

## Biological Control Measures Of Success

This book enhances our understanding of biological control, integrating historical analysis, theoretical models and case studies in an ecological framework. Covering the research findings in various aspects of weed biocontrol, this volume explores weed biology and ecology and the economic impacts, effectiveness and practical implications of weed management strategies. It is of interest to researchers and students in plant and environmental sciences.

Plants provide insects with a range of specific foods, such as nectar, pollen and food bodies. In exchange, they may obtain various services from arthropods. The role of food rewards in the plant-pollinator mutualism has been broadly covered. This book, first published in 2005, addresses another category of food-mediated interactions, focusing on how plants employ foods to recruit arthropod 'bodyguards' as a protection against herbivores. Many arthropods with primarily carnivorous lifestyles require plant-provided food as an indispensable part of their diet. Only recently have we started to appreciate the implications of non-prey food for plant-herbivore-carnivore interactions. Insight into this aspect of multitrophic interactions is not only crucial to our

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understanding of the evolution and functioning of plant-insect interactions in natural ecosystems, it also has direct implications for the use of food plants and food supplements in biological control programs. This edited volume provides essential reading for all researchers interested in plant-insect interactions. With contributions from more than 30 internationally renowned experts, this book combines coverage of theory with coverage of global practices. Highlighting the day-to-day challenges of organic crop management for cost-effective real-world application, the book explores the biological control of diseases in 12 major crops. It focuses on the use of host plant resistance through transgenics and induced systemic resistance as a part of biological control. Topics covered include the role of biocontrol agents for signalling resistance, effective ecofriendly alternative to combat bacterial, fungal, and viral infestation, and transgenic crops in disease management.

Awarded Best Reference by the New York Public Library (2004), Outstanding Academic Title by CHOICE (2003), and AAP/PSP 2003 Best Single Volume Reference/Sciences by Association of American Publishers' Professional Scholarly Publishing Division, the first edition of Encyclopedia of Insects was acclaimed as the most comprehensive work devoted to insects. Covering all aspects of insect anatomy, physiology, evolution,

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behavior, reproduction, ecology, and disease, as well as issues of exploitation, conservation, and management, this book sets the standard in entomology. The second edition of this reference will continue the tradition by providing the most comprehensive, useful, and up-to-date resource for professionals. Expanded sections in forensic entomology, biotechnology and *Drosophila*, reflect the full update of over 300 topics. Articles contributed by over 260 high profile and internationally recognized entomologists provide definitive facts regarding all insects from ants, beetles, and butterflies to yellow jackets, zoraptera, and *zygentoma*. \* 66% NEW and revised content by over 200 international experts \* New chapters on Bedbugs, Ekbohm Syndrome, Human History, Genomics, Vinegaroons \* Expanded sections on insect-human interactions, genomics, biotechnology, and ecology \* Each of the 273 articles updated to reflect the advances which have taken place in entomology research since the previous edition \* Features 1,000 full-color photographs, figures and tables \* A full glossary, 1,700 cross-references, 3,000 bibliographic entries, and online access save research time \* Updated with online access

Provides a state-of-the-science overview of arthropods affecting grape production around the world. Vineyard pest management is a dynamic and evolving field, and the contributed chapters provide

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insights into arthropods that limit this important crop and its products. Written by international experts from the major grape-growing regions, it provides a global overview of arthropods affecting vines and the novel strategies being used to prevent economic losses, including invasive pests affecting viticulture. The book contains reviews of the theoretical basis of integrated pest management, multiple chapters on biological control, current status of chemical control, as well as in-depth and well-illustrated reviews of the major arthropod pests affecting grape production and how they are being managed worldwide. This text will serve as a primary resource for applied entomologists, students, growers, and consultants with interests at the intersection of viticulture and applied entomology.

This book presents experiences and successful case studies of integrated pest management (IPM) from developed and developing countries and from major international centres and programmes. It contains 39 chapters by many contributors addressing themes such as: emerging issues in IPM, including biotechnology, pesticide policies and socioeconomic considerations (8 chapters); country experiences from Africa, Asia, North and South America, Europe, Australia and New Zealand (20 chapters); and regional and international experiences, including those of FAO, USAID, ICIPE, CIRAD, the World Bank and CGIAR Systemwide IPM Program (9

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chapters). This book will be of significant interest to those working in the areas of crop protection, entomology and pest management.

Biological control is the suppression of pest populations using predators, parasitoids and pathogens. Historically, biological control has largely been on a trial-and-error basis, and has failed more often than it has succeeded. However by developing theories based upon fundamental population principles and the biological characteristics of the pest and agent, we can gain a much better understanding of when and how to use biological control. This book gathers together recent theoretical developments and provides a balanced guide to the important issues that need to be considered in applying ecological theory to biological control. It will be a source of productive and stimulating thought for all those interested in pest management, theoretical ecology and population biology.

Egg Parasitoids in Agroecosystems with emphasis on *Trichogramma* was conceived to help in the promotion of biological control through egg parasitoids by providing both basic and applied information. The book has a series of chapters dedicated to the understanding of egg parasitoid taxonomy, development, nutrition and reproduction, host recognition and utilization, and their distribution and host associations. There are also several chapters focusing on the mass production and commercialization of egg parasitoids for biological

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control, addressing important issues such as parasitoid quality control, the risk assessment of egg parasitoids to non-target species, the use of egg parasitoids in integrated pest management programs and the impact of GMO on these natural enemies. Chapters provide an in depth analysis of the literature available, are richly illustrated, and propose future trends.

This volume discusses the sustainability of Egypt's agriculture and the challenges involved. It provides a comprehensive review and the latest research findings, and covers a variety of topics under the following themes: · Integrated natural resources management for sustainable production · Integrated biopesticides and biofertilizers for sustainable agriculture · Integrated plant and animal production for a sustainable food supply · Policies for sustainable agriculture in Egypt The volume closes with a summary of the key conclusions and recommendations from all chapters. Together with the companion volume Sustainability of Agricultural Environment in Egypt: Part I, it offers an essential source of information for postgraduate students, researchers, and stakeholders alike.

This book discusses the biological control of weeds using arthropods, providing ecological management models for use across the tropical world.

A volume of essays describing lab and field experiments that improve our understanding or ability to resolve issues surrounding endangered species and invasive plants and animals.

Annotation. Biological control has made a major contribution to integrated pest management (IPM) in

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Africa, but its documentation has been scattered and often under-reported. This book provides a review of the most important studies, including not only successes, but also on-going challenges. The focus is on arthropod pests and weeds, but diseases are also covered where significant. In 24 chapters, case studies and promising research results are presented that cover biocontrol by naturally occurring agents, by exotic agents or by seasonal manipulation. This book provides a valuable resource for scientists worldwide. It is particularly useful for pest control professionals working in Africa.

The main scientists working with enhancing fungal, bacterial, virus and insect biological control agents on different targets present the latest progress in overcoming the barrier of insufficient virulence. This multi-disciplinary group review their own work and that of others, and describe the approaches being used, the successes and the barriers yet to be overcome. There is no up-to-date equivalent work describing biocontrol, let alone enhanced biocontrol.

The loss to national economies resulting from excessive plant biomass has been appreciable and has put pressure on water managers to develop weed control procedures. The results from the most up-to-date research activities and field trials of leading aquatic plant scientists and managers in all five continents, aimed at resolving these weed problems, has been drawn together in this volume.

This book provides an invaluable review of the current methodologies used for assessing the environmental impacts of invertebrate biological agents used to control

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pests in agriculture and forestry. It explores methods to evaluate post-release effects and the environmental impact of dispersal, displacement and establishment of invertebrate biological control agents.

The abundance of insects can change dramatically from generation to generation; these generational changes may occur within a growing season or over a period of years. Such extraordinary density changes or "outbreaks" may be abrupt and ostensibly random, or population peaks may occur in a more or less cyclic fashion. They can be hugely destructive when the insect is a crop pest or carries diseases of humans, farm animals, or wildlife. Knowledge of these types of population dynamics and computer models that may help predict when they occur are very important. This important new book revisits a subject not thoroughly discussed in such a publication since 1988 and brings an international scale to the issue of insect outbreaks.

*Insect Outbreaks Revisited* is intended for senior undergraduate and graduate students in ecology, population biology and entomology, as well as government and industry scientists doing research on pests, land managers, pest management personnel, extension personnel, conservation biologists and ecologists, and state, county and district foresters. *Harmonia axyridis* has been described as the "most invasive ladybird on Earth". It has a long history of use as a classical biological control agent in the USA and more recently in Europe. This beetle has been effective at controlling pest insects in a variety of crop systems but it poses unacceptable risks by impacting on non-target

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species as both an intraguild predator and competitor. Written by renowned scientists, this book is a synthesis of recent research on *H. axyridis* and provides informative insights into current perspectives and future directions. Biological control is an essential component of sustainable agriculture but the distinction between a successful biological control agent and an invasive species can be narrow. We hope that lessons can be learnt from *H. axyridis*.

This open access volume presents a comprehensive account of all aspects of biological invasions in South Africa, where research has been conducted over more than three decades, and where bold initiatives have been implemented in attempts to control invasions and to reduce their ecological, economic and social effects. It covers a broad range of themes, including history, policy development and implementation, the status of invasions of animals and plants in terrestrial, marine and freshwater environments, the development of a robust ecological theory around biological invasions, the effectiveness of management interventions, and scenarios for the future. The South African situation stands out because of the remarkable diversity of the country, and the wide range of problems encountered in its varied ecosystems, which has resulted in a disproportionate investment into both research and management. The South African experience holds many lessons for other parts of the world, and this book should be of immense value to researchers, students, managers, and policy-makers who deal with biological invasions and ecosystem management and conservation

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in most other regions.

Insects, pests and weeds are responsible for substantial loss of crops and reduced food supplies, poorer quality of agricultural products, economic hardship for growers and processor. Generally, chemical control methods are neither always economical nor are they effective and may have associated unwanted health, safety and environmental risks. Biological control involves use of beneficial biological agents to control pests and offers an environmental friendly approach to the effective management of plant diseases and weeds. The chapters are written by well recognized group leaders in the field. This book provides a comprehensive account of interaction of host and pests, and development of biological control agents for practical applications in crops management utilizing inherent defence mechanism, induced stimulation and biological control agents. The contents are divided into the following sections: General biology of plant defence, Use of natural compounds for biological control, Use of biological agents, Mechanism of action and Commercial aspects. The book will be useful for academicians, researcher and industries involved in study and manufacturing these products.

As well as examining successful biological control programmes this book analyses why the majority of attempts fail. Off-target and other negative effects of biological control are also dealt with. Chapters contributed by leading international researchers and practitioners in all areas of biological control afford the book a breadth of coverage and depth of analysis not

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possible with a single author volume. Combined with the use of other experts to review chapters and editorial oversight to ensure thematic integrity of the volume, this book provides the most authoritative analysis of biological control published. Key aspects addressed include how success may be measured, how successful biological control has been to date and how may it be made more successful in the future. With extensive use of contemporary examples, photographs, figures and tables this book will be invaluable to advanced undergraduate and postgraduate students as well as being a 'must' for all involved in making biological control successful.

The history of biological control of harmful organisms by mites is marked by outstanding achievements with a few premiere natural enemies. Early works concentrated on the use of predatory mites for the control of synanthropic flies, More recently, the focus has been mostly on mites of the family Phytoseiidae for the control of plant feeding mites. This is an important family of acarine predators of plant pest mites, which are effectively used in agriculture worldwide. Besides the vast knowledge in several species in this family, there are as well many opportunities for biological control, represented in an array of organisms and through the improvement of management techniques, which are constantly explored by researchers worldwide. This has resulted in an increasing interest in predatory mite species within the families Stigmaeidae, Ascidae, Laelapidae, Rhodacaroidea, Macrochelidae, Erythraeidae and Cheyletidae, among others. This book will compile

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important developments with predatory mite species within these families, which are emerging as important tools for integrated pest management. New developments with predatory insects and pathogenic organisms attacking mites will also be a subject of this book. Finally, the potential and gaps in knowledge in biological control of acarine plant pests will be addressed.

### Publisher Description

Pest and disease management continues to challenge the agricultural community. The rise in new pest and crop problems juxtaposed with public concern over pesticide use and more stringent environmental regulations creates the need for today's agricultural producers to stay current with new technologies for producing quality crops profitably. *Biological and Biotechnological Control of Insect Pests* presents an overview of alternative measures to traditional pest management practices, utilizing biological control and biotechnology. The removal of some highly effective broad-spectrum chemicals, caused by concerns over environmental health and public safety, has resulted in the development of alternative, reduced risk crop protection products. These products, less toxic to the environment and easily integrated into biological control systems, target specific life stages or pest species. Predation - recognized as a suitable, long term strategy - effectively suppresses pests in biotechnological control systems. *Biological and Biotechnological Control of Insect Pests* covers these topics and more. It explores the current approaches in alternative solutions such as:

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biological control agents, parasites and predators, pathogenic microorganisms, pheromones, botanical insecticides, genetic control, genetic engineering of plants and biocontrol agents, and government regulations for biocontrol agents and recombinant DNA technology. This book will be a useful resource to entomologists, agronomists, horticulturists, and environmental scientists.

*Plutella xylostella* (DBM) is a key pest of crucifers resistant to many insecticides and some crystalendotoxins. Biological control based IPM and classical biocontrol have had varied success. How can it be improved? This book presents key papers and the proceedings of an international symposium held in Montpellier (France) in October 2002. The status of *Plutella* and control measures used in different areas of the world are discussed, and recommendations for improving biocontrol are made.

Encyclopedia of Agriculture and Food Systems, Second Edition addresses important issues by examining topics of global agriculture and food systems that are key to understanding the challenges we face. Questions it addresses include: Will we be able to produce enough food to meet the increasing dietary needs and wants of the additional two billion people expected to inhabit our planet by 2050? Will we be able to meet the need for so much more food while simultaneously reducing adverse environmental effects of today's agriculture practices? Will we be able to produce the additional food using less land and water than we use now? These are among the most important challenges that face our planet in the

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coming decades. The broad themes of food systems and people, agriculture and the environment, the science of agriculture, agricultural products, and agricultural production systems are covered in more than 200 separate chapters of this work. The book provides information that serves as the foundation for discussion of the food and environment challenges of the world. An international group of highly respected authors addresses these issues from a global perspective and provides the background, references, and linkages for further exploration of each of topics of this comprehensive work. Addresses important challenges of sustainability and efficiency from a global perspective. Takes a detailed look at the important issues affecting the agricultural and food industries today. Full colour throughout.

Biological control is among the most promising methods for control of pests, diseases and weeds, and this book treats ecological and societal aspects together for the first time. The aim is to evaluate the significance of certain biological properties like biodiversity and natural habitats. In a societal approach terms like 'consumer's attitude', 'risk perception', 'learning and education' and 'value triangle' are recognized as significant for biological production and human welfare.

Biocontrol is among the most promising methods for a safe, environmentally benign and sustainable pest control. Microbial pesticides offer a great potential, and it is anticipated that they will become a substantial part of the use of all crop protection products. Their development and commercialization, however, has been

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difficult and with many failures. In this book a rational and structured roadmap has been designed for the development and commercialization of microbial pest control products for the control of arthropod pests. The building blocks of the entire process are identified and essential aspects highlighted. Biopesticides based on entomopathogenic bacteria, fungi, viruses and nematodes are elaborately discussed. This systematic roadmap with a strong focus on economics and market introduction will assist academic researchers and industrial developers of biopesticides in accomplishing their goal: the development of successful cost-effective microbial pesticides.

This pioneering encyclopedia illuminates a topic at the forefront of global ecology—biological invasions, or organisms that come to live in the wrong place. Written by leading scientists from around the world, *Encyclopedia of Biological Invasions* addresses all aspects of this subject at a global level—including invasions by animals, plants, fungi, and bacteria—in succinct, alphabetically arranged articles. Scientifically uncompromising, yet clearly written and free of jargon, the volume encompasses fields of study including biology, demography, geography, ecology, evolution, sociology, and natural history. Featuring many cross-references, suggestions for further reading, illustrations, an appendix of the world's worst 100 invasive species, a glossary, and more, this is an essential reference for anyone who needs up-to-date information on this important topic. *Encyclopedia of Biological Invasions* features articles on:

- Well-known invasive species such

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the zebra mussel, chestnut blight, cheatgrass, gypsy moth, Nile perch, giant African snail, and Norway rat • Regions with especially large numbers of introduced species including the Great Lakes, Mediterranean Sea, Hawaiian Islands, Australia, and New Zealand. • Conservation, ecological, economic, and human and animal health impacts of invasions around the world • The processes and pathways involved in invasion • Management of introduced species

Oilseed brassicas are among the largest traded agricultural commodities and are grown in around fifty countries worldwide. Utilised for both consumption and bioenergy use, demand is increasing and this book covers the entire gamut of oilseed brassicas. Beginning with an introduction and then organised into two sections, it reviews genetics and genomics (including breeding, heterosis and selection methods) and stress management and important pathogens, to provide a complete overview of brassica oilseeds.

This book analyses the mass production and application of biological control products for biotic and abiotic factors affecting agricultural production. It also describes how to develop sustainable agriculture under Egyptian conditions. The book is divided into four parts covering: 1) mass production of parasitoids, insects and mite predators, 2) mass production of the microbial control agents for managing insect pests, 3) biocontrol products for plant diseases, and 4) bioproducts against abiotic factors. It discusses various methods of controlling insect pests and plant diseases in order to increase agricultural production, improve the quality of field crops and reduce

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the food gap by applying a range of technologies. This book helps increase our understanding and awareness of how to produce healthy products for local consumption and utilization as well as for exports.

This book, intended for all those involved in studying entomology, crop protection and pest management, has 18 review chapters on topics ranging from the ecological effects of chemical control practices to the ecology of predator-prey and parasitoid-host systems.

The noxious weed Canada thistle, *Cirsium arvense*, causes extensive problems in agricultural and conservation land worldwide. Systemic infections of the host-specific rust pathogen *Puccinia punctiformis* produce severe impacts on *C. arvense* survival and the pathogen has been explored as a potential biological control agent since 1893. Implementing successful biological control has been limited by ineffective inoculation methods, low disease incidence within weed patches, inconsistent disease latency, and lack of spread across the landscape. Overcoming these hurdles requires knowledge of *P. punctiformis* epidemiology, specifically the interplay of host-pathogen-environment, in producing severe and widespread disease. Experiments were conducted to determine the infection court and seasonal timing required for systemic *P. punctiformis* disease. Statewide Pennsylvania field trials were conducted to test a novel technique utilizing living, diseased *C. arvense* transplants as an inoculum source. Late season root inoculations with teliospores were found to be most effective at producing systemic disease. Transplanting diseased plants did not produce significant infections compared to control patches. The role of *C. arvense* landscape distribution, genetic diversity, and host resistance in limiting biological control efficacy was investigated by testing natural *C. arvense* populations from

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three sites in Pennsylvania. Landscape surveys of *C. arvensis* density showed aggregated weed distributions, but with high connectivity between patches. Host diversity within and between patches was determined with SSR markers and unique genotypes were clonally propagated and challenged with inoculations. Highly variable host resistance was observed within patches of *C. arvensis*. Pathogen movement and spread was investigated with a series of experiments to evaluate production and dispersal characteristics of the two infective *P. punctiformis* spore types. Aerial spore concentrations were measured with volumetric spore traps in naturally infected *C. arvensis* patches. Dispersal gradients were measured by releasing spores in windy field conditions and capturing spores at different distances from the source. Timing and quantity of spores released were evaluated in systemically infected thistle patches. Terminal velocities of spores were also compared in a particle settling tower. By all measures, aerial movement is significantly different between the two major spore types but both are capable of escape from weed patch canopies and landscape scale dispersal given the right meteorological conditions. Better understanding of infection conditions, pathogen dispersal and host resistance helps progression towards prescriptive applications of *P. punctiformis* for effective biological control but the litany of natural limitations delimited by this research explains why success with this pathosystem has remained elusive for so long.

This book provides recent contributions of current strategies to control insect pests written by experts in their respective fields. Topics include semiochemicals based insect management techniques, assessment of lethal dose/concentrations, strategies for efficient biological control practices, bioinsecticidal formulations and mechanisms of action involving RNAi technology, light-trap collection of

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insects, the use of sex pheromonal components and attractants for pest insect capture, measures to increase plant resistance in forest plantations, the use of various baculoviruses as biopesticides, and effect of a pathogenic bacterium against an endangered butterfly species. There are several other chapters that focus on insect vectors, including biting midges as livestock vectors in Tunisia, mosquitoes as vectors in Brazil, human disease vectors in Tanzania, pathogenic livestock and human vectors in Africa, insect vectors of Chagas disease, and transgenic and paratransgenic biotechnologies against dipteran pests and vectors. This book targets general biologists, entomologists, ecologists, zoologists, virologists, and epidemiologists, including both teachers and students.

Invasive species have a critical and growing effect upon natural areas. They can modify, degrade, or destroy wildland ecosystem structure and function, and reduce native biodiversity. Landscape-level solutions are needed to address these problems. Conservation biologists seek to limit such damage and restore ecosystems using a variety of approaches. One such approach is biological control: the deliberate importation and establishment of specialized natural enemies, which can address invasive species problems and which should be considered as a possible component of restoration. Biological control can be an effective tool against many invasive insects and plants but it has rarely been successfully employed against other groups. Safety is of paramount concern and requires that the natural enemies used be specialized and that targeted pests be drivers of ecological degradation. While modern approaches allow species to be selected with a high level of security, some risks do remain. However, as in all species introductions, these should be viewed in the context of the risk of failing to reduce the impact of the invasive species.

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This unique book identifies the balance among these factors to show how biological control can be integrated into ecosystem restoration as practiced by conservation biologists. Jointly developed by conservation biologists and biological control scientists, it contains chapters on matching tools to management goals; tools in action; measuring and evaluating ecological outcomes of biological control introductions; managing conflict over biological control; and includes case studies as well as an ethical framework for integrating biological control and conservation practice. *Integrating Biological Control into Conservation Practice* is suitable for graduate courses in invasive species management and biological control, as well as for research scientists in government and non-profit conservation organizations.

*Biological Control: Global Impacts, Challenges and Future Directions of Pest Management* provides a historical summary of organisms and main strategies used in biological control, as well as the key challenges confronting biological control in the 21st century. Biological control has been implemented for millennia, initially practised by growers moving beneficial species from one local area to another. Today, biological control has evolved into a formal science that provides ecosystem services to protect the environment and the resources used by humanity. With contributions from dedicated scientists and practitioners from around the world, this comprehensive book highlights important successes, failures and challenges in biological control efforts. It advocates that biological control must be viewed as a global endeavour and provides suggestions to move practices forward in a changing world. *Biological Control* is an invaluable resource for conservation specialists, pest management practitioners and those who research invasive species, as well as students studying pest management

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science.

This book contains 11 chapters by 35 contributors, which are noticed elsewhere. The papers were presented at an international symposium held in Montpellier, France, on 17-20 October 1999.

The book 'Silent Spring' written by Rachel Carson in 1962, is considered the landmark in changing the attitude of the scientists and the general public regarding the complete reliance on the synthetic pesticides for controlling the ravages caused by the pests in agriculture crops. For about several decades, the Integrated Pest Management (IPM) is the accepted strategy for managing crop pests. IPM was practiced in the Amazon Valley, Peru in 1950s, even before the term IPM was coined. Integrated Pest management: Innovation-Development Process, Volume 1, focuses on the recognition of the dysfunctional consequences of the pesticide use in agriculture, through

research and development of the Integrated Pest Management innovations. The book aims to update the information on the global scenario of IPM with respect to the use of pesticides, its dysfunctional consequences, and the concepts and advancements made in IPM systems. This book is intended as a text as well as reference material for use in teaching the advancements made in IPM. The book provides an interdisciplinary perspective of IPM by the forty-three experts from the field of entomology, plant pathology, plant breeding, plant physiology, biochemistry, and extension education. The introductory chapter (Chapter 1) gives an overview of IPM initiatives in the developed and developing countries from Asia, Africa, Australia, Europe, Latin America and North America. IPM concepts, opportunities and challenges are discussed in Chapter 2.

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