic N pool, depending on the C:N ratio of the manure-mulch mix. While the "available" portion of compost, manure, and mulch N helps provide for the needs of the current crop, the "unavailable" portion of manure, compost and mulch N, go toward replenishing soil organic N.

- **Foliar feeding**

In organic farming as majority of the nutrient sources are in the form of bulky organic manures or through mulching/ green manuring their application is done as basal manure at the time of sowing and planting. To meet the need of additional nutrients during flowering/ fruiting/ grain setting organic farmers resort to foliar feeding through diluted fermented cow urine, panchgavya, vermiwash or farm made protein hydrolysates prepared by fermenting protein rich organic materials such as oil cakes, fish meal, slaughterhouse waste etc with microorganisms such as yeasts. Two to three foliar applications give results comparable to urea top dressing. These practices are very effective in getting optimum yields in high nutrient demanding crops.

7.6 Organic Pest Management

First and foremost strategy for organic pest management is creation and maintenance of diversity, which includes permanent diversity plantation on boundary and internal bunds, and seasonal diversity through cover crops, intercrops, flowering plants and trap crops. Permanent diversity plantation includes plantation nitrogen fixing plants like *Gliricidia, Leucaena leucocephala* etc, or some fruit plants like custard apple, karonda or hena etc on borders and pesticidal value plants such as *Adathoda, Ipomea, Calotropis* etc randomly in between border plantation and aromatic grasses such as lemon

and citronella grass on bunds. Seasonal diversity includes intercrops and cover crops. Some flowering trap crops such as marigold, maize and *hibiscus* can also be planted along the borders. Second strategy involves manipulation of cultural practices to ensure a balance in natural processes, which in turn keep the pests below the economical threshold limit. Important cultural practices are as follows:

A. Cultural strategies

- Planting of disease free and resistant cultivars.
- Proper spacing, mulching, adequate use of green and organic manures and proper irrigation
- Avoid high density planting.
- Intercropping with legumes
- Keeping soil covered with living vegetation and or crop residue.
- Adequate use of organic manures followed by biomass mulching and drenching with fermented dung-urine slurry (such as *Jivamrit*).
- Frequent application of bio-fertilizers especially *Mycorrhizae* and plant growth regulators (PGRs)

B. Ecological strategies

- Ensure natural habitat and survival conditions for natural pest enemies such as pest predators, parasites and pathogens
- Do not uproot weed plants those are growing naturally and act as nectar source for natural enemies.
- Due to enhancement of biodiversity by the flowering plants, number of parasitoid and predators (natural enemies) will also increase due to availability of nectar, pollen and insects etc. The major predators are a wide variety of spiders, ladybird beetles, long horned grasshoppers, *Chrysoperla*, earwigs, etc.
- Collect egg cards of beneficial insects for release such as *Trichogramma, Chrysoperla, Telenomus* etc, which are available from state Biocontrol Labs.
- Install 4-5 pheromone traps for monitoring and 10-12 traps for mass trapping of moths.
- Set up yellow pan water trap/sticky traps 15 cm above the crop canopy for monitoring whitefly and blue sticky trap for thrips @ 10-15 traps/acre.
- Set up light traps 1-2 trap/acre 15 cm above the crop canopy for monitoring and mass trapping of insects. Light traps with exit option for natural enemies of smaller size should be installed and operate around the dusk time (6 pm to 10 pm).
- Grow flowering plants along the border by arranging small plants towards the crop and taller plants towards border. Important insectary plants that can be planted as intercrops also include mustard, sunflower, alfalfa, marigold, carrot, French bean, cowpea, maize, spearmint, peppermint, coriander, *Ocimum* etc.

7.7 Pest Control Strategies

Keep on monitoring pest: defender ratio. If pest defender ratio is 2:1 then no need to worry. If it increases above 2:1 then adopt necessary curative and control protocols

▪ Use of Bio-pesticides

Trichoderma viride or *T. harzianum* or *Pseudomonas fluorscens* @ 4g/ kg seed either alone or in combination, manage most of the seed borne & soil borne diseases. There are other formulations viz. *Beauveria bassiana*, *Metarhizium anisopliae*, *Nomuraea rileyi*, *Verticillium* sp, which are available in

the market and can manage their specific host pest. *Bacillus thuringiensis tenebrionis and B.thuringiensis san diego* are effective against coleopterans as well as some other insect species. Bacillus thuringensis has been used in the management of diamond back moth on crucifers and vegetables.

Viral bio-pesticides of baculovirus group *viz*. granulosis viruses (GV) and nuclear polyhedrosis viruses provided a great scope in plant protection field. Spray of nuclear polyhedrosis viruses (NPV) of *Helicoverpa armigera* (H) or *Spodoptera litura* (S) @ 250 larval equivalents are very effective tools to manage the *Helicoverpa* sp. or *Spodoptera* sp. respectively.

- **Botanical Pesticides**

Many plants are known to have pesticidal properties and the extract of such plants or its refined forms can be used in the management of pests. Among various plants identified for the purpose, Neem, Karanj, *Adathoda*, *Datura*, *Calotropis* and *Vitex negundo* has been found to be most effective. Various formulations using such plants are available in the literature and farmers can use any of them depending upon their availability and crops.

- **Use of Microorganisms – A Futuristic Approach**

Microorganisms play important role as indicators of soil degradation, in organic matter decomposition, nutrient cycling, immobilization, uptake, soil structure porosity and for pest control. They also act as nutrients flow regulators, fixers, plant growth promotors, phosphate solubilizer and play important role in nutrients acquisition. The crop-microbial-soil ecosystem can therefore, be energized in organic farming with considerable ecological stability and environment quality. Different bio-sources are available in the market supplied/ sold by different agencies like Azolla, Blue green algae, Actinomycetes, *Azospirillum, Azotobacter* culture, *Rhizobium* culture, phosphate-solubilizers, waste decomposer, green manuring etc.

Biological method of pest management has been promising. Many farmers are successfully using microbial control agents like *Trichoderma*, - a well-known bio-fungicide for its effectiveness in combating all kinds of soil borne diseases like wilt, vascular wilt, root rot, rhizome rot, vine wilt of all crops. It quickly colonises the root section and soil surface around roots, depriving the harmful fungi from food and space, preventing them to grow and multiply. They considerably help in improving the soil structure by growing and colonising on harmful fungi and utilising them as its own food.

- **Trapping Technologies and Potential of Pest-Enemies**

Pheromones and Kairomones are immune contraception-emitted by an organism that benefits another species which receives it without benefitting the emitter. It can be used as an attraction to lure a pest species to a location containing neem / kerosene oil. In organic farming, farmers should be trained to increase the population of carnivorous organisms so as to parasitize the pest in the farm. Many beneficial insect-pest (*Pyrilla* control by *Epiricanica* in sugarcane), birds and animals that help to suppress the populations of pest has been reported useful as biological methods. Also many bacteria, yeast and fungus (BYM) has been suggested as pest management tools.

Parasitizing with the help of lady bird beetle, spider, dragonfly, frog etc are also important pest management strategies in organic farming. The bio-control agents such as myco-herbicides have been investigated for biological weed management of *Sorghum halepense* and *cascutta*. The *Cyprus rotundas* has been found to be effective bioagent for *Bactra verutana* but all these technologies are yet to mature and their technical information is yet to be passed on to the end users.

ANNEXURE 1

Groups Registered and Facilitating Regional Councils under PGS-India Program for Organic Certification

S.No	Group	Regional Council	District
1	5th Mile	Chetna Vikas Swarajya Trust, Bulandshahar	Fatehabad
2	AFC Palwal Organic Grower Group	AFC India Ltd	Palwal
3	Agsus	Organic Way of Life	Nuh
4	Arya Prakritic Krishi Kisan Samuh	Chetna Vikas Swarajya Trust, Bulandshahar	Kurkshetra
5	Ashok Lokra Organic Kisan Seva Kender	Chetna Vikas Swarajya Trust, Bulandshahar	Gurugram
6	B.K Natural and Healthy Farming	Chetna Vikas Swarajya Trust, Bulandshahar	Kurkshetra
7	Bhiwani Jaivik Krishak Samuh	AFC India Ltd	Bhiwani
8	Bhiwani Jaivik Krishak Sangh	AFC India Ltd	Bhiwani
9	Buraj Kotian Organic Farmers Group	Deputy Director Agriculture & FW, Panchkula	Panchkula
10	Dhani Organic Farm	R S Eventtech Pvt Ltd., Noida	Sirsa
11	Fresh from Farm Organics	Chetna Vikas Swarajya Trust, Bulandshahar	Faridabad
12	Gau Bhumi Jaivik Khaliyan Samuh	Chetna Vikas Swarajya Trust, Bulandshahar	Palwal
13	Gram Swaraj Javik Kisaan Samuh	Chetna Vikas Swarajya Trust, Bulandshahar	Jind
14	Gram Swarajya Krisak Samuh	Chetna Vikas Swarajya Trust, Bulandshahar	Jind
15	Guru Organic Farms	Chetna Vikas Swarajya Trust, Bulandshahar	Karnal
16	Jadi Buti Krishi Faridabad-Patanjali Yogpeeth Trust- Haryana	R S Eventtech Pvt Ltd., Noida	Faridabad
17	Jaivik Krishak Sangh Samalkha	Chetna Vikas Swarajya Trust, Bulandshahar	Panipat
18	Javik Kissan Kandra Solada Palwal	Chetna Vikas Swarajya Trust, Bulandshahar	Palwal
19	Jevik Kisan Samuh ,Safidon	Deputy Director Agriculture & FW, Jind	Jind
20	Jhajjar Organic Grower Group	Shri Ram Solvent Extraction Pvt Ltd, Jaspur	Jhajjar
21	Jhajjar Organic Grower Group-2	Shri Ram Solvent Extraction Pvt Ltd, Jaspur	Jhajjar
22	Krishi Kalyan Manch Haryana	Chetna Vikas Swarajya Trust, Bulandshahar	Jind

23	Khara Agriculture Farm	Chetna Vikas Swarajya Trust, Bulandshahar	Rohtak
24	Kisan Kalyan Manch Haryana	Chetna Vikas Swarajya Trust, Bulandshahar	Jind
25	Kudrati Kheti Kisan Samuh	Sri Sri Institute of Agricultural Sciences and Technology, Banglore	Jhajjar
26	Kudrati Kheti Kisan Samuh Maham Chaubisi	Sri Sri Institute of Agricultural Sciences and Technology, Banglore	Rohtak
27	Mahala Organic Farmers Society	Masum Foundation	Bhiwani
28	Maharishi Dayanand Prakritik Krishi Shikshan Avem Shodh Sansthan	Chetna Vikas Swarajya Trust, Bulandshahar	Yamuna Nagar
29	Maldey Javik Krishak Group	Chetna Vikas Swarajya Trust, Bulandshahar	Palwal
30	Nogma Organic Group	Deputy Director Agriculture & FW, Jind	Jind
31	Organic Farming Group Morni	Deputy Director Agriculture & FW, Panchkula	Panchkula
32	Organic Farming Group Mouli	Deputy Director Agriculture & FW, Panchkula	Panchkula
33	Organic Roots 2	Chetna Vikas Swarajya Trust, Bulandshahar	Palwal
34	Organika Farms	Chetna Vikas Swarajya Trust, Bulandshahar	Ambala
35	Palwal 2 Organic Grower Group	AFC India Ltd	Palwal
36	Pillukhera Jevik Utpadak Samuh	Deputy Director Agriculture & FW, Jind	Jind
37	Raghukul Javik Kissan Club	Chetna Vikas Swarajya Trust, Bulandshahar	Karnal
38	Saini Sabji Utpadak Samuh	Organic Way of Life	Nuh
39	Sanskar Javik Krishak Samhu	Chetna Vikas Swarajya Trust, Bulandshahar	Sonepat
40	Satyam Javik Kheti Kisan Samhu	Chetna Vikas Swarajya Trust, Bulandshahar	Kaithal
41	Shiv Sabji Utpadak Samuh	Organic Way of Life	Nuh
42	Shree Baba Matunath Javik Kisan Group Bas Hisar	Chetna Vikas Swarajya Trust, Bulandshahar	Hissar
43	SS Natural Aahaar	Chetna Vikas Swarajya Trust, Bulandshahar	Karnal
44	Sukh Darshanpur	Deputy Director Agriculture & FW, Panchkula	Panchkula
45	Yamunanagar Organic Farm Jaidhar	R S Eventtech Pvt Ltd., Noida	Yamuna Nagar

References

(Source : Sunita, Sanjay, Kavita, Jitender Kumar Bhatia and V.P. Mehta (2017). Changing pattern of area, production and productivity of principal crops in Haryana, India, *Int. J. Curr. Microbiol. App. Sci,* 6: 1654-61).

ANNEXURE 2

List of some Laboratories for testing of Organic Food Products in India

Sr. No.	Name of the Laboratory	Sr. No.	Name of the Laboratory
1	Accurate Laboratory, Ahmedabad	21	Micro Chem Silliker Pvt. Ltd., Mumbai
2	AES Laboratories (P) Ltd., Gautam Budha Nagar	22	National Collateral Management Services Limited (NCML), Hyderabad
3	Arbro Pharmaceuticals Limited, New Delhi	23	Nawal Analytical Laboratories, Hosur
4	Ashwamedh Engineers & Consultants, Nashik	24	NHRDF, Pesticide Residue Analysis Laboratory, Nashik
5	Auriga Research Limited, Bangalore	25	Punjab Biotechnology Incubator (PBTI), SAS Nagar, Mohali
6	Centre for Food Testing, Bharati Vidyapeeth Deemed University, Pune	26	Reliable Analytical Laboratories Pvt. Ltd., Thane
7	Chennai Mettex Lab Private Limited, Chennai	27	SGS India Private Limited, Kolkata
8	Choksi Laboratories Limited, Indore	28	SGS India Pvt. Ltd. , Gurugram
9	Delhi Test House, Delhi	29	SGS India Pvt. Ltd., Ahmedabad
10	DNA Testing Laboratory, Basmati Export Development (BEDF), Meerut	30	SGS India Pvt. Ltd., Chennai
11	Edward Food Research & Analysis Centre Ltd. (EFRAC), Kolkata	31	Shriram Institute for Industrial Research, Bangalore
12	Envirocare Labs Pvt. Ltd., Thane	32	Shriram Institute for Industrial Research, Delhi
13	Eurofins Analytical Services India Pvt. Ltd., Bangalore	33	SMS Labs Services Private Limited, Chennai
14	First Source Laboratory Solutions LLP, Hyderabad	34	T A Labs Private Limited, Chennai
15	Geo Chem Laboratories Pvt. Ltd., Mumbai	35	Testtex India Laboratories Pvt. Ltd., Rajkot
16	Interfield Laboratories, Kochi	36	TUV India Pvt. Ltd., Pune
17	International Testing Centre, Panchkula	37	TUV Sud South Asia Pvt. Ltd. Gurugram
18	Intertek India Pvt. Ltd., Hyderabad	38	TUV Sud South Asia Pvt. Ltd., Bangalore
19	MAARC Labs Pvt. Ltd., Pune	39	Vimta Labs Ltd. , Hyderabad
20	Mats India Private Limited, Chennai	40	---

ANNEXURE 3

Food Testing Laboratories in Haryana

A. Laboratories approved by Food Safety & Standards Authority of India (FSSAI)

Sr. No.	Name of Laboratory	Approved Testing Parameters (Physical, chemical and biological parameters)
1	Alpha Test House, Bahadurgarh 198-199, MIE., Phase -1, Industrial Area, Bahadurgarh, Haryana	**Physical and chemical:** Fats, Oils and Fat Emulsions ; Cereals & Cereal Products; Salt, Spices, Condiments and Related Products ; Sweetening Agents including honey; Dairy Products and Analogues; Beverages (Other than Dairy and Fruits & Vegetables based); Fruit & Vegetable Products; Sweets and confectionary ; Meat and Meat Products
		Biological: Dairy Products and Analogues; Sweetening Agents including honey; Beverages (Other than Dairy and Fruits & Vegetables based); Meat and Meat Products; Salt, Spices, Condiments and Related Products ; Cereals & Cereal Products; Sweets and confectionary; Fruit & Vegetable Products
2	Choksi Laboratories Limited, Panchkula Plot No. 362, Industrial Area, Phase II, Panchkula-734112, Haryana	**Physical and chemical:** Milk and Milk Products, Fruits, Vegetable & Their Products; Sugar & by-Products; Bakery & Confectionary Products; Processed Food; Honey; Nuts & Nut Products; Egg & Egg Products; Tea & Coffee; Spices & Condiments; Oil & Fats; Non Alcoholic Beverages; Cereals, Pulses & By-Products; Water
		Biological: Milk & Milk Products; Cereal Food / Food Grain Products (Including Bakery Products); Fruits and Fruit Products; Nuts and Nut Products; Spices and Condiments; Non Alcoholic Beverages; Ready-to- eat Foods; Water; Drinking, Packaged Drinking & Natural Mineral Water
3	Dove Research & Analytics, Panchkula Pl. No. 298, Industrial Area, Phase- II, Panchkula-134109	**Physical and chemical:** Bakery & Confectionery Products; Cereals, Pulses & Cereal Products; Edible Oils & Fats; Fruit & Fruit Products; Herbs, Spices & Condiments; Milk & Dairy Products; Vegetables & Vegetable Products; Water
		Biological: Bakery & Confectionery Products; Beverages (Alcoholic / Non-Alcoholic); Infant Foods; Milk & Dairy Products; Vegetables & Vegetable Products
4	Eurofins Analytical Services India Pvt. Ltd. Gurugram First Floor, Plot No 157, Udyog Vihar Phase–1, Gurugram, Haryana	**Physical and chemical:** Tea; Coffee & Cocoa Products; Milk & Dairy Products; Cereals, Pulses & Cereal Products; Herbs, Spices & Condiments; Oil Seeds & By-Products; Fruit & Fruit Products; Canned & Processed Foods; Sugar & Sugar Products; Honey & Honey Products; Food Additives & Preservatives; Bakery & Confectionery Products
		Biological: Bakery & Confectionery Products; Snacks and Instant Mixes; Tea; Coffee & Cocoa Products; Fish & Sea Foods; Fruit & Fruit Products; Herbs, Spices & Condiments; Infant Foods; Meat & Meat Products; Milk & Dairy Products
5	Fare Labs Private Limited, Gurgaon L17/3,DLF-Phase-II M.G. Road, Gurgaon-122002, Haryana	**Physical and chemical:** Bakery & Confectionery Products; Beverages (Alcoholic / Non-alcoholic); Cereals, Pulses & Cereal Products; Coffee & Cocoa Products; Edible Colours & Flavours; Edible Oils & Fats; Food Additives & Preservatives; Fruit & Fruit Products; Herbs, Spices & Condiments; Honey & Honey Products; Infant Foods; Jams, Juices, Sauces & Concentrates; Meat & Meat Products; Milk & Dairy Products; Nuts & Nut Products; Oil Seeds & By-Products; Starch & Starch Products; Sugar & Sugar Products; Tea; Vegetables & Vegetable Products; Marine/Aqua Culture Food Products; Residues in Food Products; Residues in Water; Drinking Water, Packaged Drinking Water; Nutraceuticals and Functional Foods - Probiotics, Dietary Fibres, Carotenoids,

		Flavonoids, Prebiotics, 6Soy Proteins, Fortified Food, Phytoestrogens.
		Biological: Edible Colours and Flavours; Edible Colours and Flavours; Canned & Processed Foods; Edible Salts; Coffee & Cocoa Products; Eggs & Egg Products; Fish & Sea Foods; Food Additives & Preservatives; Fruit & Fruit Products; Herbs, Spices & Condiments; Honey & Honey Products; Honey & Honey Products; Infant Foods; Jams, Juices, Sauces & Concentrates; Meat & Meat Products; Milk & Dairy Products; Nuts & Nut Products; Sugar & Sugar Products; Tea; Packaged Drinking Water
6	Haryana Test House & Consultancy Services, Panipat; 50-C, Sector-25, Part-II, Huda, Panipat, Haryana	**Physical and chemical:** Edible Oils & Fats; Bakery & Confectionery Products; Cereals, Pulses & Cereal Products; Fruit & Fruit Products; Herbs, Spices & Condiments; Honey & Honey Products; Milk & Dairy Products; Vegetables & Vegetable Products; Drinking Water; Packaged Drinking Water
		Biological: Bakery & Confectionery Products; Fruit & Fruit Products; Herbs, Spices & Condiments; Milk & Dairy Products; Vegetables & Vegetable Products; Drinking Water; Packaged Drinking Water; Packaged Natural Mineral Water
7	Idma Laboratories Ltd, Panchkula Idma Complex: 391, Industrial Area- Phase I, Panchkula – 134 113	**Physical and chemical:** Cereals, Pulses & Cereal Products; Edible Oils & Fats; Milk & Dairy Products; Starch & Starch Products; Drinking Water
		Biological: Bakery & Confectionery Products; Fruit & Fruit Products; Herbs, Spices & Condiments; Meat & Meat Products; Milk & Dairy Products; Vegetables & Vegetable Products; Drinking Water; Packaged Drinking Water; Packaged Natural Mineral Water
8	Interstellar Testing Centre Pvt. Ltd. , Panchkula 86,IndustrialArea,Phase 1,Panchkula - 134109	**Physical and chemical:** Bakery & Confectionery Products; Beverages (Alcoholic / Non-alcoholic); Cereals, Pulses & Cereal Products; Edible Oils & Fats; Herbs, Spices & Condiments; Infant Foods; Meat & Meat Products; Milk & Dairy Products; Starch & Starch Products; Sugar & Sugar Products; Residues in Food Products - Antibiotics, Pesticides, Mycotoxins, Trace Metal Elements; Residues in Water - Pesticides, Trace Metal Elements; Drinking Water, Packaged Drinking Water; Tea & Coffee products; Fruits & vegetable products; Thermally processes fruits & vegetables; Nuts, raisins and dry fruits; Guar gum; Dairy based desserts/confectionary; Nutritional value of packaged food materials; Food grains; Fruits & fruit products; Honey; Pan Masala
		Coffee & Cocoa Products; Fruit & Fruit Products; Geletin and Other Gums; Herbs, Spices & Condiments; Infant Foods; Milk & Dairy Products; Nuts & Nut Products; Tea; Vegetables & Vegetable Products; Packaged Drinking Water; Packaged Natural Mineral Water; Beverages (Alcoholic & non-alcoholic); Tea & tea products; Snacks; Meat & meat products; Jam; Juices products; Cereals and pulses
9	Intertek India Private Limited (Food Services), Gurugram Plot #.68, UdyogVihar, Phase-1, Gurugram, Haryana-122016	**Physical and chemical:** Bakery & Confectionery Products; Cereals, Pulses & Cereal Products; Edible Oils & Fats; Fruit & Fruit Products; Herbs, Spices & Condiments; Honey & Honey Products; Infant Foods; Jams, Juices, Sauces & Concentrates; Meat & Meat Products; Milk & Dairy Products; Oil Seeds & By-Products; Sugar & Sugar Products; Tea; Residues in Food Products - Antibiotics, Pesticides, Mycotoxins, Trace Metal Elements, Others; Residues in Water - Pesticides, Trace Metal Elements; Marine/Aqua Culture Food Products; Packaged Drinking Water
		Biological: Bakery & Confectionery Products; Beverages (Alcoholic / Non-Alcoholic); Cereals, Pulses & Cereal Products; Fruit & Fruit Products; Herbs, Spices & Condiments; Honey & Honey Products; Infant Foods; Meat & Meat Products;Milk & Dairy Products;

		Snacks and Instant Mixes; Tea; Vegetables & Vegetable Products; Marine/Aqua Culture Food Products- Shrimps; Drinking Water; Packaged Drinking Water; Packaged Natural Mineral Water
10	National Collateral Management Services Limited, Commgrade-Testing Services Regional Laboratory (North), Gurgaon Plot – 883 (3rd Floor), Phase V, Udyog Vihar, Gurgaon, Haryana	**Physical and chemical:** Cereals & Cereal Products; Sweets and confectionary ; Beverages (Other than Dairy and Fruits & Vegetables based); Fats, Oils and Fat Emulsions ; Fruit & Vegetable Products; Salt, Spices, Condiments and Related Products ; Sweetening Agents including honey; Meat and Meat Products; Dairy Products and Analogues; Egg and Egg Products ; Other Food Products and Ingredients ; Nutritional Value in food and agricultural products; Vitamins; Contaminants, toxins and residues ; Food Additives
		Biological: Cereals & Cereal Products; Sweets and confectionary ; Beverages (Other than Dairy and Fruits & Vegetables based); Fats, Oils and Fat Emulsions ; Meat and Meat Products; Egg and Egg Products ; Fish and Fish Products ; Fruit & Vegetable Products; Salt, Spices, Condiments and Related Products ; Sweetening Agents including honey; Dairy Products and Analogues; Other Food Products and Ingredients ; Food additive and preservatives
11	Ozone Pharmaceuticals Limited, Bahadurgarh 639 - 640, 1st floor, MIE, Bahadurgarh-124507, Haryana	**Physical and chemical:** Bakery & Confectionery Products; Canned & Processed Foods; Cereals, Pulses & Cereal Products; Edible Oils & Fats; Fruit & Fruit Products; Herbs, Spices & Condiments; Honey & Honey Products; Milk & Dairy Products; Vegetables & Vegetable Products
		Biological: Packaged Drinking Water; Canned & Processed Foods; Cereals, Pulses & Cereal Products; Fruit & Fruit Products; Herbs, Spices & Condiments; Milk & Dairy Products; Vegetables & Vegetable Products; Other Specified Food Items
12	Saturn Quality Certifications Pvt. Ltd., Bahadurgarh, V-17, Red Cross Road, Modern Industrial Estate (MIE), B.Garh, Haryana–124507	**Physical and chemical:** Packaged Drinking Water/ Natural Mineral Water; Bakery & Confectionery Products; Cereals Products; Milk Powder (Skimmed or Partly Skimmed); Snacks Products ; Ready To Eat Food Products; Spices And Condiments (Whole & Ground) ; Oils & Fats
		Biological: Not Available
13	SGS India Private Limited, Manesar, Gurgaon, Plot No. 21, Sector-3, IMT Manesar, Gurgaon District, Haryana-122050	**Physical and chemical:** Oils & Fats ; Tea and Tea Products; Sugar and By Products; Starch and Starchy Products; Cereal, Pulses and By-Products; Nuts and nut products; Milk and Dairy Products; Meat and Meat products; Spices and Condiments; Bakery and Confectionary Products; Honey and Honey Products ; Alcoholic Drinks & Beverages; Fruits and vegetable products; Food Additives ; Coffee, cocoa and their products; Infant Foods; Nutraceuticals and functional foods; Residues in food products; Residues in Water
		Biological: Bakery & confectionery products; Beverages (Non- Alcoholic); Canned foods & processed foods; Cereals, pulses & cereal products; Coffee & Cocoa Products; Edible Oils & Fats & Oil Seeds; Eggs & Egg Products; Fish & sea foods; Fruit, Fruit Products, Vegetable & Vegetable Products; Gelatin & other gums; Herbs, Spices & Condiments; Honey & Honey Products; Infant foods; Jams, Juices, Sauces & Concentrates; Meat and Meat Products; Milk and Dairy Products; Nuts & Nuts Products; Poultry & Poultry Products; Sugar, Sugar Products & Boiled Confectionary; Snacks & Instant Mixes; Tea; Packaged Natural Mineral Water & Packaged Drinking Water; Drinking Water;
14	TUV SUD South Asia	**Physical and chemical:** Oil Seeds & By-Products; Starch & Starch Products; Sugar &

	Private Limited, Gurgaon, 373, Udyog Vihar, Phase II, Sector 20, Gurgaon-122 016, Haryana	Sugar Products; Tea; Fruit & Fruit Products;Bakery & Confectionery Products; Herbs, Spices & Condiments; Fish & Fish Products; Beverages (Alcoholic / Non-alcoholic); Honey & Honey Products; Canned & Processed Foods; Infant Foods; Cereals, Pulses & Cereal Products; Jams, Juices, Sauces & Concentrates; Coffee & Cocoa Products; Meat & Meat Products; Edible Colours & Flavours; Edible Oils & Fats; Milk & Dairy Products; Nuts & Nut Products; Drinking Water; Packaged Drinking Water; Residues in Food Products- Pesticides; Residues in Water- Pesticides
		Biological: Bakery & Confectionery Products; Beverages (Alcoholic / Non-Alcoholic); Canned & Processed Foods; Cereals, Pulses & Cereal Products; Coffee & Cocoa Products; Fish & Sea Foods; Fruit & Fruit Products; Genetically Modified Foods and Agricultural Products; Herbs, Spices & Condiments; Jams, Juices, Sauces & Concentrates; Meat & Meat Products; Milk & Dairy Products; Nuts & Nut Products; Sugar & Sugar Products; Snacks and Instant Mixes; Tea; Vegetables & Vegetable Products; Packaged Drinking Water
15	J.M. Enviro Lab Private Limited, Gurgaon S.C.O.16, Sector 10-A, Gurgaon- 122001	**Physical and chemical:** **----** Not Available **Biological:** **--** Not Available

B. NABL Accredited Laboratories Authorized for Pesticide Residue

1	Fare Labs Pvt Ltd L-17/3, DLF Phase-II, M.G. Road , Gurgaon, Haryana, 122002	Pesticide residue in food

C. NABL and APEDA Approved Laboratories for General Food Products

1	TUV Sud South Asia Pvt. Ltd. No.373 Udyog Vihar Phase-II Sector-20 Gurgaon, Haryana 122 016 Tel: 09650900136, 09871177915 info@tuv-sud.in;	Residual analysis of pesticides, heavy metals in fresh and processed fruits & vegetables, cereals (rice, wheat, maize), drugs & antibiotics in honey, meat, poultry & dairy products, aflatoxins in nuts (walnuts, groundnuts & their products), processed food products and microbiological analysis in food products
2.	Interstellar Testing Centre Pvt. Ltd. Plot No. 86 Industrial Area Phase-I Panchkula 134 109 Tel: 0172-2565825 Fax: 2651543 customersupport@itclabs.com;	Heavy metal analysis in fresh and processed fruits & vegetables, cereals (rice, wheat, maize) and microbiological analysis in food products
3.	SGS India Pvt. Ltd. Plot No. 21, Sector-3 IMT Manesar, Gurgaon Haryana 122 050 Tel: 0124-6787600 Av.Abraham@sgs.com; Shivkant.dwivedi@sgs.com	Microbiological analysis in food products

A BRIEF ABOUT THE MEMBERS OF WORKING GROUP

Dr. A.K. Yadav

Dr.A.K. Yadav, former Director, National Centre of Organic Farming, Ministry of Agriculture, Government of India is currently Advisor (NAB), National Program for Organic Production at APEDA, Ministry of Commerce and Industry, New Delhi. He is a known expert in development of organic farming policies, programs and quality assurance systems at central and state levels. As Head of National Centre of Organic Farming he spearheaded organic farming movement in the country and abroad. He has contributed in the development of regulatory system of organic and biological inputs, organic certification systems, organic package of practices and organic crop management protocols and implementation of various Government schemes. Besides contributing to spread of biological and organic inputs and organic farming he authored the book "Participatory Guarantee System under PGS-India Program" of the Ministry of Agriculture, which provides low cost organic guarantee system to farmer groups for domestic markets. He has been member of various committees, expert panels and task force on bio-fertilizers, pesticides, organic farming and research advisory committees to various ICAR research institutes. Recently he has authored three books on organic package of practices for vegetables, fruits, plantation crops, tubers and spices crops.

DR. I.S. Hooda

Dr. Hooda earned his B.Sc. (Hons.) Ag, M.Sc. (Agronomy) and Ph.D from Haryana Agricultural University, Hisar, Haryana and retired there as Chief Scientist after a long service of over 35 years. He guided twelve M.Sc. and six Ph.D students. He worked as Sub Editor: Indian Journal of Agricultural Research, Chief Editor of PrakritikKheti (Nature Farming), Naissargik Khetibari (Organic Farming); Nature Farming for Sustainable Agriculture; Joint Secretary of Haryana Agronomists Association; Secretary of International Society for Nature Farming (ISNF), Board of Director for Maharishi Vedic Organic Certification Agency (accredited by USDA) USA; Member committee-ARNOA (Asia Research Network of Organic Agriculture), Dankook University, Korea, November 2002-2006 and IFOAM (International Federation of Organic Agriculture Movement). He is a Life Member of six Technical Societies. He conducted National and International Conferences on Nature Farming. Presently, he is serving as consultant for Maharishi Organic Vedic Agriculture in Brazil, Venezuela, USA, Africa and Asia.
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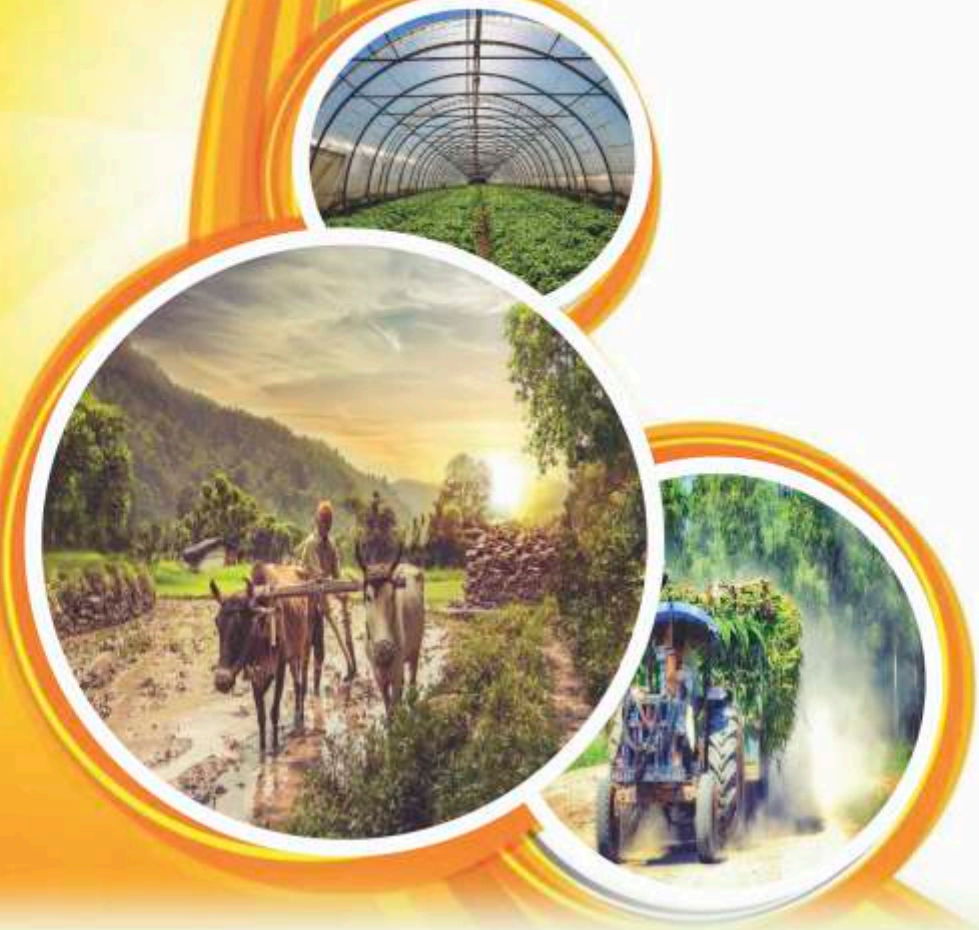
Dr. Ravindra Kumar

Dr. Ravindra Kumar obtained his Master Degree in Agricultural Chemistry and Soil Science from Agra University and started his career in processing of Pesticides formulations for quality evaluation in the Directorate of Plant Protection, Quarantine and Storage, Government of India. Later he joined National at Bio-fertilizers Development Centre (NBDC) under Ministry of Agriculture, Government of India and worked in North-West Region States of Haryana, Punjab, Jammu and Kashmir and Himachal Pradesh and Central Region States of Maharashtra, Andhra Pradesh, Telangana, Goa, Dadara and Nagar Haveli and remained associated with identification of local strains of microbes used in bio-fertilizers production. During this tenure he worked for the promotion of bio-fertilizers having certain targets fixed by the Government. Under National Project on Promotion of Organic Farming through HRD programs and Field Demonstrations he is working as campaigner for implementation of PGS-India Organic Certification and evaluation of quality of Organic Inputs while being posted in various regions in the country. He has worked for 16 years in the State of Haryana. He is currently posted and serving as Deputy Director in National Centre of Organic Farming, Ghaziabad under Ministry of Agriculture, Government of India.

Dr. Attar Singh Sangwan

Dr. Sangwan passed his B.Sc (Hons.) Agri. from CCS HAU Hisar in 1975 and then joined as Agriculture Development Officer in the Department of Agriculture, Haryana and retried as Deputy Director Horticulture from the Department of Horticulture Haryna in January 2010. He served these departments for 34 years and held positions of ADO/HDO, Technical Assistant, District Horticulture Officer and Deputy Director Horticulture. He was trained for sustainable Agriculture in USA during April 1998. After retirement he served the Department as a pioneer organic expert at Center of Excellence for Vegetables under Indo Israel Project, Gharaunda (Karnal).



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