CAMBRIDGE

Cambridge University Press
978-0-521-29558-1 - Crop Evolution, Adaptation and Yield
L. T. Evans
Frontmatter
More information

The efforts of countless agriculturalists over the past ten thousand years have led to the improvement of a wide range of agricultural crops. In this major new work, Lloyd Evans provides an integrated view of their domestication, adaptation and improvement, bringing together genetic diversity, plant breeding, physiology and aspects of agronomy. Considerations of yield and yield potential provide continuity throughout the book. Food, feed, fibre, fuel and pharmaceutical crops are all discussed. Cereals, grain legumes and root crops, both temperate and tropical provide many of the examples, but pasture plants, oilseeds, leafy crops, fruit trees and others are also considered.

Lloyd Evans was born in New Zealand, where he received his initial training in science and agriculture before doing his doctorate in soil science at Oxford. In 1956, after a post-doctoral fellowship in the phytotron at the California Institute of Technology, he joined the CSIRO Division of Plant Industry in Canberra, Australia. He was involved in the design and use of CERES, the Australian phytotron. Much of his work there has been on the physiology of crop yield, and on the control of flowering by daylength. His research has been recognized by election to fellowship of the Australian Academy of Science, the Royal Society of London and of the New Zealand and Norwegian national academies.

Particularly through his membership of the Technical Advisory Committee of the CGIAR, and close involvement with several of the international centres of agricultural research, the author has had many opportunities to observe the diverse agricultural problems of developing countries.

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-29558-1 - Crop Evolution, Adaptation and Yield
L. T. Evans
Frontmatter
More information

Crop evolution, adaptation and yield

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-29558-1 - Crop Evolution, Adaptation and Yield
L. T. Evans
Frontmatter
More information

Crop evolution, adaptation and yield

L. T. Evans

CAMBRIDGE
UNIVERSITY PRESS

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-29558-1 - Crop Evolution, Adaptation and Yield
L. T. Evans
Frontmatter
More information

Published by the Press Syndicate of the University of Cambridge
The Pitt Building, Trumpington Street, Cambridge CB2 1RP
40 West 20th Street, New York, NY 10011–4211, USA
10 Stamford Road, Oakleigh, Melbourne 3166, Australia

© Cambridge University Press 1993

First published 1993
First paperback edition 1996

Printed in Great Britain at the University Press, Cambridge

A catalogue record for this book is available from the British Library

Library of Congress cataloguing in publication data

Evans, L. T.
Crop evolution, adaptation, and yield / L. T. Evans.
p. cm.
Includes bibliographical references and index.
ISBN 0-521-22571-X
1. Crops – Evolution. 2. Crops – Adaptation. 3. Crop yields.
I. Title.
SB106.074E93 1993
633 – dc20 92-28314 CIP

ISBN 0 521 22571 X hardback
ISBN 0 521 29558 0 paperback

SE

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-29558-1 - Crop Evolution, Adaptation and Yield
L. T. Evans
Frontmatter
More information

Contents

		page
	Preface	ix
	Acknowledgements	xi
1	Introduction	1
2	Crop yields and world food supply	32
3	The domestication of crop plants	62
4	Adaptation and the ecology of yield	113
5	Physiological aspects of crop improvement	169
6	Increases in yield: trends and limits	269
7	Inputs and the efficient use of resources	317
8	The future of yield	365
	References	391
	Appendix: List of acronyms and abbreviations	484
	Index	486

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-29558-1 - Crop Evolution, Adaptation and Yield
L. T. Evans
Frontmatter
More information

For Margaret, Nicholas, John and Catherine

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-29558-1 - Crop Evolution, Adaptation and Yield
L. T. Evans
Frontmatter
More information

Preface

When the economist Walter Rostow asked and was told what I was trying to write he called it, not altogether pejoratively, 'a megalomaniac book'. So you, potential reader, might well ask why any author should attempt to cover so much ground, given the hazards of venturing into fields beyond his expertise, and why he should expect you to join him?

My reasons are that the yield of crops is a fascinating subject of great historical significance and still central to our global housekeeping; that too often has this many-sided subject been viewed from only one vantage point; that the nature of greater yields is widely misunderstood yet has implications for plant breeding strategies, development policy and environmental management; and that further increases in crop yields will be vital to the welfare of at least those four out of every five people on Earth in AD 2000 who will be living in developing countries.

Given the scope of the subject, a less hazardous option would have been to edit a book by the requisite range of experts, but a coherent overall perspective often eludes that approach. The perspective presented here has grown out of a preoccupation with the physiology of crop yield combined with opportunities to see something of the agricultural problems in many environments and regions of the world.

Several areas of lively current research which have received ample attention elsewhere, such as genetic engineering and crop modelling, are only lightly touched on here. Nor is this a book about plant breeding, for which excellent texts are already available. Rather, it is a book about the nature of advances in agriculture. Some crops, like the perennial trees so important in the humid tropics, get a raw deal, but I have tried to balance the claims of temperate and tropical crops in both developed and developing countries.

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-29558-1 - Crop Evolution, Adaptation and Yield
L. T. Evans
Frontmatter
More information

The introductory chapter provides an overview of the whole field, especially for those wanting a closer look at only one corner of it. However, my hope is that the synthetic approach followed here may lead to more fruitful interactions between disciplines, between the two agricultures – the traditional and the modern – and between the two cultures within biology itself, of *Drosophila* and *Arabidopsis* on the one hand and of wheat and soybeans on the other.

L.T. Evans
October, 1991

© Cambridge University Press www.cambridge.org

CAMBRIDGE

Cambridge University Press
978-0-521-29558-1 - Crop Evolution, Adaptation and Yield
L. T. Evans
Frontmatter
More information

Acknowledgements

Many colleagues have provided me with insights and information, drawn my attention to out-of-the-way publications, clarified issues or remoulded my interpretations, among them David Andrews, Roger Austin, Paul Biscoe, Derek Byerlee, T.T. Chang, Dana Dalrymple, Tina David, Don Duvick, Tony Fischer, Wayne Hansen, Diane K. Johnson, Gurdev Khush, Gerald Stanhill and Danny Zohary. My unbroken series of arguments over many years with Otto Frankel about the nature and improvement of crop plants has been an enduring stimulus.

He and John Passioura, Richard Groves, Derek Byerlee, Tony Brown, T.T. Chang, Howard Rawson, Rod King, Ian Wardlaw, David Bagnall, Rex Oram, Richard Richards, Jim Davidson, Peter Randall, John Freney, John Kirk and John Zwar have all read and improved individual chapters. I am also grateful to the anonymous referees who read and commented on the whole text, to Alan Crowden and his predecessors at Cambridge University Press for their patience and skill in the arts of keeping authors at it, and to Lynn Davy for her helpful editing.

Here in Canberra, I am indebted to Carol Murray for tracking down difficult references, to Renata Sawa and Pat Riddell for endless word processing, to Anne Warrener for illustrations and to Cheryl Blundell for so patiently checking everything.

This book and I owe more than can be measured to the CSIRO Division of Plant Industry and to my colleagues in it. I also acknowledge the support of the Rockefeller Foundation for the writing of the final chapter during a residency at the Villa Serbelloni in Bellagio, the only part of the overall process which has not required great forbearance by my wife, Margaret.

I am also grateful to the original authors and/or publishers for permission to use quotations and to republish many of the figures in the book, and to Nancy Sawer for allowing me to use her delightful crop vignettes.

© Cambridge University Press www.cambridge.org