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Integrated Pest Management

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This issue is the second of two parts on the topic of pesticide use in the Caribbean. As summarized in part one, pesticide use has helped to establish the agricultural sector as a mainstay of the Caribbean economy, but environmental and health concerns have shaken the foundations of agrochemically-based crop protection. Chemicals released into the environment pose a threat to once-pristine natural resources and, through direct exposure or bioaccumulation, to the health of living organisms all the way to the top of the food chain. Little is understood about what happens to pesticides once they enter the environment or what long-term adverse effects they might cause. This knowledge deficit, together with increased international concern over growing evidence of environmental decline has paved the way for alternative pest management approaches, most prevalently, Integrated Pest Management (IPM). By pairing IPM practices with a policy supporting sustainable development, new crop protection measures can exceed the immediate goal of pesticide use reduction. Implementation of alternative controls under such a policy will require institutional innovations and networked collaborations at local, national and regional levels which, in the long run, will strengthen the role of the farmer, and increase production capacity while protecting fragile ecosystems. This issue of Caribbean Currents provides a brief history of the IPM approach to pest control and the challenges inherent in developing sustainable IPM programs that move the practice of crop protection at a local level toward the global imperatives of natural resource protection and conservation.

In the Caribbean, as elsewhere around the world, the responses to the problems posed by pesticide use range from risk reduction programs, designed to communicate to farmers that there *is* a problem, to organic farming initiatives capable of competing in newly developing environmentally-conscious global markets. Between these two extremes lies IPM, often referred to as a "continuum" of options,

Welcome to *Caribbean Currents*, Volume Eight, Number Four. This newsletter is edited by UNEP-Infoterra/USA in its capacity as the Regional Service Center (RSC) for UNEP-Infoterra National Focal Points (NFPs) in the English- and French-speaking Caribbean. Although *Caribbean Currents* is assembled at UNEP-Infoterra/USA, the content belongs to you, the readers. You are encouraged to send in any questions, comments, problems, or interesting issues relevant to the Region for inclusion in *Caribbean Currents*. Please see the "Guidelines for Contributions" on page 8 for more information.

Each issue features a directory of NFPs in the region so that anyone with international environmental questions can contact their nearest resource. Please feel free to contact one another as well as your RSC for assistance or materials.

Please don't hesitate to share *Caribbean Currents* with your friends and colleagues, and to make copies as needed. *Caribbean Currents* should serve as an informational forum for anyone who lives, works, or is involved in environmental issues in the Caribbean.

designed to optimize pest control while reducing pesticide use and, more recently, to promote sustainable agricultural practices.

A Brief History of Integrated Pest Management

The term IPM was first coined to distinguish an approach to pest control which offered an alternative to excessive dependence on pesticides. It has since evolved to describe a whole new way of thinking of crop protection, based on ecological principles, in the context of sustainable agricultural development and natural resource management (Consultative Group on International Agricultural Research (CGIAR), 1998).

The agrochemical era, ushered in by the promise of DDT and other broad spectrum chemicals introduced in the 1940s, has suffered setbacks due to concern over unforseen harmful side-effects that repeatedly surfaced with successive generations of synthetic chemicals. The excitement occasioned by DDT and other organochlorines was grounded in their ability, at low doses, to eradicate almost all insect species. This enthusiasm was quickly tempered by the unanticipated speed with which targeted pests developed resistance and secondary pest outbreaks occurred (Ruttan as in Radcliffe's, 2000). Originally referred to as "Integrated Control", IPM was developed by entomologists at the University of California in the late 1950s in response to these pesticide-induced outbreaks. They recommended a new strategy which employed biological and other natural controls to *manage* rather than eradicate pest populations by reducing the number of pests to an economically acceptable level through reliance on natural enemies (Moore, 1996). Cast in an ecological framework, integrated control required extensive knowledge of the target system, gained in part through monitoring and scouting pests, and calculation of action thresholds beyond which backup support would be required (U.S. Environmental Protection Agency (EPA), 1999). Chemicals, assigned this backup role, would be judiciously "integrated" into the control process when biocontrols were determined to be ineffective. Though initially the role of chemicals was diminished and emphasis was on ecologically-based pest control, by the early 1980s the emphasis had clearly shifted toward inclusion of chemicals into a mix of pest control tactics that relied heavily on improved timing of pesticide applications and development of pest resistance management strategies. What had begun as an alternative to pesticide use had gradually come to resemble what some termed "integrated pesticide management" (Moore, 1996). Ecologically-based IPM regained a foothold as global concern over the risks of excessive pesticide use mounted. Pesticides were destroying beneficial insects, and concern was growing over their indirect effects on wildlife and human health. These concerns were galvanized by Rachel Carson's Silent Spring (published by Fawcett Crest, 1964) which sounded an alarm on the chemical poisoning of the environment (Ruttan as in Radcliffe's, 2000).

The IPM - Sustainable Agriculture Link

Beginning with the 1960s, a period of broadening environmental consciousness led to protective action at the governing level. Environmental regulations were enacted in most developed nations and international bodies demonstrated a firm resolve to stem the environmental decline that was becoming increasingly evident worldwide. Beginning with the Stockholm Declaration of the United Nations Conference on the Human Environment in 1972, international law widened its focus from narrowly defined issues to broader efforts seeking to preserve and protect the global environment (Burnett, 2000). A number of subsequent international laws built on the Stockholm Declaration's call for "governments and peoples to exert common efforts for the preservation and improvement of the human environment" (United Nations Educational, Scientific, and Cultural Organization, 2000). Concepts such as "sustainable agriculture and rural development", or SARD, gradually found international acceptance and support. Formally defined in 1988 by the United Nations Food and Agriculture Organization (FAO), SARD "conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable" (Hansen as in Moore, 1996). SARD's role was further articulated as a part of "a declaration and action agenda for replacing chemical-intensive agriculture with more sustainable and holistic agricultural production," with an emphasis on farmer and rural community participation (FAO as in Moore, 1996). IPM was officially linked to sustainable agricultural development in 1992 at the United Nations Conference on Environment and Development in Rio de Janeiro, which reaffirmed the earlier Stockhom Declaration. The conference, better known as the Earth Summit, "formally recognized the threat posed to human health and the environment by excessive pesticide use and, in its Agenda 21 action plan for achieving sustainable

"SARD conserves land, water, plant and animal genetic resources...is economically viable and socially acceptable."

development in the 20th century, declared IPM to be a key element in sustainable agricultural development" (CGIAR, 1998).

IPM in the Caribbean

Limited resources, high transportation and communication costs, lack of economies of scale, and other economic and ecological vulnerabilities complicated the task of responding to Agenda 21 for the Small Island Developing States (SIDS). In their support of Agenda 21, the Caribbean nations would benefit as a region by acting collectively to shape policy, enact legislation, and create innovative institutional infrastructures to coordinate a reorientation to SARD. With this in mind, the United Nations convened a Global Conference for the Sustainable Development of Small Island Developing States in Barbados in the spring of 1994. Participants drafted an action plan, the Barbados Programme of Action for the Development of SIDS, which set forth policies, actions, and measures to be implemented at the national, regional and international levels in support of sustainable development capacity (United Nations Department of Economic and Social Affairs, 2000).

Within a few months, representatives from 14 Caribbean nations formulated a series of recommendations calling for area governments to adopt a series of Integrated Pest Management policies, chief among them, to "explicitly adopt IPM as national policy for sustainable agricultural development" (Deutsch, 1995). In linking adoption of IPM with a policy of sustainable agricultural development, the Caribbean agricultural sector could begin to respond to Agenda 21's call for increased production to meet food demands projected to double by the year 2050 (National Resources Institute (NRI), 2000). Adoption of SARD-compatible IPM practices was a viable, if challenging, route to boosting production *without* heavy reliance on agrochemicals. Perhaps the best way to represent this agricultural reorientation is to view the function of IPM adoption as a dynamic process, or "continuum", moving from treatment-centered, chemically-based farming practices on one end to prevention-centered, farmer-participatory, biointensive approaches on the other (Lynch, 1998). A farmer's location along the continuum at any given time would depend on a number of factors including awareness of pesticide risk, regulatory compliance, access to information on alternate control techniques, technical and economic ability to implement new methods, and degree of commitment to SARD-compatible practices.

In many areas of the Caribbean, the shift toward farmer-centered biointensive IPM would have to begin with disposal of obsolete pesticides and the establishment or upgrading of national pesticide registration and control schemes. Post-registration activities would involve training, monitoring and enforcement of proper pesticide use within IPM principles (FAO, 1998). Such activities are already underway. Over the past 5 years, for example, Jamaica inventoried and disposed of 8,000 kg of obsolete pesticides, began licensing procedures for over 80% of local pesticide manufacturers and conducted a public awareness campaign on the safe handling of pesticides, reaching over 20,000 people in all of the island's 13 parishes (Organization for Economic Cooperation and Development, 2000).

An IPM Toolkit

Moving along the continuum toward bio-intensive IPM practices is a growing inventory of approaches, some rooted in tradition and others derived from advances in the biotechnology industry. All require farmer expertise in pest identification and a thorough understanding of natural enemies and crop ecosystem dynamics - not entirely unfamiliar ground for the Caribbean farming community. Indigenous farmers traditionally used biological, cultural and physical controls finely tuned over many years to local conditions. Biological control protects crops by using beneficial organisms - predators, parasites, and diseases - to suppress pest organisms. Releases of the larval parasitic *cotesia flavipes*, for example, have controlled the sugar cane moth borer in Barbados, saving $5 million annually. Cultural control, by contrast, uses rotations, cultivation, sanitation and other farm practices that reduce persistent pest problems. A form of cultural control using IPM methods of plant cover has boosted yields and has significantly lowered levels of viral infection in the tomato variety Gemstar. Physical control, as its name implies, uses barriers, traps, trap crops, adjusting planting location or timing to evade or diminish pest pressure (Pennsylvania IPM Program, (n.d.) & Caribbean Agricultural Research and Development Institute, 2000). A remarkably successful application of physical control made worldwide headline news recently when China publicized the stunning results of a new crop protection method that has "doubled the yields of their most valuable crop and

"Releases of cotesia flavipes...have controlled the sugar cane moth borer...saving $5 million annually."

nearly eliminated its most devastating disease - without using chemical treatments or spending a single extra penny." A simple change in planting methods, from growing one large stand of a single kind of rice to growing alternating rows of different kinds of rice in the same field, blocked the airborne spores of rice blast fungus, a disease which "destroys millions of tons of rice and costs farmers several billion dollars in losses each year" (Yoon, 2000).

Biocontrols have also been used extensively in Cuba where economic conditions forced a rapid shift along the "continuum" from conventional high-input chemical agriculture to organic or semi-organic farming. In a matter of 3 years an estimated 56% of Cuban cropland was treated with biocontrols at an annual savings of over $15.5 million. One of the biocontrols on which Cuban researchers have focused is the latest tool in the IPM mix - a promising and potentially controversial category of unconventional pesticides called biological pesticides (World Resources Institute (WRI), 2000).

Biological Pesticides

A high-tech spinoff of the biotechnology industry, biological pesticides, or biopesticides, are pest management techniques derived from naturally occuring beneficial microorganisms such as bacteria, viruses, fungi and protozoa as well as other biologically-based active ingredients. Biopesticides fall into three distinct groups. The first are biochemical pesticides, which control pest populations through the introduction of growth regulators that interfere with growth or mating, or through pheremones which repel or attract pests. The next group, microbial pesticides, relies on a microorganism, most commonly from the bacterium *Bacillus thuringiensis*, or Bt, which contains a protein harmful to specific insects. The third group, also the one responsible for most of the concern associated with biopesticides, is plant-pesticides. Plant-pesticides are insect-destroying substances, manufactured in the plant itself, after genes from a harmful substance - such as the Bt protein - are introduced into the plant's own genetic material. Using plant-pesticides, farmers avoid the risk of toxic chemical poisoning associated with the handling of conventional pesticides since the toxin is generated within the plant itself. Concern, however, centers on several potential new risks. Genetically modified plants may, for example "compete or cross with unmodified varieties, they may become weeds, or they may make pests hardier than ever by inducing new resistance to naturally occurring pesticides" (Sollod & Proulx, 1998). Researchers are also evaluating a potential risk to monarch butterflies who may feed on windblown toxic pollen while in the caterpillar stage. (Yoon, 2000).

Neither strictly biocontrol nor chemical control, biopesticides are uniquely conferred with benefits and concerns that relegate them to their own distinct category. Like biocontrols, they are inherently less harmful than conventional pesticides, they pose no apparent risk of toxic exposure, they can affect a single pest or a narrow spectrum of pests, and they decompose quickly. Nevertheless, like conventional pesticides, they are subject to rigorous reviews in the U.S. and many require EPA registration. EPA cautions that "microbial pesticides need to be continuously monitored to ensure they do not become capable of harming non-target organisms, including humans" (EPA 1999). More a customized tool than an all-purpose instrument, biopesticides are valuable for situations where pesticide resistance, niche markets, or environmental concerns make use of chemical pesticide products unacceptable (International Biopesticide Consortium for Development, 2000).

Institutional Frameworks

Widespread adoption of SARD-compatible IPM practices will require increased collaboration, cooperation and innovation among the islands of the region. The approach of Agenda 21 is to strengthen existing national plans and build on current institutional capacity (United Nations Development Program (UNDP), 2000). With help from support systems and frameworks coalescing on an international scale in response to the Earth Summit mandates, the Caribbean has already begun to reshape its networks and programs in support of sustainable development objectives. Under the guidance of the UN's Capacity 21 program, an initiative specifically created to assist with sustainable development programs in developing countries, 31 national consultations were held in the islands between 1994 and 1998. "New policy and operational frameworks for national development strategies were called for, as well as identifying means for capacity building that would strengthen links between and within sectors. A Sustainable Development Council (SDC) was set up in each country....and a sustainable development network was set up to facilitate sharing information, human resources and valuable experiences (UNDP, 1999)".

The groundbreaking efforts of such networks improve the agricultural sector's prospects for establishing successful SARD-compatible IPM programs. Networks create new channels for broadening public awareness of the issues, for general consensus-building and for improving communications among farmers, researchers, extension staff and government and commercial agents. They can also foster the growth of crop

protection science by aiding in the development of a common methodological framework for gathering and uniformly presenting environmental data, currently incompatible and inaccessible, from among the island nations. That data is key to formulating the various social, economic and environmental indicators necessary for shaping policy, directing the course of research, and measuring progress toward sustainability. Other computer-based resources can also accelerate progress along the IPM continuum. Pest identification databases, online training modules, decision support software and local electronic networking will all improve access to information on crop protection practices. Many of those practices must be adapted to local conditions, and farmers, extension staff, and government and commercial agents will require training in their use. As new solutions become necessary, research in the laboratory and the field will continue to require appropriate dissemination and training (NRI, 2000).

Conclusion

Development of resources, networks and partnerships has been ongoing at all levels as local, national, regional and international communities contend with issues so pervasive they have received global recognition and support. Referring to a recently published global assessment of the state of the environment at the turn of the millenium, World Resources 2000-2001 (WRI, 2000), Klaus Toepfer, Executive Director of the United Nations Environment Programme, reiterated the pressing need to address harmful environmental practices:
"Every measure used by scientists to assess the health of the world's ecosystems tells us that we are drawing on them more than ever and degrading them at an accelerating pace. We depend on ecosystems to sustain us, and their continued good health depends, in turn, on how we take care of them."

The magnitude of the problem is matched only by the multitude of responses set in motion by the action agendas and global agreements created through the Earth Summit. Implementing sustainable Integrated Pest Management practices is only one small component of Agenda 21's ambitious program. But within the growing framework of innovative partnerships, collaborations, and networks forming in support of sustainable development, farmers will be better positioned to meet the challenge of advancing the practice of crop protection at the local level toward the global imperatives of increased food production, natural resource protection and conservation in the 21st century.

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WEBSOURCES

IPM in the Caribbean - WEB RESOURCES

An Island Network
Caribbean Agricultural Research and Development Institute (CARDI)
University Campus, St. Augustine
Trinidad, West Indies
Phone: (868) 645-1205 Fax: (868) 645-1208
E-mail: infocentre@cardi.org
CARDI is the primary agricultural research and development organization in the Caribbean. In existence since 1975, CARDI provides technical assistance, technology development, and technology transfer in many areas including plant pathology, virology, nematology. Design, testing and validation of production and marketing systems are conducted in a series of CARDI Research Centers. Demonstration and Training Centers, located in each CARDI country, perform tests and demonstrations of the commercialized systems and protocols before releasing them to the farming community for further improvement. Linked through collaborative work with over 50 regional and international research and development groups, CARDI is also the Executing Agency of PROCICARIBE, whose Executive Secretariat is located at CARDI headquarters.

PROCICARIBE
http://www.procicaribe.org
CARDI, UWI Campus
Trinidad, West Indies
Phone: (868) 645-1205 Fax: (868) 645-1208
E-mail: procicaribe@cardi.org
At the heart of the region's network for agricultural science and technology, PROCICARIBE coordinates and integrates agricultural research at the national and regional levels with links to international organizations. Institutional strengthening, research coordination and resource mobilization are some of its primary activities. The network operates among public and private agricultural groups and NGO's. Its aim is to further international competitiveness and sustainable development of the Caribbean's agricultural sector while ensuring food security, poverty alleviation and environmental sustainability. Administered by the Caribbean Agricultural Research and Development Institute, PROCICARIBE answers to a Board of Governors made up of the Ministers of Agriculture of Caribbean member states.

Caribbean IPM Network (CIPMNet)
http://www.procicaribe.org/cipmnet.org
CARDI, UWI Campus
Trinidad, West Indies
Phone: (868) 645-1205 Fax: (868) 645-1208
E-mail: procicaribe@cardi.org
CIPMNet is one of several National Network Committees within PROCICARIBE that focus on the generation, validation and transfer of technology and information nationally and regionally with links to regional and international strategic alliance partners. Their aim is to improve agricultural productivity and marketability while sustaining the natural resource base. The CIPMNet website provides a regional forum for discussion as well as communication of work program priorities and updates. CIPMNet joins together with the other networks at a regional level under a Regional Coordinator who is responsible for finding program funds, for forming links between national IPM programs and PROCICARIBE, and for helping to ensure the technical integrity of the networks activities. The Regional Coordinator also maintains a close working relationship with the Technical Advisory Committee, comprised of members of several regional and national organizations.

WEBSOURCES (Cont.)

Caribbean Agricultural Information System (CAIS)
see *http://www.procicaribe.org*
Not yet fully funded and implemented, the Caribbean Agricultural Information Service will provide PROCICARIBE's system of networks with targeted help toward integrating information and communication management capabilities at the national and regional level. CAIS will undertake a broad information inventory as well as link to AgroInfo and other international information systems and networks.

Caribbean Agricultural Technical Assistance Service (CTAS)
see *http://www.procicaribe.org*
Not yet fully functional, CTAS was established by PROCICARIBE to tap a considerable variety of experts throughout the region who are capable of resolving technological difficulties in production, post harvest, marketing and agro-processing matters. Resource persons from a network of participating insitutions respond with short term, quick response, "fire-fighting" assistance with technological problems anywhere in the region.

Other

EU-CARIFORUM Caribbean Agriculture & Fisheries Programme (CAFP)
http://www.cafpro.org/ IPM page at *http://www.cafpro.org/pest.html*
11, 1A Dere Street, Port of Spain, Trinidad and Tobago
Phone: (868) 623-2708/9 Fax: (868) 624-4903
E-mail: cariafp@tstt.net.tt
The objective of the CAFP Integrated Pest Management sub-programme is to address significant plant pest problems in specified areas of the Caribbean, using IPM techniques. The overall aim is to contribute to the regional agricultural sector development through the implementation of IPM programs in selected CARIFORUM countries based on the most significant economic returns on the intervention to that country. Current areas of priority include the whitefly-gemini virus complex in the Dominican Republic, the citrus blackfly in Trinidad and Tobago, the papaya mealybug in St. Kitt's and Nevis and weed control in Guyana.

Caribbean IPM Working Group
http://wwwusers.sunbeach.net/users/lec/ipmprin.html
Dr. Janice Reid or Dr. L.E. Chinnery
Caribbean Agricultural Research and Development Institute
University Campus, Box 113, Mona, Kingston 7, Jamaica
A working group of the Caribbean Mycorrhizal Network (CARIVAM). The network aims to encourage collaboration, to share research results and to provide access to relevant literature. The group also aims to educate agriculturalists, horticulturalists and the general public on the benefits of mycorrhizae and sustainable agriculture, incuding integrated pest management.

INTERNATIONAL RESOURCES

Centre for Pest Information and Technology Transfer (CPITT)
http://www.ctpm.uq.edu.au/CPITT/Default.htm
CPITT is a center within the University of Queensland, Australia which develops innovative tools for training and decision support for a wide audience. CPITT's products are aimed primarily at those involved in IPM or Natural Resource Management although their software can be used for virtually any purpose requiring information dispersal.

Consortium for International Crop Protection (CICP) and IPMNet
http://www.ipmnet.org/about.html
CICP was formed in 1978 by a group of U.S. universities. Its principal purpose is to assist developing nations reduce food crop losses caused by pests while also safeguarding the environment. CICP's basic goal is to advance economically efficient and environmentallly sound protection practices in developing countries and to ensure the health of rural and urban communities. IPMNet is a network of organizations and resources administered by CICP. IPMNet includes a database of IPM resources, bibliographies, and links to IPM and other crop protection resources.

Consultative Group on International Agricultural Research (CGIAR)
http://www.cgiar.org/
CGIAR's mission is to contribute to food security and poverty eradication in developing countries through research, partnership, capacity building, and policy support. The CGIAR promotes sustainable agricultural development based on the environmentally sound management of natural resources. The World Bank, the Food and Agricultural Organization of the United Nations (FAO), the United Nations Development Programme (UNDP), and the United Nations Environment Programme (UNEP) are cosponsors of CGIAR.

Gateway to Online IPM Resources
http://www.ippc.orst.edu:80/CICP/Gateway/
A web index of enomology, plant pathology, agricultural, and pest management web resources.

WEBSOURCES (Cont.)

National Biological Control Institute (NBCI)
http://www.aphis.usda.gov/nbci/nbci.html
USDA,APHIS,PPQ,CPHST
4700 River Road Unit 5, Riverdale, MD 20737-1229
Phone: (301) 734-4329 Fax: (301) 734-7823
From the U.S. Department of Agriculture's Animal and Plant Health Information Service (APHIS), NBCI provides technical advice and information; develops and maintains computerized databases; initiates, coordinates and monitors projects in cooperation with other agencies and institutions; organizes and facilitates focus groups and workshops to deal with specific issues of importance to biological control and IPM; suports biological control projects through and Implementation Grant Program; supports education/information needs, meetings, and conferences through a Facilitation Grant Program; supports systematics through a Postdoctoral Program in Systematics; and identifies and supports other needs of customers. A Customer Advisory Group (consisting of 12 leading biological control scientists and administrators) and Visiting Scientists (for specific projects) help NBCI refine its activities.

National Integrated Pest Management Network (NIPMN)
http://www.reeusda.gov/agsys/nipmn
NIPMN is the result of a U.S. federal-state extension partnership dedicated to making the latest and most accurate pest managment information available on the World Wide Web. Participating institutions have agreed to a set of standards which ensure science-based, unbiased pest management information. This site contains information on IPM by commodity, pest, region, and pest control tactic.

Pesticide Action Network (PAN)
http://www.pan-international.org/
49 Powerll St., Suite 500, San Francisco, CA 94102
Phone: (415) 981-1771 Fax: (415) 981-1991
E-mail: panna@panna.org (North American office)
PAN is a network of over 600 participating nongovernmental organizations, institutiions and individuals in over 60 countries working to replace the use of hazardous pesticides with ecologically sound alternatives. Its projects and campaigns are coordinated by five autonomous Regional Centers.

Radcliffe's IPM World Textbook
http://ipmworld.umn.edu/
This site aims to provide 1.) a venu for easily maintaining and updating "state of the art" information from the world's leading experts on all aspects of IPM, 2) a resource economically deliverable anywhere in the world that can be freely downloaded and used by students, teachers, and IPM practitioners, 3) a forum for the international presentation of practical information and theory on IPM, 4) links to the vast and rapidly growing IPM resources available on the Internet including photographs and decision-support software.

Virtual Center for Integrated Pest Management (CIPM)
http://ipmwww.ncsu.edu/cipm/
CIPM is a National Science Foundation sponsored Industry/University Cooperative Research Center, which works to support and further IPM through the evaluation of emerging technologies, information management and dissemination, environmental stewardship, estimation of economic consequences, resistance management tools and systems, and integration of disciplinary expertise. CIPM fosters the development and implementation of pest management programs based on a high level of knowledge of pest biology coupled with choices of monitoring tools and control technology, resulting in economically sound, environmentally compatible, and sociologically responsible integrated crop protection.

LISTSERVS

IPM Listservs

PANUPS
Subscription address: majordomo@igc.org Send messages to: panups@igc.org
PANUPS, the Pesticide Action Network Updates Service, is a weekly news service featuring updates about pesticides and sustainable agriculture. PANUPS also includes the Resource Pointer, which summarizes and gives ordering information for recent publications. To subscribe, send a message to majordomo@reeusda.gov with the message reading "subscribe PANUPS firstname lastname".

NIPMN-L
National Integrated Pest Management Network
Address to Subscribe/Unsubscribe: listproc@cornell.edu
Message body to subscribe: subscribe NIPMN-L Your Name
Message body to unsubscribe: unsubscribe NIIPMN-L
Email to Group: NIPMN-L@cornell.edu

CONFERENCES

Current Conferences on Integrated Pest Management

06-09 November -- INTERNATIONAL CONFERENCE, ENVIRONMENTAL RISK ASSESSMENT OF PESTICIDES AND INTEGRATED PESTICIDE MANAGEMENT IN DEVELOPING COUNTRIES
Kathmandu, NEPAL
Contact: A. Herrmann, K-IPM Conf., Inst. of Geog. and Geoecol., Tech. Univ. Braunschweig, Langer Kamp 19c, D-38106 Braunschweig, GERMANY
Fax: 49-531-391-8170
E-mail: ipmktm@tu-bs.de
Web: http://www.tu-bs.de/institute/igg/physhyd/conference.html

21-23 March -- 2001 AN INTERNATIONAL WEED ODYSSEY, "An International Invasive Exotic Species Conference"
Athens, GA, USA.
Contact: C. McCormick, Inst. of Ecol., Univ. of Georgia, Athens, GA 30602, USA
Phone: 1-706-542-2968 Fax: 1-706-542-4819
E-mail: cheryl@arches.uga.edu
Web: *http://www.ecology.uga.edu/*

20-24 May -- 15TH NEMATOLOGICAL CONGRESS, "Integrated Nematode Control in the New Millennium,"
Skukuza, SOUTH AFRICA
Contact: M. Daneel, ARC-ITSC, Private Bag X11208, Nelspruit 1200, SOUTH AFRICA
Phone: 27-13-753-2071 Fax: 27-13-752-3854
E-mail: mieke@itsc.agric.za
Web: *http://www.agnic.org/mtg/2001/15nc.html*

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Any organization or individual operating or involved in the English and French-speaking Caribbean Region is welcome to contribute to the newsletter. Contributions should be addressed to:

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Please note that submissions should meet the following criteria:

- They are relevant to environmental issues
- They must be of interest to or directly involve the Region
- They must not endorse or recommend any product or commercial service, explicitly or implicitly
- They must be received by the posted deadline (see below)

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DEADLINE FOR CONTRIBUTIONS TO Vol. 8 No. 5: December 1, 2000

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