## CONTENTS

### VOLUME I

**Interactions: Food, Agriculture and Environment**

1. Introduction
2. Natural Resources and Features of Agricultural Production
3. Effect of Agriculture on The Environment
4. Cattle Breeding and Condition of The Environment
5. Sustainable Agriculture, its Ecologization, and Elimination of Limiting Factors
6. Influence of Food Production on The Environment and Ecologization of Food Processing Technologies
7. Aquatic products and the Environment
8. Food and Health of the Population
9. Conclusion

**Environment Impact on Aquaculture Production**

1. Introduction
2. Heavy metal pollution of fishes and invertebrates
3. The fish and sea products pollution with organic compounds
4. Parasite infestation of fishes and sea products
5. Artificial breeding in marketable fish culture (pisciculture), reproduction of rare and disappearing species

**Water Pollution and its Impact on Fish and Aquatic Invertebrates**

1. Heavy Metals
2. Organic Compounds

**Parasite Infestation of Fishes and Sea Products**

1. Introduction
2. Parasitology of marine and fresh waters
3. Parasite diseases of commercial fish and shellfish
4. Parasitic infection of humans

**Artificial Breeding in Pisciculture, and Breeding of Rare and Endangered Species of Freshwater Fish**

1. Introduction
2. Commercial fish culture
3. Sturgeon fisheries
4. Conservation of endangered species
5. Future prospects for aquaculture
### Food Safety with Special Reference to Public Health

G.A. Talanov, All-Russian Research Institute for Veterinary Sanitation, Hygiene and Ecology, Russian Academy of Agricultural Sciences, Russia

1. Introduction  
2. Occurrence of the food-borne diseases  
3. Control of the food safety  
4. Conclusion

### Mother’s Milk Substitutes and Infant Human Health

Lipatov Nikita Nikolayevich, Russian Academy of agricultural sciences, Moscow, Russia

1. Introduction  
2. Classification of mother’s milk substitutes  
3. Mother’s milk as a criterion for the development of its substitutes  
4. Alimentation-dependent diseases as a result of irregular feeding of infants during first months of their life  
5. Principles of adaptation and assortment of mother’s milk substitutes  
6. Index of safety of mother’s milk substitutes

### Climate Change and Agriculture

Richard M. Adams, Department of Agricultural and Resources Economics, Oregon State University, USA

1. Introduction  
2. Agriculture and Climate  
   2.1. The Biophysical Dimensions  
      2.1.1. Temperature  
      2.1.2. Rainfall  
      2.1.3. Carbon Dioxide Concentrations  
      2.1.4. Climate Variability and Extreme Events  
      2.1.5. Indirect Effects  
   2.2. The Dimensions of Human Response  
3. Climate Change Impacts on Crop Yields and Livestock Performance  
   3.1. Crop Yield Responses to Climate Change  
   3.2. Livestock Performance Responses to Climate Change  
4. Role of Human Response and Adaptation to Climate Change  
   4.1. Adaptation and Adjustment of Agricultural Systems to Climate Change  
   4.2. Economic Approaches to Measuring Climate Change Effects  
   4.3. The Structural Approach  
   4.4. The Spatial Analogue Approach  
   4.5. Importance of Adaptation Assumptions in Economic Assessments  
5. Impacts of Climate Change on Agricultural Production, Prices, and Welfare  
   5.1. Estimated Crop Supply and Price Response  
   5.2. Potential Impacts on Economic Welfare  
6. Environmental Effects on Agricultural Production  
7. Mitigation of Greenhouse-Gas Emissions  
   7.1. Mitigating Agricultural Emissions  
   7.2. Sequestering Carbon  
8. Conclusions
Conservation Agriculture

Amélie Berger, Food and Agriculture Organization of the United Nations (FAO), Rome, Italy
Theodor Friedrich, Crop Production Systems Intensification, Crop and Grassland Service (AGPC), FAO, Rome, Italy
Josef Kienzle, Equipment and Institutions/Agro-Industries, Rural Infrastructure and Agro-Industries Division (AGST), FAO, Rome, Italy

1. Definition of Conservation Agriculture
2. Basic Principles
3. Purpose of Conservation Agriculture
4. Conservation Agriculture in the World
   4.1. Latin America
   4.2. USA, Canada, Australia
   4.3. Europe
   4.4. Asia
   4.5. Africa
5. Conservation Agriculture Practices
   5.1. Minimum Soil Disturbance
   5.2. Cover Crops
      5.2.1. Choice of the Cover Crop
      5.2.2. Management of Cover Crops
   5.3. Crop Rotation
6. Benefits of Conservation Agriculture
   6.1. More Stable Yields under Extreme Climatic Conditions
   6.2. Labor and Farm Power Saving
   6.3. Reduced Production Costs and Improved Gross Margin
   6.4. Improved Yields
   6.5. Improved Soil Fertility
   6.6. Environmental Impact
      6.6.1. Impact on Biodiversity and Resilience
      6.6.2. Impact on Land Management
      6.6.3. Impact on Water Management
      6.6.4. Impact on Water Quality
      6.6.5. Carbon Sequestration and Reduction of Greenhouse Gases Emissions
7. Issues and Challenges for Conservation Agriculture
8. Conclusions

Management of Dryland and Desert Areas

Eddy F. De Pauw, Agroecologist, International Center for Agricultural Research in the Dry Areas (ICARDA), Aleppo, Syria

1. Introduction
2. Drylands Of The World
3. Geographical Distribution Of Drylands
4. Agro-Ecological Diversity And Vulnerability
5. Dryland Management Principles
   5.1. Runoff Control
   5.2. Water Conservation
   5.3. Soil Fertility Management
   5.4. Fitting Crops To The Available Growing Period
   5.5. Irrigation
   5.6. Range Management
6. Agricultural Systems Of Drylands
7. Conclusions
The Socioeconomics of Agriculture
Angel Paniagua, Consejo Superior de Investigaciones Científicas, Madrid, Spain
Kathleen Baker, Geography Department, King's College London, Great Britain.

1. Introduction
2. Socioeconomic Agricultural system
3. Different types of agricultural systems
   3.2. Industrialized agriculture
   3.3. Marginal Agriculture.
   3.4. Peri-urban agriculture
4. Dynamic processes in agricultural systems
   4.1. Agricultural development.
   4.2. Agricultural change
   4.3. Agricultural adaptation.
   4.4. Agricultural restructuring.
5. The environmental dimension of modern agricultural systems
   5.1. Sustainable agriculture
   5.2. Organic agriculture.
   5.3. Alternative agriculture
6. Agricultural politics.
   6.1. Agricultural policy
   6.2. Agricultural government
       6.2.1. Farming policies, rural communities and traditional rural ecosystems and protected areas
   6.3. International trade in agricultural products

Sustainability and Resilience in Natural Resource Systems: Policy Directions and Management Institutions
Anthony T. Charles, Management Science / Environmental Studies, Saint Mary's University, Canada

1. Introduction
2. Sustainability and Resilience
3. Policy Directions for Sustainable and Resilient Resource Systems
   3.1. Developing a Management Portfolio
   3.2. Applying the Precautionary Approach
   3.3. Robust and Adaptive Management
   3.4. Co-management and Community-Based Management
   3.5. Planning for Efficiency in Natural Resource Systems
   3.6. Managing Resource Sector Capacity
   3.7. Diversifying Livelihoods
   3.8. Developing and Utilizing the Knowledge Base
   3.9. Monitoring Sustainability
4. Institutions
   4.1. Sustainable and Resilient Institutions
   4.2. Institutional Effectiveness in Achieving Sustainability and Resilience
   4.3. Institutional Choices
5. Conclusions

Global Sustainability: Rhetoric and Reality, Analysis and Action - The Need for Removal of a Knowledge - Apartheid World
Thomas G. Whiston, Professor of Environment, Roskilde University, Denmark

1. The Global Problem
2. The Main Pressure Points
3. The Track Record to Date
Current Issues in Agricultural Science and Technology Policy

1. Introduction and Context
   1.1. A Second Green Revolution?
2. Current Issues
   2.1. Institutional Changes
      2.1.1. Plant Breeders’ Rights vs. Farmers’ Rights
      2.1.2. Responses
   3. Technological Innovations
      3.1. New Biotechnologies
         3.1.1. What they are
         3.1.2. Increasing global inequality
         3.1.3. Consumer acceptance
         3.1.4. Labeling
         3.1.5. Allergens
         3.1.6. Food Safety
         3.1.7. Biosafety
         3.1.8. Policy Issues
      3.2. Other Technologies
3. What is at Stake?
   4.1. Environment
   4.2. Food Security
   4.3. Control of the Agrifood System
   4.4. The Public Interest
      4.4.1. Participation in Science and Technology Policy

Food and Agricultural System Development Information and Knowledge

1. Introduction
   1.1. Agriculture as Complex Systems
   1.2. Stating the Problem
   1.3. The Bottom Line: Two Crucial Questions
2. Contrasts in Agricultural Food Production and Consumption—Past and Present
3. Development of Agricultural Technology in Industrial Nations
   3.1. The Peasant System of the Past
   3.2. Industrialization of Farming
      3.2.1. Spillover from Industrial Farming
      3.2.2. Caught in a Social Trap
   3.3. Organic Food
      3.3.1. Definition of Organic Agriculture
      3.3.2. Demand Side Satiety, Abundance, and Ethics
      3.3.3. Supply Side Grass-Root Pioneers and Idealists
Developing Nations and their Double Bindings

4.1. Food Provision Systems
4.2. Poverty and Economic Performance
4.3. Population Growth versus Aggregate Production of Food

Cultivated Capital: Agriculture, Food Systems, and Sustainable Development

Patrick Webb, Professor, Director of the Food Policy and Applied Nutrition Programme, School of Nutrition Science and Policy, Tufts University, Boston, USA

1. Introduction
2. Critical Links between Food Insecurity, Poverty, and the Environment
   2.1. Concepts and Linkages
3. Food Insecurity and Agricultural Growth
   3.1. Global Food Needs
   3.2. Food Supply and Future Demand
4. Farm Technologies and Natural Capital Decline
5. Sustainable Food Systems in the Twenty-First Century
   5.1. Examples of Sustainable Systems?
   5.2. Potential Contributors to Sustainability
6. Conclusions

Water Interactions with Energy, Environment, Food, and Agriculture

Maria Concepcion Donoso, Environment and Water Sciences, Montevideo, Uruguay
N.M. Vargas, Graduate Research Assistant, Illinois State University, Normal, Illinois, USA

1. Water and the Environment
   1.1. The Hydrological Cycle
   1.2. Surface Water and Groundwater
   1.3. Aquatic Ecosystems
   1.4. Water Quality and Health
   1.5. Climate Variability and Water Resources
   1.6. Climate Change and Water Resources
   1.7. Other Threats Linked to Water Resources
2. Water and Food: Agriculture
   2.1. Water Requirements
   2.2. Farming with Agrochemicals
   2.3. Water and Animal Production Systems
   2.4. Aquaculture and Fisheries
   2.5. Water and Diseases Linked to Food Production
3. Water and Energy
   3.1. Hydroelectric Power
   3.2. Thermal Pollution
   3.3. Tidal and Wave Power
   3.4. Hydrothermal Power
   3.5. Ocean Thermal Energy Conversion
   3.6. Nuclear power
4. Conclusions

Water, Agriculture and Food Interactions

Wulf Klohn, Land and Water Development Division, Food and Agriculture Organization, Rome, Italy

1. Introduction
2. The forces that shape agriculture
3. Characteristics of water use for food production

©Encyclopedia of Life Support Systems (EOLSS)
4. How much water does it take to produce food?
5. The outlook for water for agriculture
6. Adapting to water scarcity
7. Rural poverty, water and food security
8. The special role of groundwater
9. Food production and the aquatic environment

Index

About EOLSS

VOLUME II

Food Sources
Aree Valyasevi, National Health Foundation, Bangkok Institute of Nutrition, Mahidol University, Salaya (campus), Nakhon Pathom, Thailand
Pattanee Winichagoon and Visith Chavasit, Mahidol University, Salaya (campus), Nakhon Pathom, Thailand

1. Introduction
2. Essential Characteristics of Foods: Ensuring Quality of Life
3. Food Sources: An Evolutionary Perspective
4. Sources of Foods
   4.1 Indigenous Foods
   4.2 Foods from Natural Waters
   4.3 Foods from Agricultural Production
      4.3.1 Agricultural Inputs for Food Production
      4.3.2 Issues on Production of Major Food Commodities
5. Expanding Food Sources
   5.1 The Green Revolution
   5.2 Aquaculture
   5.3 Food Technology
   5.4 Biotechnology
   5.5 Crop Arrangement
6. From Food Sources to Consumers
7. Sustainable Food Sources
   7.1 Promoting Indigenous Food Sources
   7.2 Proper Management of Agricultural Resources
   7.3 Organic Foods
   7.4 Preserving Biodiversity
   7.5 Broad Policy and Strategies
8. Closing Remarks

Food and Agriculture and the Use of Natural Resources
Victor R. Squires, Adelaide University, Australia

1. Introduction
2. A Brief History of Food—Gathering, Production, and Storage
3. The Impact of Technology on Agriculture and Food Production
   3.1 The Green Revolution
4. Protecting the Resource Base: Economic and Ecological Imperatives
5. Constraining Factors in Food Production
6. Challenges for the Twenty-first Century
## Food Control and International Food Trade

Anthony J. Whitehead, *FAO, Food and Nutrition Division, Rome, Italy*

John Lupien, *FAO, Food and Nutrition Division, Rome, Italy*

1. Introduction
2. Concerns for Food Quality and Safety
3. Elements of a Food Control System
   3.1. Inspectorate
4. Common Food Control Deficiencies
   4.1. The Impact of International Food Trade
   4.2. Impact of International Organizations on Food Control
5. Permanent Expert Groups/Committees
   5.1. The Joint FAO/WHO Expert Committee on Food Additives and Contaminants (JECFA)
   5.2. The Joint FAO/WHO Meetings on Pesticide Residues (JMPR)
   5.3. The Joint FAO/IAEA/WHO Expert Committee on Food Irradiation (JECFI)
   5.3.1. Ad-hoc Expert Groups/Committees
6. Codex Alimentarius Commission (CAC)
   6.1. Role and Function of Codex
   6.2. CAC Procedures
   6.3. Role of Codex and the World Trade Organization
7. Future Directions for Food Control
   7.1. Food Law and Regulations
   7.2. Reorientation of Food Control

## A History of Fishing

D.F. Gartside, *Center for Coastal Management, Southern Cross University, Lismore, Australia*

I.R. Kirkegaard, *Department of Environment, Heritage and Aboriginal Affairs, Adelaide, Australia*

1. Introduction to Fish
   1.1. Fish/Human Interaction
   1.2. Definition of "Fishes"
   1.3. The Earliest Interactions between Humans and Fish
2. Fishing Methods, Trawling, and Influential Fish
   2.1. Traditional Fishing Methods
   2.2. The Development of Trawling
   2.3. Influential Fish
3. Fish Surplus, Over-exploitation, and Extinction
   3.1. Development of the Concept of Surplus
   3.2. The Paradox of the Fishery: The Tragedy of the Commons, and Over-exploitation
   3.3. Extinction
   3.4. The Modern Era’s Conflicting Perceptions
4. Fisheries Science, Models, and Management
   4.1. Early Steps in Fisheries Science: The Concept of Surplus Production
   4.2. Fisheries Models in Fisheries Management: An Exact Science?
   4.3. The Unintended Experiment—The Impact of the World Wars
   4.4. The Modern Era of Fisheries Management
   4.5. What Constitutes Successful Fisheries Management?
5. Global Fish Issues
   5.1. Global Fish Production
   5.2. Major Species in the World Catch
   5.3. The Major Fish-Producing Countries
   5.4. Commercial Value of Global Fish Production
   5.5. How Much of the Global Catch Is Used for Human Nutrition?
   5.6. Demand For Fish For Human Nutrition
   5.7. Threats to the Yield of Fish
6. The Future for Fisheries
   6.1. The Challenging Future for Fisheries
INTERACTIONS: FOOD, AGRICULTURE AND ENVIRONMENT

6.2. A Probable Future
7. Conclusion

Plant and Animal Genebanks
J.M.M. Engels, *International Plant Genetic Resources Institute (IPGRI), Rome, Italy*
Hareya Fassil, *International Plant Genetic Resources Institute (IPGRI), Rome, Italy*

1. Introduction
2. Historical Background
   2.1. Plant and Animal Domestication
   2.2. History of Plant Genetic Resources Conservation
   2.3. History of Animal Genetic Resources Conservation
   2.4. Plant and Animal Genebanks: General Similarities and Differences
3. State of the Art: Ex Situ Conservation Approaches and Methods
   3.1. Functions and Activities of Genebanks
      3.1.1. Seed Storage
      3.1.2. Field Genebanks
      3.1.3. Botanic Gardens
      3.1.4. In Vitro Conservation
      3.1.5. Community Genebanks
      3.1.6. DNA Storage
   3.2. Genebank Management
      3.2.1. Exploration and Collecting
      3.2.2. Regeneration
      3.2.3. Characterization and Evaluation
      3.2.4. Germplasm Health and Plant Quarantine
      3.2.5. Distribution of Germplasm
      3.2.6. Information Management
   3.3. *In situ* Conservation
4. Perspectives and Trends
   4.1. Changing Priorities
      4.1.1. Emergence of a Holistic Approach to Conservation: Complementary Conservation Strategies
      4.1.2. Facilitating the Use of Conserved Germplasm
   4.2. The Policy Environment
5. Future Research
   5.1. Development of Low-Input Conservation Techniques
   5.2. Promoting Access to Conserved Germplasm
   5.3. Improving Initial Quality of Germplasm
   5.4. Seed Viability Monitoring
   5.5. Routine Application of Cryopreservation and Associated Techniques

Social and Policy Issues of Agriculture and Food
Luther Tweeten, *Department of Agricultural, Environmental, and Development Economics, Ohio State University, Columbus, Ohio, USA. 43210*

1. Introduction
2. Stages Underlying Contemporary Social and Policy Issues of Agriculture
   2.1. Stages II and III: The Rise and Decline of Agriculture
   2.2. Stage IV: Mature Economies
3. Food Supply and Demand
   3.1. Food Supply-Demand Balance and Real Price
   3.2. Agriculture is Not Just for Food and Fiber Production Any More
   3.3. Biotechnology
4. Market Structure in Food Industries
   4.1. Production Agriculture
### Decision Support Systems for Food and Agriculture

1. **Introduction**
2. **Systems Definition and Systems Theory**
   2.1. Agricultural Systems
   2.2. Systems Analysis Techniques & Decision Support
   2.3. Structure of a Decision Support System
   2.4. Qualitative and Quantitative Decision Paths
   2.5. Examples of Decision Support Systems used in Agriculture
      2.5.1. Application Areas
      2.5.2. Example of Qualitative DSS – Expert Systems
      2.5.3. Example of Quantitative DSS – Simulation Modeling
      2.5.4. Example of Combination DSS
3. **Conclusion**

### Agricultural Meteorological Models

1. **Introduction**
2. **Approaches in Developing Agricultural Meteorological Models**
   2.1. Statistical Approaches
   2.2. Process Approaches
3. **Models of Weather Variables not commonly measured**
   3.1. Solar radiation models
   3.2. Leaf wetness duration
   3.3. Dew-point models
   3.4. Evapotranspiration models
   3.5. Soil moisture models
4. **Derived Weather Variables**
   4.1. Diurnal temperature distribution
   4.2. Growing degree units
   4.3. Chilling units
5. **Models Linking the Microclimate to Atmospheric Forcing**
6. **Crop, Livestock, Insect, and Disease Weather Response Models**

### Development Issues In Food And Agriculture

1. **Introduction**
The Need For An International Approach – The Role Of FAO and WHO

Jorgen Schlundt, Director, Department for Food Safety, Zoonoses and Foodborne diseases, World Health Organization, Geneva, Switzerland
Kazuaki Miyagishima, Secretary, Codex Alimentarius Commission, Joint FAO/WHO Food Standards Programme, Rome, Italy

1. Introduction
2. Food Safety Risk Assessment at the International Level
   2.1. Joint FAO/WHO Expert Committee on Food Additives (JECFA)
   2.2. Joint FAO/WHO Meetings on Pesticide Residues (JMPR)
   2.3. Joint FAO/WHO Expert Meetings on Microbiological Risk Assessment (JEMRA)
3. Food Safety Risk Management at the International Level
   3.1. Codex Alimentarius Commission (CAC)
      3.1.1. Overview
      3.1.2. Legal Basis and Membership
      3.1.3. Organizational Structure and Strategic Planning
      3.1.4. Operation and Procedure
      3.1.5. International Standards and Related Texts
      3.1.6. Linkage with the World Trade Organization (WTO)
      3.1.7. Coordination with Other International Organizations
      3.1.8. Challenges
   3.2. International Food Safety Authorities Network (INFOSAN)

Management Of Food Safety In The Industrial Setting

Yasmine Motarjemi, Nestec, Vevey, Switzerland

1. Introduction
2. Risks and Controls along the Food Supply Chain
   2.1. Environmental Contamination
   2.2. Raw Material (The focus of this section is on the hazards inherent to the raw material. Hazards contaminating the raw material are addressed in the next sections.)
   2.3. Primary Production
   2.4. Slaughter, Harvesting, Storage and Transport
   2.5. Processing and Manufacturing
   2.6. Retail and Distribution
   2.7. Food Preparation in Homes and in Food Service
3. Role of Food Technologies in Ensuring Food Safety
   3.1. Technologies Used For Rendering Food Safe
      3.1.1. Heat Treatment
      3.1.2. Non-thermal Technologies
   3.2. Technologies used to Control Contaminants
   3.3. Technologies to Prevent Re-Contamination during or after Processing
   3.4. Technologies to Support Food Analysis
   3.5. Technologies to Provide Support in Logistics and Supply Chain Management
   3.6. Emerging Technologies
4. Safety and Quality Assurance System
   4.1. Code of Good Practices
   4.2. HACCP
   4.3. Verification and Validation
   4.4. Traceability, Recall Procedure and Crisis Management
   4.5. Management Commitment, Human Resource Management and Training
5. Challenges and Outlook
   5.1. Changes Related to Internal Operations
   5.2. Changes in the Environment
6. Conclusions

Chemistry of Organic Pollutants Including Agrochemicals
Desley W. Connell, *Griffith University, Brisbane, Queensland, Australia*
Rudolf S.S. Wu, *City University of Hong Kong, Hong Kong, China*
Bruce J. Richardson, *City University of Hong Kong, Hong Kong, China*
Paul K.S. Lam, *City University of Hong Kong, Hong Kong, China*

1. Introduction
   1.1. Historical Perspective
   1.2. Development of the Chemistry of Organic Pollutants
   1.3. Chemistry in Environmental Management
2. Types and Properties of Organic Pollutants
   2.1. Origin and Occurrence in Discharges
   2.2. Classes and Properties of Organic Pollutants
   2.3. Persistent Organic Pollutants and Endocrine Disruptors
3. Chlorohydrocarbons - Insecticides, Industrial and Waste Chemicals
   3.1. Types and Chemical Nature
   3.2. Behavior and Effects in the Environment
4. Petroleum and Polycyclic Aromatic Hydrocarbons
   4.1. Types and Chemical Nature
   4.2. Behavior and Effects in the Environment
5. Herbicides
   5.1. Types and Chemical Nature
   5.2. Behavior and Effects in the Environment
6. Oxygen, Nitrogen and Phosphorus Containing Insecticides
   6.1. Organophosphates
      6.1.1. Types and Chemical Nature
      6.1.2. Behavior and Effects in the Environment
   6.2. Carbamates
      6.2.1. Types and Chemical Nature
      6.2.2. Behavior and Effects in the Environment
   6.3. Pyrethrins and Pyrethroids
      6.3.1. Types and Chemical Nature
      6.3.2. Behavior and Effects in the Environment
7. Plastics - Polymers and Monomers
   7.1. Types and Chemical Nature
   7.2. Behavior and Effects in the Environment
8. Soaps and Detergents
   8.1. Types and Chemical Nature
   8.2. Behavior and Effects in the Environment
9. Organometallic Compounds with Mercury, Tin and Lead
   9.1. Types and Chemical Nature
   9.2. Behavior and Effects in the Environment
10. Conclusions – The Future

Deposition of Pollutants and Their Impacts on Fisheries
B.B. Jana, *University of Kalyani, West Bengal, India*
3.1. Assimilative Capacity

4. Fate of Aquatic Pollutants
   4.1. Pollutant Deposition in Sediments
      4.1.1. Microbial Transformation

5. Biotransformation of Pollutants
   5.1. Bioconcentration
   5.2. Bioaccumulation
   5.3. Biomagnification

6. Impacts of Different Pollutants on Fisheries
   6.1. Inorganic Pollutants
      6.1.1. Mercury
      6.1.2. Cadmium
      6.1.3. Zinc
      6.1.4. Copper
      6.1.5. Lead
      6.1.6. Other Heavy Metals
      6.1.7. Mixture of Toxicants
      6.1.8. Mechanism of Heavy Metal Toxicity
      6.1.9. Other Inorganic Toxicants
      6.1.10. Chlorine
      6.1.11. Aluminum
      6.1.12. Relative Accumulation from Food and Water
      6.1.13. Acid Rain and Subsequent Effects
      6.1.14. Toxicity to Fish
   6.2. Organic Pollutants
      6.2.1. Persistent Organic Pollutants
      6.2.2. Chlorinated Hydrocarbons
      6.2.3. Polychlorinated Biphenyls (PCBs)
      6.2.4. Polycyclic Aromatic Hydrocarbons (PAHs)
      6.2.5. Chlorobenzene
      6.2.6. Cyclodienes
      6.2.7. Polyaromatic Hydrocarbons
      6.2.8. Nonpersistent Organic Pollutants: Herbicides
   6.3. Key Issues of Fisheries Unsustainability
      6.3.1. Sewage-Fed Fisheries
      6.3.2. Nutrient Enrichment Syndrome
      6.3.3. Bioaccumulation of Bloom Toxin
      6.3.4. Intensive Aquaculture Systems: Salmonids
      6.3.5. Intensive Aquaculture Systems: Shrimp Farming
      6.3.6. Soil and Groundwater Salinization
      6.3.7. Ichthyoeutrophication
      6.3.8. Nitrogen Excretion
      6.3.9. Ammonia
      6.3.10. Water Quality Deterioration at Harvest
      6.3.11. Destruction of Mangroves
      6.3.12. Aquachemicals
      6.3.13. Antibacterials
      6.3.14. Antibiotics
      6.3.15. Insecticides
      6.3.16. Algicides
      6.3.17. Parasiticides and Fungicides
      6.3.18. Hormone Residues
      6.3.19. Persistence of Drug Residues in the Environment
      6.3.20. Drug Residues in Bottom Sediments
      6.3.21. Residues in Cultured Animals
      6.3.22. Residues in Nontarget Species
      6.3.23. Drug Resistance
      6.3.24. Resistance in Gut Microflora
7. Environmental Impact Assessment
   7.1. Determination of Toxicity
       7.1.1. Shapes of Toxicity Curves
       7.1.2. Application Factor
   7.2. Biomonitoring
       7.2.1. Microbial Biomass Indicator
   7.3. Clinical Indicators
   7.4. Genotoxic Effects
8. Reclamation Strategies
   8.1. Crop Rotation
   8.2. Probiotics
   8.3. Eco-Friendly Feed Quality
   8.4. Withdrawal Period
   8.5. Mathematical Models
9. Conclusions

Index

About EOLSS