



COG PRACTICAL
SKILLS HANDBOOKS

GROWING STRAWBERRIES ORGANICALLY

Maureen Moore

Canadian Organic Growers
Cultivons Biologique Canada



FUNDING PROVIDED BY

AGRICULTURE AND AGRI-FOOD CANADA

THE MCLEAN FOUNDATION

CROFTER'S FOOD LTD

THE BIG CARROT NATURAL FOOD MARKET



Agriculture and
Agri-Food Canada

Agriculture et
Agroalimentaire Canada

The McLean Foundation



705-746-6301 • www.croftersorganic.com



416-466-2129 • www.thebigcarrot.ca

Growing Strawberries Organically

Maureen Moore

A COG PRACTICAL SKILLS HANDBOOK

Canadian Organic Growers
Cultivons biologique Canada



GROWING STRAWBERRIES ORGANICALLY

First published in 2011

CANADIAN ORGANIC GROWERS INC.

39 McArthur Ave, Level 1-3 · Ottawa

Ontario · K1L 8L7 · Canada

Tel.: 613-216-0741 Fax: 613-236-0743

www.cog.ca publications@cog.ca

COPYRIGHT

© Canadian Organic Growers Inc., 2011

PRODUCTION

EDITOR:

Kristine Swaren

CONTRIBUTING EDITORS:

Laura Telford, Rob Wallbridge

DESIGN AND LAYOUT:

Jean-Michel Komarnicki, JMK Image-ination

COVER DESIGN:

Angela Robak, Artful Ideas

FRONT COVER PHOTOGRAPH:

Emilie Duchesne, © copyright 2011

BACK COVER PHOTOGRAPH:

Laura Telford

PROJECT MANAGER:

Kristine Swaren, Blue Chicory Communications

NOTICE OF RIGHTS

ALL RIGHTS RESERVED

Reproduction or transmission of any part of this publication, in any form or by any means, electronic or mechanical, including photocopying, recording, or entering in an information storage and retrieval system now known or hereafter invented, without prior written consent of the copyright holders or their descendants, is an infringement of copyright law, Chapter C-42, Revised Statutes of Canada, 1985

NOTICE OF LIABILITY

The methods and opinions expressed in this publication are not necessarily those of Canadian Organic Growers Inc. Use of any products or methods mentioned in this book cannot be a guarantee that an operation will meet certification standards or that they will work on a particular farm. It is the responsibility of the farmer to ensure that any methods used meet the standards of the certifying body.

Library and Archives Canada Cataloguing in Publication

Moore, Maureen, 1954–

Growing strawberries organically / Maureen Moore.

(A COG practical skills handbook)

ISBN 978-0-9808987-3-6

1. Strawberries – Organic farming – Handbooks, manuals, etc

2. Organic farming – Canada – Handbooks, manuals, etc.

I. Canadian Organic Growers

II. Title.

III. Series: COG practical skills handbook

SB385.M66 2011

634'.7584

C2011-905559-7

Printed and bound in Canada



CHANGES IN THE ORGANIC SECTOR have been dramatic since COG's inception in 1975. A movement then struggling to be noticed is now a multi-million dollar industry with widespread consumer recognition and national standards backed by federal regulation.

Organic agriculture is now the fastest growing sector in agriculture, and as such it is the most economically and environmentally viable solution for Canada's rural areas.

COG has a significant positive impact on organic growing in Canada through our policy and media work, educational materials, production statistics, scholarships, farmer training, market development, and the grassroots work of our regional chapters.

ORGANIC AGRICULTURE:

- sequesters carbon in the soil and produces food with energy efficient methods
- increases soil organic matter and a diversity of living soil organisms
- improves water quality and quantity
- improves biodiversity
- improves the health of soil, plants, animals, farm workers, consumers
- increases farm financial viability by reducing dependence on inputs and providing farmers a fairer return for their products

COG is a federally registered charity (no. 13014 0494 RR0001). Our members are farmers, gardeners, processors, retailers, researchers and consumers who share a vision of a sustainable bioregionally-based organic food system.

COG's **MISSION** is to lead local and national communities towards sustainable organic stewardship of land, food and fibre while respecting nature, upholding social justice and protecting natural resources.

JOIN CANADIAN ORGANIC GROWERS
OUR NATURE IS ORGANIC

CONTENTS

ACKNOWLEDGMENTS	6
1 INTRODUCTION	8
FINDING INFORMATION IN THIS BOOK	9
GOOD SPRING FARM	12
2 PLANNING FOR ORGANIC	14
PLANNING	14
MARKETING	20
PROMOTION	26
SONGBERRY ORGANIC FARM	28
3 SOIL MANAGEMENT	30
FEEDING STRAWBERRIES	30
THE PHYSICAL ELEMENT	32
THE CHEMICAL ELEMENT	32
THE BIOLOGICAL ELEMENT	33
TESTING SOIL HEALTH	34
4 SOIL MINERALS	38
CEC AND PBS	38
ORGANIC MATTER	39
pH	40
NUTRIENTS	40
SOIL BUILDERS AND BALANCERS	45
HOLISTIC SOIL MANAGEMENT	53
PILGRIMS' PRODUCE	54
5 GROWING SYSTEMS	57
MATTED ROW	58
RIBBON ROW SYSTEM	60
PLASTICULTURE	61

HIGH TUNNEL SYSTEM	64
GREENHOUSE PRODUCTION	65
WISEACRES	66
6 PLANTING STOCK	70
VARIETIES OF STRAWBERRIES	70
SELECTION FACTORS	73
PROPAGATION METHODS	75
GREENFIELDS ORGANIC FARM	77
7 FIELD MANAGEMENT	79
COVER CROPS AND GREEN MANURES	79
WATER	82
WEEDS	84
WEEDER GEESE	87
8 CULTURAL PRACTICES	89
SITE SELECTION AND PREPARATION	89
PLANTING AND MANAGING NEW STRAWBERRY FIELDS	91
MANAGING ESTABLISHED STRAWBERRY PLANTINGS	93
9 BENEFICIAL AND DAMAGING ORGANISMS	97
STRATEGIES	98
INSECT PEST PROFILES	107
10 DISEASE CONTROL	115
PREVENTIVE MEASURES	115
DISEASE PROFILES	118
REFERENCES AND RESOURCES	124
PRODUCTION	124
SOIL AND FERTILITY	125
PESTS & DISEASES	126
ONLINE RESOURCES	128

ACKNOWLEDGMENTS

This book would not have been possible without the input of experienced organic strawberry growers from across Canada. While writing this book, we spoke to experienced growers from the east coast to the west; from hardiness zones 3 to 8. Some growers kept a small strawberry patch as part of a larger market garden; others had extensive fields of strawberries. The climate, soil and type of operation varied, but these farmers had three things in common: a wealth of information, a willingness to share stories of challenges and successes, and a commitment to the principles of organic farming. We would like to thank all these growers, not just those profiled, for their invaluable input.

FARMS PROFILED IN THIS HANDBOOK

- Karen and Brock Davidge, Fredericton, NB
- Rob and Kathryn Hettler, Vernon, BC
- Lorenz Eppinger, Guelph, ON
- Rob Wallbridge, Bristol, QC
- John Wise, Centreville, ON

This handbook was funded in part by Agriculture and Agri-Food Canada through the Advancing Canadian Agriculture and Agri-Food (ACAAF) program. We wish to acknowledge the support of the following organizations for making this publication possible: the Investment Agriculture Foundation of British Columbia, the Manitoba Rural Adaptation Council, the New Brunswick Agriculture Council / Conseil Agricole Nouveau-Brunswick, the Territorial Farmers Association and the Yukon Agricultural Association.

Agriculture and Agri-Food Canada (AAFC) is pleased to participate in the publication of this guide. AAFC is committed to working with its industry partners to increase public awareness of the importance of the agriculture and agri-food industry to Canada. Opinions expressed in this handbook are not necessarily those of AAFC.

THIS BOOK WAS PUT TOGETHER BY:



Maureen Moore has had an ongoing love affair with strawberries since she was a child, and some of her sweetest memories include scouring the fields on the family farm in Haliburton for succulent little wild berries. She still lives on the farm and now keeps a menagerie of horses, llamas, chickens, ducks and pigs. When not farming, Maureen works as an organic farm inspector and college instructor.

Maureen would like to dedicate this book to her parents, Joan and Bill Moore, who traded in suburban life and started a farming dynasty that has now been passed on to the third generation.



Rob Wallbridge grew up on dairy and cash crop farms in Eastern Ontario. After university, he apprenticed on organic farms in Nova Scotia and Western Ontario before returning to the family farm to start an organic market garden. In 2003, he and his wife, Julie Perrault, purchased a conventional PYO strawberry farm near Bristol, Quebec and began their tumultuous relationship with organic strawberry production. Rob is an organic certification inspector, a graduate of the Advanced Agricultural Leadership Program, and currently volunteers on the Livestock Working Group of the CGSB Organic Technical Committee. He consults on organic production and certification, and operates Songberry Organic Farm with his wife and two young children, producing a wide range of vegetables and fruit for sale in the Ottawa area.



Kristine Swaren, project manager for the Practical Skills handbooks, is also series editor and fact-checker. Kristine would like to acknowledge the heroic efforts of Maureen and Rob in sorting through the wealth of information that is “out there” and distilling it into a readable, do-able handbook (see also the resource section for just a few of the sources available). Good luck with your strawberry patch!

1 INTRODUCTION

BEGINNING WITH the sweet, succulent little wild berries that grow in pastures, woods and roadsides, strawberries have always been a prized crop in Canada.

A study partially funded by The Organic Center discovered that organically grown strawberries offer a number of compelling benefits when compared with conventionally grown strawberries. The researchers discovered that organic strawberries had¹:

- Significantly higher antioxidants and vitamin C
- A longer shelf life
- More dry matter, or, “more strawberry in the strawberry”
- Overall better taste and sweetness

Over 20,000 tonnes of strawberries a year have been marketed by Canadian growers since 2000; sales in 2008 were over \$61 million.² While organic strawberries are a small proportion of that total, it is a high-potential niche market. Over the past years, a number of factors have led to increased profits for organic berries including:

- rapidly growing consumer demand
- direct sales which eliminate the need for a distribution chain
- reduced cost of fertilizers and other inputs

As more producers begin to grow organic strawberries, supply may catch up with demand and, if they are to realize acceptable profits, farmers will need to maximize productivity, improve efficiency and reduce expenses. The key to success for any venture in organic farming is avoiding problems rather than treating them. This handbook takes a holistic approach offering practical advice and techniques that focus on building the soil fertility needed to grow healthy and profitable strawberries.

1 Reganold, John, et al. Fruit and Soil Quality of Organic and Conventional Strawberry Agroecosystems. 2010

2 Canadian Horticulture Sector 2008 Crop Year Performance Overview, Agriculture and Agri-Food Canada

FINDING INFORMATION IN THIS BOOK

Successfully growing strawberries organically involves a number of crop management practices throughout the year. You may find yourself referring to a number of different sections of the book at different points in the season, depending on:

- type of growing system used
- scale of the enterprise
- existing operations
- previous experience

Chapters have been organized to cover:

- planning and marketing for an organic operation – Chapter 2
- soil management concerns – Chapters 3 and 4
- strawberry plant management options – Chapters 5 and 6
- management of strawberry fields, pre- and post-establishment – Chapters 7, 8, 9 and 10

As a perennial crop, the techniques for new fields are different from those for established fields. The charts on pages 10 and 11 may be used to find information in the following chapters when planning a new organic strawberry enterprise. The first chart is organized by task, and the second is organized by season and by the field's stage of development.

STRAWBERRY FACTS

The word “strawberry” comes from Old English but the history behind the name is unclear. Some historians believe that the name comes from the centuries old practice of growing strawberries on straw mulch; others think it is because the daughter plants are “strewn” over the surface. One final theory is that after being picked, wild berries were threaded onto straws to be sold.



Use the following chart to determine when to perform certain tasks, and where to find related information in the text:

TASK:	WHEN TO DO IT:	REFERENCE:
Select a location	before you start	Chapters 3 & 8
Choose a growing system		Chapter 5
Choose a propagation method		Chapter 6
Choose a variety		Chapter 6
Test your soil	preparing a new field	Chapter 3
	spring (optional)	
	summer, after renovation (optional)	
Add soil amendments	preparing a new field	Chapter 4
	spring (optional)	
	summer, after renovation (optional)	
Establish cover crops	preparing a new field	Chapters 7 & 8
Set out strawberry plants	spring – new plantings	Chapter 8
Remove blossoms, train or remove runners	summer – new plantings	Chapter 8
Control weeds	summer & fall – new plantings	Chapter 3, 4 & 7
	spring, summer, and fall – established plantings	
Irrigate	summer – new plantings	Chapters 3 & 7
	spring & summer – established plantings	
Frost control	spring – established plantings	Chapter 8
Pest and disease control	spring & summer established plantings –	Chapters 3, 9 & 10
Harvest berries	spring, summer, or fall	Chapters 5 & 8
Renovate strawberry field	summer – established plantings	Chapter 8
Mulch for winter protection	late fall/early winter	Chapter 8
Remove mulch	early spring – established plantings	Chapter 8

Use the following chart to understand the timing of tasks as they are related to the preparation, establishment, and management of strawberry fields. The first task (plow) starts at least 18 months before planting.

SEASON	NEW FIELDS	NEW PLANTINGS	ESTABLISHED FIELDS
Fall and Winter	Plow	Plant fall cover crop	Apply mulch and row covers
	Plant fall cover crop		Monitor mulch to ensure that it stays in place
Spring	Till under fall cover crop (optional)	Till under fall cover crop	Rake and/or replace mulch
	Soil test	Short fallow	Add soil amendments as needed
	Amend soil as necessary	PLANT STRAWBERRIES	Control for frost
		Irrigate	Irrigate
Summer	Till and plant cover crops	Remove blossoms	Renovate and rotate
	Monitor and control weeds		
	Test soil		
	Amend soil as necessary		

Chapter 2 – Planning for Organic – outlines the theory behind organic production and recommends steps for making the transition from conventional to organic. It also includes some advice on economics and marketing.

If you're just starting to get into organic production, we refer you to COG's other publications listed inside the back cover. *The Organic Field Crop Handbook* is a great general reference guide that will give you the information you need about soil management and general organic methods. *Gaining Ground: Making a Successful Transition to Organic Farming* is a good starting point for those in transition from conventional methods. Attending organic conferences and workshops is also recommended to increase your knowledge and to meet other organic farmers who can help along the way. Check the COG website www.cog.ca for national and regional activities.

GOOD SPRING FARM

KAREN AND BROCK DAVIDGE, KESWICK RIDGE, NEW BRUNSWICK

FARM:

13 hectares
(32 acres)

ORGANIC

CERTIFICATION:

Organic Crop
Improvement
Association
(OCIA)

CERTIFIED SINCE:

1987

GROWING SYSTEM:

matted row

VARIETIES:

Sparkle, Veestar,
Brunswick,
Cavendish, Kent,
Honeoye

We come from the position that it can be done, we just have to figure out how,” says Karen Davidge. On the crest of a ridge, Karen and Brock cultivate 11 acres, including strawberries (1/2 ac), raspberries, blueberries, hascaps, a wide variety of vegetables, 12 varieties of potatoes (3.5 ac), grain and rotation cover crops. They also raise rare breeds of pastured poultry; the “Good Spring Select” meat bird was developed on their farm.

The Davidges plant their strawberries near an irrigation pond, on sloped south-facing ground that provides excellent air circulation to limit disease and provide frost protection. Their soil is sandy loam and full of stones. After years of hand-picking stones, Karen and Brock contracted a rock mulcher. This equipment digs stones (up to 20 cm (8 in) in diameter) and crushes them, working to a depth of 25 cm (10 in). At \$1500 per acre the price was steep but Karen says, “It was worth every cent” compared to the cost of a rock picker and the damage done to potatoes and equipment during harvest. Following

this activity extra fertility was added due to the existing nutrients being diluted over the disturbed depth.

Fertility is maintained with cover crops and composted chicken manure both from the farm and a neighbour’s in-vessel system. The composted manure is applied at a rate of 5 tonnes per hectare (2 tons per acre). Raw manure is not used because it contributes to the load of weed seeds.

Cover crops are important for weed and disease control, building and holding soil nutrients, preventing erosion, and improving soil structure. Because the primary crop is potatoes, compost and cover crops are used the pre-potato year. A mix of cover crop seed is used:

- Field peas and vetch increase soil nitrogen levels
 - Oats and/or wheat have a fibrous root system that prevents erosion (the peas and vetch climb the oats giving better growth)
 - Oil seed radish has a deep root system that brings minerals to the surface, breaks up the soil, and prevents potato rhizoctonia
- All together the mix increases soil organic matter and has the advantage of being winter killed so the soil is easily prepared for crops the following spring.

Strawberries follow potatoes in a five-year rotation that also includes vegetables. Potato

production usually has meant good weed control and soil preparation. Strawberries are harvested for 2-3 years before the plants are retired due to weed competition.

Winter protection is accomplished with a fall covering of straw. Sometimes floating row cover is used if the plants are well established. It also offers protection for plants from a large deer population, their most troublesome pest. Local hunters are invited onto their land; and the Davidge's dog, a Pointing Griffon (a pointer/retriever used mainly for the poultry), is trained to chase deer out of the field and return. It also keeps mice, moles and birds out of the strawberry patch.

Insect pest pressure comes from clipper weevil and tarnished plant bugs. To provide alternate food and habitat, adjacent pasture is not mowed until after the berries are fairly large. Not mowing also allows wild flowers in the pasture to attract an abundance of bees for pollination. Karen has noticed that the decline in domestic honeybees is balanced by a growing population of wild bees, wasps and bumblebees.

Weather is an ongoing challenge. For the past ten years, "the weather has flip-flopped, going from extended dry spells to torrential rain." Wet fields promote berry mould, and in temperatures of 29-32°C (84-90°F), a great crop can quickly turn to mush. Excellent air movement and soil drainage is critical. During six years of excessively wet growing conditions, weeds were more than the usual challenge: they could not get on the ground

for 4-5 weeks at a stretch, either on foot or tractor. Sometimes new plantings ended up being plowed under. Deciding when to give up on a planting and not waste more resources is a challenge to emotions and business smarts.

Farm labour over the years has included apprentices, students, WWOOFers, Canada World Youth, ex-offenders, at-risk youth, or people just wanting to learn more about organic production. Brock and Karen appreciate that experiences at Good Spring Farm have contributed to developing life potential for many of their helpers.

During harvesting, pickers sort by berry quality into two boxes as they pick. This saves time, reduces waste, ensures consistent quality and gives customers exactly what they want. First-quality berries are sold fresh; seconds are frozen and marketed for mid-winter smoothies and jams. Berries are cooled immediately to maintain quality until they are sold at farm gate, farmers' market and a retail shop in Fredericton. When the harvest is complete, chickens are allowed in the strawberry patch to reduce weeds and insects.

Despite some downright disastrous seasons, the Davidges continually update their knowledge about strawberry production technology and techniques. Their can-do philosophy helps overcome multiple challenges.

2 PLANNING FOR ORGANIC

PLANNING

With just 25 original plants eventually producing 25 to 50 quarts of berries per growing year³, strawberries may seem like the goose that laid the golden egg. While organic berries often command a higher price than conventional berries, they also present unique challenges to transitioning growers.

COSTS

Organic strawberry production can be profitable if growers can overcome the challenges of higher labour requirements, lower or variable yields, and a shorter production cycle due to crop rotations.

The costs to establish and maintain organic strawberry fields, as well as expected returns, vary over time and by geographic area; however, growers may use the following numbers as a rough guideline for planning purposes.⁴

ACTIVITIES FOR ONE ACRE (0.4 HECTARE)	MATTED ROW	PLASTICULTURE
Establish field over 2 years, including site preparation, plants, labour (\$ for 2 years)	\$3,600	\$7,800
Productive years: weeding, cultivation, harvest, supplies (\$ per year)*	\$10,300	\$10,100
Yield	7,000-12,000 lb	8,000-14,000 lb
Price at \$2.50 per pound	\$17,500-\$30,000	\$20,000-\$35,000
Profit for one productive year	\$3,600-\$16,100	\$2,100-\$17,100

* organic systems not using herbicides may require approximately 40 hours of hand weeding and 10 hours of cultivation time as additional labour; with proper pre-planting preparation, the labour could be significantly less.

³ Bordelon, Bruce. *Growing Strawberries*. Purdue University Cooperative Extension Services, December 2001.

⁴ Adapted from Demchak, Kathleen. *Strawberry Production*. Penn State College of Agricultural Sciences, 2010.

LABOUR

“Labour is the biggest cost of going organic – strawberry production requires a lot of hoeing. Once strawberry plants are established, there seems to be no good mechanized weed management system.” – John Wise, ON

A dependable, cost-effective workforce is important throughout the growing season, and at harvest time it is crucial. “If you want a quality product, you have to get the berries out of the field fast,” says grower Lorenz Eppinger.

Labour costs on organic farms are estimated to be 15% higher than on conventional operations. Determining whether to hire outside labour depends on the skill and experience of the producer along with such factors as:

- **Weed pressure**, especially in transitional years, means labour-intensive hand weeding.
- **Condition of soil** may require more labour for soil improvement.
- **Type of growing system** determines varying amounts of labour at different times of the year. For example, growing through plastic needs labour to set out and remove the irrigation lines and plastic in spring and fall, whereas fields without plastic will require labour for weeding throughout the season.
- **Marketing methods** dictate the timing and amount of labour such as pick-your-own operation, weekly farmers’ market, or bulk delivery to a processor.
- **Short harvest season** makes it challenging to find short term labourers. Some strawberry growers add vegetables or other crops to their operation in order to guarantee an available labour pool to manage the strawberry harvest. It may make sense to plant varieties that ripen at different times, lengthening the harvest season and appealing to labourers who want to work for more than just a week or two.

TRANSITION

Organic production is often defined as farming without chemicals, but it is much more than that. Organic farming is a holistic approach to agriculture that relies on the earth's own natural resources, promotes biodiversity and takes an ethical approach to the treatment of livestock.

“It all starts with the soil.” Rob Wallbridge, QC

The main tenets of organic agriculture include:

- Promotion and maintenance of healthy soil through crop rotation, green manures, compost, encouragement of beneficial life forms and acceptable cultivation practices
- Management of weeds, insects and diseases by focussing first on soil health
- Reduction of off-farm inputs and elimination of chemical fertilizers, pesticides, fungicides, herbicides and similar products
- Avoidance of genetically engineered organisms (also known as genetically modified organisms)
- Promotion of animal health through breed selection, nutrition and living conditions that meet natural behavioural needs, and use of health care methods that avoid antibiotics, hormones and other prohibited treatments
- A focus on prevention, rather than treatment, of problems
- A “whole earth” focus on renewable agricultural practices that will maintain an ecological balance within the environment

Making a successful transition to organic should be a long term vision rather than a “get rich quick” scheme and may involve a significant shift in outlook on the part of the grower.

CERTIFICATION

Some farmers follow organic practices without becoming certified organic since their crops are for farm use or customers who know and trust them. However, certification is required by federal law for growers who plan to advertise and sell their crops as organic.

Organic certification requires adherence to national standards, which are developed and updated by industry experts, and published and enforced by the federal government.

Certification is managed by certifying organizations (certifiers) that are not government agencies; rather they are independent bodies that charge fees for their services. A grower applies annually for certification by submitting an application that describes the farm practices. During annual inspections, third party inspectors verify those practices by looking at records and observing the farm in operation.

RECORD-KEEPING

ADVICE & TEMPLATES

More record-keeping advice and templates are available in COG's Practical Skills Handbook, Record Keeping for Organic Growers.

ESTABLISHING RECORDS

Whether a grower is certified or not, records should begin when field preparation begins. Over the years, this will be an invaluable source of information to improve soil fertility and yields. Records should be clear, complete, expandable, and include at least the following information:

- soil amendments or treatments (to soil or plants): substance, rate applied and source, date applied
- condition of field prior to preparation: soil test results, weeds, yields from previous crops
- types and timing of cover crops
- varieties: purchase receipts and sources
- pest and disease problems
- rainfall, drought and other weather events
- storage and processing
- yields and sales
- comments and reactions of customers

Field histories and activity logs are examined during the annual inspection, and audits may be conducted to ensure that planting, harvest and storage records tally with sales, and that organic practices can be traced from seed to sale.

TRANSITION PERIOD

Although it may take 5 to 10 years for fields to reach their maximum organic potential, organic standards require only that land be free of prohibited chemicals for 3 years before it can be designated organic. If a grower has documented proof that there have been no prohibited inputs in previous years, the length of the transitional period may be reduced. Crops grown during the transitional period must be stored separately and any equipment used in conventional or transitional fields must be properly cleaned before use in organic fields. When one crop is grown at the same time