



ORGANIC AGRICULTURE

A Global Perspective

Editors:
Paul Kristiansen,
Acram Taji and
John Reganold

Contents

Foreword	xiii
Preface	xv
Acknowledgements	xvi
Contributors	xvii

1 Organic production

Chapter 1 Overview of organic agriculture	1
<i>Paul Kristiansen and Charles Merfield</i>	
The search for sustainability	1
The origins of organic agriculture	4
The principles of organic agriculture	12
Challenges for organic agriculture	17
References	19
Chapter 2 Soil fertility in organic farming systems	25
<i>Jennifer Davis and Lyn Abbott</i>	
Introduction	25
Components of soil fertility	26
Managing soil fertility in organic farming systems	30
Conclusions	42
References	43
Chapter 3 Crop agronomy in organic agriculture	53
<i>Peter von Fragstein und Niemsdorff and Paul Kristiansen</i>	
Introduction	53
Crop rotations	54
Nutrient management	55
Green manures	56
Designing rotations	58
Cultural strategies used in organics	61
Conclusions	71
References	71

Special topic 1 – Developing no-tillage systems without chemicals: the best of both worlds?	83
<i>Ron Morse and Nancy Creamer</i>	
Introduction	83
Organic no tillage – oxymoron or opportunity?	84
Non-inversion tillage tradeoffs	87
Conclusions and recommendations	89
Future research priorities	90
References	90
Chapter 4 Crop protection in organic agriculture	93
<i>Deborah Letourneau and Ariena van Bruggen</i>	
Introduction	93
Pest and disease management case studies in organic versus conventional agriculture	104
Conclusions	113
Acknowledgements	114
References	114
Chapter 5 Organic plant breeding and seed production: ecological and ethical aspects	123
<i>Edith Lammerts van Bueren and Henk Verhoog</i>	
Introduction	123
Variety characteristics	126
Variety testing	128
Seed production	128
Plant breeding	130
Genetic modification, <i>in vitro</i> techniques and ethics	132
The use of molecular markers in organic breeding programs	135
Conclusion: research for organic breeding concepts and strategies	135
References	136
Special topic 2 – Biodynamic agriculture today	141
<i>Florian Leiber, Nikolai Fuchs and Hartmut Spieß</i>	
Introduction	141
General principles in biodynamic farming	141
Background – what are the roots of biodynamic farming?	144
Research – what are the main questions faced by biodynamic farmers and researchers?	145
References	147

Chapter 6 Organic livestock husbandry and breeding	151
<i>Bernhard Hörning</i>	
Introduction	151
Housing	152
Breeding	157
Conclusions	163
References	163
Chapter 7 Animal health and nutrition in organic farming	167
<i>Mette Vaarst, Martin Riis Weisbjerg, Troels Kristensen, Stig Milan Thamsborg, Andrew White, Stephen Roderick and Willie Lockeretz</i>	
Introduction	167
Organic livestock production and animal disease patterns – an overview	168
Animal nutrition and feeding: the challenges of organic farming	171
Grazing and grassland management	175
Health promotion and the human role in organic animal herds	175
Animal disease treatment in organic animal husbandry	177
From organic livestock production to organic animal food production: the whole food chain	179
Conclusions and future perspectives	180
References	181
Chapter 8 Animal welfare and ethics in organic agriculture	187
<i>Vonne Lund</i>	
Introduction	187
Animal welfare and ethics	187
Organic values	188
Is animal welfare an issue according to organic values?	189
The organic understanding of animal welfare	191
Is there a general welfare problem in organic production systems?	192
Organic farming and the traditional animal protection movements	195
Future research needs	195
Conclusions	196
References	196
2 Regulatory and management issues	
Chapter 9 Organic standards and certification	201
<i>Sasha Courville</i>	
Introduction	201
History of the development of organic standards and certification	202

Organic standards and standards setting processes	203
Conformity assessment processes (international verification processes)	204
Key challenges for the future of organic regulation	207
Conclusions	216
References	216
Special topic 3 – Contradictions of principles in organic farming	221
<i>John Ikerd</i>	
Philosophical history of organic farming	221
Modern definitions of organic farming	222
Permanent versus productive agriculture	223
The challenge to organics of increased demand	224
Deep organic farming	226
Sustainability	226
References	228
Chapter 10 Economic management in organic agriculture	231
<i>Els Wynen</i>	
Introduction	231
Economic management	231
SWOT analysis	238
Conclusions	241
References	241
Chapter 11 Understanding the market for organic food	245
<i>Stewart Lockie, Darren Halpin and David Pearson</i>	
Introduction	245
The demand for organic foods	246
Why people do or do not consume organic foods	248
Marketing organic foods	250
Expanding the 'market' for organic foods	253
Conclusion	255
References	255
3 Beyond the farm gate	
Chapter 12 Environmental impacts of organic farming	259
<i>Nadja Kasperczyk and Karlheinz Knickel</i>	
Introduction	259
Biodiversity	260

Landscape	265
Soil	266
Ground and surface water	271
Climate and air	274
Energy	277
Conclusions	279
References	282

Special topic 4 – Tillage: how bad is it in organic agriculture? 295

Paolo Bàrberi

Introduction	295
When tillage is important in organic agriculture	295
When over-reliance on tillage can be troublesome	296
Environmental impact of tillage	297
Conceptualising tillage management in organic agriculture	298
Are there any differences between tillage management in organic and conventional agriculture?	300
Conclusions and future perspectives	300
References	301

Chapter 13 Food quality 305

Kirsten Brandt and Jens Peter Mølgaard

Abstract	305
Introduction	305
Definitions of production systems and food qualities	307
Safety from pathogens	310
Safety from toxic substances	312
Beneficial nutritional properties or other positive impacts on health	317
Perspectives	322
References	322

Chapter 14 Social responsibility in organic agriculture: learning, collaboration and regulation 329

Rhiannon Pyburn, Nadarajah Sriskandarajah and Arjen Wals

Introduction	329
Social responsibility in the organic context	330
A framework for approaching social responsibility in organic agriculture	336
Learning and social responsibility	339
A three-pronged approach to social responsibility	346
Conclusions	347
References	348

Special topic 5 – Voice from the other side: a Ghanaian view on organics	351
<i>Kees van Veluw</i>	
Introduction	351
The African backbone is agriculture	352
The traditional production level	352
Extension is technically oriented	353
Extension method is top down	354
The organic approach: sustainability as a subject of extension and participation as an extension method	354
Participatory extension methods	356
Voice from Northern Ghana: organic farming and participatory extension	356
The challenge: ‘stop soul erosion’	359
References	359
4 Knowledge and capacity building	
Chapter 15 Research to support the development of organic food and farming	361
<i>Christine Watson, Erik Steen Kristensen and Hugo Alrøe</i>	
Introduction	361
History and status of organic research	361
Researching organic systems	363
Future perspectives on research approaches	374
Conclusions	378
References	378
Chapter 16 Education and training in ecological agriculture: the Nordic region and the USA	385
<i>Nadarajah Sriskandarajah, Charles Francis, Lennart Salomonsson, Helena Kahiluoto, Geir Lieblein, Tor Arvid Breland, Ulrika Geber and Juha Helenius</i>	
Overview of Ecological Farming and Education	385
Emerging university programs and resistance to change	387
How ongoing research informs education	388
Experiential learning	390
Programs and courses in organic farming and agroecology	391
Development of a curriculum	395
Key information resources	397
Future perspectives in designing educational programs	399
Conclusions	403

References	404
Chapter 17 Design of farmer education and training in organic agriculture	407
<i>Laura Seppänen and Charles Francis</i>	
Introduction	407
Characteristics and challenges of organic farming	408
Perspectives for learning	410
Using a learning tool in organic vegetable farming (Finland)	412
Networking in organising educational activities (Norway, USA)	414
Discussion and conclusions	416
References	417
5 Summary	
Chapter 18 Organic agriculture: opportunities and challenges	421
<i>Paul Kristiansen, Acram Taji and John Reganold</i>	
Introduction	421
Opportunities and challenges	424
Looking to the future	426
Supply chain technology	428
Farming systems technology	431
Summary	435
References	436
Index	443