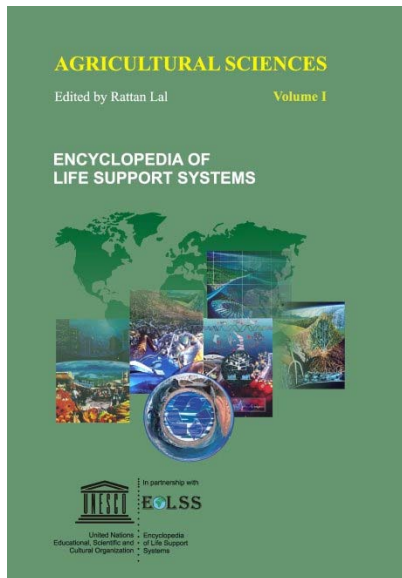


CONTENTS

AGRICULTURAL SCIENCES



Agricultural Sciences - Volume 1

No. of Pages: 460

ISBN: 978-1-84826-091-7 (eBook)

ISBN: 978-1-84826-541-7 (Print Volume)

Agricultural Sciences - Volume 2

No. of Pages: 498

ISBN: 978-1-84826-092-4 (eBook)

ISBN: 978-1-84826-542-4 (Print Volume)

For more information of e-book and Print Volume(s) order, please [click here](#)

Or [contact : eolessunesco@gmail.com](mailto:eolessunesco@gmail.com)

CONTENTS

VOLUME I

Soil and Its Life Support Systems **1**
R. Lal, *The Ohio State University, School of Natural Resources, Columbus, Ohio, USA*

1. Introduction
2. Soil Attributes
3. Soil and Civilization
 - 3.1. Soil exploitation
 - 3.2. Soil manipulation
 - 3.3. Soil affliction
4. Soil Functions of Importance to Modern Civilization
5. Soil Processes of Importance to Humans
 - 5.1. Finite extent
 - 5.2. Unequal distribution
 - 5.3. Susceptibility to degradation
 - 5.4. Non-renewability
6. Global Challenges of the Twenty-first Century
 - 6.1. World population
 - 6.2. Food insecurity
 - 6.3. Soil degradation
 - 6.4. Per capita land area
 - 6.5. Accelerated greenhouse effect
 - 6.6. Water quality
7. Soil's Capacity to Feed the World
8. Future Strategies of Soil Management
 - 8.1. Soil degradation
 - 8.2. Accelerated greenhouse effect
 - 8.3. Agricultural intensification and productivity
 - 8.4. Increasing food production while improving the environment
9. Future Role of Soil Science

Introduction to Soil Physics **23**
S. W. Duiker, *The Department of Crop and Soil Sciences, Pennsylvania State University, Pennsylvania, USA*
D.D. Fritton, *The Department of Crop and Soil Sciences, Pennsylvania State University, Pennsylvania, USA*

1. The beginning of soil physics
2. Contemporary soil physics
 - 2.1. Theory of soil physics
 - 2.1.1. Solid phase
 - 2.1.2. Liquid phase
 - 2.1.3. Gaseous phase
 - 2.1.4. Heat flow and temperature
 - 2.2. Applications of soil physics
 - 2.2.1. Soil erosion
 - 2.2.2. Soil organic matter management
 - 2.2.3. Soil compaction
 - 2.2.4. Irrigation
 - 2.2.5. Drainage
 - 2.2.6. Water use efficiency
3. The future of soil physics

Soil Biology

48

A. J. Franzluebbers, *USDA–Agricultural Research Service, Watkinsville, GA, USA*

1. Soil organisms
 - 1.1. Bacteria
 - 1.2. Actinomycetes
 - 1.3. Fungi
 - 1.4. Algae
 - 1.5. Mycorrhizae
 - 1.6. Lichens
 - 1.7. Microfauna
 - 1.8. Mesofauna
 - 1.9. Macrofauna
2. Soil biological processes
 - 2.1. Decomposition
 - 2.2. Mineralization-immobilization
 - 2.3. Nitrification
 - 2.4. Denitrification
 - 2.5. Biological nitrogen fixation
 - 2.6. Rhizosphere processes
 - 2.7. Soil structure formation
3. State of the art in soil biology
 - 3.1. Soil microbial diversity
 - 3.2. Enzymes
 - 3.3. Soil organic matter characterization
 - 3.4. Quantification of soil microbial biomass
 - 3.5. Bioremediation
 - 3.6. Decomposition
 - 3.7. Soil quality
 - 3.8. Soil carbon sequestration
4. Concluding remarks

Soil Genesis, Classification and Mapping

73

C. Lee Burras, *Department of Agronomy, Iowa State University, USA*

1. Introduction
2. The soil profile
3. The catena
4. History of pedology
5. Soil classification
6. Soil Mapping (also known as Soil Survey)

Soil Climatology and Meteorology

83

Jean L. Steiner, *US Department of Agriculture, Agricultural Research Service, Watkinsville, Georgia, USA*

1. Introduction
 - 1.1. Macroclimate and microclimate
 - 1.2. Soil-plant-animal-atmospheric interaction
2. Radiation
 - 2.1. Radiation Laws
 - 2.2. Radiation balance
 - 2.3. Biological responses to light
3. Soil heat flux and soil temperature
 - 3.1. Conduction
 - 3.2. Daily and seasonal patterns of soil temperature
 - 3.3. Frozen soils

- 3.4. Temperature effects on organisms
- 4. Water
 - 4.1. The state of water in soil
 - 4.2. Evaporation
 - 4.3. Flow of water in soil
 - 4.4. Moisture effects on soil organisms
- 5. Oxygen and other gaseous materials
- 6. Wind and atmospheric transport
 - 6.1. Boundary layer
 - 6.2. The logarithmic wind speed profile
 - 6.3. The Reynolds analogy
- 7. Practices to modify the soil microclimate
 - 7.1. Mulching
 - 7.2. Crop geometry
 - 7.3. Slope and aspect
 - 7.4. Windbreaks
- 8. State of the art in soil microclimate

Plant Propagation **109**

Robert L. Geneve, *Department of Horticulture, University of Kentucky, Lexington, KY, USA*

- 1. Sexual propagation
 - 1.1. Seed testing
 - 1.2. Treatments to enhance seed germination
 - 1.3. Seed storage and germplasm preservation
- 2. Asexual propagation
 - 2.1. Apomixis
 - 2.2. Cutting propagation
 - 2.3. Grafting propagation
 - 2.4. Micropropagation in tissue culture
- 3. Somatic embryogenesis and synthetic seeds
- 4. Automation and robotics in propagation

Farm Animal Science **130**

Herbert W. Ockerman, *Department of Animal Sciences, The Ohio State University, Columbus, Ohio, USA*
 Lopa Basu, *Department of Animal Sciences, The Ohio State University, Columbus, Ohio, USA*

- 1. Introduction
- 2. Beef Cattle
- 3. Dairy Cattle
- 4. Swine
- 5. Sheep and Goats
- 6. Horses
- 7. Poultry
- 8. Other Animals

The Dairy Industry **138**

David L. Zartman, *Department of Animal Sciences at the Ohio State University, Ohio, USA*
 Michel A. Wattiaux, *Dairy Science Department, University of Wisconsin-Madison, USA*

- 1. Overview
- 2. Information Sources
- 3. Nature of The Dairy Industry Today
- 4. Influential Factors
- 5. Increasing Efficiency

6. Marketing

World Beef Cattle Production **157**

S. L. Boyles, *Department of Animal Sciences, The Ohio State University, USA*

Jose M. Pellegrino, *Secretariat for Agriculture, Livestock, Fisheries and Food, Argentina*

1. Introduction
2. History
 - 2.1. Trade in Hides and Tallow
 - 2.2. Cured, Preserved, and Tinned Meats
 - 2.3. Exports of Live Cattle
 - 2.4. The Fresh Meat Trade
 - 2.5. World Events can alter Beef Marketing
3. Breeds
 - 3.1. Selected British Breeds
 - 3.2. Selected Continental Breeds
 - 3.3. Selected Brahman and Brahman Crosses
 - 3.4. Other Breeds
 - 3.5. Composite Breeds
 - 3.6. Trait Selection
 - 3.7. Crossbreeding Cattle
 - 3.8. Heritability
4. Worldwide Distribution
5. Production Systems
 - 5.1. Forage-based Systems versus Grain-based Systems
 - 5.2. Bulls versus Steers
 - 5.3. Multipurpose Cattle Systems
6. Areas of the World
 - 6.1. East and South Asia
 - 6.2. Semi-arid Asia and Africa
 - 6.3. Europe, Oceania and the Americas
 - 6.4. Beef from Dairy Herds
 - 6.4.1. Veal Calves
 - 6.4.2. Steers and Young Bulls
 - 6.4.3. Cull Cows and Heifers
 - 6.5. Beef from Beef-Type, Cow-Calf Herds
 - 6.5.1. Western Europe
 - 6.5.2. Latin America
 - 6.5.3. North America
 - 6.5.4. Southern Africa, Australia and New Zealand
7. Yield of Animal Products
 - 7.1. Composition of Product
 - 7.2. Factors affecting Eating Satisfaction
 - 7.2.1. Marbling
 - 7.2.2. Maturity
 - 7.2.3. Preparation Method
8. Advantages and Disadvantages of Product compared to Competitors
9. By-Products Useful to Humans

Sheep Production **184**

Kenneth E. McClure, *Department of Animal Sciences, Ohio State University, USA*

Hasan Yetim, *Food and Engineering Department, College of Engineering, Erciyes University, Turkey*

Francisco Leon Crespo, *Cordoba University, Spain*

1. History
2. Breeds of Sheep

3. Worldwide distribution
4. Other Breeds, Breed Types and Recent Developments in Sheep Genetics of Interest in Specific Localities.
5. Production Systems / Areas of the World
6. Yield, Product and Consumption
7. Advantages and Disadvantages of Product Compared to Competitors
8. By-Products Useful to Man
9. Other Products Useful to Man

Overview of World Swine and Pork Production **195**

Steven J. Moeller, *The Ohio State University, Columbus, Ohio, USA*
 Francisco Leon Crespo, *Cordoba University, Spain*

1. History
2. Geographic Distribution
3. Breeds
4. Genetic Improvement
 - 4.1. Selection
 - 4.2. Breeding Programs
5. Feeding Programs
6. Production Systems
7. Harvest, Consumption and Trade
8. Production Trends and Efficiencies
9. By-products and Other Uses for Swine and Swine Products
10. Challenges for the Future

Poultry Products as Food **209**

J. D. Latshaw, *Department of Animal Sciences, The Ohio State University, USA*
 N. A. Musharaf, *Department of Poultry Science, University of Khartoum, Sudan*

1. Domestication And Development Of Breeds
 - 1.1. Chickens
 - 1.2. Turkeys
 - 1.3. Ducks
2. Production Systems
 - 2.1. Rural Production Systems
 - 2.2. Intensive Commercial Production
 - 2.2.1. Meat-Type Chickens
 - 2.2.2. Egg-Type Chickens
 - 2.2.3. Turkeys
 - 2.2.4. Ducks
3. Marketing And Preservation
4. Worldwide Distribution
5. Yields Of Product From Poultry
6. Composition Of Products
7. Advantages And Disadvantages Of Poultry
8. By-Products
 - 8.1. Meat By-Products
 - 8.2. Egg By-Products

Undomesticated Food Animals Hunted and Used For Food **232**

Herbert W. Ockerman, *The Ohio State University, Columbus Ohio, USA*
 Lopamudra Basu, *The Ohio State University, Columbus Ohio, USA*

1. Introduction

2. Alligators and crocodiles
3. Amphibians
4. Insects
 - 4.1. Ants (order-Hymenoptera)
 - 4.2. Crickets, grasshoppers, leafcutter ants, leafhoppers, locusts, stingless bees, and weevils
 - 4.3. Beetles, dragonflies, June beetles, lemon ants, longhorn beetles, water bugs, white beetles, winged adult ants, and wood worms
 - 4.4. Butterflies
 - 4.5. Nutrition of Insects
 - 4.6. Insects as a food resource
5. Mammals
 - 5.1. Ruminants: antelope, bison, caribou, deer, elk, llama (alpaca), and moose
 - 5.2. Other large mammals: bears, kangaroos, wallabies, seals, whales
 - 5.3. Small Animals
6. Birds
 - 6.1. Large birds: Emu (Australia and New Guinea), ostrich (up to 300 pounds), rhea and turkey
 - 6.2. Small Poultry: Duck, Pheasant and Quail
7. Reptiles
8. Eels

Other Domesticated and Farmed Animals 250

Herbert W. Ockerman, *The Ohio State University, Columbus Ohio, USA*
 Lopamudra Basu, *The Ohio State University, Columbus Ohio, USA*

1. Introduction
2. Undomesticated animals
3. Domesticated Animals

Veterinary Medicine: Preventing Livestock Diseases, With Emphasis on the USA 269

J. C. Gordon, DVM, MPH, *Department of Veterinary Preventive Medicine, College of Veterinary Medicine, The Ohio State University, USA*
 R. W. Meiring, DVM, *Department of Veterinary Preventive Medicine, College of Veterinary Medicine, The Ohio State University, USA*

1. Introduction
2. Disease control in the USA
 - 2.1. Introduction
 - 2.2. Disease Control in the Beef and Dairy Industry
 - 2.2.1. Respiratory Diseases.
 - 2.2.2. Reproductive Diseases
 - 2.3. Control of Swine Diseases
 - 2.3.1. Respiratory diseases of swine.
 - 2.3.2. Intestinal diseases of swine.
 - 2.3.3. Reproductive diseases of swine.
 - 2.4. Control of Poultry Diseases
 - 2.4.1. Neoplastic diseases of poultry.
 - 2.4.2. Respiratory infections of poultry.
 - 2.4.3. Coccidiosis of poultry.
 - 2.5. Other US Disease Control Programs
3. International Disease Control Programs
 - 3.1. Introduction
 - 3.2. Foot-and-mouth disease.
 - 3.3. African Swine fever.
 - 3.4. Newcastle disease.
 - 3.5. Avian Influenza.
 - 3.6. Bovine Spongiform Encephalopathy (BSE).
 - 3.7. Theileriosis.

4. Public Health Issues
 - 4.1. Occupation and Disease.
 - 4.2. Historical Importance.
5. Concerns of Today
 - 5.1. Food Safety.
 - 5.2. Wildlife Reservoirs.

The Role of Meat in the Human Diet

300

Herbert W. Ockerman, *The Ohio State University, Columbus, Ohio, USA*
 Norma Pensel, *ITA-INTA, Buenos Aires, Argentina*

1. Population versus food supply
2. Vegetarianism vs omnivory
3. Land Use
4. The Purpose of Food
5. Protein Source
6. What Food to Produce?
7. Economics and meat consumption
8. The relationship between food and health
9. New concerns over pathogens
10. Animal rights
11. The future for meat

Water Uptake by Plants

312

Jose Enrique Fernandez, *Instituto de Recursos Naturales y Agrobiología, Spanish Research Council, Spain*
 Brent E. Clothier, *Palmerston North Research Center, HortResearch, New Zealand*

1. Introduction
2. Water in the root environment
 - 2.1. Water Content
 - 2.2. Water Potential
 - 2.3. Water Movement in the Rootzone
3. Water absorption through roots
 - 3.1. Structures for Water Uptake
 - 3.2. Water Flow within the Root
 - 3.2.1. Radial Flow
 - 3.2.2. Axial Flow
4. Determining water uptake
 - 4.1. Changes in Soil Water Content
 - 4.2. Water Movement within the Plant
 - 4.3. Modeling
 - 4.4. Mechanisms Related to Water Uptake
5. Dynamic growth responses
 - 5.1. Root Structure
 - 5.2. Root Distribution and Activity
 - 5.3. Root Dynamics
 - 5.4. Influence of the Root Environment
6. Conclusions

Nature of Mineral Nutrient Uptake by Plants

355

Paul R. Adler, *United States Department of Agriculture-Agricultural Research Service, Leesville, West Virginia, USA*
 Jonathan R. Cumming, *Department of Biology, West Virginia University, Morgantown, WV USA*
 Rajeev Arora, *Department of Horticulture, Iowa State University, Ames, Iowa USA*

1. Introduction

2. Nutrient uptake by plants
 - 2.1. Nutrient supply by the soil
 - 2.2. Nutrient movement to the root surface
 - 2.3. Nutrient uptake by plant roots
 - 2.4. Membrane transport proteins
 - 2.5. Nutrient uptake by leaves
 - 2.6. Functions of nutrients
3. Plant responses to soil nutrient supply
 - 3.1. Changing soil supply
 - 3.2. Changing plant uptake
 - 3.3. Mycorrhizae
4. Nutrient uptake from extreme soil environments
 - 4.1. Acid soils
 - 4.2. Calcareous soils
 - 4.3. Saline soils
 - 4.4. Soils with high levels of heavy metals: phytoremediation

Transport of Water and Nutrients in Plants	372
<i>W. E. Riedell, Plant Physiologist, U.S. Department of Agriculture, Agricultural Research Service, Brookings, South Dakota, USA</i>	
<i>T. E. Schumacher, Professor, Plant Science Department, South Dakota State University, Brookings, South Dakota, USA</i>	

1. Introduction
2. Source-Sink Relationships
3. Phloem Loading and Unloading
4. Driving Gradients and Transport Processes
5. Carrier Molecules and Sequestration

Index	389
About EOLSS	397

VOLUME II

Agricultural Production Capacity of North America's Soil Resources	1
<i>Fred P. Miller, School of Natural Resources, The Ohio State University, Columbus, Ohio, USA</i>	

1. Retrospective – The Perils of Projecting into Unknown Futures
2. A World View – Ratcheting Up Demands on the Land
3. Can Global Cropland Yield More Food Sustainably?
4. North America's Agricultural Production: Character and Nemesis
5. Capacity of North America's Agricultural Productivity
 - 5.1. How Much Can Be Gained from Expanding the Agricultural Base?
 - 5.2. How Much More Production Can Be Coaxed from Existing Cropland?
6. What Production and Demand Scenarios Would Test the Limits of North America's Agricultural Production Capacity?
 - 6.1. Divining Future Global Food Demands
 - 6.2. Soil Quality, Can It Be Sustained?
 - 6.3. The Impact of Genetics and Biotechnology on Carrying Capacity
 - 6.4. Water Availability – Scarcity
 - 6.5. Global Change: Impacts on North America's Agricultural Capacity
 - 6.6. Resource Competition for Non-Food Plant-Animal Products
 - 6.7. The Impact of Urbanization-Development on Agricultural Productivity
7. Concluding Thoughts and Summary

Sustainable Soil Use in Tropical South America, with Emphasis on Brazil 17

E.V.S.B. Sampaio, R.S.C. Menezes, *Dept. Energia Nuclear, UFPE, Recife, Brazil*

1. Soil functions and sustainability
2. Tropical South America
 - 2.1. Amazonian region
 - 2.2. Savanna region
 - 2.3. Semi-arid region
3. General Conclusions

Agricultural Soils in Europe - Special Demands Related to Intensive Agriculture in an Industrialized Environment 28

S. Thiele-Bruhn, *Institute of Soil Science and Plant Nutrition, University of Rostock, Germany*

1. Introduction
2. Soil Changes Caused by Intensive Agriculture
 - 2.1. Fertilization
 - 2.2. Chemical Plant Protection
 - 2.3. Soil Compaction and Erosion
3. Soil Changes Caused by Urbanization and Industrialization
 - 3.1. Soil Sealing and Urbanization
 - 3.2. Input of Pollutants by Industry and Traffic
 - 3.3. Soil Acidification
4. Alternatives and Solutions
 - 4.1. Sustainable Agriculture
 - 4.2. Legal Regulations
5. Problems and Opportunities Arising out of the Transition of Agriculture in Eastern Europe
6. Prospects

Capacity of Africa's Soils to Sustain or Extend Current Crop and Animal Production 44

M. A. Bekunda, *Department of Soil Science, Makerere University, Uganda*

R. J. Delve, *Tropical Soil Biology and Fertility Institute of the Centro Internacional de Agricultura Tropical, Kampala, Uganda*

1. Introduction
2. Current agricultural production in sub-Saharan Africa
3. Soils
4. Mixed farming systems
 - 4.1. Intensification in agricultural production
5. Strategies for soil fertility management
 - 5.1. Physical conservation
 - 5.2. Nutrient replenishment
 - 5.3. Targeting application of input
 - 5.4. Soil fertility maintenance in intensive mixed farming systems
 - 5.4.1. Manure production and management
 - 5.4.2. Closing the nutrient cycle
6. Integrated soil fertility management in practice
 - 6.1. What farmers know
 - 6.2. Evidence from research
7. Conclusion

Capacity of Soils to Sustain or Extend Current Crop and Animal Production: New Zealand and South Pacific Islands Perspective 58

L.M. Condron, H.J. Di, *Centre for Soil and Environmental Quality, Lincoln University, Canterbury, New Zealand*

1. Introduction

2. New Zealand
 - 2.1. Geography and Landforms
 - 2.2. Climate
 - 2.3. Soils and Landuse
 - 2.4. Constraints to Soil Productivity
 - 2.4.1. Soil Fertility
 - 2.4.2. Soil Erosion
3. South Pacific Islands
 - 3.1. Geography and Landforms
 - 3.2. Climate
 - 3.3. Landuse
 - 3.4. Constraints to Soil Productivity
 - 3.4.1. Limitations in Natural Soil Fertility
 - 3.4.2. Soil Erosion
 - 3.4.3. Soil Quality Degradation
 - 3.4.4. Soil and Environmental Contamination
 - 3.4.5. Constraints on Animal Production
4. Conclusions and Future Research Requirements
 - 4.1. New Zealand
 - 4.2. South Pacific Island Countries

Land Classifications, Sustainable Land Management, and Ecosystem Health

77

J. Dumanski, *Centre for Land and Biological Resources Research (CLBRR), Canada*

Prem S. Bindraban, *Plant Research International, Wageningen University and Research Centre, The Netherlands*

W.W. Pettapiece, Peter Bullock, Robert J. A. Jones, A. Thomasson, *National Soil Resources Institute, Cranfield University, UK*

1. Land Evaluation
 - 1.1. Soil Interpretations
 - 1.2. Land Capability and Land Suitability
 - 1.2.1. Development of the Land Capability Classification in USA
 - 1.2.2. The Canada Land Inventory (CLI) - A Modified Land Capability Classification
 - 1.2.3. Land Capability Systems in Europe
 - 1.3. Physical and Integral Land Evaluation
 - 1.4. The International Framework for Land Evaluation
 - 1.5. Quantitative Land Evaluation Using Computer Models
 - 1.6. Yield Potential Analyses - A Computerized Application of Land Evaluation
 - 1.7. The International Framework for Evaluation of Sustainable Land Management
 - 1.8. Land Quality Indicators
2. Sustainable Land Management and Ecosystem Health
 - 2.1. Opportunities for Sustainable Land Management and Improved Ecosystem Health through the International Conventions
3. Sustainable Land Management and Sustainable Agriculture Capturing Opportunity

Crop Production Capacity: A Global Perspective

99

K. D. Wiebe, *Economic Research Service, U. S. Department of Agriculture, USA*

P. Crosson, *Resources for the Future, USA*

1. Introduction
2. Trends in Demand
 - 2.1. Population
 - 2.2. Income
 - 2.3. Urbanization
 - 2.4. Future Demand
3. Sources of Production Growth: Natural Resources

- 3.1. Land
 - 3.1.1. Land Quantity
 - 3.1.2. Land Quality
 - 3.1.3. Land Degradation
 - 3.1.4. Land Use Projections
- 3.2. Water
- 3.3. Climate
- 3.4. Genetic Resources
- 3.5. Summary: Supplies of Natural Resources
4. Sources of Production Growth: Knowledge and Technology
 - 4.1. Improved Crop Varieties
 - 4.2. Fertilizer
 - 4.3. Machinery
5. Trends in Crop Yields and Production
 - 5.1. Yields
 - 5.2. Past Production
 - 5.3. Future Production
6. The Critical Role of Markets and Institutions
 - 6.1. Prices
 - 6.2. Institutions
7. Challenges for Policy and Research
 - 7.1. The Quantitative Dimension
 - 7.2. The Direction of Future Research
 - 7.3. Summary: Policy and Research
8. Conclusion

Crop Production Capacity in North America

129

G.K. Pompelli, *Economic Research Service, U. S. Department of Agriculture, USA*

1. Introduction
2. Past Trends in Demand
 - 2.1. Macroeconomic Influences
3. Past Trends in Crop Production
 - 3.1. Agricultural Policy Issues
 - 3.2. North American Resource Use Issues
 - 3.3. Current Production Trends
 - 3.3.1. Oilseed Production
 - 3.3.2. Corn
 - 3.3.3. Wheat
 - 3.3.4. Rice
4. Projections of Future Trends
 - 4.1. North American Production Projections
 - 4.1.1. Soybeans
 - 4.1.2. Corn
 - 4.1.3. Wheat
 - 4.1.4. Rice
5. Policy Challenges
6. Research Challenges
7. Conclusion and Summary

Crop Production Capacity in Europe

143

David R. Kelch, *Economic Research Service, USDA, USA*
 Stefan Osborne, *Economic Research Service, USDA, USA*

1. Introduction
2. Europe in the Aggregate
3. Western Europe Dominated by the CAP

- 3.1. The European Union
- 3.2. Technology, Resources, and Environment
- 4. Eastern Europe in Transition
 - 4.1. Future Directions
- 5. Transition in Russia and Neighboring Countries
 - 5.1. Introduction
 - 5.2. Russia and Ukraine Crop Production Capacity
 - 5.3. Crop production during the decade of transition
 - 5.4. The future of crop production in the FSU

Crop Production Capacity in Africa

161

Shahla Shapouri, *Economic Research Service, U.S. Department of Agriculture, USA*
 Stacey Rosen, *Economic Research Service, U.S. Department of Agriculture, USA*
 Johann Kirsten, *University of Pretoria, South Africa*

- 1. Introduction
- 2. Past Trends in Demand
 - 2.1. Population
 - 2.2. Income
- 3. Past Trends in Crop Inputs and Production
 - 3.1. Policy issues
 - 3.2. Resource issues
 - 3.2.1. Land
 - 3.2.2. Water
 - 3.2.3. Fertilizer
 - 3.2.4. Machinery
 - 3.3. Production
- 4. Projections of Future Trends
 - 4.1. Production
 - 4.2. Policy issues
 - 4.3. Resource issues
- 5. Conclusions

Fertilizer Use in North America: Types and Amounts

176

T.L. Roberts, and D.W. Dobb, Potash & Phosphate Institute, Norcross, Georgia, USA

- 1. Introduction
- 2. History of Fertilizer Use
 - 2.1. Early American Agriculture
 - 2.2. Introduction of Commercial Fertilizer Industry
 - 2.3. Discovery of Phosphate Rock
 - 2.4. Discovery of Potash
 - 2.5. North American Nitrogen Industry
- 3. Fertilizer Use and Crop Production
- 4. Fertilizer and Environmental Issues
- 5. Future Trends in the Fertilizer Industry

Fertilizer Use in Central and Eastern Europe : Types and Amounts

190

K.F. Isherwood, Former head of the International Fertilizer Industry Association, Paris, France

- 1. Central Europe
 - 1.1. Agriculture
 - 1.2. Fertilizer Consumption
- 2. Eastern Europe
 - 2.1. Agriculture

- 2.2. Fertilizer Consumption
3. The Baltic States
4. Conclusion

Fertilizer Use in Western Europe: Types and Amounts

200

K.F. Isherwood, *Formerly of the International Fertilizer Industry Association, Paris, France*

1. Introduction
2. Crops
3. Fertilizers and Their Types
 - 3.1. Nitrogen
 - 3.2. Phosphate
 - 3.3. Potash
 - 3.4. Multi-nutrient fertilizers
4. The West European fertilizer industry
5. Fertilizer Consumption
 - 5.1. Outlook

Fertilizer Use in Sub-Saharan Africa: Types and Amounts

211

V.A. Kelly, *Department of Agricultural Economics, Michigan State University, USA*

A. Naseem, *Department of Agricultural Economics, Michigan State University, USA*

1. History of Fertilizer Use in Sub-Sahara Africa
 - 1.1. Background
 - 1.2. Quantities of Fertilizer Consumed
 - 1.3. Intensity of Fertilizer Use
 - 1.4. Types of Fertilizers Used
2. Factors Influencing the Growth of Fertilizer Use
 - 2.1. Historical and Policy Influences
 - 2.2. Agro-ecological Zones and Other Geographic Factors
 - 2.3. Colonial Heritage
 - 2.4. Demography
 - 2.5. National Income
 - 2.6. Infrastructure
 - 2.7. Crop Choice
 - 2.8. Prices and Profitability
3. The Effect of Fertilizer Use on Crop Production and the Environment
4. Future Trends Anticipated

Fertilizer Use in South Asia

223

J. C. Katyal, *National Academy of Agricultural Research Management, Hyderabad, India*

M. N. Reddy, *National Academy of Agricultural Research Management, Hyderabad, India*

1. Introduction
 - 1.1. Geographical Setup
 - 1.2. Demography
 - 1.3. Cropland and Soil Fertility
2. Fertilizer use in South Asia
 - 2.1. Consumption and production
 - 2.2. NPK consumption pattern
 - 2.3. NPK – product profile
3. Elements of fertilizer use in South Asia
 - 3.1. Irrigation
 - 3.2. Price and non-price factors
 - 3.3. Crop-nutrient specificity

4. Fertilizer use and sustainability of agriculture
 - 4.1. Area expansion
 - 4.2. HYVs and irrigation
 - 4.3. Fertilizers
 - 4.3.1. Efficiency of use
5. Conclusions

Fertilizer Use in China: Types and Amounts

247

Sam Portch, *Potash and Phosphate Institute of Canada, China*

Ji-yun Jin, *Potash and Phosphate Institute of Canada, China*

1. Background
2. Factors Influencing Fertilizer Consumption Growth in China
3. Factors Affecting Fertilizer Use and Crop Production
4. Environmental Issues
5. Future Trends and Forecast

Fertilizer Use in Oceania: Types and Amounts

257

G.J.Blair, *Agronomy and Soil Science, University of New England, Australia*

V. Manu, *Ministry of Agriculture and Fisheries, Kingdom of Tonga*

1. The region
2. Geology and soils
 - 2.1. Australia
 - 2.2. New Zealand
 - 2.3. Melanesian countries
 - 2.4. Mid-sized islands of Polynesia and Micronesia and the small high Island Territories of the United States.
 - 2.5. Small coral islands
3. Agricultural production and changes in fertilizer consumption in the last 10 years
 - 3.1. Australia
 - 3.2. New Zealand
 - 3.3. Pacific Islands and New Guinea
4. Environmental consequences of fertilizer usage in Oceania

Pest Control in World Agriculture

272

David Pimentel, *College of Agriculture and Life Sciences Cornell University, Ithaca, NY 14853-0901, USA*

1. Introduction
2. Natural Resources Used in Agriculture
 - 2.1. Land
 - 2.2. Water
 - 2.3. Energy
 - 2.4. Biological Resources
3. Ecological Causes of Pest Problems
 - 3.1. Introduced Crops
 - 3.2. Introduced Pests
 - 3.3. Monocultures
 - 3.4. Regional Climatic Differences
 - 3.5. Breeding Crops
 - 3.6. Genetic Diversity
 - 3.7. Plant Spacings
 - 3.8. Crop Rotations
 - 3.9. Soil Nutrients
 - 3.10. Planting Dates

- 3.11. Crop Associations
- 3.12. Pesticides Alter Crop Physiology
- 3.13. Ecology of Pests and Crops
- 4. Economic Losses Due to Pests
- 5. Costs of Pest Control
 - 5.1. Pesticides
 - 5.2. Biological Controls
 - 5.3. Host-Plant Resistance
 - 5.4. Crop Rotations
 - 5.5. Crop Sanitation
 - 5.6. Planting Time
 - 5.7. Short Season Crops
 - 5.8. Fertilizers
 - 5.9. Water Management
- 6. Pesticides and Pest Control
- 7. Reducing Pesticide Use
- 8. Environmental And Public Health Costs of the Recommended Use of Pesticides
 - 8.1. Public Health Impacts of Pesticides
 - 8.2. Livestock Destruction and Contamination
 - 8.3. Destruction of Beneficial Natural Enemies
 - 8.4. Costs of Pesticide Resistance
 - 8.5. Losses of Honey Bees and Other Pollinators
 - 8.6. Fish Kills
 - 8.7. Birds Killed by Pesticides
- 9. Conclusion

Pest Control: Insects and Other Arthropods

294

Divender Gupta, *Department of Entomology, Dr. Y.S. Parmar University of Horticulture & Forestry, Nauni (Solan), India*

- 1. Introduction
- 2. Insecticidal control
- 3. Biological control
 - 3.1. Microbial control
 - 3.1.1. Protozoa
 - 3.1.2. Fungi
 - 3.1.3. Bacteria
 - 3.1.4. Viruses
- 4. Insect growth regulators
- 5. Sterilants
- 6. Semiochemicals
 - 6.1. Pheromones
 - 6.1.1. Sex pheromones
 - 6.2. Allelochemicals
 - 6.2.1. Allomones
 - 6.2.2. Kairomones
 - 6.2.3. Synomone
- 7. Plant resistance
- 8. Mechanical and physical control
 - 8.1. Mechanical control
 - 8.1.1. Mechanical exclusion
 - 8.2. Physical control
- 9. Cultural control
 - 9.1. Crop rotation
 - 9.2. Trap crops
 - 9.3. Strip cutting
 - 9.4. Time of planting and harvest

- 9.5. Clean cultivation
- 9.6. Non-host or banker plants
- 10. Plant products
- 11. Fumigants
- 12. Novel insecticides
 - 12.1. Avermectins
 - 12.1.1. Emamectin benzoate
 - 12.2. Spinosad
 - 12.3. Neonicotinoids
 - 12.4. Nereistoxin related insecticides
 - 12.5. Formamidines
 - 12.6. Phloroglucinol
- 13. Regulatory control
- 14. Conclusion

Pest Control: Herbaceous Weeds **320**

A. DiTommaso, *Department of Crop and Soil Sciences, Cornell University, USA*
 C.L. Mohler, *Department of Crop and Soil Sciences, Cornell University, USA*
 R.E. Nurse, *Department of Crop and Soil Sciences, Cornell University, USA*

- 1. Introduction
- 2. Review of Current Management Strategies
 - 2.1. Cultural Control
 - 2.2. Mechanical Control
 - 2.3. Biological Control
 - 2.4. Integrated Weed Management
- 3. Conclusions

Pest Control: Fungi, Streptomyces, and Yeasts **337**

Karen L. Bailey, *Agriculture and Agri-Food Canada, Saskatoon Research Centre, Saskatchewan, Canada*

- 1. Introduction
- 2. Crop losses due to fungal diseases
- 3. Traditional disease control practices
- 4. Evolution of using microorganisms for plant disease control
- 5. Biological Control with Fungi
- 6. Biological Control with Streptomyces
- 7. Biological Control with Yeasts
- 8. Conclusions

Pest Control: Rodents **352**

Mark E. Tobin, *National Wildlife Research Center, U. S. Department of Agriculture, Colorado, USA*
 Michael W. Fall, *National Wildlife Research Center, U. S. Department of Agriculture, Colorado, USA*

- 1. Introduction
- 2. Characteristics of Rodents
- 3. Rodent populations
- 4. Types of Rodent Problems
 - 4.1. Grain Crops
 - 4.2. Sugarcane
 - 4.3. Orchard and Plantation Crops
 - 4.4. Stored Products
 - 4.5. Forest Crops and Reforestation
 - 4.6. Hydraulic Structures
 - 4.7. Urban Rodent Problems

- 4.8. Damage to Cables, Wires, and Electronics
- 4.9. Rodents and Disease
- 4.10. Conservation of Rare Species
- 5. Control Methods
 - 5.1. Integrated Pest Management
 - 5.2. Habitat Management
 - 5.3. Traps
 - 5.4. Rodenticides
 - 5.5. Biological Control
 - 5.6. Reproductive Inhibition
 - 5.7. Ultrasonics
 - 5.8. Bounties and Insurance

High Density Residential Areas

373

Wolfgang Burghardt, *Institute of Ecology, University of Essen, Germany*

- 1. Introduction
- 2. Street tree patches
- 3. Container gardens
- 4. Impervious and pervious pavements and sealed areas
- 5. Rooftop planting
- 6. Roof run off infiltration area

Soils in Low Density Residential Areas

397

Joyce Mack Scheyer, *USDA-NRCS National Soil Survey Center, Lincoln, Nebraska, USA*

John M. Galbraith, *Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA*

- 1. Introduction
 - 1.1. Temporary and potentially reversible nature of scattered soil disturbances
 - 1.2. Common soil problems get worse when isolated sites are joined together
 - 1.3. Low density areas function as urban disposal areas or independent sustainable systems
- 2. Nightsoil: human waste disposal on soils
 - 2.1. Dilution pathways for human waste to soil
 - 2.2. Chemistry and physics of human waste and soil disposal areas
 - 2.3. Local planning for soil-based human waste management
- 3. Ponds
 - 3.1. Ponds for stormwater and sediment storage
 - 3.2. Ponds for food and water supply
 - 3.3. Pond water for fire protection
 - 3.4. Ponds for recreation use
- 4. Unpaved roads and trails
 - 4.1. Location and design criteria
 - 4.2. Capping materials for roads and trails
 - 4.3. Erosion control measures
 - 4.4. Food supply possibilities
- 5. Riparian corridors
 - 5.1. Flood and erosion control
 - 5.2. Food and water supply
 - 5.3. Recreation and parks in riparian corridors

Soils in Landscaped Public Areas

409

Wolfgang Burghardt, *Institute of Ecology, University of Essen, Germany*

- 1. Introduction
- 2. Parks
- 3. Playgrounds

4. Burial Grounds

Landscaped Commercial Areas: Golf Course and Athletic Field Soils 424

Ed McCoy, *School of Natural Resources, Ohio State University, USA*

Pamela Sherratt, *Department of Horticulture and Crop Science, Ohio State University, USA*

John Street, *Department of Horticulture and Crop Science, Ohio State University, USA*

1. Introduction
2. Soil Compaction
3. Root Zone for High Traffic Areas
 - 3.1. Sand Characteristics
 - 3.2. Organic and Inorganic Amendments
4. Examples of Root Zones for High Traffic Areas
5. Putting Greens, Tees, and Athletic Field Soil Profiles
 - 5.1. Minimally Modified Soil Profiles
 - 5.2. Soil Profiles for Deeper Root Zones
6. The Continuum of Soils for High Traffic Areas
7. The Relation between Agronomic Quality and Play for High Traffic Areas
8. The Establishment of Playing Quality Standards
9. Interactions between Player and Surface
 - 9.1. Traction and Friction
 - 9.2. Hardness and Resilience
10. Interactions Between the Ball and the Surface
 - 10.1. Ball Bounce Resilience
 - 10.2. Ball Rolling Resistance
11. Agronomic Reliability, Playing Quality and Level of Use

Index 443

About EOLSS 451