

**A New Publication:  
IRRIGATED ALFALFA PRODUCTION FOR MEDITERRANEAN AND  
DESERT ZONES**

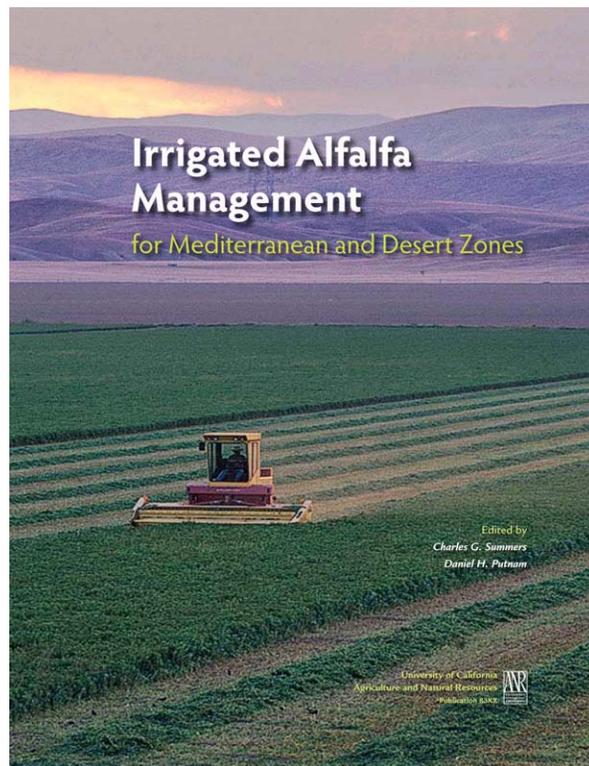
**Dan Putnam, Charles Summers (eds.), Khaled Bali, Mick Canevari, Carlos Cangiano, Alejandro Castillo, Michael Davis, Ed DePeters, Carol Frate, Juan Guerro, Larry Godfrey, Blaine Hanson, Jerry Higgenbotham, Karen Klonsky, Dan Marcum, Marsha Campbell Mathews, Roland D. Meyer, Shannon Mueller, Eric Natwick, Steve Orloff, Nyles Peterson, Barbara Reed, Peter Robinson, Ann Rodiek, Blake Sanden, Jerry Schmierer, Carolyn Stull, Larry Teuber, Dan Undersander, Ron Vargas, Becky Westerdahl (authors)<sup>1</sup>**

**ABSTRACT**

The University of California Alfalfa Workgroup is pleased to announce the upcoming publication of a new production manual, “Irrigated Alfalfa Production for Mediterranean and Desert Zones.” This manual will be available both as an on line publication and a hard copy to be published in early 2008. In total, it is approximately 400 pages, with full color plates for alfalfa disease, fertility symptoms and other diagnostics. This manual is designed in ‘modules’ which can be used as individual units, and also fit into a sequence that describes the whole range of alfalfa production issues, from stand establishment through pest management and utilization and economics. Currently, chapters are available at <http://alfalfa.ucdavis.edu/irrigatedalfalfa>. It is anticipated that this manual will be fully on-line shortly after the first of the year and will be available in printed format by March 2008.

**IRRIGATED ALFALFA – FROM A TO Z**

The purpose of this manual and web series is to provide detailed, scientifically-based information about the growth, production, management, and utilization of alfalfa grown under irrigation, particularly in Mediterranean and desert zones. This publication was developed to provide a resource to



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serve the needs of an applied, diverse audience with interests in alfalfa. This publication covers nearly all practical issues associated with alfalfa production in our region.

### **OUR INTENTIONS**

This publication is designed in a combination on-line and book format so that it fulfils a role as a downloadable document for specific subjects, and also serves as a comprehensive guide for irrigated alfalfa production and management. This manual is intended for use by growers, managers, consultants, agents, and advisors, but it is anticipated it will be useful to anyone who grows irrigated alfalfa world wide. It was our intention to provide a useful comprehensive reference of important production information which would have sufficient depth to be of use to both experienced and novice growers or advisors, but be readily accessible to those who simply need specific pieces of information or a handy reference. We also designed it in such a way that it could be readily updated using the world wide web and other resources as new knowledge becomes available. Thus, we envision this as both an on-line resource and as a published document.

### **THE AUTHORS**

In this series, we have tapped the interdisciplinary expertise of members of the University of California Agricultural Experiment Station and Cooperative Extension, members of the UC California Alfalfa Workgroup, and colleagues from neighboring regions. Although there is much useful information contained herein for *all* alfalfa producers, the emphasis is heavily weighted towards our experiences with alfalfa production in the Great Central Valley of California, the deserts of Southern California and several neighboring states. These articles have each been through peer-review process, and is published through the University of California Division of Agriculture and Natural Resources. We wish to thank all of the anonymous reviewers of this publication for their exhaustive efforts in reviewing and improving the manuscripts. Each chapter has been professionally copy edited and laid out prior to publication.

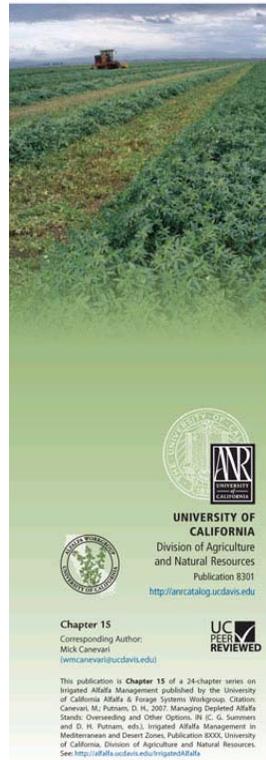
### **THE SCOPE**

This series begins with an overview of alfalfa production in Mediterranean and desert zones of California, statistical information, the history of alfalfa, common production methods, and alfalfa's role in cropping systems and economics in these regions. The next several chapters discuss the importance of getting the crop off to a good start including site selection, variety selection, alfalfa growth and stand establishment. The next several chapters discuss important issues relating to managing the alfalfa stand once it is established including fertilization and irrigation. The pest management chapters cover each individual pest and group of pests: weeds, insects, diseases, nematodes, and vertebrates. Harvesting and utilization are covered in several chapters on harvest management, curing and storage, forage quality, utilization by livestock and industrial uses. Overseeding and old stand management are covered in a separate chapter (Fig. 2) as is economics and marketing. A series of special topics including organic alfalfa, seed

production, grazing alfalfa, use of wastewater or manures on alfalfa and diagnostic tools are covered in separate chapters, totaling 24. The latter diagnostic chapter is a pictorial key that identifies the primary pests of alfalfa including insects, diseases, weeds, nematodes and vertebrates and identifies herbicide injury, mineral deficiencies, and abiotic stresses.

The manual is richly illustrated with a large number of professional color photographs depicting various aspects of alfalfa production, crop management, and the identification of pests, natural enemies, mineral deficiencies and herbicide injury.

These chapters have been deliberately conceived as ‘stand alone’ units, so that they can be used to focus on specific issues for specific needs, as well as to be used as chapters in the overall published book format. The book format provides the user with all of the essential information on producing alfalfa in one text.



## Managing Depleted Alfalfa Stands: Overseeding and Other Options

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The productivity of alfalfa fields typically declines over time due to loss of plants and weakening of crowns from disease or other factors. These factors include traffic injury, nematodes, insect damage, weed competition, winter injury, compaction of soils, saturated soil, drought and heat stress, and rodents. As stands decline, weeds invade open areas and become more difficult to control. Eventually, yield and forage quality decline to a point where a difficult decision must be made as to whether to keep or remove an alfalfa stand. Compelling economics may encourage some growers to remove old alfalfa stands to plant crops of higher value. Alternatively, lack of rotation opportunities may encourage others to look for ways to extend the life of their alfalfa stands, including overseeding grasses or legumes to improve productivity. Continuing to harvest a depleted stand may not be economical, especially when yields fall significantly, such that the costs of production exceed potential returns.

Figure 2. Each of 24 chapters addresses a specific issue, such as this chapter on overseeding and old-stand management.

## TABLE OF CONTENTS

Following is a Table of Contents including the authors of each chapter along with a selected quote for each chapter.

### **Chapter 1—Alfalfa Production Systems in California-Daniel H. Putnam and Charles G. Summers.**

*“Alfalfa is considered the ‘Queen of Forages’ and is unrivaled among forage crops due its combination of high quality, high yield, stand persistence, wide adaptation, biological N fixation and soil benefits. It is an ‘engine of human food production’, eventually transformed into milk, cheese, meat, wool and even honey”.*

### **Chapter 2—Choosing Appropriate Sites for Alfalfa Production-Steve B. Orloff**

*“One of the first steps before embarking on alfalfa production is selecting the proper site. This is a critical step, as site conditions can limit both yield and profit potential. The characteristics of a site affect both the yield and quality of alfalfa.”*

### **Chapter 3—Alfalfa Growth and Development-Shannon C. Mueller and Larry R. Teuber**

*“All aspects of alfalfa management require a thorough understanding of the growth and development of the crop. Basic knowledge of botanical aspects of alfalfa, its growth patterns and requirements is the key to better management of a healthy, productive stand...”*

**Chapter 4—Alfalfa Stand Establishment-Shannon C. Mueller, Carol A. Frate and Marsha Campbell Mathews**

*“Time spent planning and preparing for stand establishment pays off in many ways resulting in a dense, vigorous stand that produce high quality, high yielding alfalfa crops for many years.”*

**Chapter 5—Choosing an Alfalfa Variety-Daniel H. Putnam, Steve B. Orloff and Larry R. Teuber**

*“Variety selection is an important factor in alfalfa production, affecting crop yield, quality, and pest management. Selection of a top variety requires just a small degree of foresight, but yields large dividends in crop performance and profit.”*

**Chapter 6—Fertilizing Alfalfa for Maximum Production and Quality-Roland D. Meyers, Daniel H. Putnam, Steve B. Orloff and Jerry I. Schmierer**

*“Providing an adequate supply of nutrients is important for alfalfa production and is essential to maintain high and profitable yields. The process includes an analysis of which nutrients are needed, selection of the proper fertilizer, application timing and placement, economics, record keeping, and environmental considerations.”*

**Chapter 7—Irrigating Alfalfa in Arid Regions-Blaine R. Hanson, Khaled M. Bali and Blake Sanden**

*“Properly managing a system for maximum profit requires good irrigation scheduling, which involves determining when to irrigate and how much water to apply.”*

**Chapter 8—Weed Management in Alfalfa- Mick Canevari, Ron Vargas and Steve B. Orloff**

*“Weeds are serious economic pests of alfalfa.. Weeds in alfalfa directly compete for the same resources required for alfalfa development. If weeds are left uncontrolled, they will reduce alfalfa yield and weaken or even destroy the stand.”*

**Chapter 9—Managing Insects in Alfalfa-Charles G. Summers, Larry D. Godfrey and Eric T. Natwick**

*“California alfalfa is home to over 1000 species of arthropods. Of these, only about 20 cause injury and even fewer can be considered as serious pests. Alfalfa has been called “the insect nursery of the Central Valley” since it is home to many predators and parasites that move into other cropping systems and provide biological control of pests...”*

**Chapter 10—Alfalfa Diseases and Management-Carol A. Frate and R. Michael Davis**

*“For a plant disease to develop, the variety must be susceptible, the pathogen that causes the disease must be present, and the right environment must occur. For the most part, temperature and humidity are the environmental factors that determine if a disease will occur once the susceptible host and the pathogen are present.”*

**Chapter 11—Parasitic Nematodes in Alfalfa-Becky G. Westerdahl and Carol A. Frate**

*“Strategies for managing nematodes in alfalfa include site selection, the use of certified seed, the importance of using clean equipment and irrigation water, weed management, the use of resistant varieties, crop rotation, fallow, organic amendments, and chemical nematicides.”*

**Chapter 12—Integrated Management of Vertebrates in Alfalfa-Desley A. Whisson and Terrell Pl Salmon**

*“The most successful management approach is one that aims to manage vertebrate pest populations at levels at which significant damage never occurs. This requires knowledge of the biology and behavior of the potential pests and regular monitoring.”*

**Chapter 13—Harvest Strategies for Alfalfa-Steve B. Orloff and Daniel H. Putnam**

*“Alfalfa yield and forage quality are almost always inversely related within a growth cycle. Cutting alfalfa at an immature growth stage (short interval between cuttings) results in relatively low yield but high forage quality. Conversely, cutting alfalfa at a mature growth stage (long interval between cuttings) results in high yield but low forage quality.”*

**Chapter 14—Harvest: Curing, Preservation, and Storage of Alfalfa-Steve B. Orloff and Shannon C. Mueller**

*“The goals of harvesting are to cut alfalfa at the growth stage that provides the optimum combination of yield and quality and to maintain quality and minimize losses through proper preservation..”*

**Chapter 15—Managing Older or Depleted Alfalfa Stands-R. Mick Canevari and Daniel H. Putnam**

*“When faced with a declining alfalfa stand, growers may remove the stand and rotate to another crop, continue to harvest a depleted stand or attempt to extend the stand life and increase production by overseeding another species or overseeding alfalfa.”*

**Chapter 16—Forage Quality and Testing-Daniel H. Putnam, Peter H. Robinson and Edward J. DePeters**

*“Forage quality requirements affect both marketing and crop management, and the demands for high quality by the marketplace have been relentless. Although crop yield is still the primary economic factor determining crop value per unit land area, forage quality has rapidly become a close second.”*

**Chapter 17—Alfalfa Utilization by Livestock—Dairy, Horses, Sheep and Goats-Gerald E. Higginbotham, Carolyn L. Stull, Anne B. Rodiek, Barbara A. Reed, Nyles G. Peterson, and Juan N. Guerrero**

*“Nutritionists favor alfalfa hay for its high energy content, its ability to digest rapidly in the rumen and its high protein level, which supports the protein needs of the dairy cow. Alfalfa hay may not be the best feed for all horses in all situations, but it contains nutrients for many classes of horses”*

**Chapter 18—Alfalfa Grazing Management-Carlos A. Cangiano, Alejandro R. Castillo, Juan N. Guerrero and Daniel H. Putnam.**

*“There is increased interest in grazing in North America due to harvest costs, environmental benefits, and interest in organic, natural, or grass-fed products in the market, and in increased interest in animal welfare.”*

**Chapter 19—Utilization of Alfalfa for Industrial and Other Uses-Shannon C. Mueller, D. J. Undersander and Daniel H. Putnam**

*“The potential also exists for alfalfa to be used for industrial purposes providing farmers with new high-value, profitable products. Exploitation of these potential food, feed, and industrial products will expand markets for alfalfa..”*

**Chapter 20—Lagoon Water, Manures and Biosolids Applied to Alfalfa-Roland D. Meyers, Blake L. Sanden and Khaled M. Bali**

*“Animal wastes are a valuable resource in the production of a number of crops. Many crops, including alfalfa, require large quantities of nitrogen, phosphorus, potassium and other nutrients which can be supplied by lagoon water and solid manures.”*

**Chapter 21—Producing Alfalfa Hay Organically-Rachael F. Long, Roland D. Meyers and Steve B. Orloff**

*“Despite the extensive knowledge and recordkeeping needed to produce alfalfa organically, the rise in the demand for organic feed makes alfalfa an attractive crop for some organic farmers where there can be a 15% or higher premium over conventionally grown alfalfa.”*

**Chapter 22—Alfalfa Seed Production in California-Shannon C. Mueller**

*“The primary market for alfalfa seed produced throughout the world is the forage market. Seed is planted to produce alfalfa for grazing, greenchop, silage, baled hay, cubes, or pellets to support the livestock industry including dairy, beef, horses, and sheep. A small fraction of the total production is utilized by the sprout industry.”*

**Chapter 23—Alfalfa Marketing and Economics-Karen M. Klonsky, Barbara A. Reed and Daniel H. Putnam**

*“There are several potential business strategies for alfalfa hay production that growers might employ to meet market expectations. They include the low cost production strategy, product quality differentiation or niche marketing strategy, and provision of additional service strategy.”*

**Chapter 24—Diagnostic Key to Problems in Forage Alfalfa-Charles G. Summers**

*“This key is a quick guide to some of the more common problems, including insects, diseases, vertebrate pests, herbicide injury and mineral deficiencies, found in forage alfalfa.”*

**SUMMARY**

This comprehensive new publication “Irrigated Alfalfa Production for Mediterranean and Desert Zones”. provides a significant new opportunity to learn about alfalfa production methods. All aspects of alfalfa are covered., and individual chapters may be downloaded from the internet. To purchase a copy of this book, see <http://alfalfa.ucdavis.edu>.