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Package of Practices For Organic Potato Cultivation in Hills

ICAR - Central Potato Research Institute
Shimla - 171 001 Himachal Pradesh, India

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PACKAGE OF PRACTICES FOR ORGANIC POTATO CULTIVATION IN HILLS

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Abbreviations

APEDA	Agricultural and Processed Product Export Development Authority
CPRI	Central Potato Research Institute
CPRI-RS	Central Potato Research Institute Regional Station
DAC	Department of Agriculture and Cooperation
GMO	Genetically Modified Organisms
ICAR	Indian Council of Agricultural Research
IFOAM	International Federation of Organic Agriculture Movement
LoQ	Level of Quantification
MRL	Maximum Residue Limit
MT	Million Tonne
NAB	National Accreditation Body
NAC	National Advisory Committee
NCOF	National Centre of Organic Farming
NGO	Non-Government Organization
NPOP	National Programme for Organic Production
NSOP	National Standards for Organic Production
PGS-India	Participatory Guarantee System of India

FOREWORD

Himalayas and Nilgiris have ample scope for organic potato cultivation as fewer chemicals have been used in these regions during the era of green revolution. That is why policy planners have kept hilly Indian states in the top priority list for organic farming. Sooner or later almost complete hilly regions are going to be converted into organic cultivation. Ecology of the hilly region is fragile and climate change is also affecting it unpredictably, therefore, natural means of farming will get amalgamated with their ecology with minimum disturbance to their balance. These regions also possess huge biodiversity and numerous natural products can be integrated into the package of organic farming. The potato crop would be no exception for that as it is an important off-season tuber cash crop of this region and its organic cultivation will fetch a premium price for seed, fresh as well as processing potatoes. At the national level, hills contribute around 6% of total potato production and this crop will be promoted better with the timely intervention of improved organic potato technologies.

The potato crop is mainly raised as long day crop in the northern hills and has different challenges of crop management as compared to the plain regions. A similar situation exists in the southern hills too. Therefore, the selection of the most appropriate variety is pivotal for successful potato production in this zone. It is recommended to cultivate late blight resistant varieties in hills since late blight is the major damaging disease. In southern hills, resistance to cyst nematode and wart is also necessary. Further, most of the crop is grown in rainfed conditions, so, production technology has to be moulded accordingly in the context of biotic and abiotic stresses.

Keeping in view all these factors, development of a package of practices for organic farming is highly desirable at this time and it gives me immense pleasure that agro-technologies for organic cultivation of potato in hills have been developed by the Institute to help the farming community of this region. I hope that this bulletin will address the queries of farmers for organic potato cultivation and improve their livelihood. Refinement in the package of practices in future should go

on to attain higher yields under organic farming. A focused approach should be followed in future for dealing with the issues of disease pressure and water stress.

I expect that this effort of authors will be fruitful for hill potato growers for increasing their income and environmental equilibrium will also be preserved. Scientists working in the hilly region will also take a clue and work for precision organic technologies. I wish them all success.

Director

ICAR-CPRI, Shimla

INTRODUCTION

Organic potatoes from the hilly region will certainly attract more consumers as already off-season market for traditional hill potatoes exists in plains and in metropolitan cities. This will not only improve farm profits but also help in maintaining the fragile ecological balance of hills. Traditionally, very fewer agrochemicals have been used in hilly regions as compared to plains and the national average, therefore, conversion of farmland into organic would be easy and take less time. Soils of hilly states are rich in organic matter which gives ample scope for organic cultivation of potato crop in these zones. This creates an opportunity for initiating organic farming of potato in hills.

Accreditation, compliance, evaluation and certification are the chief components of organic farming. Accreditation by the National Accreditation Body (NBA) is mandatory for certifying the organic farms, products and processes as per the National Standards for Organic Products (NSOP) and as per the guidelines of the National Accreditation Policy and Programme for organic products. The farmers who wish to start organic farming need to comply with the NSOP norms set under the National Program for Organic Production (NPOP). Evaluation of the crop at prescribed time interval as per the crop stages is mandatory for certification and it is done by authorized agencies. Certification of organic food is essential to ensure that they comply with all the laid out set standards. After certification, the farmer can sell his produce with logo in the domestic as well as international market.

Keeping the whole scenario in view, organic potato production package for the hilly region has been developed and compiled as per the NSOP guidelines. The organic farming package of practices is described below in lucid language for ease to potato growers.

NSOP BASED PRE-REQUISITES FOR ORGANIC FARMING

Potato crop production plan

Organic potato cultivation should include different components in its cropping scheme as it is an exhaustive crop. Two to three year cropping systems, raising of cover crops, green manures, intercropping or other diverse crop production techniques. Potato growers or their group adopting organic farming for this crop should develop an organic crop production plan. It will include recording complete information about all crops (main crop, intercrop, cover crop, sequential crop etc.) taken up in a production cycle. All agronomic practices and procedures followed should be recorded. Complete information of all the inputs utilized in fields like their source, elemental composition, usage frequency, rate of application, time of application, mode and method of application, storage etc. should be available in farm records. Inputs used for organic farming should be of organic origin. Record of all practices and field operations should be maintained at the farm site for the certification process. Proper management practices and physical barriers should be adhered to prevent mixing and contamination of organic production unit from non-organic farms. Maintaining record for all farm operations is mandatory for compliance of organic standards.

Organic farm conversion requirement

The conversion period is the interim period required for establishing the organic management system and soil fertility built up at the farm site. The start of the conversation phase can be counted from the day of the first inspection by the certification body. The conversion period may or may not be sufficient in order to develop the organic management system and build-up of soil fertility, but it is the period during which all necessary actions required to achieve the goal are to be initiated. A clear cut plan is prepared for converting a farm efficiently into an organic one within an expected timeframe. The plan should be updated by the potato growers for meeting all required standards. Criteria given in the standards shall comply during the conversation period which shall be applicable from the initiation of conversion period till it is over. If *de facto* requirements mentioned under NSOP standards have been

met for several years at the farm then a full conversion phase is not necessary and this can be verified through available documents like analysis reports. Inspections shall be carried out at a fixed time interval prior to the first harvest for such conditions.

Duration of conversion period

Certification for organic potatoes can be provided as and when requirements of the standards are met during the conversion period of at least two years under organic cultivation before the start of the production cycle. Accredited certification bodies shall decide in certain cases for extension or reduction of conversion period depending upon the past history of land use and the surrounding environment. Reduction of twelve months in conversion period may be considered for field crops if a documentary proof is presented to certification body that the requirements of the standards have been met for a period of minimum three years or more. For example, land certified for a minimum of three years under PGS- India and having inputs used from the approved list (Annexure I & II). The certification body shall also consider shortening of the conversion period if it gets satisfactory proof to demonstrate that the land uncultivated and/or only approved products were applied for three years or more. During the conversion period, organic produce of farm shall be sold as 'produce of organic agriculture in conversion' or of a similar 'description'during the conversion period, when the requirements prescribed under these standards have been adhered to for at least past one year.

Landscape

Biodiversity maintenance and natural conservation are essentials for organic farming. Certification programme at farm level shall set standards or procedures to facilitate biodiversity and natural conservation. Regions managed organically shall have to facilitate biodiversity. These may be extensive grasslands such as moorlands, reed land or dry land; all areas which are not under rotation and are not heavily manured; extensive pastures, meadows, extensive grassland, extensive orchards, hedges, hedgerows, groups of trees and/or bushes and forest lines; ecologically rich fallow land or arable land; ecologically diversified extensive field margins; waterways, pools, springs, ditches, wetlands and swamps and other water-rich areas which are not used for intensive agriculture or aqua production.

Diversity in crop production and management plan:

Organic farms shall maintain sufficient diversity taking into account pressure of insects, weeds, diseases and other pests while improving and maintaining soil organic matter, fertility, microbial activity and general soil health. Soil fertility shall be maintained through the cultivation of legumes or deep-rooted plants and the use of green manures in an established programme consisting of crop rotation and nutrient management with permitted organic products. The concept behind this in organic farming is to minimize nutrient losses by preserving soil structure and fertility and the ecosystem in the vicinity of the farm site.

Contamination control

Contamination by prohibited substances in any form is very critical control point in organic farming. Therefore, all possible means have to be adopted for not permitting the contamination from outside and within the farm area. Buffer zones of sufficient size have to be maintained to prevent contamination from conventional or non-organic fields. Analysis of doubtful produce and the possible source of contaminants like inputs, soil and water etc. is mandatory under the certification programme if doubt is there. Polyethene and polypropylene or other polycarbonates coverings such as plastic mulches, fleeces, insect net and silage wrapping are permitted. But, these should be removed from fields after use and should not be burnt on the farmland. However, the use of polychloride based products is prohibited in organic cultivation.

Soil and water conservation

Soil and water resources are to be managed in a sustainable way. All possible methods have to be adopted for preventing soil erosion and salinization, excessive and improper use of water and pollution of ground and surface water. Land clearing by way of burning organic matter, e.g. slash and burn, straw burning etc. shall be restricted to the minimum. Clearing of primary forest is prohibited. The organic certification programme shall include checking appropriate stocking rates which do not lead to land degradation and ground or surface water pollution.

NPOP norms for weeds, pests and diseases management

Basic requirements of NPOP for weed, pests and disease control

should be met sincerely to avoid rejection of produce. Emphasis should be given on proper land preparation, appropriate variety, balanced use of nutrients, sustaining soil fertility with high biological activity, crop rotations, green manuring, intercropping, mulching etc. so that losses are reduced below economic threshold level from these menaces in organic farming. Natural enemies of pests and diseases should be protected and encouraged through proper habitat development by growing hedges and maintaining nesting sites. An ecological equilibrium has to be achieved in the pest-predator cycle. Products prepared at farm level from local plants, animals and microorganisms are permitted for pests, diseases and weed control (Annexure-II). Thermic weed control and physical methods for pests, diseases and weeds management are permitted. Thermic sterilization of soils to combat pests and diseases are restricted in circumstances where a proper rotation or renewal of soil cannot take place. Permission of certification body is required on a case to case basis. All equipment from conventional farming systems must be properly cleaned and free from residues before being used in organic fields. Use of synthetic herbicides, fungicides, growth regulators, synthetic dyes, insecticides and other pesticides are prohibited. Potato growers have to maintain product content and use records for inspection by the certification body. Permission for the application of commercial products will always be evaluated by the certification body as per the NPOP criteria (Annexure-II). Genetically engineered organisms or products are prohibited in organic agriculture.

PACKAGE OF PRACTICES FOR ORGANIC POTATO CULTIVATION

Potato growing regions in hills

Hills have wider variability of topography, directions and soils. So, these regions have further been divided into suitable potato growing regions along with their respective varietal requirements (Table 1).

Table 1: Major potato growing hill zones in India with their varietal requirements

Zone	Major states	Crop season	Varietal requirements
North-western and central hills	Jammu and Kashmir, Himachal Pradesh & Uttaranchal		
Very high hills (3000-3500 m amsl)		***Summer:*** June to September	Long day adapted, resistance to late blight
High hills (1800-3000 m amsl)		***Summer:*** March/ April to August/ September	Long day adapted, high resistance to late blight
Mid hills (1000-1800 m amsl)		***Spring:*** January/February to May/June ***Autumn:***August/ Septemberto November/ December	Resistance to early blight, late blight, bacterial wilt and viruses
Low hills (600-1000 m amsl)		***Winter:*** November to February/ March ***Autumn:*** July/ August to September/ October	Resistance to early blight, late blight, bacterial wilt, viruses and tuber rots
North-eastern hills (500-2400m amsl)	Meghalaya, Manipur, Mizoram, Tripura, Nagaland & Arunachal Pradesh	***Spring:*** February/ March to June/July ***Autumn:***August/ September to December	Long day adaptation and resistance to late blight, bacterial wilt.
North Bengal and Sikkim hills (1000 –2000 m amsl)	Sikkim & hills of West Bengal	***Spring:*** January/ February to June /July ***Autumn:*** September/ October to November/ December	Resistance to late blight and wart, and distinct preference of red skin tubers

Southern hills (1000 –2000 m amsl)	Nilgiris & Palini hills of Tamil Nadu	***Summer:*** March /April to August/ September ***Spring:*** January/ February to May/June ***Autumn:*** September to December	Long day adapted, early bulking, resistance to late blight and cyst nematodes

*m amsl-meter above mean sea level

Crop rotation

Following suitable crop sequence is very significant in controlling weeds, pests and diseases as continuous cultivation of the same crop in the same filed increase their incidence and severity. In hills, it is very important as inoculum load of diseases like late blight and pests like cyst nematode increases from one season to next season. At least one leguminous, vegetables, green manure and forage crop should be included in potato based cropping systems. Preceding and succeeding crops should not be exhaustive like potato crop. It is advisable to follow atleast 2-4 year cropping system in hills. Farmers can select potato and other crop varieties, adjust crop duration suitable to their overall farming situation and develop the more remunerative organic farming system. This will also help in improving and sustaining soil structure and fertility (Table 2).

Table 2: Major potato based cropping systems for hilly regions

Zones	Suitable cropping system	Suitable intercropping system
North-Western & Central hills (Jammu & Kashmir, Himachal Pradesh and Uttarakhand)	High hills: Potato- vegetable pea Mid hills: Potato- potato, potato- radish, potato-turnip, potato- carrot, potato- fenugreek, potato- spinach, potato- radish- radish Lower hills: Maize- potato- spring potato, maize- wheat- potato, maize- toria- potato, maize- vegetable pea- potato- maize	Potato+ French bean, potato + maize, potato + garlic
North-Eastern hills (Assam, Meghalaya, Arunachal Pradesh, Manipur, Nagaland, Mizoram and Tripura)	Potato- potato, rice- potato, maize- potato, radish- potato, cauliflower- potato, cabbage- potato, potato- beans, potato (summer)-barley (autumn), rice- potato- rice, rice- potato- green gram	-

North Bengal and Sikkim hills	Potato- potato, maize- potato	-
Southern hills (Nilgiris and Palini hills of Tamil Nadu)	Potato- cabbage, potato- carrot, potato- potato, potato- radish, potato- cabbage- potato, potato- cabbage- radish	Potato (summer)+ French beans

Choice of cultivar

It is recommended to cultivate disease-resistant potato varieties suitable to different regions of hills, like late blight, wart disease and cyst nematodes (Table 3). Similarly, consider genetic diversity while selecting varieties for other crops in the cropping/ inter-cropping sequence. NSOP norms also suggest selecting locally adapted varieties in organic farming systems for the lower incidence of disease and pest, and sustainable productivity of individual crops and overall systems.

Table 3: Potato varieties for hills

Variety	Adaptability	Maturity	Yield (t/ha)	Resistance	Tuber characters
Kufri Girdhari	Indian hills	100-110	30-35	Late blight	White cream, ovoid tubers, shallow eyes, white flesh
Kufri Himsona	Indian hills	110-120	25-30	Late blight, wart, chipping variety	White-cream, round tubers, shallow eyes, cream flesh
Kufri Himalini	North Indian hills	90-100	30-35	Late blight,	White cream, ovoid tubers, medium-deep eyes, cream flesh
Kufri Jyoti	Indian hills	90-100	25-30	Early and late blight, immune to the wart	White-cream, ovoid tubers, shallow eyes, cream flesh
Kufri Mehga	North eastern hills	90-100	25-30	Early and Late blight	White-cream, ovoid tubers, medium- deep eyes, cream flesh
Kufri Shailza	North Indian hills	90-100	30-35	Late blight	White-cream, ovoid tubers, shallow eyes, white flesh
Kufri Swarna	South Indian hills	90-100	30-35	Early and late blight, wart, cyst nematode	White-cream, ovoid tubers, shallow eyes, white flesh

Planting time

Summer (February-July) and autumn (August-November) are two distinct planting season for hills. In hills, summer planting starts from the third week of february and autumn planting starts from last week of August. However, the date of planting may be set depending upon region, elevation and soil moisture (Table1).

Potato seed

Tuber seed must be procured from authenticated source with proper certification and replaced within 3-4 years. NSOP norms state that all seed/ planting material must be a certified organic one. If such material is not available then use chemically untreated conventional seed/ planting material. Use of genetically engineered seed, transgenic plants or plant material is prohibited in organic farming. Healthy seed can also be multiplied organically by farmers by following eco-friendly technologies.Vector particularly aphid population should be kept below critical limits (20 per 100 compound leaves). Aphids are monitored by placing yellow traps. Yellow coloured sticky traps are placed 8-10 days after planting to trap whitefly and aphids. Height of traps should be adjusted to canopy height. Suitable locally available insect repellant mulch may be used for seed production. Weekly foliar sprays of horticulture mineral oil @ 0.5% helps in reducing whiteflies and aphid population. Seed potatoes are withdrawn from cold store 10-15 days before planting. Seed tubers are kept in a diffused light under shades with proper provision of ventilation for better sprouting. Tubers can be kept in baskets, wooden boxes and plastic trays or may be spread in a thin layer on the floor. Off variety, un-sprouted and rotten tubers should be periodically removed.

Fig. 1:Ridges and furrows planting method

Land preparation

Soil should be thoroughly plough one month prior to planting and expose to sunlight to destroy soil-borne pest and pathogens. At second ploughing application of lime @ 300 kg/ha and neem cake @ 300 kg/ ha along with other manure is recommended and it should be done 15-20 days before planting. Last ploughing and planking should be done 1-2 days before planting.

Planting

Ridges and furrow method is suitable for potato planting in hills. Plant spacing of 60 x 20 cm is recommended for better growth and optimum tuber yield. Optimum seed size tuber is 30- 50g and it is better to plant medium size tubersin organic cultivation.

Irrigation

The potato crop is raised mainly as a rain-fed crop in hills, but if the water is available and dry spell prolongs during crop period than two-three irrigations can be applied. Light irrigation may be scheduled immediately after planting, during the vegetative stage and in tuberization phase.

Weeding and earthing

The critical period of crop-weed competition is upto 50-60 days in hills and during this period crop must be kept weed-free. It is always advisable that weeding must be done whenever weed appears during the crop season. Normally, first-hand weeding is done at 35- 40 days after planting when plants attain a height of 10-15 cm.Inter-cultivation is done followed by application of the organic product for nitrogen and earthing up. Second inter-cultivation and earthing up should be done at 55-60 days. Inter-cultivation and earthing up improves aeration in the root zone, efficient utilization of organic inputs, soil moisture conservation, check weeds and greening of tubers.

Mulching

Mulching is a very efficient traditional way of controlling weeds, conserving soil moisture and slowly decomposing organic residues in soil. It deprives weeds of solar radiation and thus inhibits their germination and growth. The mulch cover helps in conserving soil moisture which facilitates quick emergence of the potato crop. Crop residue, dry straw, dry grasses, pine needles and any locally available vegetative material may be utilized in this operation. Their decomposition shall enrich the soil with organic matter and humus.

Plastic mulching has also come up as a promising technique for weed control in combination with micro-irrigation which is permitted in organic farming provided plastic material is removed from the field after use and either re-used or disposed of in an eco-friendly way.

Nutrient management

The certification programme shall set limits for the total amount of biodegradable material of microbial, plant or animal origin brought onto the farm unit from outside by considering local conditions and varietal requirements. This process shall also set procedures which prevent over manuring where there is a risk of pollution i.e. nitrate leaching etc. So as much as possible, such material shouldbe produced within the organic farms. Non-synthetic mineral fertilizers and brought-in biofertilizers (biological origin) shall be regarded as supplementary and not as a replacement for nutrient recycling. Mineral fertilizers shall only be used in a supplementary role to carbon-based materials. Mineral fertilizers shall be applied in their natural composition and shall not be rendered more soluble by chemical treatment. Only those organic or mineral fertilizers that are brought into the farm and shall be used when the circumstances demand (Annexure I). These products are permitted to use only when other fertility management practices have been optimized. Manures containing human excreta shall not be used. Accumulation of heavy metals and other pollutants shall be prevented. Certification bodies may grant some exceptions, but mineral fertilizers containing nitrogen are not permitted. Restrictions are there for using inputs like mineral potassium, magnesium fertilizers, trace elements, manures and fertilizers with a relatively high heavy metal content and/or other unwanted substances, e.g. basic slag, rock phosphate and sewage sludge. All synthetic nitrogenous fertilizers are prohibited.

Composting of crop residues and preparation of vermicompost is a common and very useful technique for utilization of farm waste into crop nutrition. This is an invariably indispensable part of organic farming. Several available methods can be used for this activity. Adopt any of the practices of manuring as per their availability. Apply well decomposed FYM @ 20t/ha + bamboo leaves ash @ 2.5 t/ha + rock phosphate @ 140 kg / ha or vermicompost @ 12 t/ha + bamboo leaves ash @ 2.5 t/ha + rock phosphate @ 140 kg / ha or organic poultry manure @ 7.5 t/ha + bamboo leaves ash @ 2.5 t/ha + rock phosphate @ 140 kg / ha. Again at the time of earthing up apply dry powder form of cow dung / FYM @ 5 t /ha for better growth, yield and for good microbial growth. Use bio-fertilizers are beneficial in organic agriculture. Apply *Azotobactor/ Azospirillium*, Phosphate Solubilizing Bacteria (PSB) and

Potash Mobilizing Bacteria as a seed treatment or Apply Azotobactor / Azospirillium @ 2.5 kg/ha, PSB @ 2.5 kg/ha and Potash mobilizing bacteria @ 2.5 kg/ha as a soil application at the time of planting. Purchase the bio-fertilizers from reliable sources and maintain its certificates for the evaluation and certification.

Disease management

The potato crop is affected by various diseases, which are caused by fungi, bacteria, virus and nematodes. Major diseases are early blight, late blight, leaf spot complex, black scurf, common scab, bacterial wilt, soft rot, charcoal rot, potato virus X, S, M,V,Y, stem necrosis, apical leaf curl virus and root-knot nematode etc. Integration of cultural and biological methods is permitted in organic cultivation and chemical measures are prohibited. Growing resistant cultivars and using disease-free seed is a very important component for all diseases. Green manuring and summer ploughing during summer is also effective in checking such diseases. Tuber damage and injury must be avoided during harvest and post-harvest handling of tubers. Damaged and rotten tubers must be removed from the heap before storage. Late blight is controlled by adjusting planting dates to avoid its serious attack and making heavy ridges to reduce tuber infection. Field scouting is done to identify and destroy patches of primary infection by removal of infected plants after drenching them with restricted permitted products. Irrigation should be stopped for some time when the weather condition is very congenial *Trichoderma viride* @ 0.7% in liquid formulation and *Bacillus subtillus* @ 0.25% can be used for its control. Spraying should be initiated before the appearance of disease and number of sprays may be more depending upon disease severity. Use of copper oxychloride @ 0.2% and copper hydroxide @ 0.2 % have shown lower disease severity, so these can be used for late blight control with permission from the certification body. Avoid cultivation of solanaceous crops and apply the recommended dose of organic manures/ products for sufficient nitrogen supply for controlling leaf spot complexes. Seed tuber treatment before storage with 3% boric acid for 25-30 minutes followed by drying under the shade, and crop rotation takes care of most of the seed/ soil-borne diseases like black scurf,fusarium wilt, dry rot, charcoal rot, bacterial wilt and common scab. Soil solarization and bio-fumigation with cruciferous plant species (mustard, radish) is also very effective in controlling such diseases. Diseases like charcoal rot and soft rot require potato harvesting before the soil temperatures exceed 28°C. Trap crop like marigold in alternate rows can reduce root-knot nematodes. Viral diseases are kept in check by field sanitation, regular rouging and

controlling weeds in seed crop.

Pest Management

Population dynamics of insects associated with potato crop should be watched carefully as they are fluctuating due to climate change. Ploughing before planting should be done to expose the soil pests *i.e.* larvae of white grubs, cutworms etc. to birds. Liquid culture of EPN (*Heterorhabditis indica*) prepared in water and EPN cultured in *Galleria* cocoons reduces white grub larvae drastically in soil. Dried *Neem* leaves are used as mulch in organic plots to reduce the insect population by their decomposition and repellant action. Combination of *neem* leaves with weekly foliar sprays of horticultural mineral oil @0.5% is fairly good in controlling whiteflies and aphids. Caterpillars can be controlled by using light traps. Potato tuber moth is controlled by heavy ridging, use of water traps and covering of potato heaps with dried lantana and eucalyptus leaves.

Harvesting

Dehaulming is done 10-15 days before harvesting of the crop for better tuber skin setting. Harvesting should be done on good sunny days. Spread the tubers on a clean and dry surface after harvesting for drying. All the rotted and diseased tubers should be sorted out and removed from the bulk and then grading should be done.

Storage

After proper drying, tuber should be kept in wooden crates or in plastic trays or in bamboo baskets in a cool and dry place (Fig. 2 and Fig 3). Beneath and above in wooden crates or plastic trays or in bamboo baskets place a 2 cm layer of dry chopped leaves of Lantana species to control potato tuber moth. Unscientific storing of potato tubers in heaps should be avoided because it generates heat inside the heap as it causes rottage of tuber in a moist atmosphere.

Fig. 2:Wooden crates

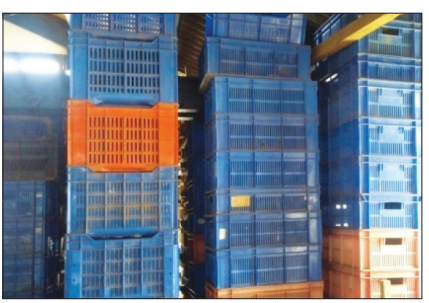


Fig. 3:Plastic trays

CERTIFICATION OF ORGANIC PRODUCE

The accredited certification bodies in case of NPOP and regional councils in case of PGS- India are responsible for certifying the organic food products (Annexure-IV).Certification of organic food is essential to ensure that they comply with all the laid out set standards.Organic foods should comply with the requirements for metallic contaminants, aflatoxins, naturally occurring toxic substances (NOTS)and pathogens as specified under the Food Safety and Standards (Contaminants, Toxins and Residues) Regulation, 2011. In the case of residues of insecticides, the limit of residue shall be 5% of the maximum limits prescribed under the above mentioned regulations or revel of quantification (LoQ) whichever is higher. The organic foods should comply with which other standards besides food Safety parameters. The organic foods should comply with the requirements of various parameters covered under the Food Safety and Standards (Food Product Standards and Food Additives) Regulations, 2011.

Brief description of terms and process used in organic farming (Adopted from APEDA)

Accreditation-Accreditation means a procedure adopted by the National Accreditation Body for ascertaining the competence of a Certification Body to certify organic farms, products and processes as per the National Standards for Organic Products.

Accreditation body- Accreditation Body shall be the agency set up by the Steering Committee for National Programme for Organic Production for accrediting Certification Body.

Accredited certification body- An organization with legal entity complying with NPOP accreditation criteria and recognized by the National Accreditation Body for certifying organic products and for granting the right to use Certification Trade Mark to the operators on behalf of Accreditation Body.

Accredited programme- It is the programme of Certification Body that has been approved by the Accreditation Body on the basis that it is in compliance with the provisions of National Programme for Organic Production.

Buffer zone- A clear defined and identifiable area boarding an organic production /site from that of the conventional production unit.

Certificate of accreditation- This is a document issued by APEDA, on behalf of National Accreditation Body (NAB) to the Certification Body certifying that accredited Certification Body is compliant with the standards as envisaged under National Programme for Organic Production and is competent to certify producers as per the standards specified by National Standards for Organic Production.

Certification- Certification shall refer to the procedure by which the accredited Certification Body by way of a Scope Certificate assures that the production or processing system of the operator has been methodically assessed and conforms to the specified requirements as envisaged in the National Programme for Organic Production.

Certification Trade mark- shall mean the India Organic Logo, which is owned by the Ministry of Commerce.

Certification programme- It shall mean that the system operated by a Certification Body in accordance with the criteria for carrying out certification of conformity as laid down herein.

Compliance- Compliance shall mean the adherence to the norms laid down under NPOP.

Consultancy- Consultancy shall mean the advisory service for organic operations, independent from inspection and certification procedures.

Conventional farming- Conventional farming shall mean the farming systems dependent on the input of artificial fertilizers and/or chemicals and pesticides or which are not in conformity with the basic standards of organic production.

Conversion- Conversion is the process of changing an agricultural farm from conventional to the organic farm. This is also called a transition.

Conversion period- This is the time between the start of organic management and the certification of crops as organic.

Inspection- It shall include the site visit to verify that performance of an operation

is in accordance with the production, processing and chain of custody as per NPOP standards.

ISO guide 65/ ISO 17065- These are general requirements for Certification Bodies operating product certification system.

ISO 17011- These are general requirements for accreditation bodies carrying out accreditation of Certification Bodies.

Labelling- Labeling shall mean any written, printed or graphic representation that is depicted on the label of the certified organic product, for the purpose of promoting its sale.

License- It is the permission granted to the operator by the accredited Certification Body on behalf of National Accreditation Body to use the Certification Trade Mark "India Organic Logo" to certify that their products or processes are organic.

National programme for organic production (NPOP)- NPOP has set up standards for organic production, criteria, system, and accreditation procedure from certification bodies, "India organic logo" and regulations governing it.

National standards for organic production (NSOP)- NSOP sets out the standards to be followed in cultivation/ harvest/ production /processing and trading of organic products

Organic- Organic refers to a particular farming system as described in the standards.

Organic agriculture- It is a system of farm design and management to create an eco-system, which can achieve sustainable productivity without the use of artificial external inputs such as chemicals, fertilizers and pesticides.

Package of practices- The guidelines for organic production and processing for specific crop and region.

Parallel production- Parallel production shall mean any production where the same unit is growing, breeding, handling or processing the same products both in a certified organic quality and a noncertified organic quality. Similarly, a situation with "organic" and "in conversion" production of the same product is also parallel production.

Plant protection product- Plant protection product shall mean any substance intended for preventing, destroying, attracting, repelling, or controlling any pest or disease including unwanted species of plants or animals during the production, storage, transport, distribution and processing of food, agricultural commodities, or animal feeds.

Participatory guarantee system of India-PGS-India is a decentralized organic farming certification system under Department of Agriculture & Cooperation, Ministry of Agriculture and Farmers Welfare, Government of India. It is a quality assurance initiative that is locally relevant, emphasize the participation of stakeholders, including producers and consumers and operate outside the framework of third party certification.

Standards- Standards shall mean the NSOP approved by the National Steering Committee for NPOP.

TraceNet- TraceNet is an internet-based electronic service offered by APEDA to the stakeholders for facilitating process certification for the export of organic products from India which comply with the NPOP or NSOP standards. TraceNet collects stores and reports- forward and backward traces and quality assurance data entered by the operators/ producer groups and certification bodies within the organic supply chain in India.

ANNEXURES

Annexure I

Products for use in plant nutrition and soil conditioning (Source: NPOP)

Matter produced on an organic farm unit	
Farmyard & poultry manure, slurry, urine, crop residues and green manure, straw and other mulches	Permitted
Matter produced outside the organic farm unit	
Compost from plant residue; Peat without synthetic additives (prohibited for soil conditioning); Sawdust, wood shavings, wood provided it comes permitted from untreated wood	Permitted
Blood, meat, bone and feather meal without preservatives; Compost made from any carbon-based residues (animal excrement including poultry); Farmyard manure, slurry, urine; Fish and fish products without preservatives; Guano; By-products from food and textile industries of biodegradable material of microbial, plant or animal origin without any synthetic additives; Seaweed and seaweed products obtained by physical processes, extraction with water or aqueous acid and/or alkaline solution; Sewage sludge and urban composts from separated sources monitored for contamination; Straw; Vermicasts; Animal charcoal; Compost and spent mushroom and vermiculate substances; Compost from organic household reference; By-products from oil palm, coconut and cocoa (including empty fruit bunch, palm oil mill effluent (pome), cocoa peat and empty cocoa pods); By-products of industries processing ingredients from organic agriculture	Restricted
Human excrement	Not allowed
Minerals	
Calcified seaweed; Calcium chloride; Calcium carbonate of network origin (chalk, limestone, gypsum and phosphate chalk); Sodium chloride; Magnesium sulphate (Epson salt); Gypsum (calcium sulphate); Clay (bentonite, perlite, zeolite)	Permitted
Basic slag; Calcareous and magnesium rock; Mineral potassium with low chlorine content (e.g. sulphate of potash, kailinite, sylvinite, patenkali); Natural phospahte (e.g. rock phospahte); Pulverised rock; Trace elements (boron, Fe, Mn, Mo, Zn); Wood ash from untreated wood; Potassium sulphate; Aluminum calcium phosphate; Sulphur; Stone mill	Restricted
Microbial preparations	
Bacterial preparations (bio-fertilizers), biodynamic preparations, plant preparations, botanical extracts, vermiculate, peat	Permitted

"Restricted: Conditions and procedure for use shall be set by the certification programme"

Annexure II

Products for plant pest and disease control (Source: NPOP)

Substances from plant and animal origin	
Plant-based extracts (*neem*, garlic, Pongamia etc.); Gelatine; Casein; Extract from mushroom (Shiitake fungus); Extract from Chlorella	Permitted
Azadirachta indica (*neem* oil etc.); Preparation of rotenone from *Derris elliptica*, *Lonchocarpus, Thephrosia* spp.; *Propolis*; Preparation of *pyrethrins* extracted from *Chrysanthemum cinerariaefolium*, containing possibly a synergist, *Pyrethrum cinerafolium*; Preparation from *Quassia amara*; Release of parasite predators of insect pests; Preparation from *Ryania* species; *Lecithin*; Seaweeds, seaweed meal, seaweed extracts, sea salt and salty water; Fermented product from *Aspergillus*; Natural acids (vinegar)	Restricted
Tobacco/ tea	Not allowed
Minerals	
Clay (bentonite, perlite, vermiculite, zeolite etc.); Sodium bicarbonate	Permitted
Chloride of lime/soda; Copper salts/inorganic salts (Bordeaux mix, copper hydroxide, copper oxychloride) used as a fungicide, maximum 8 kg/ ha/ year depending upon crop and under the supervision of inspection/ certification agency; Diatomaceous earth; Light mineral oils; Permanganate of potash; Lime sulphur (calcium polysulphide); Silicates (sodium silicate, quartz); Sulphur (as a fungicide, acaricide, repellent)	Restricted
Mineral powders (stone meal, silicates)	Not allowed
Microorganisms / Bio-control agents	
Viral preparations (Granulosis viruses, Nuclear polyhydrosis viruses etc.); Fungal preparations (*Trichoderma* species etc.); Bacterial preparations (*Bacillus* species etc.); Parasites, predators and sterilized insects	Permitted
Others	
Softsoap (potassium soap); Homeopathic and ayurvedic preparations; Herbal and biodynamic preparations	Permitted
Carbon dioxide and nitrogen gas	Restricted
Ethyl alcohol	Not allowed
Traps	
Physical methods (chromatic traps, mechanical traps, light traps, sticky traps and pheromones); Mulches, nets etc.	Permitted

Average nutrient content in various manures

Table 1: Average nutrient content of bulky organic and green manures

Manure	Percentage content (dry weight)		
	Nitrogen	Phosphoric acid (P_2O_5)	Potash (K_2O)
Farmyard manure	0.95	0.62	2.20
Rural compost	0.75	0.63	1.05
Urban compost	1.35	0.62	1.45
Sesbania	2.01	0.32	2.03
Sunhemp	2.16	0.48	2.11
Cluster bean	1.46	0.25	1.89
Cowpea	2.45	0.56	2.32

Table 2: Average nutrient content of major concentrated organic manures

Manure	Percentage content (dry weight)		
	Nitrogen	Phosphoric acid (P_2O_5)	Potash (K_2O)
Castor	4.3	1.8	1.3
Cottonseed cake un-decorticated	3.9	1.8	1.6
Neem cake	5.2	1.0	1.4
Safflower cake un-decorticated	4.9	1.4	1.2
Groundnut cake	7.3	1.5	1.3
Linseed cake	4.9	1.4	1.3
Niger cake	4.7	1.8	1.3

Table 3: Average nutrient content of crop residues

Manure	Percentage content (dry weight)		
	Nitrogen	Phosphoric acid (P_2O_5)	Potash (K_2O)
Rice straw	0.60	0.24	1.48
Wheat straw	0.56	0.11	1.52
Maize stalks	0.42	0.45	1.65
Potato haulms	1.90	0.36	2.14
Sunflower stalks	1.90	0.61	2.10
Vegetable peas straw	1.40	0.32	1.27
Banana dry	0.61	0.12	1.00

Table 4: Characteristics of vermicompost prepared from organic wastes

Substrate	C/N ratio	Available nutrient			Microbial counts
		Nitrogen	P_2O_5	K_2O	
Cow dung					
Original	49.16	0.53	0.003	0.104	-
Vermicomposted	16.83	1.20	0.004	0.396	24 x 106

Annexure IV

Accredited certification bodies under NPOP (Source: APEDA)

Name of certification agency and accreditation no.	Contact person and address
Bureau Veritas (India) Pvt. Limited NPOP/NAB/001	Mr. Ramesh Koregave Director – Certification: 72 Business Park, Ground Floor Marol Industrial Area, MIDC Cross Road 'C', Andheri (East) Mumbai - 400 093, Maharashtra Email : kaushik.sengupta@in.bureauveritas.com Contact Number : Office : +91 22 62742905; Mobile :+91 22 8691874332; Direct : +91 22 62742932 Website : http://www.bureauveritas.co.in
ECOCERT India Pvt. Ltd. NPOP/NAB/002	Mr Anil Jadhav Chief Executive Officer: Unit number 801, 8th Floor, The Palm Square, Sector 66, Golf Course Extension Road, Gurgaon 122102 Haryana India Telephone: +91-124-6999959 Fax: +91 124 4313171 Email: anil.jadhav@ecocert.com Website: www.ecocert.in
IMO Control Pvt. Ltd. NPOP/NAB/003	Mr Umesh Chandrasekhar Director: No. 3627, 1st Floor, 7th Cross, 13th 'G ' Main, H.A.L. 2nd Stage, Bangalore-560 008. Tel. No: +91-80-25285883, 25201546, 25215780 Fax: 0091-80-25272185 Email: imo@imocontrol.in , Web: www.imocontrol.in
Indian Organic Certification Agency (INDOCERT) NPOP/NAB/004	Mr Mathew Sebastian, Executive Director: Kuttamassery, Thottumugham P.O Aluva – 5, Ernakulam District Kerala, Telefax: 0484 2922400, 2630908 Email: info@indocert.org Web: www.indocert.org
Lacon Quality Certification Pvt. Ltd. NPOP/NAB/006	Mr Bobby Issac, Director, Chenathra, Theepany, Thiruvalla - 689 101 (Kerala) Tel. No: 0469 2606447 Fax: 0469 2631902 Email: info@laconindia.com , Web: www.laconindia.com
OneCert Asia Agri Certification (P) Ltd. NPOP/NAB/008	Mr. Sandeep Bhargava, Chief Executive Officer: H-08, Mansarovar Industrial Area, Mansarovar Jaipur-302020, Rajasthan , Phone & Fax- 0141-2395481,6541882, 6541883 Email:- info@onecertasia.in , Web site:- www.onecertasia.in
SGS India Pvt. Ltd. NPOP/NAB/009	Mr. Soumik Mondal National Certification Manager, SGS India Pvt Ltd 226,Udyog Vihar, Phase-I Gurgaon-122016 Haryana Tel: +91 124 6776300 Ext 6379 91 124 6776379 (Direct) Fax: +911246776403/04 Mobile: +91 8860117818 Email: Soumik.Mondal@sgs.com , Website www.sgsgroup.in
Control Union Certifications NPOP/NAB/0010	Dr. Binay Kumar Choudhury, Chairman, Plot No. C-113, Pawane MIDC, Navi Mumbai - 400709 Tel: +91-22-61294300 Fax:+91-22-61294217 Mobile: 9969002860 Email: cuc@controlunion.in, bkchoudhury@controlunion.com Website: www.controlunion.com

Uttarakhand State Organic Certification Agency (USOCA) NPOP/NAB/0011	Sh. Gauri Shankar, Director, Third Floor, Krishak Bhavan, Mussoorie By-Pass Ring Road Nehru Gram, Dehradun, Uttarakhand Tel: 0135 2671734 Email: info@usoca.org, Website: www.usoca.org
APOF Organic Certification Agency (AOCA) NPOP/NAB/0012	Mr Swapnil Satish, General Secretary, Holkar House, First Floor, Sr no: 54, Near Nikhil Garden, Wadgaon Bk. Pune 411041 Phone /fax: 020-65410070 Mobile: +91 7720073202 Email: info@aoca.in, Website: www.aoca.in
Rajasthan Organic Certification Agency (ROCA) NPOP/NAB/0013	Mr Madhu Sudan Sharma, Director, 3rd Floor, Pant Krishi Bhawan, Janpath, Jaipur 302 005 Rajasthan Tel. No.: 0141-2227104, Tele Fax: 0141-2227456 Email: rocajpr.cb@gmail.com, Website: www.mpsoca.org
Vedic Organic Certification Agency NPOP/NAB/0014	Dr. (Mrs.) M. Usha, Managing Director, Plot no-54,Ushodaya Enclave Mythrinagar, Miyapur Hyderabad-500050 Telangana Phone: 040-65276784 Fax: 040-23045338 Email : voca_org@yahoo.com , Website: www.vediccertification.com
ISCOP (Indian Society for Certification of Organic Products) NPOP/NAB/0015	Prof: Dr K. K. Krishnamurthi, President, Indian Society for Certification of Organic Products (ISCOP) 135, Ponnurangam Road West R.S. Puram, Coimbatore-641002 Tamil Nadu Phone:0422-2544199/ 0422-2546160 Mobile:91 94432 43119 Email: iscopcbe@gmail.com Website:iscoporgcertindia.com
TQ Cert Services Private Limited (formerly FoodCert India Private Limited) NPOP/NAB/0016	Mr Tenny Koshy Cherian, Director, A Wholly Owned Subsidiary of Tata Projects Limited 4th floor, Mithona Towers-I 1-7-80 to 87 Prenderghast Road, Secunderabad Telangana - 500003 Mob: +91 9848335693; 9654803362 Email: tq@tqcert.in; tennycherian@tataprojects.com, Website:- www.tqcert.in
Aditi Organic Certifications Pvt. Ltd NPOP/NAB/0017	Mr Narayana Upadhyaya, Director, Aditi Organic Certifications Pvt. Ltd. No. 38, 1st Floor, 20th Main Road, First Block, Rajajinagar, Bengaluru-560010 Tel.: +91-080 23328134/35/36 Fax: +91-80-23373083 Mobile: +91-9845064286 Email: aditiorganic@gmail.com, Website: www.aditicert.net
Chhattisgarh Certification Society, India (CGCERT) NPOP/NAB/0018	Mr S.C. Agrawal (IFS), Chief Executive Officer, Campus SFRTI Near Vidhan Sabha Zero point, Baloda Bazar Road, Raipur, Chhattisgarh 493 111 Tel: +91-771-2283249 Fax: +91-771-2283249, Email: cgcert@gmail.com, Website: www.cgcert.com
Tamil Nadu Organic Certification Department (TNOCD NPOP/NAB/0019	Mr N. Sundar, Director, 1424 A, Thadagam Road G.C.T Post, Coimbatore – 641013 Tamil Nadu Tel.: 0422 2435080 Fax: 0422 2457554 Email: tnocdcbe@gmail.com Website: www.tnocd.net
Intertek India Pvt. Ltd. NPOP/NAB/0020	Mr. Neeraj Gupta, (Head–Certification, Food Services), E-20, Block B-1 Mohan Cooperative Industrial Estate Mathura Road New Delhi - 110 044 Ph : +91-11-4159 5430/ +91 9971656236 Fax : +91-11-4159 5475, E-mail:neeraj.gupta@intertek.com, Websit : www.intertek.com

Madhya Pradesh State Organic Certification Agency NPOP/NAB/0022	Mr K.S. Tekam, Managing Director, Vasundhara, B-II Office Complex Gautam Nagar Bhopal 462 023 Madhya Pradesh Tel: 0755 2600609 E-mail: md.mpsoca@gmail.com, Website: www.mpsoca.org
Odisha State Organic Certification Agency (OSOCA) NPOP/NAB/0025	Mr Subash Chandra Biswal, CEO, Plot No.-326, Baramunda, Bhubaneswar, Odisha, 751003 Phone-(0674) 2563639/2561783 Fax.-(0674)2562078 Mobile No.- 9437211001 Email: ceoosoca@gmail.com, directorossca@rediffmail.com, Website: www.ossopca.org
Natural Organic Certification Agro Pvt. Ltd. NPOP/NAB/0026	Mr Sanjay Deshmukh, Managing Director, Office No.2 Karan Plaza-II Near Rosary School Warje Pune - 411058 Maharashtra State Tel- 91-20-65218063 Cell no. 09822006586 E mail-nocaindia@gmail.com, Web site: www.nocaagro.com
Fair Cert Certification Services Pvt. Ltd. NPOP/NAB/0027	Dr Pushkar Kulshrestha, CEO, C-122, Gauridham Colony Khargone Madhya Pradesh 451001 Tel: +91-7282-231271/203017 Fax: +91-7282-231271 E-mail: cert.fair@gmail.com, Website: www.faircert.com
Gujarat Organic Products Certification Agency (GOPCA) NPOP/NAB/0028	Mr B.M. Modi, Director, Beej PramananBhavan Opp. Gokul Row House, Nr. Shyamal Cross Satellite, Ahmedabad 380 015 Gujarat Tel : +079-26740031 Fax : +079-26740031, E-mail: dirgopca@gmail.com , Website: www.gopca.in
Uttar Pradesh State Organic Certification Agency NPOP/NAB/0029	Mr P.C Singh, Director, Government Garden Campus Kariyappa Road, Alambagh Lucknow 226 005 Uttar Pradesh Tel: +91 – 0522 – 2451639 Mobile: +917317001283 E-mail: upsoca.org@gmail.com, Website: www.upsoca.org
Karnataka State Organic Certification Agency NPOP/NAB/0030	Mr T. Ramachandraiah, Director, Opp. Baptist Hospital Bellary Road, Hebbal Bangalore, Karnataka-560024 Tel : +91 – 80- 23418302 FAX : +91 – 80 - 23415506 E-mail: ksocabng@gmail.com , Website: www.kssoca.in
Sikkim State Organic Certification Agency (SSOCA) NPOP/NAB/0031	Mrs Sherab L. Dorjee, CEO, Ground Floor, Soil Testing Lab Building, ICAR Complex, Tadong, Gangtok, Sikkim 737102 Tel: +91 – 03592-232494 FAX: +91 – 03592-232495 E-mail: ssoca2016@gmail.com , Website: www.ssoca.in
Global Certification Society NPOP/NAB/0032	Dr Subhash Chaudhary, Chairman, KesarBagh Colony, Mohal Nihang (Tika Nihang), near Dr Chaudhary Hospital, Palampur, H. P.- 176 061. Tel : 01894-234230 Fax: 01894-230131, E-mail: chairman@glocert.org ,Website:www.glocert.org
Green Cert Biosolutions Pvt. Ltd NPOP/ NAB/0033	Mr Neelesh Gharmalkar, CEO, Office 2, Building No.12, Runwal Meadow, Warje Pune 411 052 Tel: +91 – 9922488750 E-mail: greencert.pune@gmail.com , Website: www.greencert.in
Telangana State Organic Certification Authority NPOP/NAB/0034	Dr K Keshavulu, Director, HACA Bhawan, 1st Floor. 5-10-193, Opp. Public Garden Hyderabad 500 004 Tel: 040-23237016, 040-23235939 E-mail: tsscadir@gmail.com, Website: www.tsoca.telangana.gov.in

Annexure V

Maximum Residual Limit (MRLs) of insecticides in organic potato

(Source: *Jaivik Bharat*, https://jaivikbharat.fssai.gov.in)

S. No.	Name of insecticide	Tolerance limit mg/kg (ppm) for organic foods	Instrument to be used to achieve the LoQ
1.	Carbaryl	0.01*	LC-MS/MS
2.	Chlorpyrifos	0.005*	GC -MS/MS
3.	2,4-Dichlorophenoxy acetic acid	0.01*	LC -MS/MS
4.	Paraquat dichloride (Determined as Paraquat cations)	0.01*	LC -MS/MS
5.	Phosalone	0.005*	LC -MS/MS
6.	Thiometon (Residues determined as thiometon its sulfoxide and sulphone expressed as thiometon)	0.01*	LC -MS/MS
7.	Copper oxychloride (determined as copper)	0.05	AAS/ICP -MS
8.	Dithiocarbamates (the residue tolerance limit are determined and expressed as mg/CS_2/kg and refer separately to the residues arising from any or each group of dithiocarbamates	0.01*	GC -MS
9.	Chlorothalonil	0.01*	GC -MS/MS
10.	Malic hydrazide	2.5	LC -MS/MS
11.	Dimethomorph	0.005*	LC-MS/MS
12.	Propineb	0.025	GC-MS/MS

* MRL recommended at LoQ

Annexure VI

APEDA approved laboratories

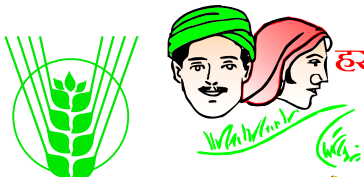
S. No.	Name of the laboratory
1	First Source Laboratory Solutions LLP, Hyderabad
2	National Collateral Management Services Limited (NCML), Hyderabad
3	Intertek India Pvt. Ltd., Hyderabad
4	Vimta Labs Ltd. , Hyderabad
5	Accurate Laboratory, Ahmedabad
6	SGS India Pvt. Ltd., Ahmedabad
7	Testtex India Laboratories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

35	SMS Labs Services Private Limited, Chennai
36	AES Laboratories (P) Ltd., GautamBudha Nagar
37	DNA Testing Laboratory, Basmati Export Development Foundation (BEDF), Meerut
38	Edward Food Research & Analysis Centre Ltd. (EFRAC), Kolkata
39	SGS India Private Limited, Kolkata

Annexure VII

Useful Links for further information

1. Agricultural and Processed Foods Products Export Development Authority (APEDA): www.apeda.gov.in
2. ICAR-Central Potato Research Institute, Shimla -171001: www.cpri.icar.gov.in
3. *Jaivik bharat*: www.jaivikbharat.fssai.gov.in
4. National Center for Organic Farming: www.ncof.dacnet.nic.in
5. National Program for Organic Production: www.apeda.gov.in/apedawebsite/organic/organic_contents/national_programme_for_organic_production.htm
6. Participatory Guarantee System (PGS) India: www.pgsindia-ncof.gov.in/pgs_india.aspx
7. TraceNet : www.apeda.gov.in/apedawebsite/TracenetOrganic/TraceNet.htm



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