

MANUAL ON **ORGANIC** AGRICULTURE



Mission Organic Value Chain
Development for NE Region (MOVCDNER), Manipur

Product Promotion by MANIPUR ORGANIC MISSION AGENCY (MOMA)





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FOREWORD

Organic farming advocates chemical free agriculture and the use of appropriate and affordable farming techniques in improving soil fertility and ensuring sustainability. The state of Manipur is blessed with fertile land crucial for land productivity. However, inappropriate farming practices and heavy use of agrichemical has put under enormous pressure on the productive farms resulting in soil degradation which needs to be arrested.

This practical manual will be a vital tool for all those involved and interested in the organic crop production and sustainable agriculture. It contains scientific information on nearly every aspects of Organic Farming and offer guidance on practical application in the fields. It would also serve as a resource for trainers which could be adapted and further developed according to need.

While, the increasing importance of Organic Farming has necessitated the development of this manual, the realization of this manual has been possible thanks to the contribution of experts in various field of organic agriculture.

The manual has been commissioned by Manipur Organic Mission Agency (MOMA) and funded by the Ministry of Agriculture and Farmers Welfare, Government of India under the central sector scheme Mission Organic Value Chain Development for North Eastern Region (MOVCDNER) MOMA is indebted to Shri N. Biren Singh, Hon'ble Chief Minister, Manipur for his committed support, innovative vision, energetic leadership and constant guidance which has become the inspiration for it to scale new heights for the benefit of the farmers of the State.

I hope that this manual will benefit all users and invite all suggestions and material for further improvement of the manual.

(P. Vaiphei)

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Chairman, Manipur Organic Mission Agency (MOMA)

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Agriculture Development Indicators

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Agriculture development indicators must be pursued for development outcomes like higher income, reduced vulnerabilities and resilience, food and environmental security, greater well-being, and meaningful and productive life. As farmers are affected disproportionately when they are stressed, a true development which leads to productive capacity, positive change and transformational ability can address many issues prevalent in agriculture. The following agriculture development indicators are comprehensive but not exhaustive.

1. Social Indicators

- i. Participation: In addition to information sharing and consultation, farmers should be empowered and take part in decision making.
- ii. Inclusion of women: The role of women in agriculture are manifold but they face numbers of barriers. Their access and participation can revolutionise agriculture and reduce poverty to large extent.
- iii. Organisation: Farmers need collective strength for better bargaining power and access to resources.
- iv. Skill development of farmers: Capacity building to gain knowledge and apply best farm practices.

2. Environment Indicators

- i. Carrying capacity and improvement in soil quality: A good soil management program to increase organic matter and soil microorganisms should be carried out for long term crop production.

- ii. Polluters pay principle: Development of agrichemicals and its use needs to be strictly regulated with application of polluters pay principle.
- iii. Circular economy: Reduce, recycle and reuse every farm waste.

3. Economic Indicators

- i. A progressive taxation and farmer welfare-oriented schemes needs to be implemented and strengthened. Putting more in the hands of the farmers leads to increase in demand for goods and services in rural areas which has large multiplier effect.
- ii. Direct Benefit Transfer for transparency and financial autonomy to farmers.
- iii. Ease of doing business - Starting new agribusiness and obtaining other necessary requirements and permits like electricity connection, construction permit, shop licence etc., should be easy and hassle free. Agribusiness like processing units can generate large number of jobs uplifting the economy.
- iv. Gross fixed capital formation– Investments and capital formations are necessary for long term growth of agriculture. Increase in number of tractors may be taken as proxy.
- v. Research and Development - New and emerging agrotechnology and applications like artificial intelligence, digital agriculture, precision agriculture etc, needs to be pursued and applied in fields.

Plant Diseases Management Practices in Organic Farming

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Seed treatment with Biocontrol products

Seed dressing with *Trichoderma* which are available in solid as well as liquid formulations e.g., BioSar, Bhoomika, Hasiru, *Trianum P* etc.

Soil treatment with Biocontrol products

Biocontrol products such as species of *Gliocladium*, *Trichoderma*, *Streptomyces*, *Pseudomonas*, and *Bacillus* are used primarily for the control of soil-borne plant pathogens.

Nematode populations could potentially be reduced by fungi such as *Myrothecium* and *Paecilomyces* or bacteria such as *Burkholderia* and *Pasteuria*.

Foliar treatment with Botanical pesticides, Biocontrol products and ecofriendly products

Natural pyrethrum extracted from dried *Chrysanthemum* flowers, neem extracted from *Azadirachta indica*, other plant extracts and bicarbonate salts can be used against various plant pathogens and insect vectors. The organic pesticide TillecurR, which is based on mustard extracts, successfully reduces stinking smut (*Tilletia caries*) on wheat.

Soil Solarization

Moist soil is covered with transparent, UV-resistant plastic and exposed to sunlight for a few weeks. The solarization effect can be enhanced by the incorporation of isothiocyanate producing residues from brassica crops into the soil before covering with plastic.

Anaerobic Soil Disinfestation (ASD)

Fresh organic material is incorporated into the soil, and moistened and covered by airtight plastic for 3 – 6 weeks. ASD results in the control of many soilborne plant-pathogenic fungi, bacteria, and nematodes, including *Rhizoctonia*, *Fusarium*, *Verticillium*, *Sclerotinia*, *Phytophthora*, *Meloidogyne* spp., as well as most weeds.

Aerobic soil disinfestation / Biofumigation

Aerobic soil disinfestation (Biofumigation) involves the addition of organic amendments to the soil, generating biologically derived volatile compounds that are toxic to soil microorganisms. Green manure crops that contain glucosinolates, mainly *Brassica* spp., are most commonly used. Various toxic compounds are released after tissue decomposition, such as organic cyanides, nitriles, and thiocyanates, which have fungistatic or biocidal properties. Application of animal-derived residues that are high in nitrogen, such as manure or compost, can result in the production of ammonia gas, which is toxic to a wide range of pathogens and nematode pests.

Other Strategies used for organic plant disease management

Biofertilizer, organic soil amendments, proper sanitation of the crop field, properly prepared composted manure, straw mulch, proper timing of cultivation, removal of volunteer plants and alternate host, enhanced biological control via endemic natural enemies, including competitors, antagonists, predators, or parasites, through habitat management etc.

Nutrient and Weed Management in Organic Farming

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Nutrient management techniques/ methods in organic farming

1. FYM (Farm Yard Manure) is a well decomposed mixture of dung and urine of farm animals along with other farm wastes.
2. Compost is a decomposed organic matter which is used for fertilizing. e.g. Vermicompost, urban compost, bokasi, etc.
3. Oil cakes is the left-over solid portion of seed after extraction of oil from the seed. e.g. Pongamia oil cake, Neem oil cake, etc.
4. Liquid organic manure is organic matter in liquid form derived from animal faeces and plants material. e.g. Jeevamrutha, Panchagavya, Vermiwash, Sea weed extract, etc.
5. Biofertilizers is a substance that contains living microorganisms which increase the availability of nutrients to the host plant. e.g. *Azolla*, VAM, PSB, etc.
6. Organically approved amendments/conditioner like Lime, Gypsum, etc.
7. Adoption of cropping system management.
 - a. Crop rotation: Practice of growing a sequence of plant species on the same land to provide the soil fertility. e.g. Use of N_2 fixing crops.
 - b. Cover cropping: Growing a plant primarily for the benefit of the soil rather than the crop yield crops. e.g. Annual ryegrass, Crimson clover, Oats, etc.
 - c. Green manuring: Practice of ploughing the undecomposed green plant tissues to improve soil fertility.

e.g. Sunhemp, *Glyricidia*, Karanj, Dhaincha, etc.

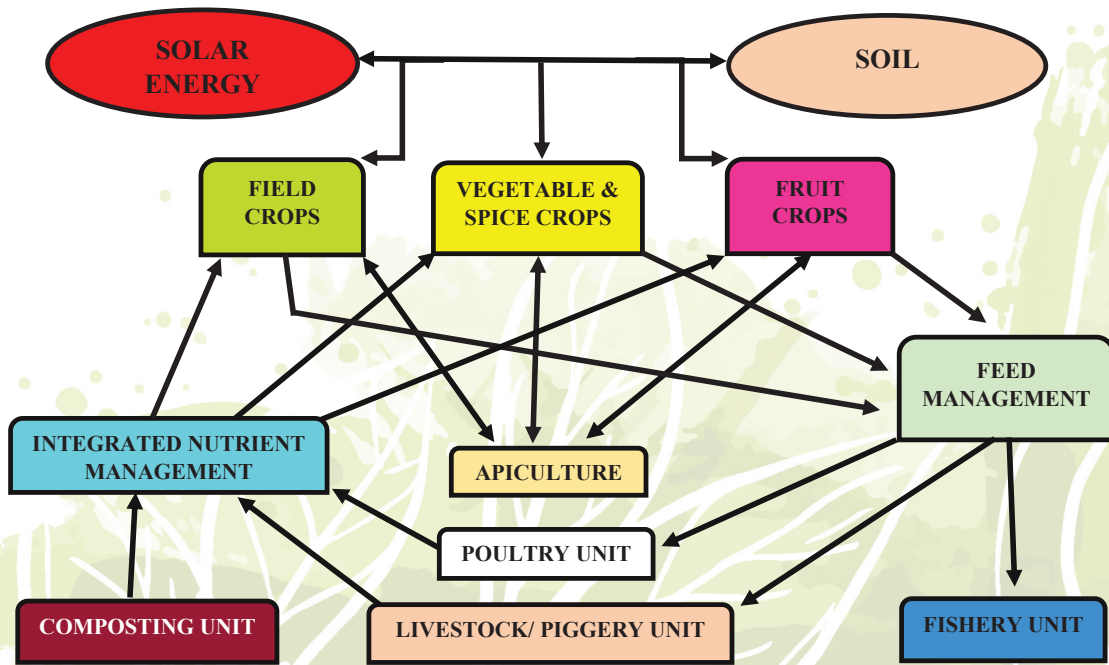
- d. Use of crop residues as mulch. e.g. stalks, stubbles, stems and leaves.

Weed management techniques/ methods in organic farming

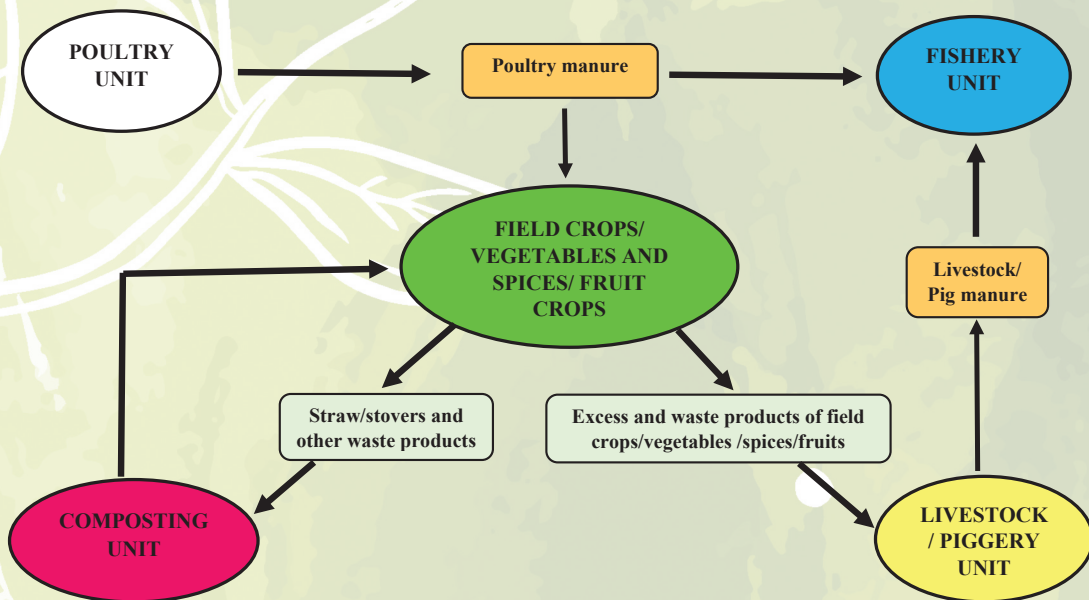
1. Cultural weed control using cover crops, crop rotation by selecting crop varieties that compete better with weeds, altering the planting dates, adjusting seeding rate, etc.
2. Use of mulches which can be synthetic or organic mulches
3. Weed control by tillage and cultivation using different types of tools and implement like harrows, hoes, weeders, cultivators, etc
4. Stale (or False) seedbed technique where weed seeds are allowed to germinate and then killed prior to planting the crop.
5. Control by mowing which also produce mulch material for weed suppression.
6. Soil solarization utilizes solar radiation and a thin film of transparent mulch (25 to 50 μm PE) to heat the soil for a min. of 4-6 weeks. Quite effective in control of annual weeds.
7. Bioherbicide made of naturally occurring compound like plant oil extracts and acts as a non-selective contact. e.g. acetic acid, corn gluten meal, cinnamon oil, citrus oils, etc.
8. Use of biocontrol agents like *Cuscuta* spp. controlled by *Melanogromyza cuscutae*, *Cyperus rotundus* by *Bactra verutana*. *Parthenium hysterophorus* by *Zygotogramma bicolorata*, etc.

Model of Integrated Farming System (IFS) & Recycling and Linkage of by-products

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1. Model of Integrated Farming System



2. Recycling and linkage of by-products in IFS

Some basic information on Farmer Producer Company (FPC)

Dr. Leishangthem Jeebit Singh
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Mission Agency

Introduction:

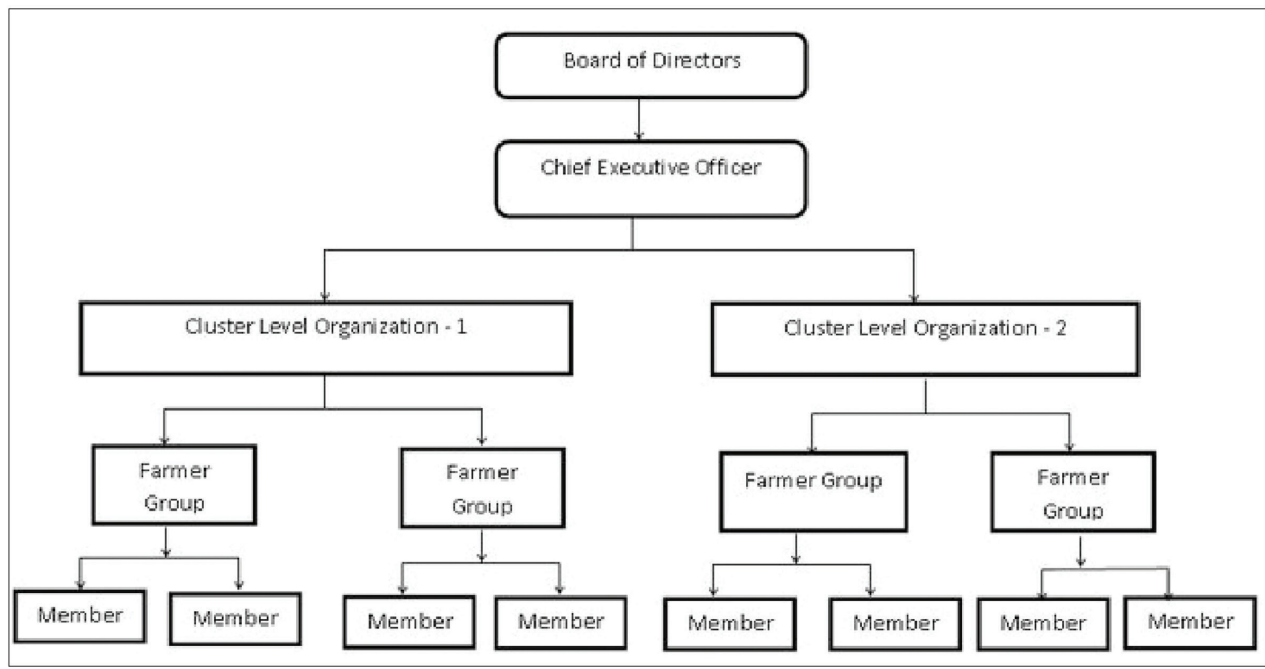
Farmer producer company is a company of farmer/producer members as per Indian Companies Act, 1956 and incorporated with Registrar of Companies. The company should have a separate bank account opened and can be formed by any 10 or more producers. It has an elected governing body to take up the responsibility and decision in functioning of the company known as Board of Directors (BoD) with a fixed tenure depending on the Article of Association (AoA) or Memorandum of Agreement (MoA) of the FPCs. The BoDs should be 5-15 numbers and it is mandatory to have a min. of one woman representative to avail various benefits from schemes of Govt. of India. The financial power of the company is vested upon the Chairman and its BoDs which is headed by a Chairman selected among them and assisted by a Chief Executive Officer (CEO) for planning, functioning and execution of FPC's business as per the decision of the BoD. The registered farmer members who contribute financially to the company's share becomes a shareholder. The profits earned by the FPC from the business will be distributed equally among the shareholder as per the share. There should be a minimum of 50 shareholders to avail various benefits.

Advantage of FPCs

- It is a hybrid between a private limited company and a cooperative society which combines the goodness and efficiency of both.
- Increased efficiency by combining the skill & expertise of farmers and managerial & marketing skill from the professional experts
- It will reduce the overall cost of production by purchase of inputs on bulk and then sell the produce in bulk
- FPC having an annual turnover up to Rs. 100 crore are exempted to pay tax on profits.
- The private assets of the members are not liable losses incurred by company.
- The FPC shall help in farmers in capacity and skill building.
- Becomes eligible to avail various benefits from government like Equity Grant & Credit Guarantee Fund Scheme, Venture Capital Fund of SFAC, etc.

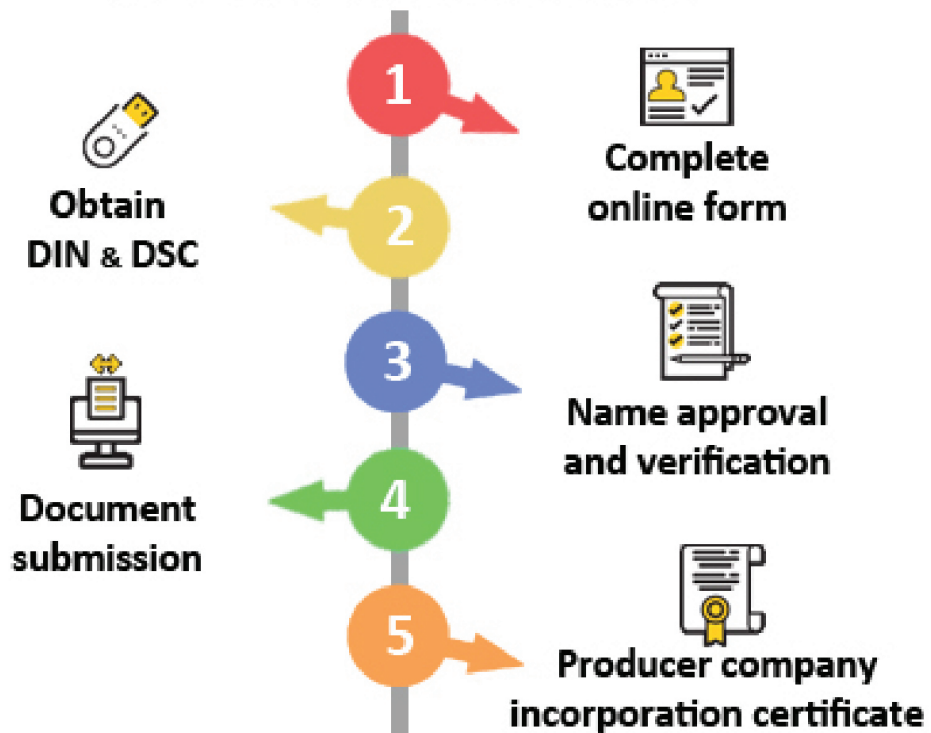
Conclusion

FPC can be instrumental in improving their standards of living of farmer. Most of the government schemes are now FPC oriented and our farmers should try to avail and reap these benefits upto the maximum possible extent.



1. Organogram of producer company

REGISTRATION



2. Registration process of FPC

Good Agricultural Practices

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Good Agricultural Practices is a certification system for agriculture with specifying practices that address environmental, economic and social sustainability for on-farm processes which result in safe and quality food and non-food agricultural products". The four pillars of Good Agricultural Practices include Economic viability, Environmental sustainability, Social acceptability and Food safety & quality.

Good Agricultural Practices (GAP) helps growers & processors to produce and maintain quality agricultural produce and products. This requires a holistic and strategic plan from sustainable utilization to economic development, conservation of vital biodiversity, crop diversification, quality raw material and marketing etc.

Objectives:

1. Ensuring safety and quality of produce in the food chain.
2. Encourage sustainable agriculture practices.
3. Minimize negative impact on environment.
4. Encourage documentation of required information.
5. Improving natural resources use, workers health and working conditions.
6. Creating new market opportunities for farmers and exporters in developing countries.

Components:

1. Soil

- Appropriate soil management to maintain and improve soil productivity

- Enhancing soil biological activity by maintaining or restoring soil organic content
- In situ green manuring by growing leguminous crops
- Minimizing losses of soil, nutrients and agrochemicals through erosion, runoff or leaching
- Reduction of soil compaction by avoiding heavy machines in the field.
- Application of adequate doses of fertilizer to avoid run-off
- Soil conservation measures through agronomic and mechanical measures

2. Water

- Cropping system should be planned depending on the duration of water availability
- Careful management of water resources and efficient use of water for rain-fed crop
- Scheduling irrigation accurately to avoid water loss by drainage
- Maximise water infiltration and minimize unproductive efflux of surface water from watersheds
- Maintain permanent soil covering particularly in winter
- Prevent soil salinization by limiting water input to needs and recycling water whenever possible.
- Maintaining or restoring wetlands

3. Crop production

- Selection of suitable crops, their cultivars and varieties to meet local consumer and market needs
- Crop rotation for management of soil fertility, pests and diseases
- Inclusion of legumes to provide biological source of nitrogen
- Intercropping of short duration high yielding varieties
- Perennial crops to provide long term production options
- Balance application of organic and inorganic fertilizer
- Fertilise crops that respond most in the system and allow others to make use of residual fertility
- Recycling farm or organic waste

4. Crop protection

- Use of disease & pest resistant crops
- Crop rotations, crop diversification, residue management, need based pesticide use
- Integrated Pest Management
- Apply pest & disease forecasting techniques
- Maintain accurate records of agrochemical use
- Weed management practices should be planned for the cropping system as a whole rather than for individual crops to avoid herbicide residue in soil

5. Harvest and On-farm Processing and Storage

- Harvesting must conform to regulations relating to pre harvest intervals for agrochemicals
- Storage should be under hygienic and appropriate conditions of temperature and humidity
- Clean and safe handling for on-farm processing products
- Packed food produce should be transport

from the farm in clean and appropriate containers

6. Human Welfare, Health and Safety

- Farming must be economically viable to be sustainable. The social and economic welfare of farmers, farm workers and their communities depend upon it. Health and safety are also important concerns for those involved in farming operations. Thus, good practices related to human welfare, health and safety will include those that direct all farming practices to achieve an optimum balance between economic, environmental and social goals, provided adequate household income and food security.

7. Environment

- Conserve wildlife habitats and landscape features
- Adoption of diverse cropping pattern on the farm
- Minimize the impact of operations such as conventional tillage and excessive agrochemical use on wildlife
- Encourage diverse flora and fauna with beneficial species
- Manage water courses and wetlands to encourage wildlife

Potential benefits of GAP

- Appropriate adoption and monitoring of GAP helps improve the safety and quality of food and other agricultural products.
- It may help reduce the risk of non-compliance with national and international regulations, standards and guidelines (in particular of the Codex Alimentarius Commission, World Organisation for Animal Health (OIE) and the International Plant Protection Convention IPPC regarding permitted pesticides, maximum levels of contaminants (including pesticides, veterinary drugs, radionuclide

and mycotoxins) in food and non-food agricultural products, as well as other chemical, microbiological and physical contamination hazards.

- Adoption of GAP helps promotes sustainable agriculture and contributes to meeting national and international environment and social development objectives.

Challenges related to GAP

- GAP implementation and especially record keeping and certification will increase production costs. In this respect, lack of harmonization between existing GAP-related schemes and availability of affordable certification systems has often led to increased confusion and certification costs for farmers and exporters.
- Standards of GAP can be used to serve competing interests of specific stakeholders in agri-food supply chains by modifying supplier-buyer relations.
- Compliance with GAP standards do not always foster all the environmental and social benefits, which are claimed.

Importance of Genetic Diversity For Organic Farming

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- Organic farming is not only a production management system but it also promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity.
- Genetic diversity is the differences in one or a few traits (e.g. plant height, flower color etc.) of the organism. Therefore intra- and inter-specific differences exist between plants of a single crop.
- Traditional varieties cultivated by the farmers possess more genetic diversity than the modern varieties developed through modern techniques. On the other hand, traditional varieties tend to be more stable in local conditions than modern varieties.
- Therefore, organic breeding efforts will be most attracted in landrace material and traditional varieties that are maintained in germplasm collections as well as in germplasm that is being conserved on-farm.
- Genetic diversity present in the traditional varieties in particular nutrient efficiency, characteristics that contribute to yield constancy and to weed inhibition are the main types of germplasm for organic agriculture and organic seed production.
- Organic farming create a significant role to the maintenance of genetic diversity on-farm (conservation through use), in particular for the so called neglected and underutilized species.
- In order to combat various biotic (e.g. pest,diseases incidence etc.) and abiotic (e.g. flood, drought etc.) stresses, an organic farmer should grow different type of crops rather than a single crop and also different varieties of the same crop.
- An organic farmer should also follow mixed cropping, intercropping etc. in the same field.
- The role genetic diversity in producing organic varieties as well as in the making of organic agricultural products creates an opportunity to genebanks (those conserving the traditional varieties) to initiate a close linkage with the organic agricultural sector and to find the conserved germplasm further intensively utilized by this sector.

Postharvest Handling of Organic Produce

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Agriculture, Central Agricultural
University, Imphal

Optimal quality organic produce is a result of careful implementation of recommended production inputs & practices, careful handling at harvest, & appropriate postharvest handling and storage conforming to the organic standards applicable.

Specific requirements: The operator must develop an organic production & handling plan which must include:

- a) Description of practices and procedures to be performed.
- b) List of each substances/inputs used during production, storage and handling indicating its composition, source, locations where it will be used and its documentation.
- c) Monitoring practices and procedures followed and maintained.
- d) Record keeping system implemented to comply with NPOP standards.
- e) Management practices to prevent commingling of organic & non-organic products
- f) Pollution sources shall be identified and contamination avoided.
- g) Handling of organic products should be done separately from non-organic products.
- h) All products shall be adequately identified through the whole process.
- i) Certification programme shall regulate the means and measures to be allowed.
- j) Decontamination, cleaning or disinfections of all facilities where organic products are kept, handled, processed or stored.

Pest control: Pests should be avoided by good manufacturing practices which includes

general cleanliness and hygiene. For pest management and control the following measures shall be used in order of priority:

- Preventive methods such as disruption, elimination of habitat and access to facilities
- Mechanical, physical and biological methods
- Pesticidal substances contained in the Appendices of the national standards
- Other substances used in traps

Ripening: Ethylene gas is permitted for ripening of organically produced crops.

Packaging: Biodegradable, recyclable, reusable systems and eco-friendly packaging materials shall be used wherever possible. Material used for packaging shall not contaminate food. Certain additives for use in manufacturing of packaging films for packaging of organic food stuffs are allowed for restricted use as per NPOP.

Labelling: It should be done according to the labelling standard laid down by NPOP and FSSAI for organic produces in India or as per the importing countries organic labelling standards.

Storage & Transport: The special conditions of storage permitted are controlled atmosphere, cooling, freezing, drying, humidity regulation. Organic Products must be protected at all times from co-mingling with non-organic products and from contact with materials and substances not permitted for use in organic farming and handling. Storage areas and transport containers for organic product should be cleaned using methods and materials permitted in organic production.

E-Commerce On Agribusiness

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NERAMAC (North Eastern Regional Agricultural
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Under Ministry Of DoNER, Govt.of India.

Agriculture is the dominant occupation of the people of Manipur. It is not only the main source of livelihood of the overwhelming majority but also a tradition and a way of life that moulds the socio – economic status of the people. A larger section of the population in the state pursued agriculture as secondary occupation too even though agriculture is not their primary occupation.

As agriculture is directly or indirectly linked to the people of Manipur, agriculture marketing becomes even more important. Moreover, cities are expanding which lead to the growth of Mandis/vegetable shops. Therefore, the farmers of this state have to take commercial marketing skill in order to meet the supply chain.

“Marketing” is the process by which the space between the producers and the consumers are bridged. In one sense marketing chain of agriculture is of two-way process:

1. Produces flows from farm / rural areas into the cities/Mandi.
2. Money and market information flows back to the farmers/ producers.

Thus, this two-way process helps them in planning supply chain management between producers and the marketers for future reference.

Role of Marketing in Agriculture

In the process of marketing, goods pass through several hands before they reach the

consumers. There is different middleman between producers and consumers who perform various activities. Some important activities are:
- 1. Assembling 2. Transportation 3 Storage 4. Classification and Grading 5. Equalization 6. Processing and 7. Distribution. The process of agriculture marketing varies depending on the products/commodities accepted by the consumers.

In short, the channel of marketing varies for grains from fruits and vegetables.

E-Commerce and its Importance

Along with the traditional marketing process and the evolution of E- Commerce (Digital Marketing), the agribusiness sector is picking up slowly in this tiny state due to certain factors such as rate of adoption of internet by producers as well as consumers as a business tool; their scale of operations and the size of the market are also on the rise. In one sense, agriculture marketing with the emergence of E- Commerce has started changing the flow of marketing, in which the price of the products is reasonable comparing with local vendors / Mandis.

Scope of E-Agribusiness

There is a large scope of E-Agribusiness in agriculture specially in horticulture processed products like Tea, Pineapple candy, Dairy products, beverages and particularly organic products which can also be sold online to

gain more profit for capturing larger area of marketing. Hence, sellers/ farmers should get up-to date information about the market and also the consumer's behaviors.

Major Advantages of E- Agribusiness

1. Global market- A virtual global distribution market place.
2. Inventory cost- It help to minimize inventory cost. It also enhances the firm's ability to forecast demand of an industry more accurately.
3. Consumer service- The cost incurred towards customers after sale services general account for not less than 10% of the operation cost under e- Agribusiness.
4. Distribution period-The customer can place order anytime and anywhere immediately on the net and goods are delivered under normal ways.
5. Easy reach-With E-Agribusiness Small, Medium, Startup companies / Entrepreneurs also gets an opportunity to highlight their products and serve all potential customers.
6. Transaction and accountability-Completing the transaction on time and settle accordingly.

Conclusion

Internet based e-commerce will transform agribusiness which leads to easy flow of supply chains. Stronger connection between producers and consumers may result in more different products that meet consumer needs. In brief, E-commerce offers an alternative venue of promoting and marketing agricultural products that benefit for reaching extensive geographical populations and providing detailed product information at a relatively low cost. Moreover, Markets may become more transparent. As the Internet transcends geography, the globalization of the sector has become a reality. The world is fast changing through the devices of internet. Transformation is about change and change creates winners and losers. The winners will be the first innovators best serving consumer's needs. The losers are likely those unwilling to catch this powerful technological tool and adopt the trend. As Charles Darwin says, "It's not the strongest of the species that survives, nor the most intelligent; it is the one most adaptable to change".

Insect Pest Management in Organic Farming

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Insect pest management in organic farming is accomplished by using suitable cropping techniques, cultural and biological control and naturally derived pesticides. Organic management practices are more preventive than curative. However, manipulation of agro ecosystem and crop husbandry practices as well as conservation of natural enemies play a significant role in pest management. Before applying management practices, proper identification, inspection and monitoring of insect pests and their natural enemies to know their occurrence and extent of damages are essential. It can be done through visual observation, pheromone and light traps, sticky traps, water traps, yellow traps etc.

Cultural control

Alteration in the planting, harvesting times, crop rotation, selection of crop varieties, irrigation management, pruning and thinning, soil manuring and fertilization help reduce certain pests. Growing of trap crops and intercropping can disrupt the occurrence of regular pests and avail refuge and food for beneficial insects.

Mechanical and physical control

Summer ploughing, proper weeding, handpicking of adult and larva of insects can reduce pest incidences and infestation. Reflective mulches can be used to prevent from early aphid infestations in row crops such as tomatoes, brinjal, king chilli and squash.

Biological control

Biological control includes three strategies viz., Introduction of exotic pest's natural enemies ; Augmentation comprises the supplemental

release of pest's natural enemies; and Conservation which includes the conservation of existing natural enemies like ladybird beetle, spiders, water striders, dragon flies, damsel flies, tiger beetles, social wasps, mantis, hover flies, tachinid flies by growing trap crops and flowering plants. Some of the biocontrol agents recommended in vegetable and fruit crops are as follows

- i. Seed treatment with *Trichoderma harzianum* 1.5 WP or *T. viridae* 1.5 WP @ 20gm/kg of seeds enriched with FYM @ 5 tons/ha to the soil before planting can control root-knot nematodes.
- ii. Use of plant products like Neem (Azadirachtin 1%EC @2-3ml/litre water for *Helicoverpa armigera* on tomato and *Lecucinodes orbonalis* on brinjal).
- iii. Application of *Trichogramma brassiliensis* @ 2,50,000 parasitized eggs/ha (inundative release) or 50,000 parasitized eggs/ha (weekly inoculative release) for okra shoot and fruit borer and tomato fruit borer.
- iv. Application of Nuclear Polyhedrosis Virus (NPV) or Granulosis Virus (GV) is specific for the specific insect pests like HaNPV @ 250 LE/ha for tomato fruit borer (*Helicoverpa armigera*) or SINPV @ 250 LE/ha for *Spodoptera litura*.
- v. Application of entomopathogenic bacteria like *Bacillus thuringiensis* @ 1-1.5 kg/ha for caterpillars, beetles, etc.
- vi. Application of entomopathogenic fungi

like *Beauveria bassiana* for lepidopteran insect pests, *Metarrhizium anisoplae* for grasshoppers and soil insects and *Verticillium lecani* for sucking insect pests.

- vii. Application of protozoans like *Nosema* for grasshoppers.
- viii. Application of Entomopathogenic nematodes like *Steinernema carpocapsae* and *Heterorhabditis bacteriophora* against soil inhabiting insects and tissue borers.



Mulching

Nurina Shahni
M.Sc. Agronomy

Mulching is a practice of covering the soil surface with organic materials to create congenial condition for the plant growth, development and efficient production.

In organic farming mulches have several effects on the soil which help to improve plant growth:

- To conserve soil moisture
- Prevent surface compaction or crusting and improving the infiltration of rain or irrigation water
- Reduce runoff and soil erosion
- Control weed growth, with a sufficient mulch layer
- Adding nutrients to the soil and improving soil quality
- Adding organic matter to the soil
- Mulches provides moderate soil temperature and the retained moisture keeps it cool
- Organic matter becomes food for the beneficial earthworms and other soil organisms in the soil and creates a very good porous soil.

Selection of mulch materials

The organic mulching materials are straw, dry grass, leaves or crop residues, saw dust, compost and manures.

- Materials like straw which easily decomposes will protect the soil only for a rather short time but will provide nutrients to the crops while decomposing
- Use fresh organic mulch (wood chips and bark) will decompose more slowly and therefore cover the soil for a longer time
- Organic manures such as animal dung may be spread on top of the mulch, thus increasing the nitrogen content

Application of mulch

- The mulch should be applied before or at the onset of the rainy season, as then the soil is most vulnerable. If possible always apply mulches to a warm and wet soil
- Mulch is applied prior to sowing or planting, the mulch layer should not be too thick in order to allow the germination of planted seeds, a layer of less than 10 cm should be used
- Mulch can also be applied in established crops, between the rows, directly around single plants or evenly spread on the field
- Over mulching can create a moisture barrier will prevent air flow and encourage pests.

Preparation of NADEP Compost

Dr. T. Basanta Singh, Scientist (Soil Science)

ICAR Research Complex for NEH Region, Manipur Centre, Lamphelpat

NADEP method of making miracle compost was first invented by a farmer named Narayan Deorao Pandharipande living in Maharashtra (India). The use of compost reduces the need for mineral fertilizer thus reducing production costs and outside dependence.

Tank Constriction:

- The recommended size of the tank is 10 ft (length) x 5 ft (breadth) x 3 ft (height) made of bricks, sand and cement.
- All the four walls of NADEP tank are provided with 6 inch vents by removing every alternate brick after the height of 1ft. from bottom for aeration.
- After the tank is built, the walls and floor are covered with a light plaster of fresh cow dung mixed with water, and then the plaster is left to dry.

Raw materials required:

- Agricultural waste (dry & green) – 1350-1400 kg (inert materials should be removed)
- Cattle dung or biogas slurry – 98 – 100 kg.
- Fine sieved soil – 1675 kg.
- Water – 1350-1400 litres.



Filling the Tank:

- The entire tank should be filled in one go, within 24 hours and should not go beyond 48 hours, as this would affect the quality of the compost.

- If urine from cattle is available, it should be diluted in 1:10 proportion of urine and water.
- Before starting to fill the tank, sides and floor of the tank are to be thoroughly wetted with slurry made from fresh cow dung. The three layers used to fill the tank are as follows:
 - First layer: Use 100–150 kg of dry or mixed dry and green plant materials to make a layer 15–25 cm thick at the sides, and slightly thicker in the middle.
 - Second layer: Mix 4 kg of cow dung or 10 kg of fresh biogas slurry in 25–50 litres of water and sprinkle or scatter it over the plant materials so they get completely moistened.
 - Third layer: Cover the wet plant waste and cow dung or slurry layer with 50–60 kg of clean, sieved top soil.
- Repeat to fill the tank like a sandwich with these three layers put in sequence.
- Put more materials in the middle of the tank than around the sides as the centre rises 30–50 cm higher than the sides.
- Cover the last layer of plant materials with a layer of soil 7–8 cm thick. Make a cow dung plaster and cover the soil so that there are no cracks showing.
- Refill the tank with 2-3 layers (15-30 days later) the organic biomass when tank gets pressed down to 2 ft and get resealed which is not to be disturbed for 3 months except for moistening at 6-15 days intervals.
- The entire tank is covered with a thatched roof to prevent excessive evaporation of moisture.
- Under no circumstances no cracks should be allowed to develop if it should be resealed with slurry.
- From each NADEP tank approximately 2.5 tons of compost is prepared within 90-120 days.
- The best time to make compost is during the dry season.

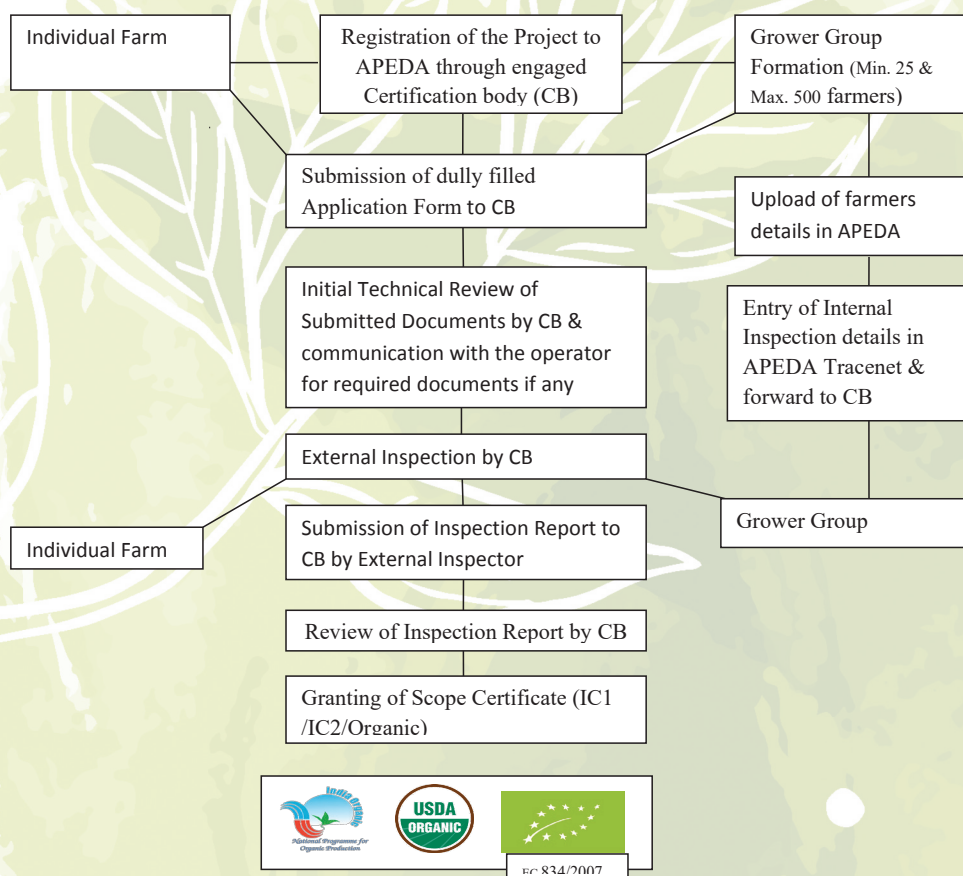
Organic Certification

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Organic Certification is a procedure for verifying that products conform to certain defined or set standards. In case of Organic Products, it is primarily the acknowledgement that the products have been produced according to the applicable Organic Crop Production Standards.

- Organic certification helps in building trust between consumers and organic farmers.
- The certification mark 'Organic' is the only means to differentiate between certified organic and conventional foods.
- Labels and certification marks help a consumer to easily recognise trustworthy organic products.
- Organic certification and the logo are important marketing tools.
- Organic certification helps in getting comparatively a better price for a produce.

Flow Chart for Organic Certification Process:



For the sustainable agriculture, good environment & biodiversity, good health, for marketing opportunity globally, we should aim and follow the organic farming system.

Importance of Processing of Organic Foods

Dr. Ng. Joykumar

Dean, College of Food Technology CAU, Imphal

Organic food contains no artificial flavors, colors or preservatives. Minor non-organic ingredients used in processed organic food must come from a list of approved substances, known as the "National List", that have been evaluated for safety and their impact on both human and environmental health. By law, these ingredients must make up 5% or less of the total ingredients used to make organic food. Organic processors must take a number of steps to ensure additional standards are met for how the snacks are made. This means thoroughly cleaning machinery, storing organic ingredients separate from non-organic ones to avoid mixing, and lots of record-keeping to verify that when one buys an organic product it contains only what he/she expects. Organic products reduce public health risks to farm workers, their families, and consumers by minimizing their exposure to toxic and persistent chemicals on the farm and in food, the soil in which they work and play, the air they breathe, and the water they drink. Children are especially vulnerable to pesticides. Thus, offering organic food and fiber products into the marketplace gives parents the option of choosing products produced without the use of these toxins.

Not only does organic production help reduce public health risks, mounting evidence shows that food grown organically are rich in nutrients, such as Vitamin C, iron, magnesium, and phosphorus, with less exposure to nitrates and pesticide residues in organically grown fruits, vegetables, and grains when compared to conventionally grown products.

Organically processed fruit juice (RTS)

- i. Selection: Fruits from organically certified field /orchard must be selected at right maturity level.
- ii. Washing : Washing with soft water in

trough or mechanical washing for bulk quantity

- iii. Sorting/ grading/Peeling/coring: Mechanical grader/peeling/coring are used for primary processing
- iv. Extraction of Juice: Spiral screw type of juice extraction can be used for juice extraction
- v. Homogenization: After proper filtering process, the juice can be passed through suitable capacity homogenizer for breaking down of the micro-fruit pulp and sediments are separated. A clear solution can be obtained.
- vi. Preparation of RTS: Organically produced sugar, plant extract thickening agents (Xanthene gum), organically produced colouring agent (tetrazine if required) may be added.
- vii. Filling in the tetrapack packages aseptically or in sterilized glass bottle and subjected to thermal treatment (autoclaved) for high temperature short period, then cooling in running water.
- viii. Storing: Store in cold room and can be kept for 6 months.

Dried fruit candy: After washing and cutting the fruits in mechanical slicing machine, soaking in the sugar syrup (organically produced sugar) and dried in the mechanical drier / solar drier can produce the organic dried fruits/candy.

Fruit/vegetable pickle: Selection of organically grown Fruits or vegetables and ingredients such as garlic, onion, spices, oil must be organic source. The final product (pickle) remains free from any chemical or toxic, artificial additives.

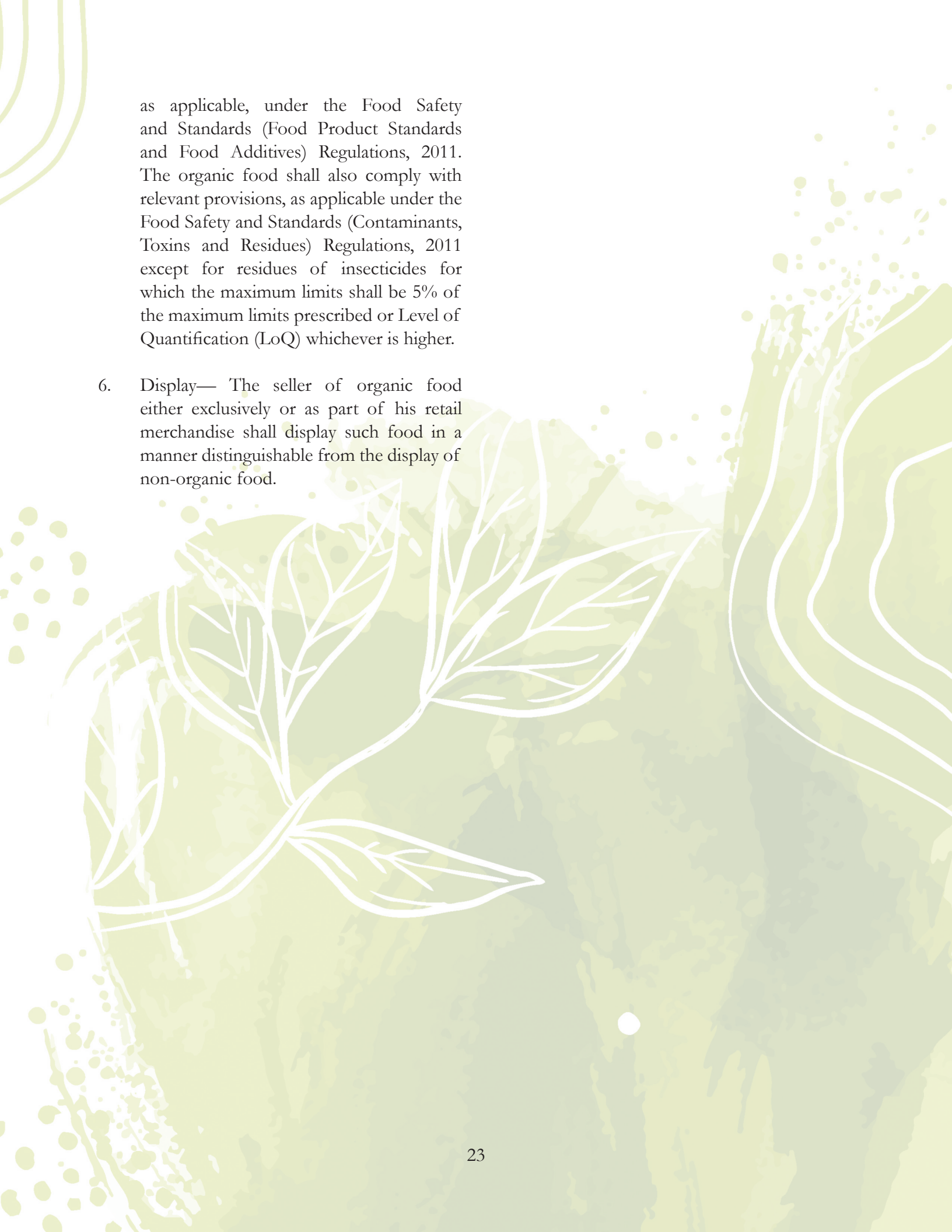
Food Safety and Standards Regulations (Organic Foods), 2017

Sougaijam Surendro Singh
Food Safety Officer, Department of
Health Services, Bishnupur, Manipur

People are wary to purchase organic food due to lack of confidence about its genuineness. The problem of fraud and mis-labelling occurs when a Food Business Operator (FBO) marks a product as organic while it contains non-organic ingredients or where the organic production standards are not adhered to in the production process. Therefore, it becomes important to check if the food labelled as "organic" is genuinely organic. Food Safety and Standards (Organic Foods) Regulations, 2017 based on two systems of certification i.e. National Programme for Organic Production (NPOP) and Participatory Guarantee System (PGS-India) have been notified in the Gazette of India on 29.12.2017. All the Organic Food Business Operator shall comply with all the provisions of these Regulations by 1st July, 2018.

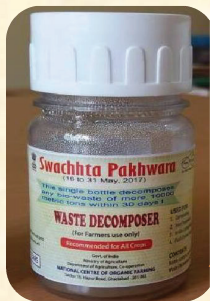
Organic Food Labelling and Certification:

1. Manufacture, pack, sell, etc., of organic food - No person shall manufacture, pack, sell, offer for sale, market or otherwise distribute or import any organic food unless they comply with the requirements laid down under these regulations.
 2. Applicability of the systems –
 - a. The organic food offered or promoted for sale shall also comply with all the applicable provisions of one of the following systems, namely: (i) NPOP; (ii) PGS-India or (iii) Any other system or standards as may be notified.
 - b. The Organic food which is marketed through direct sales by the small original producer or producer organization, as determined by the Food Authority from time to time, to the end consumer shall be exempted from the provisions of the systems referred in sub-regulation (1).
- ### 3. Labelling –
- a. Labelling on the package of organic food shall convey full and accurate information on the organic status of the product. Such product may carry a certification or quality assurance mark in addition to the FSSAI organic logo.
 - b. All organic foods shall comply with the packaging and labelling requirements specified under the Food Safety and Standards (Packaging and Labelling) Regulations, 2011 in addition to the labelling requirements under one of the applicable systems.
4. Traceability - shall be established upto the producer level and it shall include any other requirements prescribed by Food Authority to maintain the organic integrity of the food product.
 5. Requirement to comply with the provision of the other regulations made under the Act - Without prejudice to the provisions of these regulations, all organic food shall comply with the relevant provisions,



as applicable, under the Food Safety and Standards (Food Product Standards and Food Additives) Regulations, 2011. The organic food shall also comply with relevant provisions, as applicable under the Food Safety and Standards (Contaminants, Toxins and Residues) Regulations, 2011 except for residues of insecticides for which the maximum limits shall be 5% of the maximum limits prescribed or Level of Quantification (LoQ) whichever is higher.

6. Display— The seller of organic food either exclusively or as part of his retail merchandise shall display such food in a manner distinguishable from the display of non-organic food.



Waste Decomposer



This single bottle decomposes bio-waste of more than 10000 metric tons just in 30 days !



Union Minister of Agriculture Sh. Radha Mohan Singh Ji is distributing Waste Decomposer to Farmers

Directions for Use

Mass Multiplication

1. Mix 2 kg of jaggery in 200 liter of water in a container and stir well
2. Open the bottle and pour the contents of bottle into the solution (avoid direct contact of contents with hands)
3. Stir the contents of the container and cover it with a paper/cardboard etc and stir it daily once within 4 days the material is ready

Composting

1. Spread 1 ton of compost as layer on a plastic sheet placed under shade
2. Sprinkle 20 liter of the above prepared solution over the compost layer
3. Spread one more layer of compost above the existing layer
4. Sprinkle 20 liter of the solution over the compost layer
5. Use the solution for 10 compost layers
6. Maintain 60% moisture during



entire period of composting

7. Turn over the compost at 7 day interval

The compost is ready to use after 30 days



Foliar Spray

Spray the preparation on the standing crop for 4 times at 10 days interval

Drip irrigation

Mix the preparation in water required for 1 acre and use it for drip irrigation.

In-Situ Composting of Crop Residue

Spray the preparation on the post-harvest stalks of crop plants of 1 acre land and leave it for decomposition



Seed Treatment

1. Wear gloves; 2. Content of 1 bottle is thoroughly mixed with 30 g jaggery and used to treat 20 kg seeds
3. Leave the treated seeds under shade for 30 minutes
4. After 30 min. the seeds are ready for sowing

For regular disease control, spray the preparation on standing crop once in a month.

For further details:

NATIONAL CENTRE OF ORGANIC FARMING

(Ministry of Agriculture & Farmers Welfare, Government of India)

Hapur Road, Kamla Nehru Nagar, Ghaziabad-201002

Phone : 0120-2764906, 2764212; Fax 0120-2764901 Email : nbdc@nic.in; Website : <http://ncof.dacnet.nic.in>

Celebrating *Farmers*

their contribution to food security,
health, sustainability & economy.



MANUAL ON ORGANIC AGRICULTURE



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