



California Agriculture

JANUARY-FEBRUARY 1992
Volume 46 Number 1

*Invasion forecast:
the exotic pest threat*



KENNETH R. FARRELL
Vice President
Agriculture and Natural Resources

Exotic pest research well worth the price

This special issue of *California Agriculture* vividly illustrates that exotic pests may impose huge potential losses on California agriculture and the statewide economy. It also defines some serious gaps in our scientific knowledge of these pests — knowledge needed to undergird effective prevention, eradication, and control programs for the lengthening list of exotic pests to which California agriculture is vulnerable.

The risk of major economic loss to these pests is magnified by increasingly stringent public regulation of pesticides, by genetic resistance of pests to the diminishing number of chemical controls still available, and, in some cases, by the absence of any effective controls for certain pests — illustrated by the devastating invasion of sweetpotato whitefly in Southern California.

If we are to address these risks in an effective, intelligent manner — rather than lurching from crisis to crisis using the most expedient means available — several actions are necessary. As indicated by Dowell and Krass, we need strong programs to prevent entry of exotic species. As Carey points out, “Sound exclusion policy for the future must be based on detailed and in-depth understanding of the nature of the introduction problem. . .”

To provide that in-depth understanding, a “Manhattan project” type research program supported by the state and federal governments and the agricultural industries is needed now. The program should be targeted to scientifically well-defined, mission-oriented objectives, multidisciplinary in nature, leading to integrated use of pest control technologies with emphasis on biological control. UC scientists, as well as the “blue ribbon” committee which I appointed in 1990 to address Mediterranean fruit fly problems, have described the framework for such a program.

A major constraint on the development of needed research is the inadequacy of research facilities at the University and throughout the western United States, as well as in other vulnerable states such as Florida and Texas, and at the Agricultural Research Service of the United States Department of Agriculture (USDA).

At the direction of the House and Senate Agricultural Appropriations Subcommittees in 1991 as well as the California Legislature in 1990, the University, in collaboration with the California Department of Food and Agriculture (CDFA) and USDA, has developed a facilities proposal which, if funded, would constitute a giant step forward in

research to address pest management issues into the 21st century.

The research strategies upon which the facilities proposal is based are premised on the need for increased use of parasites, microorganisms, predators, and genetically engineered organisms such as disease-resistant plants or more potent microbial insecticides. Sophisticated biological pest control methods are now possible due to the recent development of recombinant DNA technology which allows the cloning of genes and stable insertion of such genes into insects, plants or microorganisms. To conduct the necessary research on exotic or genetically engineered biocontrol agents requires “state-of-the-science” quarantine and physical containment facilities to ensure safety before field releases are made. These facilities do not now exist at the University or anywhere else in the western U.S.

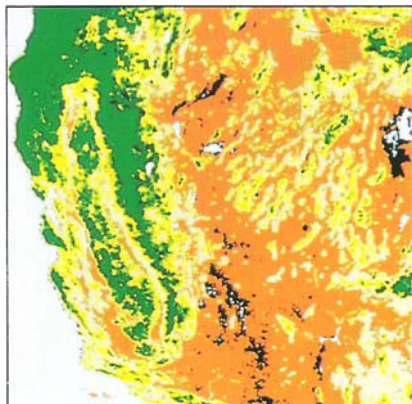
The proposal would provide such facilities on the Davis and Riverside campuses, expanding their current programs in biological control. It calls for three-way participation by the University, CDFA, and USDA. The facilities would be available for use by scientists from other states as well as state and federal research agencies. Cost of the facilities is estimated at \$25 million to \$35 million.

The proposal has been reviewed by a panel of five scientists appointed by the Cooperative State Research Service, USDA, in a site visit in mid-1991. The panel concluded “the benefits to agriculture are potentially very large. Biological controls will lessen the need for the use of synthetic chemical pesticides and this will help commercial agriculture to remain competitive at the international level. The intelligent use of recombinant organisms in a multitude of ways will benefit agriculture by enhancing the efficacy of some components of integrated pest management (IPM), providing greater options by identifying new products, and probably opening new markets.”

Public investment in agricultural research has yielded large benefits to American agriculture and consumers, domestic and foreign, during the past century. Now the advancement of productivity and competitiveness in agriculture must be coupled with public goals of environmental protection. New investments in science are needed now to make these goals a reality in the 21st century. Investing in pest management research and extension is one of the most important commitments we can make for the benefit of agriculture and society as a whole.

In this issue

Special report: exotic pests



Cover photo: Registered by a satellite sensor 35,000 kilometers above Earth, the red tones of the infrared image on the cover indicate reflectance by green, photosynthesizing plants.

Such satellite images can be used to generate maps of vegetative cover (as seen above), using a Normalized Difference Vegetation Index (NDVI). NDVI images help track and predict the spread of exotic pests. (Cover photo and computer image courtesy of NASA Ames Research Center; the latter was generated by William Acevedo and Liane Guild.)

5 **UC develops expanded agenda to combat exotic pests**

Lyons

UC has recently established the Center for Pest Management Research and Extension.

6 **Exotic pests pose growing problem for state**

Dowell, Krass

Major pest threats are profiled, as are the CDFA's exclusion and eradication efforts.

9 **Plant quarantines: domestic strategies yield to international policies**

Zadig

Domestic regulatory policies are changing in response to international trade.

12 **The Mediterranean fruit fly in California: taking stock**

Carey

The medfly has been captured in California 11 years since 1975, and probably poses a long-term threat.

18 **How Africanized honey bees will affect California agriculture**

Page

Within the next three years, Africanized honey bees are expected to invade Southern California.

20 **Long-term studies to gauge effects of invading bees**

Thorpe, et al.

Long-term studies have documented the ecological importance of native and introduced bees.

24 **Biological control of ash whitefly: a success in progress**

Bellows, et al.

Two natural enemies of ash whitefly proved effective in Southern California field trials.

25 **Sweetpotato whitefly: prospects for biological control**

Parrella, et al.

Origins of the current problem and potential biological control agents of the sweetpotato whitefly are discussed.

29 **Imported fire ants: potential risk to California**

Lewis, et al.

Since 1987, 758 intercepts of fire ants at the state's border inspection stations have been reported.

32 **Russian wheat aphid: natural enemies, resistant wheat offer potential control**

Gonzalez, Summers, Qualset

Coordinated UC research efforts are underway to manage this severe pest of small grains.

35 **"Organizational classes" explain differences between westside farms**

Campbell, Dinar

Five organization types were defined in this study of farms on the westside of the San Joaquin Valley.

39 **1991 Index**

California Agriculture

Director of External Relations: Al Donner

California Agriculture is published bimonthly by the Division of Agriculture and Natural Resources, University of California, 300 Lakeside Dr., 6th floor, Oakland, CA 94612-3560. Telephone: (510) 987-0044. Mailed at second class postage rates at Oakland, CA and at additional mailing offices. Postmaster: Send change of address "Form 3579" to *California Agriculture* at the above address. (ISSN 0008-0845)

SUBSCRIPTION RATES: Free upon request in U.S.; \$12 yearly outside the U.S. (check or Interna-

Reports of Progress in Research by the Division of Agriculture and Natural Resources, University of California

VOLUME 46, NUMBER 1

Managing Editor: Janet White Art Director: Pamela Fabry Circulation Manager: Lorrie Mandoriao

tional Money Order in U.S. funds payable to UC REGENTS). MasterCard/Visa accepted; requests require signature and card expiration date. Library subscriptions are free. Single copy price \$2. For a change-of-address, send old label or subscription number. Articles published herein may be reprinted, provided no advertisement for a commercial product is implied or imprinted. Please credit *California Agriculture*, University of California. No endorsement of products named in articles is intended.

In accordance with applicable State and Federal Laws the University of California does not discriminate in any of its policies, procedures, or practices on the basis of race, religion, color, national origin, sex, marital status, sexual orientation, age, veteran status, medical condition, or handicap. Inquiries regarding this policy may be directed to the Affirmative Action Director, University of California, Agriculture and Natural Resources, 300 Lakeside Drive, 6th floor, Oakland, CA 94612-3560. (510) 987-0097.

Special report: exotic pests

The sweetpotato whitefly has destroyed more than \$200 million in crops, the medfly has cost the state more than \$150 million in 10 eradication efforts, and the approaching Africanized honey bee threatens crops worth \$1.8 billion a year. No matter how you look at it, the cost of exotic pests is high, and with increasing international trade, travel and immigration, imported pests are likely to increase as well.

In this issue, California Agriculture provides a forum for scientists who specialize in exotic pests, both from UC and the California Department of Food and Agriculture (CDFA). Some inherent differences in viewpoint are expressed; CDFA is mandated to take regulatory actions based on established practice, while university research — by its nature — often questions such practice. These differences have been cross-referenced.

The first article provides an overview and introduces UC's recently established Center for Pest Management Research and Extension. (Ed.)

Taken through the glass wall of an observation hive in Brazil, photo shows Africanized queen bee waiting to be fed and groomed by worker bees stimulated by a special pheromone she has emitted. (Norman Gary)

