

Handbook on Organic Farming and Processing

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India is an agro based country. So organic farming plays an important role in agro field. The popularity of organic farming is gradually increasing and now organic agriculture is practiced in almost all countries of the world, and its share of agricultural land and farms is growing. As the organic food market continues to expand, so do the opportunities for small farmers.

Organic farming has emerged as the only answer to bring sustainability to agriculture and environment.

This handbook is a comprehensive guide to growing, certifying, and marketing organic produce. Organic farming is not only a philosophy, but also a well-researched science that combines soil fertility, plant pathology and other biological and environmental sciences.

The major contents of this book are Sustainable Agriculture, National Programme on organic farming, Integration with organics and biofertilizers, Bulky organic manures and crop residues, Manuring on sight, Manuring potentials, Green Manuring, Production and promotion of organic fertilizers, Vermi composting, Response of crops to organic fertilizers, Phosphate solubilizing, *Bacillus thuringiensis*, Crop residue management, Integrated nutrient management towards sustainable agriculture, Integrated farming system, Mechanism of nitrogen fixation, Economics and marketing of organic farming.

As we have seen, the booming development taking place in organic farming and marketing offers many opportunities. We will be able to go on contributing to the establishment of organic production systems and this could lead to changes in life style and consumption patterns that will reach far beyond food and nutrition.

This book will be very helpful to soil scientists, microbiologists, biologists, students, new entrepreneurs, fertilizer industries, training centers and to all those interested in efficient use and sustainable farming.

1. SUSTAINABLE AGRICULTURE

Evolution of Sustainable Agriculture

Sustainable Livelihood

2. NATIONAL PROGRAMME ON ORGANIC FARMING

National Programme for Organic Production

Operational Structure of NPOP

Accreditation Agencies

Evaluating Agency

- Accredited Inspection and Certification Agencies
- Inspectors
- Accreditation Regulation 2001
- Committee for Accreditation
- Application for Accreditation
- Updating and Renewal of Accreditation
- Power to Issue Guidelines
- Logo
- Suspension/Termination of Accreditation
- Categories for Accreditation
- Reciprocity
- The National Standards for Organic Products
- Guidelines for Organic Production and Processing
- Package of Practices

3. INTEGRATION WITH ORGANICS AND BIOFERTILIZERS

- Fertilizers
- Nutrient Uptake and Removal by Crops
- Fertility Status of Soils
- Crop Responses to Fertilizer Application
- Optimum Application Rates
- Integration of Diverse Sources of Plant Nutrients
- Some Basic Issues
- Farmyard Manure
- Green Manures
- Rhizobium
- Blue Green Algae
- Azolla
- Conclusions

4. BULKY ORGANIC MANURES AND CROP RESIDUES

- Organic Manures and Their Composition
- Potential and Available Supplies
- Technologies for Quicker and Better Compost Production
- Competing Uses of Resources
- Fate of Organic Materials in Soil
- Effect on Soil Properties
- Effect on Crop Yields
- Long-term Effects of Organic Manures
- Management Aspects
- Constraints in Adoption
- Future Research Needs

5. MANURING ON SIGHT

- In-situ Manuring by Animal
- The System
- Advantages
- Limitations
- Verification of Farmers Experiences
- Sustainability
- Prospects
- In-situ Manuring with Plants (Green Manures)
- Benefits of Using Green Manures

- Enhance Soil Fertility
- Supplement for Nutrients
- Improved Soil Structure
- Prevention of Soil Erosion
- Weed Control
- Method of Use
- Green Manuring in Situ
- Green Leaf Manuring
- Place in Farming System
- Green Manures in Rotation
- Green Manures and Undersowing
- Long Term Green Manures
- Green Manures as Mulch
- Green Manures in Agroforestry
- Management of Green Manuring
- Time of Sowing and Seed Rate
- Seed Treatment
- Stem Cuttings
- Mixed Cropping
- Inter Cropping
- Border Planting
- Phosphorus Response
- Digging in Green Manures
- The Choice of Green Manure
- Other Important Considerations
- Achieving Sustainability in the Use of Green Manures
- Sustainability
- Experiences Worldwide
- Conclusions

6. MANURING POTENTIALS

- Available Potential of Organic Materials for Ex-Stu Manuring
- Organic Resources and Potential
- Livestock and Human Wastes
- Crop Residues, Tree Wastes and Aquatic Weeds
- Urban and Rural Wastes
- Agro-Industries Byproducts
- Marine Wastes
- Agricultural Waste
- Crop Residues
- Agro-industrial Wastes
- Rice Husk
- Bagasse
- Pressmud
- Tea Wastes
- Coir Waste
- Characteristics of Agricultural Wastes
- Nitrogen
- Phosphorus
- pH
- Bio Plant Growth Promoters
- Livestock Wastes
- Type of Production Unit

Species and Age of Animal
Other Factors
Beef Cattle
Slotted Floors
Dairy Cattle
Utilization of Agricultural Organic Waste
Recycling of Organic Materials for Fertilization
Organic Mulch
Concentrated Organic Manures
Aquatic Weeds
Aquatic Weeds as Source of Energy
Aquatic Weeds as Organic Manures
Oilcakes
How to Use Oilcakes
Cattle, Pig, and Poultry Manures
Poultry
Litter Grown
Cage Grown
Meat-meal
Bloodmeal
Fishmeal
Horn-and-hoofmeal
Collection and Storage of Organic Waste
Economic Value of Organic Waste
Availability of Organic Waste in India
Processing of Agriculture Waste
Conclusion
Economic Considerations
Public Policy

7. GREEN MANURING : NUTRIENT POTENTIALS AND MANAGEMENT

Green Manures
Role of Green Manuring in Cropping Systems
Fate of Green Manures on Application to Soils
Availability of Essential Nutrients
Crop Responses and Residual Effects
Green Manure Management
Residual and Long-term Effects
Economics of Green Manuring
Constraints of Green Manuring
Future Research Needs
Conclusions

8. PRODUCTION, DISTRIBUTION AND PROMOTION OF ORGANIC FERTILIZERS

Definition and Classification
Practical Significance of Biofertilizers
Requirement of Biofertilizers
Production Technology of Biofertilizers
Production of Biofertilizers
Standards and Quality Control
Government Support and Programmes
Constraints

Areas for Future Development

Conclusions

9. VERMI COMPOSTING

Earthworms as Indicators of Soil Fertility

Earthworms and Plant Growth

Interaction of Vermicompost-Earthworm-Mulch-Plantroot (Vemp)

Vermicompost

Recycling of Wastes Through Verm-composting

Minimizing Pollution Hazard

Advantages of Vermi-Compost

Adverse Effects on Crops

Economic Viability

Vermiculture Process

Selection of Suitable Species

Epiges

Endoges

Aneciques

Basic Characteristics of Suitable Species

Fixing Earthworms for Identification

Transport of Fixed Worms to Laboratory

Description of Suitable Species

Family: Lumbricidae

Eisenia foetida (Sav.)

Family: Eudrilidae

Eudrilus eugeniae (Kinb.)

Family: Megascolecidae

Lampito mauritii (Kinb.)

Metaphire anomala Mich. (= *Pheretima anomala*)

Metaphire posthuma (= *Pheretima posthuma*)

Perionyx excavatus E. Perr.

Perionyx Sansbaricus Michaelson

Maintenance of Base Culture

Vermicomposting Materials

Animal Dung

Agricultural Waste

Forestry Wastes

City Leaf Litter

Waste Paper and Cotton Cloth etc.

City Refuge

Biogas Slurry

Industrial Wastes

Preliminary Treatment of Composting Material

Pre-Treatment of Leaf Litter and Agricultural Waste

Small Scale or Indoor Vermicomposting

Large Scale or Outdoor Vermicomposting

Requirements for Vermicomposting

Container

Bedding Material

Moisture Content

Temperature

Initiation of Vermiculture in India

10. RESPONSE OF CROPS TO ORGANIC FERTILIZERS IN SALT AFFECTED SOILS

Response of Crops in Salt-Affected Soils of Punjab and Haryana

11. PHOSPHATE SOLUBILIZING SOIL ACTINOMYCETES AS BIOFERTILIZERS

Material and Methods

Results and Discussion

Summary

12. VERMICOMPOSTING OF KITCHEN WASTE

Material and Methods

Results and Discussion

Conclusion

13. BACILLUS THURINGIENSIS : AN EFFECTIVE BIOINSECTICIDE

Criteria for Microbial Insecticide

Material and Methods

Results

Discussion

Summary

14. COMPOSTING OF AGRICULTURAL AND INDUSTRIAL WASTES

Definition

Principles of Composting

Agricultural Wastes

Methods for Composting of Agricultural Wastes

Indore Method

Activated Compost

Banglore Method

NADEP Compost

Coimbatore Method

Synthetic Compost

Windrow Composting (Leaf Compost)

Accelerated Composting and Enrichment

Vermi-composting

Animal Waste Composting

Oil Palm Waste Composting

Phospho-Compost

Reinforced Compost from Sugarcane Trash and Pressmud

Enriched FYM (EFYM)

Weed Composting

Composting of Parthenium

Hints for Composting Agricultural Wastes

Industrial Wastes

Composting of Coir Pith

Composting of Pressmud

Using Distillery Effluent

Using Microbial Inoculum

Using Pressmud and Distillery Effluent

Conclusion

Future Needs

15. CROP RESIDUE MANAGEMENT

- Residue Management
- Crop Residue Potential
- Crop Residue Components
- Crop Residue Uses
- Effect on Soil Management
- Residues with Fertilizer
- Effect of Residues on N Fertilization
- Future Research Needs

16. INTEGRATED NUTRIENT MANAGEMENT TOWARDS SUSTAINABLE AGRICULTURE

Need for INM

Concepts and Approaches

Components of Integrated Nutrient Management Strategies

Reduction of Losses from Applied Inorganic Fertilizers

Application to synchronize with the demands of Crops

Timing, Placement and Choice of Fertilizers

Controlled Release of Nutrients

Crop Choice

Retention of Native Soil Nutrients

Alternate or Supplementary Sources of Nutrients

Biofertilizers in INM

Blue Green Algae

Azolla

Azospirillum spp. (*A. Lipoferum* and *A. brasilense*)

Rhizobium

Phospobacteria

VAM

Organic Manures

Municipal and Sewage Wastes

Composting of Organic Wastes

Crop Residue Management

Green Manuring

Non-conventional Green Manures

Oil Cakes

Legumes in INM

Legumes Grown in System

Legumes as Intercrops

INM Cropping System

Rice-based Cropping System

Cotton-based Cropping System

Wheat-based Cropping Systems

Sugarcane-based Cropping System

INM and Long Term Studies

Future Strategies

17. MECHANISM OF NITROGEN FIXATION

18. INTEGRATED FARMING SYSTEM

Definitions

Advantages of IFS

1. Productivity
2. Profitability
3. Potentiality/Sustainability

4. Balanced Food
5. Environmental Safety
6. Recycling
7. Income Round the Year
8. Adoption of New Technology
9. Saving Energy
10. Meeting Fodder Crisis
11. Solving Fuel and Timber Crisis
12. Employment Generation
13. Agro-industries
14. Increasing Input Efficiency
15. Increasing the Standard of Living of the Farmer

Integration of Subsystem in Farming System

Aquaculture

Paddy-cum-fish Culture

Duck-cum-Fish Culture

Fish-cum-Poultry Farming

Fish-cum-Pig Farming

Sericulture and Fish Farming

Biogas Plants

Mushroom Cultivation

Mushroom Cultivation

Spawn Running Room

Cropping Room

Approximate Size of the Rack of Cropping Room

Materials Required

Preparation of Cylindrical Beds

Making Ready the Substrate

Making Ready the Polythene Bags

Making Ready the Spawn

Spawning the Bed

Spawn Running and Opening of Beds

Cropping

Harvesting Mushroom

Packing and Storage

Animal Husbandry

Dairy Farming

Sheep and Goat

Piggery

Rabbit

Poultry Farming

Japanese Quail

Ducks

Pigeons

Disease

Agroforestry

(i) Agri-silviculture System

(ii) Silvipasture System

(iii) Silvi-horti-pastural System

I. Coastal Alluvium

II. Riverine Alluvium

III. Red Gravelly Soil

IV. Lateritic Soil

- V. Black Soil (clay loam soil)
- VI. Sandy Red Loam
- VII. Calcareous Soil
- VIII. Problem Soils
 - (a) Saline and Alkaline Soils
 - (b) Mined Areas
 - (c) Theri Soils
- Sericulture
- Manuring
- Season
- Planting
- Quantity of Cuttings
- Varieties
- Pruning
- Leaf Harvest
- Leaf Yield
- Silkworm Rearing
- Life Cycle
- IFS under lowland Condition
- IFS Under Garden Land Conditions
- IFS Under Rainfed Conditions
- Coconut based Integrated Farming System
- Crop Components
- Future Needs

19. RECOMMENDATIONS

20. ECONOMICS AND MARKETING OF ORGANIC FARMING

- Economic Viability
- The Challenge of Going Organic
- Farm Production and Profit
- Microeconomic Aspects
- Output Mix
- Output Value
- Input Mix
- Input Value
- Labor Costs
- Benefits for Farmers
- Employment Generation
- Total Concept Approach
- Rural and Community Development
- Quality of Organic Product
- Product Prices
- The Organic Market
- Growth
- Constraints and Opportunities
- Unfair Trends in the Market
- Fair Trade
- Fair Trade and Trade Development
- Small Farmers Disadvantaged
- Dilemma
- Fair Trade Labeling
- Promoters of Fair Trade

Action for Fair Trade
Progress in Fair Trade Marketing
Protectionism
Priority to Local Economics
Strengthening Local Economics
Critical Factors
Challenges
Trade Opportunities
New Opportunities in a Growing Market
Alternative Markets
Role of the Trader
Quality Guarantee
The Consumer
Retailing Arrangements
Dilemma of the Farmer
Processing
Marketing of Perishables organic Produce-study in Bangalore, India
Fruits and Coconuts
Milk
Potatoes
Exclusive Outlets for Organic Products
Lessons Learnt
Certification of Organic Produce
The Standards
Trading
Serious Barriers
Meaning of Certified Organic
Partnerships are Needed
Organic Farmers and Export Markets: The Role of Co-operative - Case Study from India
IFOAM and Certification
IFOAM and Accreditation
Organic Foods Certification in India
Introduction of Certification in India for Organic Agri Exports
Suggestion
India Needs
Conclusion

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