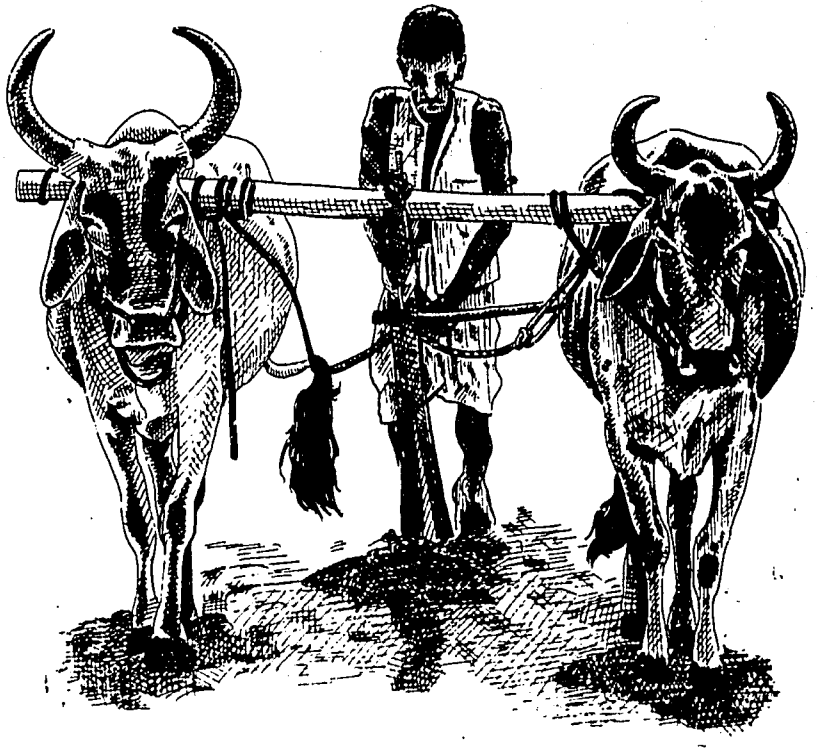
Report

Weed Control Systems Utilization for Representative Farms in Developing Countries



Oregon State University
and the
U.S. Agency for
International Development

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REPORT

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CONTENTS

PROJECT PROFILE

Project title	Weed Control Systems Utilization for Representative Farms in Developing Countries
Contracts	AID/ta-C-1303
Principal investigator (project director)	Dr. Stanley F. Miller, Director International Plant Protection Center Oregon State University Corvallis, OR 97331 / USA
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Period Covered by this report	June 1, 1982 through May 31, 1984
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AID project manager	Dr. B. L. Pollack S&T/AGR/AP Agency for International Development Department of State Washington, DC 20523 / USA

THE PROJECT IN FOCUS

Agriculture, Weeds, and LDCs

Agricultural technology introduced to developing nations has had mixed blessings. For small and medium-sized farming enterprises, increased emphasis on required inputs (fertilizer, improved seed, and irrigation) and their associated costs moved dramatic production increases beyond reach. Only more affluent operators could absorb the costs, not to mention the often increased risk.

Advanced technology also contributed to intensification of weed problems. Some of the new, high-yielding cultivars did not compete as vigorously with weeds as did many native varieties. Additional soil fertility, higher moisture levels, and improved seedbeds for both new and old crop varieties provided improved growing conditions for weeds as well. The combination often resulted in failure to realize potential gains from costly development projects.

Weed flora shifts occurred as weed control technologies changed, often causing shifts from relatively controllable broadleaf varieties to more pernicious grassy species which, once established, are more difficult to control.

Project Origin

The international development community grew increasingly concerned about weed control in developing countries. These concerns resulted in the AID-Oregon State University weed control project (a contractual relationship originated in 1966) being encouraged to assess the emerging implications of weed control technology. The formerly production-oriented AID-OSU research effort was restructured in 1973 to include a broader

overview of peasant farm problems and to work toward designing weed control systems for representative farms in developing countries.

Concurrently, the project assumed the added dimension of attempting to assess the social and economic impact of weed control technology related to employment and income distribution. The restructured project undertook programs centered in Brazil (Northeast) and El Salvador. These efforts were carried out in accordance with work plans and terminated in 1976. New project areas were identified in Central America and Southeast Asia and a series of multi-faceted programs launched in these two regions.

Formalized Technical Assistance

In 1970, a technical assistance contract was instituted to operate in tandem with the weed control research project. A series of intensive in-country weed control training programs was launched, plus stepped up consulting and information dissemination efforts. Additional technical assistance and cooperative linkages were instituted to backstop missions and LDC institutions.

Aquatic Component

Project staff became increasingly aware that aquatic weeds cause serious problems throughout the world's tropics and subtropics, especially in developing countries. Since 1960, explosive growth of aquatic weeds in major hydrological systems of several developing countries has reduced or restricted water availability. Where water systems serve multiple purposes, e.g., irrigation, transportation, cooking, sewage disposal, and hygiene--in Southeast Asia, for example--loss of ready access to water would cause serious sociological problems.

In agriculture, aquatic plants occupy space needed for water storage. Moreover, through transpiration, the aquatic biomass can accelerate water loss from a free water system up to 3 to 8 times that of a clear surface. This threat becomes especially pertinent for critically water-short regions.

To address aquatic weed problems, the AID-OSU weed project enlisted the University of Florida to conduct an aquatic weed program under a subcontract. An agreement was signed and work begun in April 1976. Under the agreement, the U. of F. aquatic weed experts provided technical assistance through short-term consultations with governments of developing countries as well as a reference and information center to the same group of nations.

ROLE AND OBJECTIVES

Project Role

The AID-OSU weed control program constitutes but one of many elements in the overall effort to raise food crop production levels in the world's less developed nations. It specifically aims to help institutions in developing countries design, organize, strengthen, and implement weed control programs to reduce food losses due to weed competition and thereby increase rural and urban living standards.

The program endeavors to work in close collaboration with local, regional, national, and international entities; it is based on sensitivity to stated needs and integration of activities. The goal involves collaboration with nonproject colleagues and counterparts to ultimately increase effectiveness of weed science and control.

Attempts to develop and assess weed control technologies for representative farms in developing countries imply a special emphasis on smaller-sized, subsistence farms. Resulting technologies, or systems, are evaluated in terms of various societal goals and performance criteria, including economic efficiency, and income distribution.

Objectives

Specific objectives include:

1. Train host country counterparts in appropriate weed control research methods;
2. Promote only practical and safe usage of herbicides (and other pesticides) through educational programs;

3. Encourage evaluation of ecological and environmental aspects of weed control systems;
4. Foster continued development and maintenance of a worldwide communication-information network for weed control linking the institutions and individuals concerned;
5. Identify biological and socioeconomic problems of aquatic weeds in agricultural production and related nonagricultural situations;
6. Provide short-term consultation for integrated weed control methods in developing countries;
7. Establish general criteria for the assessment of aquatic weed problems;
8. Operate an extensive aquatic weed information and reference center and expand delivery of data therefrom;
9. Develop integrated control systems for important aquatic weeds.

ACTIVITIES OVERVIEW

I. TRAINING

A. International

* WEED CONTROL SHORT COURSES *

The AID/OSU weed project took part in a series of intensive weed science short courses. Project personnel were directly involved with organization, arrangements, and course presentation to varying degrees. The project collaborated directly with several international and national agencies and institutions to make the courses happen: FAO, CIMMYT, UNDP, Pakistan Agricultural Research Council, Department of Agriculture (Zambia), Swedish International Development Authority, and the Barani Agricultural Research Development Project.

Characteristics and features of each course include:

- close collaboration between the AID/OSU project, as represented by the International Plant Protection Center, cooperating organizations, and host institution;

- a cadre of expatriate weed scientists, supplemented by local expertise, that maintains close and continuous contact with trainee/participants throughout the duration of the course;

- a pre-course and post-course examination that permits objective evaluation of participant progress;

- a mixture of hands-on field exercises, classroom lectures--with instructor-participant interchange encouraged--laboratory sessions, and field trips;

- provision of an extensive literature packet (reprints, books, technical data sheets) to each participant;

- provision of a light-powered, hand-held calculator for each participant (in 3 of the 4 courses);

- presentation to each participant of an official, multiple signature certificate of successful course completion.

A brief chronological synopsis of each course follows, listing: course title, date, location, organizing and cooperating organizations, plus other information. Full details for each course were published in a series of IPPC documents (nos. 47-C-83, 52-A-83, 54-C-84, and 55-C-84).

+ TRAINING COURSE ON WEED SCIENCE RESEARCH

November 20-December 8, 1982

National Agricultural Research Centre; Islamabad, Pakistan

Organized by:

Pakistan Agricultural Research Council (PARC)

Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT)

International Plant Protection Center

Supported in part by U.S. Agency for International Development

26 participants from a variety of Pakistani programs

3 primary instructors (IPPC, CIMMYT, and consultant)

average pre-course test score, 41%; post course, 78%

+ WEED MANAGEMENT TRAINING COURSE

August 29-September 10, 1983

Milimani Hotel; Nairobi, Kenya

Organized by:

FAO (Plant Protection Service)

UNDP (through FAO/UNDP Program for Improved Plant Protection)

U.S. Agency for International Development

International Plant Protection Center

26 participants from various commodity and civil programs

4 primary instructors (IPPC (2), Univ. of Nairobi, and U.S. agronomist residing in Kenya)

Participants formulated a series of resolutions calling for:

- immediate formation of Kenyan Weed Science Society;
- creation of weed scientist posts in Ministry of Agriculture and at experiment stations;
- increased emphasis on weed management at University; and,
- more frequent weed management workshops or seminars.

+ ZAMBIA WEED MANAGEMENT COURSE

December 12-23, 1983

Mt. Mukulu Research Station; Chilanga, Zambia

Organized by:

Department of Agriculture, Republic of Zambia

Swedish International Development Authority

FAO

UNDP (Action Program for Improved Plant Protection)

U.S. Agency for International Development

International Plant Protection Center

22 participants, extension oriented, representing all agriculturally important regions

5 primary instructors (U.K. (2), IPPC, U.S. agronomist residing in Kenya, and development agronomist residing in Mozambique)

Course resulted in part from efforts of U.K. weed scientist posted in Zambia.

+ WEED SCIENCE RESEARCH TRAINING COURSE - PAKISTAN II

January 14 to February 2, 1984

National Agricultural Research Centre; Islamabad, Pakistan

Organized and supported by:

Coordinated Wheat, Barley, and Triticale Program (NARC)

Centro Internacional de Mejoramiento de Maiz y Trigo (CIMMYT)

Barani Agricultural Research Development Project (Canadian aid)

Pakistan Agricultural Research Council (PARC)

U.S. Agency for International Development

International Plant Protection Center

30 participants from a variety of Pakistani programs

3 primary instructors (IPPC (2), and CIMMYT)

average pre-course test score, 42%; post course, 70%

All the courses were well received. The combination of two courses in Pakistan, plus the continuity of a CIMMYT agronomist being present, provided a more definitive measure of direct benefits, including:

* The courses effectively utilized the new National Agricultural Research Centre at Islamabad.
* The second course was arranged and funded through the resources of 6 national and international organizations.
* The teaching techniques utilized, which generated extensive trainee participation, drew as many positive reactions as the subject matter.
* Follow-up directly attributable to the 2 courses:
  - a national weed coordinator position was created and a person selected to fill it;
  - a strong impetus exists to form a professional weed science society in Pakistan;
  - a future meeting is planned for participants from both courses; and,
  - 15 of the 30 participants (2nd course) joined the International Weed Science Society.

* TRAINING MANUAL *

The Plant Protection Service of FAO, through the FAO/UNDP Action Program for Plant Protection, contacted IPPC with a request to prepare an instructor's manual for weed control research training. IPPC accepted and entered into a contract to prepared the material. A draft copy was submitted in April 1984 and accepted by FAO. The text is designed to

provide a material outline for instructors, supplemented with practical teaching aids developed from actual conduct of training courses.

* INTERNATIONAL STUDENT SUPPORT *

The AID/OSU weed project provides some support for several international students. During the report period, five graduate students--Ahmad Akbari (Iran), Raouf Cherif (Tunisia), Albert Fischer (Uruguay), Manhaz Saremi (Iran), and Karin Tanphiphat (Thailand)--were involved with the IPPC-coordinated weed project. In each case, individual research projects were specifically designed to provide the student with experience and applicable information and techniques, as well as add to the project's technical information pool.

* SAFETY REFRESHER COURSES *

In January-February 1983, a project weed scientist conducted training/refresher short courses on herbicide safety and application at five Indonesian food and estate crops research institutes and at the SEAMEO Regional Center for Tropical Biology (Bogor). Varying size groups of technicians participated in the information sessions. Hand-pumped, person-carried, lever-operated knapsack sprayers were used to demonstrate appropriate techniques for maintaining safety and effective application.

* SPRAYING SHORT COURSE *

At the request of the AID/OSU Tunisia project, IPPC arranged and conducted a one-day spraying short course for 11 Tunisian participants at Corvallis. The course, presented in French for IPPC by Albert Fischer and Herb Fisher, covered safety, sprayer calibration, pesticide handling, and environmental concerns. Participants took part in calibrating equipment provided by IPPC.

B. Domestic

* UNIVERSITY TEACHING *

Two project staff members carry university teaching responsibilities. Project director S. F. Miller teaches International Agricultural Development (AREc 462) each year during the winter quarter and also advises graduate students in agricultural and resource economics. International students comprise 25% of the course's average 36 person enrollment. The course's objectives are to introduce students to economic issues which focus on agriculture in the development process and to examine the ability of agriculture to contribute to economic growth.

Senior weed scientist L. C. Burrill instructs two laboratory sections of Crop Science 418, Weed Control, and guides four or five discussion sections. The activity is particularly useful for developing practical teaching techniques and projects that are applicable to international short courses. He also advises graduate students in crop science. The 1983 weed control class included students from Trinidad, Pakistan (2),

Thailand, China, Costa Rica, Paraguay, Indonesia, Tunisia, Philippines, Libya, Morocco, and Mexico. Ten international students were in the 1982 class.

* DOMESTIC GRADUATE STUDENTS *

Three U.S. graduate students received support from, and are involved with, the AID/OSU weed project; H. H. Fisher (PhD), A. S. Cooper (MS), and M. Peterman (MS). Descriptions of their research projects follows in the research section. Fisher and Cooper serve half-time as research assistants for the project and are involved with not only field work associated with research, but international activities, technical literature collection development, equipment evaluation, and other aspects of the project.

II. Research

A. Degree Programs

Descriptions of research projects being conducted by full and part time students receiving some measure of support through the AID/OSU project are:

* Herb Fisher (US), PhD: Adaptability and competitiveness of two Rottboellia exaltata Lf. biotypes and some of their F2 progeny - Rottboellia, a noxious grass weed of the tropics, is spreading and therefore challenges agronomists to develop effective controls. This weed

biology study seeks to predict which biotypes and progeny are most likely to invade new habitats and should receive priority in prevention and control efforts.

* Ahmad Akbari (Iran), PhD: The economic effects of minimum and no-till tillage systems for weed and erosion control in Oregon - Herbicides play an important role in minimum and no-till cultivation systems. Private and social costs and benefits occur as technology switches away from traditional tillage. This study attempts to evaluate these benefits and costs with the intent that the same approaches will be applicable to non-U.S. conditions.

* Manhaz Saremi (Iran), PhD: An econometric analysis of the Mexican import demand for U.S. pesticides - This study sought improved understanding of factors affecting Mexican import demand for three groups of pesticides: insecticides, herbicides, and fungicides. Study objectives included: description of market characteristics for pesticides in the U.S. and Mexico, identification of major consumers of pesticides in Mexico, review of Mexican agricultural policy effecting pesticide use, and construction and estimation of an econometric model for the three pesticide groups.

* A. S. Cooper (U.S.) MS, A. Fischer (Uruguay), PhD, and M. Peterman (U.S.), MS: Maize-white clover cropping system - Studies were begun in 1982 at 3 sites in Oregon's Willamette Valley to test the feasibility of growing Zea mays L. var. 'Golden Jubilee' in a living Trifolium repens L. var. 'New Zealand' (white clover) sod. Objectives were to develop a

system, based on work done at Cornell University, that optimizes the beneficial effects of a legume cover crop while simultaneously producing a sweet corn crop. Potential benefits are weed suppression, reduced soil erosion, added organic matter, added nitrogen, reduced tillage, and enhanced water use efficiency through improved soil infiltration hydraulic conductivity combined with improved root penetration.

* Raouf Cherif (Tunisia), MS: Weed control in cuphea (a new oil seed crop) - This research program was selected because the steps taken to search for a weed control program are similar for most crops. This student will be expected to conduct research to find weed control solutions for several crops upon his return to Tunisia. In the first year, 22 herbicides were tested to determine their effect on cuphea. A similar trial with different herbicides was conducted in 1984. In addition, the most promising herbicides from the 1983 test will be included in a yield trial in 1984.

* Karin Tanphiphat (Thailand), MS: Soil persistence of clopyralid - Clopyralid is a new herbicide which is safe in wheat and also controls some hard-to-kill perennial weeds commonly found in wheat. There is concern that crops following wheat will be injured by traces of clopyralid remaining in the soil. Several rates of clopyralid will be applied to the soil over a 2-year period. Sensitive crops will be planted in treated plots in the field and in soil samples in the greenhouse to determine levels of active clopyralid remaining in the soil.

B. New Herbicide Screening

In 1983, evaluations were made of general phytotoxicity and crop selectivity on 9 experimental herbicides. In 1984, 10 new herbicides were tested. Approximately 20 crops and 10 weed species were used to test these herbicides.

C. Equipment Studies

In response to increasing international interest in lever-operated knapsack sprayers, IPPC conducted a familiarization and evaluation of components study based on a randomly acquired cross-section of 37 machines representing 26 manufacturers in 15 countries. The objectives included gaining staff familiarity with the genre so as to better advise AID and other agencies, and secondly, to determine those features that are desirable to incorporate in a knapsack sprayer.

The evaluation itself was performed with practicality in mind and from the viewpoint of a potential purchaser-user. Torture-style tests were not included, but in-field performance and convenience aspects were. The results will be published as an illustrated guide in the near future.

III. Collaboration / Linkage

The project has historically worked closely with national, regional, and international institutions and organizations, both directly and indirectly. The small scope of the project and its specialized nature

demanded collaboration and cooperation in order to achieve impact and gain dissemination of information.

This section notes the organizations and institutions involved, examples of collaborative efforts, and the reach of the project when coupled with other, large organizations.

A. Direct Involvement with Institutions

* FAO *

The project has maintained contact with the Plant Protection Service of FAO for many years, and increased that collaboration noticeably since FAO created and staffed a weed scientist position. IPPC works closely with the FAO weed scientist and, more recently, the manager of the FAO/UNDP Action Program for Plant Protection, in organizing and conducting short courses, preparing printed training materials, and serving on the FAO Panel of Experts on Improved Weed Management.

In September 1982, project senior agronomist L. C. Burrill, as one of 35 weed scientists representing 20 nations, participated in the "FAO/IWSS Expert Consultation on Weed Management Strategies for the 1980s for the LDCs." Ten recommendations were developed and accepted. Special emphasis was placed on instituting improved weed control programs in Africa.

Project staff members made 8 person-trips to FAO/Rome during the report period in conjunction with various activities.

One result was that in November 1983, a 4-day workshop on Biology and Control of Selected Perennial Weeds was held in Santiago, Chile, with major funding from FAO. The AID/OSU weed project supported the travel costs of international weed scientist Dr. J. D. Doll (Univ. of Wisconsin). The workshop proceedings were published in Spanish.

* CIMMYT *

Linkage between CIMMYT and the project, extending back to the early 70s, has continued to be highly cooperative, particularly in the joint organization and conduct of two successful weed science short courses in Pakistan (December 1982 and January 1984) as described in the "Training" section of this report. The positive outcome of these courses was directly due to the professionalism of CIMMYT wheat agronomist in Pakistan Dr. P. Hobbs, and the collaboration between the two organizations and the host country institutions.

Dr. Hobbs coordinated all the on-site preparations, participant selection, field arrangements, and organizational input; the project supplied teaching materials and financial support for participants; CIMMYT and project senior staff shared instructional duties; the project published and distributed reports of the courses.

* PARC, NARC *

The project forged a close link with the Pakistan Agricultural Research Council (PARC) and the National Agricultural Research Centre (NARC) at Islamabad. The primary areas of collaboration involve the weed science short courses, advanced degree training of Pakistani scientists in Oregon, participation as coordinating scientist for a series of USDA-PL 480 programs (see below), and provision of printed materials to Pakistanis.

* CATIE, ROCAP *

The project established close ties with both the Centro Agronomico Tropical para Investigacion y Ensenaza (CATIE) and AID's Regional Office for Central American Programs (ROCAP) during the 5 years that project specialists resided at Turrialba. The linkage has remained intact as project weed scientist M. D. Shenk traveled to Central America three times at the request of ROCAP to provide technical expertise on weed control and small farming programs.

* SOCIETY SUPPORT *

Project weed scientist C. E. Munroe (until 1982) co-authored Major Weeds of the Philippines, a 328 page, fully illustrated handbook published by the Weed Science Society of the Philippines in 1984. Drs. K. Moody (IRRI weed scientist and newly named president of the International Weed Science Society), E. C. Paller, Jr., and R. T. Lubigan (University of the Philippines weed scientists) collaborated on the publication.

The volume offers full-page, full-color plates of 134 species, along with descriptions, nomenclature, and a glossary. It is the first all-color collection of weed taxonomy to be published.

B. Networking

During 16 years of project activity, an extensive list of organizations has evolved into an international network. A listing of the 66 organizations (in Latin America, Africa, Asia, and international) is attached as Appendix 1.

In a less formal sense, IPPC's 5,700 name mailing list constitutes an information channel and network in that information flows bidirectionally. This linkage results in exchange and sharing of information.

C. Support

* USDA-PAKISTAN *

The project, through IPPC, is cooperating with the USDA in Pakistan. IPPC weed scientist M. D. Shenk was designated in April 1984 as the Cooperating Scientist for five Pakistani Special Foreign Currency (SFC) research projects on weeds of cereals (P/C-ARS-199(FG-Pa-377)) through (P/C-ARS-203(FG-Pa-381)). Primary responsibilities involve interacting with Pakistani principal investigators to develop, implement, and review a weed control research program for cereal crops in Pakistan. It is anticipated that the cooperative effort will cover a 3 to 5 year span and require periodic on-site visits.

* HONDURAS *

On May 15, 1984, IPPC entered into an agreement with the distinguished Escuela Agricola Panamericana (EAP), Tegucigalpa, Honduras, under contract to USAID/Honduras, to prepare a syllabus (in Spanish) for a weed control course that will be offered at EAP, to prepare a Spanish language weed control field/laboratory guide book, to conduct a weed science course (in Spanish) at EAP from June 25 through July 27, 1984, and to provide periodic consultation to EAP in its pursuit to enhance weed control in Honduras.

Initial work on the syllabus began. Also, Albert Fischer, PhD weed science candidate from Uruguay, agreed to instruct the course and began preparing and assembling support materials. Syllabus material will be tested in the course with necessary modifications made subsequently.

The field/laboratory guide book will contain appropriate laboratory and field exercises for demonstrating weed control principles such as: leaching of herbicides in soil, herbicide volatility, movement of selected herbicides within plants, multiple crop herbicide screening trials, and problems of herbicide residues in spray application equipment.

* SUPPORT NETWORK *

The AID/OSU project extends a network of support encompassing several professional societies and activities:

* Responding to a request from the International Parasitic Seed Plant Research Group, the project redesigned and began publishing and distributing the Group's newsletter, Haustorium.

* The weed project has supplied backup to USAID projects in Yemen, Tunisia, and Tanzania through orientation of personnel and supply of technical information.

* For the International Weed Science Society, support has included publication assistance with the IWSS Newsletter, clerical services, and editorial-production, plus distribution, for the proceedings of the joint IWSS-Weed Science Society of America symposium, "Communication of Weed Science Technologies in Developing Countries: (see appendix 3).

* Through interest in mulching as a weed control technique, the project agreed to produce and publish a mulch workshop proceedings, "Crop Production using Cover Crops and Sods as Living Mulches."

* VISITORS *

The project has hosted a number of international visitors during the report period leading to enhanced linkages. In one case, a visit resulted in taped interviews of project staff being broadcast by BBC world services; the broadcast generated several letters of inquiry to the project. A complete visitor list appears in appendix 7.

IV. Consulting

A. Aquatic Weeds

* ECUADOR *

Two aquatic weed scientists from U.F., under joint sponsorship of AID the AID weed program and two Ecuadorian agencies, spent a week surveying the Rio Guayas basin in Ecuador during April 1984 to assess and advise on the problem of waterhyacinth and its impact on a major hydroelectric project under construction.

Drs. W. T. Haller and J. C. Joyce, at the invitation of the Instituto Nacional de Investigaciones Agropecuaria (INIAP) and the Comison de Estudios para el Desarrollo de la Cuenca del Rio Guayas (CEDEGE) noted dense infestations of waterhyacinth (a floating aquatic weed that is not native to Ecuador) that officials feared would drastically impact the planned 24,000 ha reservoir. Current control procedures were observed and suggestions offered for Ecuadorean research and control initiatives under way at the INIAP research stations at Guayaquil and Boliche. The U.F.

scientists also presented a seminar about waterhyacinth that was attended by more that 120 Ecuadorean technicians.

It is expected that the trip will lead to further contacts among researchers concerning biological, chemical, and mechanical control programs for waterhyacinth. Though one biological control agent, Neochetina, has been reported in Ecuador, the U.F. team found no evidence of feeding or other insect damage on waterhyacinth in the Rio Guayas Basin.

* INDIA *

U.F. aquatic plant pathologist Dr. R. Charudattan, with partial support from the IPPC aquatic weed program, presented an invited paper and chaired one section of the International Conference on Waterhyacinth held in Hyderabad, India, during February 1983. Seventy papers and 6 plenary lectures were presented. Dr. Charudattan was the lone representative of the U.S., despite participation of several Asian nations, Australia, and U.K.

Strong sentiment for utilization, rather than control, became evident, Dr. Charudattan reported. However, he felt that, "the experience of our scientists in Florida would have been very beneficial to the conference ... in a way, the conference was rediscovering the wheel with respect to utilization ... I don't think utilization is the approach (for India) to take in view of the energy inputs required."

He further reported that India had just issued clearance for the introduction of Neochetina and that this biocontrol agent, along with some

native pathogens, could provide successful control of waterhyacinth. He also noted that biocontrol appears to be the most appropriate solution to the waterhyacinth problem in developing countries.

* KENYA *

In September 1982, Dr. W. T. Haller (U.F.) and W. L. Maier, assistant chief, Bureau of Aquatic Research and Control (State of Florida) traveled to Yugoslavia to attend the Sixth International Symposium on Aquatic Weeds and the Second International Symposium on Herbivorous Fish, and then continued to Nairobi where USAID/Kenya's Dr. J. Gaudet had arranged for a visit.

Two days were devoted to meeting with scientists of several universities and institutions covering various aspects of aquatic plant problems and research currently being conducted. Field trips were made to Lake Navisha to view Salvinia molesta infestations and to view irrigation schemes in the Mwea rice fields, a relatively new development, where emergent aquatic weeds have become a serious problem. Plans were formulated for aquatic weed control short courses to be held in East Africa.

* THAILAND *

During October, 1983, Dr. Haller and Australian aquatic weed scientist Dr. D. Mitchell travelled in Thailand visiting the National Biological Control Research Center at Kasetsart University and other institutions in the Bangkok area.

The team then departed for Chiang Mai to conduct a survey and evaluation of Mimosa pigra infestations.

At the research station affiliated with Prince of Songhla University, the scientists evaluated the efficiency of waterhyacinth weevils.

B. Terrestial Weeds

* INTERACTION WITH FAO *

During the report period, AID weed project staff members provided consultation for FAO through:

+ participating in three separate meetings related to the FAO Panel of Experts on Weed Management;
+ assisting the FAO/UNDP Action Programme for Improved Plant Protection through developing and organizing information.

* ROCAP *

Consultation was provided to ROCAP on several occasions during the report period. In October 1982, project weed scientist M. D. Shenk, at the request of ROCAP and CATIE, visited Panama, Costa Rica, Nicaragua, El Salvador, Honduras, and Guatemala to evaluate the state of weed control research in ROCAP/CATIE projects, including the small farm systems program. A report of findings was provided to both ROCAP and CATIE.

A similar consulting trip was carried out by M. D. Shenk in March 1983 specifically for the Small Farmer Systems Research project.

In July, 1984, Shenk met with personnel from the ROCAP/CATIE Small Farms Cropping Systems Research Project for final review of weed control recommendations in the "tec packs" for several cropping systems.

* OTHER *

In April 1983, Dr. A. P. Appleby (Oregon State University) agreed to consult for the AID project and traveled with project senior agronomist L. C. Burrill to Bangkok. There, on the invitation of the agronomy department of Kasetsart University, Appleby and Burrill conducted a 2-day workshop for 20 people on "teaching Weed Science." The project members also traveled to Chiang Mai to attend, and present papers, at the first conference of the Weed Science Society of Thailand.

Earlier, L. C. Burrill was invited to participate in a Symposium on Tropical Agriculture organized by the Sri Lanka Pugwash Group. As a continuation of the same trip, he visited Bangladesh at the invitation of the Bangladesh Rice Research Institute. Consultation on weed problems was provided at several sites for promising methods of control.

V. INFORMATION

Collection, publication, and provision/dissemination of technical weed control information has been a hallmark of the AID/OSU project for more than a decade. Activities conducted during the report period reflect that orientation.

A. Publications

* MAJOR PUBLICATIONS *

In addition to 26 articles and presentations prepared by project staff (listed in appendix 3), IPPC--utilizing project support--published several major works.

In 1982, the project helped organize a workshop at Oregon State University focusing on the role of cover crops as mulches. IPPC was approached in regard to publishing the workshop proceedings. The result was Crop Production using Cover Crops and Sods as Living Mulches containing useful information regarding weed control and directly related to research conducted by the project in Costa Rica and underway at Corvallis.

Another proceedings, that of an international symposium held in Chiang Mai, Thailand, jointly organized by the project and Thai governmental agencies, resulted in Mimosa Pigra Management. The work represents one of a very few published information sources concerning an extremely noxious semi-aquatic weed. The symposium itself has been hailed as landmark event in furthering study and communication about M. pigra.

In collaboration with both the West African and International Weed Science Societies (IWSS), IPPC published No-tillage Crop Production in the Tropics, the proceedings of a 1981 international symposium held in Monrovia, Liberia. Indications were that the material presented at the symposium would either not be published at all, or only with difficulty and delay, had the project not become involved.

Somewhat the same conditions prevailed when the project assumed responsibility for publishing the proceedings of the 1983 IWSS-Weed Science Society of America symposium, Communication of Weed Science Technologies in Developing Countries.

Copies of all these titles have been made available widely, both to USAID missions and individual requestors in LDCs.

* INFOLETTER *

For the period reported, IPPC (with project support) published and distributed 7 issues of the IPPC INFOLETTER. Copies of each issue were mailed to over 5,700 recipients in more than 130 countries. INFOLETTER marked its 14th consecutive year of publication.

Feedback received indicated that the "In Print" section listing brief notes on a wide variety of weed science/small farm/developing agriculture materials and the policy of always including a contact address, continued to be extremely useful to recipients.

Articles published in INFOLETTER during the period included: a feature on the Commonwealth Institute of Biological Control; FAO pesticide research guidelines; use of aquatic weeds for paper-making; weeds reduce winterhardiness of some orchard crops; herbicide use trends; pigeonpea weed control; impact of weeds on African small farms; features on smaller, often hand-operated equipment; integrated crop protection; "weeds" that improve tropical pastures; weeds' impact on jojoba; dryland weed control in India; a profile on CICP; tribute/obituary for Dr. F. W. Whittemore; the cost of weed-caused crop losses in the U.S.; use of motortrikes for herbicide application (with a roundup of models and manufacturer names);

profile of Dr. B. L. Pollack, AID/OSU project manager; pesticide packaging and communication issues; pesticide poisoning symptoms and first aid measures; aquatic plant survey for Florida; the need for weed research training; impact of Striga on African cereal crops; plus, a number of smaller articles and sidelights.

* AQUAPHYTE *

The IPPC Aquatic Weed Program, a part of the Center for Aquatic Weeds at the University of Florida, publishes AQUAPHYTE twice a year and now mails it to more than 3,000 recipients worldwide. First issued in fall 1981, the newsletter reports on international dimensions of various developments concerning aquatic macrophytes.

A sampling of articles that appeared in AQUAPHYTE during the report period includes: mechanical control of aquatic plants; Salvinia -- possible biological effects on fish in Papua New Guinea?; new pathway for Hydrilla?; a profile of the University of Florida's newly formed Center for Aquatic Weeds; aquatic herbicides evaluated; a description of the CAW aquatic plant information and retrieval system; apple-snails eating chara; U.F. grass carp research; a profile of new CAW director, Dr. J. C. Joyce; and, IPPC aquatic weed survey in Ecuador.

B. Other Information Activities

* AQUATIC WEED INFORMATION SYSTEM *

The Center for Aquatic Weeds' information storage and retrieval system, partially supported by the AID weed project, currently stands as one of the most extensive aquatic macrophyte information collections in the world. Starting in July 1983, it received a $20,000 annual contribution from the Florida Department of Natural Resources for domestic use of the system.

During the report period, the system prepared full bibliographies and distributed them in response to requests received from parties in the U.S. and other countries. The staff continued to receive approximately 200 publications monthly that were cataloged into a rapidly expanding database of more than 17,000 titles.

* INFORMATION BINDERS *

The project devised and produced Weed Control Information binders (3-ring) and provided a copy for every USAID mission. Binders were divided into general, training, equipment, control methods, herbicides, and weed species sections, with additional unspecified dividers to allow for individual mission customizing.

The binders were distributed with an initial selection of material and a cover letter explaining their intent and purpose. A series of technical bulletins was launched for the binders (as well as other uses). Bulletin #1 accompanied the binders; bulletin #2 was distributed several months later. Additional topics are under consideration for future bulletins.

* TECHNICAL LITERATURE RECYCLING *

IPPC, in collaboration with the Weed Science Society of America and the International Weed Science Society, began a modest program to collect publications no longer needed by U.S. (or other) scientists and redistributing them to libraries and institutions in developing countries.

Collections, such as one containing several complete years of the WSSA journal Weed Science, were received. Two shipments totalling over 1,500 lbs. were sent to the National Agricultural Research Centre, Islamabad, Pakistan. The USAID mission in Pakistan agreed to help expedite the shipments.

* INFORMATION AUTOMATION *

IPPC and the AID/OSU weed project have been fortunate to have direct access to dedicated word processing for several years. More recently, the project received authorization to acquire personal computing equipment that will serve to:

* help train students (at Corvallis) and participants at short courses in data handling and manipulation;
* increase project staff efficiency through linkage of computers with word processors;
* decrease time and cost for publication by being able to directly transmit material to the University printing department.

VI. SPECIAL LIVING MULCH SECTION

As mentioned under the Research Section, members of the AID weed program staff are conducting work at Corvallis that is closely linked with various project objectives, including developing small farmer-appropriate weed management systems. Integrated approaches combining various methods and minimizing "external" inputs is emphasized. The following Special Section provides an in-depth review of the problems, the direction of work, and the prospect for applicability.

---------- LIVING MULCH PROJECT ----------

Introduction: The Problems

The need for effective conservation cropping systems has become increasingly apparent. Throughout the world, soil erosion is recognized as a major threat to crop production. Coupled with soil loss are problems of decreased soil fertility, lower organic matter levels, and soil moisture deficits.

Traditional mouldboard plowing inverts and exposes soil to erosive effects of wind and rain, plus water loss through surface runoff and evaporation. Plowing also can bring buried weed seeds to the surface, and stimulate their germination and growth.

Many cropping systems implementing a form of reduced tillage have been devised to combat or prevent these and other problems:

* Cover Crops have been used effectively for many years during the non-crop season in annual cropping systems. Often they are plowed under as green manure or chemically killed prior to planting a primary crop.

* In some perennial crops, cover crops are maintained as permanent cover or live mulch. A vigorous cover crop or live mulch helps suppress weed growth. However, cost effective management of living mulches to prevent competition with the primary crop has often been a problem.

Reduced tillage cropping systems, while not new, have been improved. Through technology, new tools have been developed capable of, for example, seeding, fertilizing, and applying pesticides through stubble from a previous crop, in a single pass. New herbicides and plant growth regulators can effectively control weeds and potentially serve as management tools to suppress a live mulch's competitive growth.

Dramatic fuel cost increases during the past decade have spurred adoption of energy efficient farming methods. Live mulch cover cropping potentially can save energy by decreasing travel across a field surface and, with a legume mulch species, reduce the need for supplemental nitrogen fertilizer.

Potential benefits of living mulch systems prompted investigation of specific systems. For example, work at the International Institute of Tropical Agriculture (IITA), Nigeria, for several years has focused on a maize system utilizing different legume mulch species. At Cornell University, scientists have been developing a system of growing sweet corn in white clover.

a formal link between the IITA and Cornell mulch program and the AID/OSU weed program materialized in April 1981 when IPPC cooperated with the Departments of Horticulture and Crop Science at OSU in organizing a regional living mulch workshop. Proceedings of this workshop were published and distributed worldwide by IPPC.

IPPC initiated its own living mulch research project in 1982. The combined goals of the project are: to provide graduate student training on a project relevant to Third World agriculture and to identify potential for live mulching in Oregon's Willamette Valley. Research has followed two thrusts: a sweet corn/white clover mulch system: and, plant material screening trials. Principle researchers are: L. C. Burrill, project leader and major professor; Alan Cooper, MS degree candidate and half-time IPPC staff; Albert Fischer, PhD degree candidate; and Mark Peterman, MS degree candidate.

---------- Sweet Corn / White Clover Program ----------

Introduction

Studies to test the feasibility of growing sweet corn (*Zea mays* L. var. Golden Jubilee) in a living, white clover (*Trifolium repens* L. var. New Zealand) sod began in the fall 1982 at three Willamette Valley locations. Objectives were: to develop a system, based on Cornell University research, that optimizes beneficial effects of a legume cover crop while simultaneously producing a sweet corn crop. Anticipated benefits include: weed suppression, reduced soil erosion, added organic matter, added nitrogen, reduced tillage, and enhanced water use efficiency through improved soil infiltration and hydraulic conductivity combined with improved root penetration.

Methods

Treatments in the establishment year consisted of three clover planting dates: 1. fall, prior to the spring corn planting; 2. spring, about two weeks prior to planting corn; and, 3. summer, overseeding immediately after final corn cultivation. The lime and rhizobium pelleted clover seed was drilled or broadcast seeded at the rate of 6.7 kg/ha (6 lb/A).

Superimposed on the clover establishment dates were weed control treatments of 4.5 kg ai/ha (4 lb ai/A) EPTC for the fall planting, the same rate of vernolate for the spring planting, and cultivation up to the time of summer overseeding. A control of no weed control was included for each planting date.

The treatments were further divided into different means of suppression of the clover applied just prior to corn planting to minimize competition with the corn. Suppression consisted of: mowing; atrazine applied at .84 kg ai/ha (.75 lb ai/A); the plant growth regulator PP333 applied at .84 kg ai/ha; and, a no-suppression check for the fall- and spring-planting dates. Fall-planted clover was mowed and the cuttings removed prior to suppression treatment application. No suppression was required for the summer overseeded clover since the shading effect of the developing corn plants prevented excessive clover growth. A conventional corn production check plot was included in all replications.

The experimental design was a randomized complete block with four replications. Trial locations were: the Oregon State University Horticulture vegetable farm (2 mi. east of Corvallis), the Hyslop Agronomy Farm (5 mi. north of Corvallis), and the North Willamette experiment station (Aurora, OR).

Plot size was 4.6m by 6.1m (15 by 20 ft.). All plots received 224 kg/ha (200 lb/A) single super phosphate (0-20-0) broadcast incorporated prior to clover planting and 672 kg/ha (600 lb/A) of 16-20-0 subsurface banded in the row at corn planting. An additional 112 kg/ha (100 lb/A) nitrogen in the form of urea (45-0-0) was sidedressed at corn tassling. 'Golden Jubilee' sweet corn was seeded at 91.4 cm (36 in.) between rows and 23 cm (9 in.) between plants for a total population of about 47,840 plants/ha (19,360 plants/A). Irrigation was applied as needed.

Weed counts by species were made from two .25m^2 quadrats placed randomly within the plots. Corn height was measured at three dates during the growing season from five randomly selected plants per plot. Corn was harvested from three 4m (13 ft.) rows and weighed in the field. Kernal moisture at harvest averaged 73%.

Results/discussion

Corn could not be harvested at the North Willamette location because of planting difficulties and resulting poor corn stands. For the same reason, 40 plants from within each plot's harvest area were selected as the standard harvested sample at the Horticulture farm location, whereas all plants within the designated sample area were harvested at the Hyslop farm location. The average number of plants in the harvest area at Hyslop farm was 41.

Despite difficulties, preliminary observations indicate that the described corn-clover system, is viable.

Yield: Corn yields for the various treatments that included some means of clover suppression, as measured at two locations (see accompanying tables) were either not significantly different, or only slightly reduced compared to conventional treatments. The treatments resulting in the lowest number of ears per plant and total ear weight were those where the clover received either no suppression or only mowing. Overall, average yields compared favorably with the regional average of about 3.3 t/ha (9 t/A).

Crop height: The corn height data indicate an observed etiolation of young corn growing in established clover. This is assumed to be a response to competition for light. By harvest, however, these same plants were significantly shorter than corn not grown in established clover. The tallest plants tended to be the highest yielding.

Clover establishment: Percent clover cover data recorded from the three locations indicate varying rates of establishment. Establishment was best at the North Willamette location and poorest at Hyslop farm for all planting dates. Differences in local soil characteristics and weather may have caused the variation.

Weed interaction: Weeds were generally most numerous in plots without preplant herbicide applied; however, there was no consistent corresponding corn yield reduction in these plots.

Weed suppression: The ability of mulch to suppress weeds was best demonstrated at the North Willamette location that produced both a high native weed population and good clover establishment. There were very few weeds in plots with a well established, fall planted clover crop in contrast to plots where the clover was spring planted. Application of a suppression treatment did not significantly influence the number of weeds present.

The suppression treatment using atrazine killed most of the spring planted clover. A single mowing when the corn is about .5m tall may be all that is necessary to manage the spring planted clover until the closing corn canopy begins shading it. The PP333 treatment caused a slight reduction in corn plant height, but yield was not similarly affected.

One additional potential benefit from the system was noted at the North Willamette location. Fall-planted clover harvested as forage in the spring prior to planting corn, averaged 2.1 mt/ha (5.7 t/A) fresh weight.

Conclusion/future

Some potential problems were encountered. For example, although temperature data were not recorded, it is expected that low soil temperatures under the clover may delay corn planting and maturity. Also, the observed presence of field mice and gophers may reduce both clover and corn yields. Changing patterns of weed, insect, and pathogen populations will require specific management strategies. Perhaps most important, the mechanics of planting and fertilizing corn through a living clover crop need improving.

As the project continues, researchers are seeking to solve these problems and refine what appears to be a feasible alternative to conventional sweet corn production for the Willamette Valley. Work is now underway repeating, on the same plots, some of the described treatments plus additional clover suppression treatments designed to assess the system in the second year of clover establishment. A trial is being conducted to determine the effect of corn spacing. Large plots of

clover/corn have also been established to monitor in greater detail and over a longer time span the effect of the system on corn yield, weed spectrum, soil characteristics, and water movement.

PLANT MATERIALS SCREENING

Preliminary small-plot screening of 40 legume, grass, and mixed species cover crops to evaluate their potential as live mulches began in Spring 1983. Two identical replicated trials were established in June and in September. These will be maintained and monitored throughout several years growth. Plot size is 1.5 by 3 m with four replications in each trial. Fertilization consists of preplant incorporation of about 225 kg/ha single super phosphate. All legumes were innoculated with the proper strain of Rhizobium sp. prior to hand-broadcast seeding and light raking. Irrigation was supplied as needed. The only weed control has been three mowings in the June-planted trial and none, to date, in the September trial.

The data that follow are for the June-planted trial. Casual early observations of the September trial indicate much slower establishment and heavy weed competition, especially between legumes and annual bluegrass.

Comments

Reported results are very preliminary and few conclusions can be drawn from them. Evaluations to date are for cover crops in the early establishment growth phase only. Many legumes are very slow starters and may appear to have little potential as cover crops in their first year.

Weed suppression in the first year may be more effective under a rapidly establishing grass-legume mixture. Nutrient cycling may also be enhanced with mixed species covers. However, because of anticipated management problems, the grass could be phased out as the legume establishes through cultural or chemical means.

Other species that appeared favorable in early evaluations may later develop severe disease or insect infestations that will greatly reduce their usefulness as perennial live mulches.

Frost tolerance is not accurately reflected in the data. At times damage due to frost was hard to distinguish from the combined effects of natural senescence and disease. A more complete evaluation will emerge as detailed monitoring continues over several years.

PLANT MATERIAL SCREENING

Expt. Number: PM83-1, Corvallis, OR
Established June 9, 1983

crop	seed rate -(lb/A)-	cover at 55 DAS:[1] crop (%)	weeds (%)	at 125 DAS:[2] frost damage	cover rating
1. "Dixie" Crimson Clover *Trifolium incarnatum*	20	65	15	+	P
2. "Bastion" Per. Ryegrass *Lolium perenne*	15	58	13	-	VG
3. "Kenland" Red Clover *T. pratense*	8	55	15	+	F
4. "Comet" Orchardgrass *Dactylis glomerata*	15	70	15	-	VG
5. Hairy Vetch	30	58	15	+	P
6. "Mt. Barker" Sub. Clover + "Elka" Per. Ryegrass *T. subterraneum* + *L. perenne*	10+15	20+40	13	+, 0	VG
7. "Trampas" Ky. Bluegrass *Poa pratensis*	15	20	25	-	P
8. Alsike Clover *T. hybridum*	6	73	13	+	G
9. "Echo" Chewings Fescue *Festuca rubra* var *commutata*	15	35	28	-	VG
10. "Kalo" Dwarf English Trefoil *Lotus corniculatus*	4	15	35	-	F
11. "Kenland" Red Clover + N.Z. White Clover *T. pratense* + *T. repens*	8+4	70	18	+	VG

crop	seed rate -(lb/A)-	cover at 55 DAS:[1] crop (%)	weeds (%)	at 125 DAS:[2] frost damage	cover rating
12. "Nobis" Timothy *Phleum pratense*	10	10	45	-	P
13. "Resis" Alfalfa *Medicago sativa*	15	73	13	+	F
14. "Accord" Per. Ryegrass *L. perenne*	15	65	18	-	G
15. "Alban" White Clover *T. repens*	4	50	18	+	G
16. LD 2343 Per. Ryegrass *L. perenne*	15	73	10	-	VG
17. "Penngift" Crownvetch + T3 An. Ryegrass *Coronilla varia* + *L. multiflorum*	20+15	13+48	13	0, +	VG
18. "Yarloop" Sub. Clover *T. subterraneum*	10	23	30	+	P
19. "Pollux" Chewings Fescue *Festuca rubra* var. *commutata*	15	8	40	N/A	P
20. Sourclover *Melilotus indica*	8	38	20	N/A	P
21. "Nassau" Ky. Bluegrass *P. pratensis*	10	18	20	0	P
22. Perennial Pea	100	10	40	-	F
23. "Marshfield" big Trefoil + "Ensylva" Creeping Red Fescue *Lotus ulignosus* + *Festuca* sp.	4+5	18+45	15	+, 0	VG

crop	seed rate -(lb/A)-	cover at 55 DAS:[1] crop (%)	weeds (%)	at 125 DAS:[2] frost damage	cover rating
24. "Tibbee" Crimson Clover *T. incarnatum*	20	63	15	+	G
25. "Fiesta" Perennial Ryegrass *L. perenne*	15	58	15	0	F
26. Broadleaf Birdsfoot Trefoil *L. corniculatus*	6	45	18	0	P
27. "Woogenellup" Sub. Clover *T. subterraneum*	10	43	18	+	G
28. LD 3480 Chewings Fescue *F. rubra* var. *commutata*	15	33	18	0	G
29. "Hykon" Rose Clover *T. hirtum*	8	23	23	+	P
30. Hederma Sickle Keeled Lupine *Lupinus albicaulis*	15	23	28	0	G
31. "Kalo" Dwarf Eng. Trefoil + "Melba" Ky. Bluegrass *L. corniculatus* + *P. pratensis*	4+10	15+23	15	-, 0	F
32. White Dutch Clover *T. repens*	4	65	18	-	G
33. "Delray" Per. Ryegrass *L. perenne*	15	50	15	-	G
34. "Penngift" Crownvetch *C. varia*	20	15	28	0	F
35. "Salina" Strawberry Clover *T. fragiferum*	4	13	13	+	G

crop	seed rate -(lb/A)-	cover at 55 DAS:[1] crop (%)	weeds (%)	at 125 DAS:[2] frost damage	cover rating
36. Hungarian Vetch *Vicia pannonica*	30	18	25	0	F
37. "Kenland" Red Clover + "Penngift" Crownvetch *T. pratensis* + *c. varia*	8+20	43+13	10	+, 0	G
38. "Marshfield" Big Trefoil *L. uliginosus*	4	23	23	-	F
39. "Anik" Alfalfa *M. sativa*	15	53	15	-	F
40. "Geraldton" Sub. Clover *T. subterraneum*	10	40	15	+	P

1/ DAS = Days after seeding. Values represent an average of 4 replications.

2/ Values are for 1 replication only. Frost damage: + = heavy to moderate; - = moderate to light; 0 = none visible. Cover rating: P (poor) = 0-20%; F (fair) = 21-50%; G (good) = 51-70%; VG (very good) = 71-100%.

TREATMENT LIST BY LOCATION

HYSLOP FARM:

NO.	CLOVER PLANTING	WEED CONTROL	SUPPRESSION
1	Fall	EPTC 4.5 kg ai/ha	atrazine .84 kg ai/ha
2	Fall	EPTC 4.5 kg ai/ha	mowing
3	Fall	EPTC 4.5 kg ai/ha	PP333 .84 kg ai/ha
4	Fall	EPTC 4.5 kg ai/ha	none
5	(trt. 1 without EPTC)		
6	(trt. 2 without EPTC)		
7	(trt. 3 without EPTC)		
8	(trt. 4 without EPTC)		
9	Spring	vernolate 4.5 kg ai/ha	atrazine .84 kg ai/ha
10	Spring	vernolate 4.5 kg ai/ha	mowing
11	Spring	vernolate 4.5 kg ai/ha	PP333 .84 kg ai/ha
12	Spring	vernolate 4.5 kg ai/ha	none
13	(trt. 9 without vernolate)		
14	(trt. 10 without vernolate)		
15	(trt. 11 without vernolate)		
16	(trt. 12 without vernolate)		
17	Summer	cultivation	none
18	Check		

VEGETABLE FARM:

1	Spring	vernolate 4.5 kg ai/ha	atrazine .84 kg ai/ha
2	Spring	vernolate 4.5 kg ai/ha	mowed
3	Spring	vernolate 4.5 kg ai/ha	none
4	(trt. 1 without vernolate)		
5	(trt. 2 without vernolate)		
6	(trt. 3 without vernolate)		
7	(trt. 1 broadcast seeded)		
8	(trt. 2 broadcast seeded)		
9	(trt. 3 broadcast seeded)		
10	(trt. 4 broadcast seeded)		
11	(trt. 5 broadcast seeded)		
12	(trt. 6 broadcast seeded)		
13	Summer	cultivation	none
14	Check		

NORTH WILLAMETTE STATION:

1	Fall	EPTC 4.5 kg ai/ha	mowed
2	Fall	EPTC 4.5 kg ai/ha	none
3	(trt. 1 without EPTC)		
4	(trt. 2 without EPTC)		
5	Spring	vernolate 4.5 kg ai/ha	mowed
6	Spring	vernolate 4.5 kg ai/ha	none
7	(trt. 5 without vernolate)		
8	(trt. 6 without vernolate)		
9	Summer	cultivation	
10	Check		

VEG. FARM CORN GROWTH PARAMETERS[1]

SAMPLE HEIGHT (cm)

TREATMENT	(7/21/83)	(8/22/83)	(10/7/83)
1.	32.25 (ns)	165.25 cd	222.75 cd
2.	33.50	136.75 a	202.75 a
3.	32.25	141.00 ab	200.75 a
4.	31.25	154.25 bc	223.00 bcd
5.	31.25	145.50 ab	205.75 a
6.	30.50	151.75 bc	205.75 a
7.	32.00	171.00 d	231.00 d
8.	31.00	141.25 ab	206.75 a
9.	30.00	151.00 bc	212.00 abc
10.	30.00	163.25 cd	225.25 cd
11.	30.00	151.25 bc	213.00 abc
12.	33.50	154.00 bc	209.50 ab
13.	30.00	164.50 cd	225.75 cd
14.	29.75	175.75 d	238.75 d
AVERAGE	31.23	154.75	215.91

VEG. FARM CORN GROWTH PARAMETERS (10/11/83)

TREATMENT	EARS PER PLANT	YIELD (T/A)	(mT/ha)
1.	2.03 cd	10.18 bc	3.74 bc
2.	1.89 abcd	9.03 ab	3.31 ab
3.	1.54 a	7.39 a	2.71 a
4.	1.96 bcd	9.89 bc	3.63 bc
5.	1.85 abcd	9.46 bc	3.47 bc
6.	1.54 a	8.54 ab	3.14 ab
7.	1.85 abcd	9.86 bc	3.62 bc
8.	1.69 ab	8.77 ab	3.22 ab
9.	1.55 a	7.48 a	2.75 a
10.	1.71 abc	10.23 bc	3.76 bc
11.	1.78 abcd	9.77 bc	3.59 bc
12.	1.53 a	7.66 a	2.81 a
13.	2.11 d	11.11 c	4.08 c
14.	2.09 d	11.18 c	4.10 c
AVERAGE	1.79	9.33	3.42

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[1] Values in a column followed by a common letter do not differ significantly according to the DMRT at the 5% level.

VEG. FARM WEED AND YIELD DATA[1]

TREATMENT	WEED COUNTS/.5m² (7/22/83)		
	GRASSES	BROADLVS.	TOTAL
1.	0.00 a	11.75 ab	11.75 ab
2.	0.00 a	29.75 bcd	29.75 bc
3.	0.25 a	24.75 bcd	25.00 abc
4.	6.00 ab	21.50 bcd	27.50 bc
5.	13.75 bc	26.75 bcd	40.50 cd
6.	14.50 bc	24.50 bcd	39.00 cd
7.	0.00 a	18.00 abc	18.00 abc
8.	0.00 a	26.25 bcd	26.25 abc
9.	0.00 a	30.25 bcd	30.25 bc
10.	9.75 abc	30.25 bcd	40.00 cd
11.	21.00 c	34.75 cde	55.75 de
12.	17.50 bc	38.75 de	56.25 de
13.	14.75 bc	49.50 e	64.25 e
14.	1.00 a	3.75 a	4.75 a
AVERAGE	7.04	26.46	33.50

VEG. FARM WEED AND YIELD DATA

TREATMENT	YIELD (10/11/83)		PERCENT COVER
	(T/A)	(mT/ha)	(7/25/83)
1.	10.18 bc	3.75 bc	27.50 ab
2.	9.03 ab	3.31 ab	72.50 ef
3.	7.39 a	2.71 a	75.00 f
4.	9.89 bc	3.63 bc	37.50 bc
5.	9.46 bc	3.47 bc	70.00 ef
6.	8.54 ab	3.14 ab	60.00 ef
7.	9.86 bc	3.62 bc	12.50 a
8.	8.77 ab	3.22 ab	57.50 de
9.	7.48 a	2.75 a	45.00 cd
10.	10.23 bc	3.75 bc	20.00 a
11.	9.77 bc	3.59 bc	42.50 bcd
12.	7.66 a	2.81 a	47.50 cd
13.	11.11 c	4.08 c	none
14.	11.18 c	4.10 c	none
AVERAGE	9.32	3.42	

[1] Values in a column followed by a common letter do not differ significantly according to the DMRT at the 5% level.

HYSLOP FARM CORN GROWTH PARAMETERS

SAMPLE HEIGHT (cm)

TREATMENT	(7/21/83)	(8/22/83)	(10/8/83)
1.	24.25 cde	138.50 cde	226.25 bc
2.	30.75 g	121.75 abc	210.00 a
3.	25.00 de	110.50 a	198.75 a
4.	29.00 fg	120.25 abc	201.75 a
5.	25.50 ef	133.50 bcd	223.00 b
6.	29.75 g	122.00 abc	208.50 a
7.	30.75 g	121.00 abc	202.25 a
8.	27.25 efg	115.00 ab	200.75 a
9.	20.75 abc	156.25 f	242.00 d
10.	20.75 abc	146.25 def	237.00 cd
11.	20.25 ab	141.25 def	230.00 bcd
12.	21.00 abc	153.00 ef	240.75 d
13.	21.75 bcd	154.00 ef	237.50 cd
14.	19.75 ab	154.25 ef	239.00 cd
15.	21.25 abcd	154.50 ef	233.25 bcd
16.	21.50 bcd	160.25 f	239.75 cd
17.	21.75 bcd	154.45 ef	243.75 d
18.	17.50 a	148.25 def	238.50 cd
AVERAGE	23.81	139.16	225.15

HYSLOP FARM CORN GROWTH PARAMETERS (10/27/83)

TREATMENT	PLANTS PER ACRE	EARS PER PLANT	YIELD (T/A)	YIELD (mT/ha)
1.	17948.00 (ns)	1.70 (ns)	9.48 (ns)	3.48 (ns)
2.	16638.00	1.91	9.28	3.41
3.	16537.00	1.52	7.66	2.81
4.	16638.00	1.68	8.47	3.11
5.	16839.00	1.73	9.28	3.41
6.	15428.00	1.89	8.67	3.18
7.	15226.00	1.68	7.87	2.89
8.	18150.00	1.47	8.07	2.96
9.	16940.00	1.51	8.67	3.18
10.	16436.00	1.70	9.88	3.63
11.	16033.00	1.77	9.68	3.55
12.	15226.00	1.73	8.77	3.22
13.	16638.00	1.63	9.28	3.41
14.	15125.00	1.58	8.47	3.11
15.	16940.00	1.55	9.48	3.48
16.	17142.00	1.65	9.88	3.63
17.	17343.00	1.61	9.68	3.55
18.	16537.00	1.59	8.87	3.26
AVERAGE	16542.44	1.66	8.97	3.29

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[1] Values in a column followed by a common letter do not differ significantly according to the DMRT at the 5% level

HYSLOP FARM WEED AND YIELD DATA[1]

TREATMENT	WEED COUNTS/.5m² (7/22/83)		
	GRASSES	BROADLVS.	TOTAL
1.	0.00 a	5.25 (ns)	5.25 ab
2.	0.25 a	1.25	1.50 a
3.	0.25 a	1.25	1.50 a
4.	0.25 a	0.75	1.00 a
5.	0.00 a	0.75	0.75 a
6.	0.00 a	1.50	1.50 a
7.	0.00 a	2.50	2.50 a
8.	0.25 a	0.50	0.75 a
9.	0.50 a	0.75	1.25 a
10.	1.50 ab	5.00	6.50 abc
11.	1.00 ab	1.75	2.75 ab
12.	1.25 ab	2.00	3.25 ab
13.	2.50 ab	2.25	4.75 ab
14.	5.75 bc	4.50	10.25 bcd
15.	10.00 c	5.25	15.25 d
16.	9.75 c	3.75	13.50 cd
17.	4.75 ab	3.25	8.00 abc
18.	0.50 a	0.00	0.50 a
AVERAGE	2.14	2.35	4.49

HYSLOP FARM WEED AND YIELD DATA

TREATMENT	YIELD (10/27/83)		PERCENT COVER (7/22/83)
	(T/A)	(mT/ha)	
1.	9.48 (ns)	3.48 (ns)	57.50 d
2.	9.28	3.41	62.50 d
3.	7.66	2.81	62.50 d
4.	8.47	3.11	67.50 d
5.	9.28	3.41	47.50 cd
6.	8.67	3.18	52.50 d
7.	7.87	2.89	61.25 d
8.	8.07	2.96	55.00 d
9.	8.67	3.18	5.00 ab
10.	9.88	3.63	27.50 abc
11.	9.68	3.55	27.50 abc
12.	8.77	3.22	25.00 abc
13.	9.28	3.41	2.50 a
14.	8.47	3.11	25.00 abc
15.	9.48	3.48	25.00 abc
16.	9.88	3.63	17.50 ab
17.	9.68	3.55	none
18.	8.87	3.26	none
AVERAGE	8.97	3.29	

[1] Values in a column followed by a common letter do not differ significantly according to the DMRT at the 5% level.

N. WILLAMETTE EXPERIMENT STATION CLOVER AND WEED DATA[1]

TREATMENT	WEED COUNTS/.5 m² (8/25/83)			PERCENT COVER (8/25/83)	FORAGE mT/ha (6/24/83)
	GRASSES	BROADLVS.	TOTAL		
1.	0.75 (ns)	0.00 (ns)	0.75 a	100 d	2.18
2.	0.00	0.25	0.25 a	100 d	2.17
3.	0.00	0.25	0.25 a	100 d	2.14
4.	0.00	1.00	1.00 a	98 d	2.06
5.	0.00	36.75	36.75 b	73 bc	
6.	0.25	39.25	39.50 b	70 abc	
7.	2.25	51.50	53.75 bc	70 abc	
8.	0.25	68.25	68.50 c	58 ab	
9.	0.00	3.50	3.50 a	none	
10.	2.50	7.50	10.00 a		

[1] Values in a column followed by a common letter do not differ significantly according to the DMRT at the 5% level.

WORK PLAN

A summary of anticipated and proposed activities for the period of June 1, 1984 through May 31, 1985 follows.

A. TRAINING

* TRAINING COURSES *

June 10-July 20, 1984 - Florida: The IPPC Aquatic Weed Program will conduct an international training course in Aquatic Plant Ecology and Management in conjunction with the University of Florida's Center for Aquatic Weeds. The course will include lectures on aquatic plant identification, ecology, growth, limnology, physiology, and various control methods. Field trips and laboratory projects will include individual training in various ecological and control methodology. The final week of the course will include attending the National Aquatic Plant Management Society meeting at Richmond, VA.

#

June 25-July 24, 1984 - Honduras: Under a memorandum of understanding, IPPC will provide an instructor to teach a 3-credit hour weed management course to second year students at the Escuela Agricola Panamerica. Mr. A. Fischer has agreed to undertake this assignment. All instruction will be in Spanish. IPPC will also provide certain classroom materials (in Spanish).

#

August 1984 - Lesotho and Zambia: At the request of the USAID Regional Pesticide Development Advisor (USAID/Lusaka) forwarded through S&T/AGR/AP, a project staff member will collaborate in presenting two 3-day train-the- trainer pesticide management workshops. Each workshop will include approximately 35 participants. Safety aspects of pesticide application and sprayer calibration will be emphasized. A packet of relevant materials for each participant will be assembled by IPPC and distributed to each participant.

#

September, December 1984 - Bolivia: IPPC, in cooperation with CICP and in collaboration with local Bolivian Technical specialists, has contracted with USAID/Bolivia, through the Bolivia Disaster Recovery Project, to present several workshops on the safe and efficient use of pesticides. The workshops, to be conducted in both September and December, are intended for persons dealing directly with pesticides, i.e., farmers, pesticide applicators, formulators, and extension agents. Each workshop will seek to improve the efficiency and safety with which pesticides are used and thereby minimize their harmful effects to humans, the agro-ecosystem, and the environment.

#

November 1984 - Costa Rica: IPPC will be a key participant in presenting a 3-week weed management short course at CATIE. Major funding support of $24,000 will be supplied by FAO, with supplemental support from both CATIE and IPPC.

IPPC weed scientist M. D. Shenk and CATIE weed scientist A. Beals will carry primary responsibility for organizing and teaching the course. It is expected that 5 to 7 Costa Rican scientists will also instruct. Two GTZ (German) botanists residing in Costa Rica will also be asked to assist. Funding will be sufficient to support 18 participants from throughout Central America.

#

November-December 1984 - Tanzania: FAO and IPPC resources will be combined to conduct a 3-week course on weed management for government agronomists and university staff. The training site will be the Faculty of Agriculture at Morogoro.

#

March 1985 - Thailand: IPPC has offered to conduct a 3-week training course on weed management in Thailand. The course will be organized by Kasetsart University faculty.

#

Spring 1985 - Kenya: Planning is under way for the project aquatic weed program to conduct an aquatic weed management short course in East Africa organized through USAID/Nairobi.

#

Pending: Weed management courses are also being discussed with FAO for Nepal and Brazil.

* STUDENTS *

One, and possibly two, students from Pakistan are anticipated to enroll in a MS degree program at OSU.

B. INFORMATION

* PUBLICATIONS *

The project expects to publish and begin distribution of at least two major publications during the year. The working title for the first is "Agricultural Extension Agents' Weed Control, Information Guidebook for Developing Countries." Material presents basic aspects of weed-crop problems, considerations in designing control programs, and attempts to provide information that will help generalist extension agents be more effective with their clientele.

A second planned publication reports the results of the lever-operated knapsack sprayer familiarization and component evaluation program conducted by the AID/OSU project during the past year and a half. The work will include extensive use of visuals to illustrate desirable and undesirable sprayer features, information judged to be useful for potential purchasers (to make a more informed choice), and to manufacturers (to improve the design and operation of their products).

IPPC will publish and distribute at least three issues of the IPPC INFOLETTER. The aquatic weed program will publish two issues of AQUAPHYTE.

Drs. B. Napompeth (Thailand) and D. Mitchell (Commonwealth Scientific Investigation and Research Organization) have agreed to collaborate with the IPPC-aquatic weed program to produce a 40-50 page bulletin describing the identification, biology, and control of two of the most rapidly spreading tropical aquatic weeds, Salvinia molesta and Mimosa Pigra.

* LDC LIBRARY DEVELOPMENT *

The Weed Science Society of America (WSSA) has donated US$1,000 to be used for purchasing published weed science materials to improve the resources, and increase the use, of technical literature collections in selected developing country institutions. WSSA expects to receive a matching grant from industry. The funds will be turned over to IPPC to select, purchase, and ship the materials. Also, all relevant IPPC titles will be added to the purchased sets.

The joint WSSA-IWSS-IPPC publications recycling program also will continue.

C. OTHER ACTIVITIES

Arrangements have been completed for two distinguished international weed scientists to visit IPPC. Dr. I. O. Akobundu (Nigeria), weed scientist at the International Institute of Tropical Agriculture, will begin a year's sabbatic at Oregon in August. He is expected to continue his pioneering work with use of mulch crops for weed control. Australian weed scientist, Dr. J. Swarbrick, will spend a shorter period of time at OSU during 1985 or 1986.

The project anticipates further development and refinement of the use of computers for training in technical information handling as well as office streamlining.

FINANCIAL REVIEW

The table on the next page lists expenditures by the AID-OSU weed project, according to broad work areas, during the period April 1, 1976 through May 31, 1983.

Approximately $1 million, or 56% of total expenditures, was spent in directly conducting the overseas research activities of the project. Another 10% was allocated to administrative support, and 5% for research publications. The remaining 30% underwrote research and training conducted in Corvallis and Corvallis support of the overseas research.

Oregon State University contributed an additional $62,715 to the effort, primarily through the provision of research equipment, supplies, and land. Support was also received from a variety of private and public agencies including FAO, the Ford Foundation, and a number of private businesses. The University of Florida has also made an important contribution through its Center for Aquatic Weeds.

TECHNICAL ASSISTANCE (AID/ta-C-1303)

Expenditures and obligations June 1, 1979 through May 31, 1984

	Total Budget Including All Adjustments	Expen-ditures June 1, 1979 through May 1982	Expen-ditures June 1982 through May 1983	Expen-ditures June 1983 through May 1984	Total Expen-ditures	Balance	Contributed June 1983 through May 1984
Salaries and Wages	$1,365,187	$ 752,315	$160,021	$191,977	$1,104,313	$260,874	—
Fringe Benefits	330,637	156,494	49,102	61,107	266,703	63,934	—
Indirect Costs	657,708	358,475	92,235	121,980	572,690	85,018	—
Travel and Transportation	302,200	138,611	25,431	46,816	210,858	91,342	26,000
Other Direct Costs	36,285	52,667	5,582	1,300	59,549	(-23,264)	—
Equipment, Vehicles Materials and Supplies	518,917	433,068	31,639	44,620	509,327	9,590	13,000
Aquatic Weed Sub-Contract	497,474	259,237	110,784	57,908	427,929	69,545	15,000
TOTALS	$3,708,408	$2,150,867	$474,794	$525,708	$3,151,369	$557,039	$ 54,000

* Oregon State University, University of Florida, FAO.

APPENDIXES

Appendix 1: Organizations with which IPPC Networks

* - Indicates a primary networking contact

LATIN AMERICA

* CIMMYT, Apartado Postal 6-641, Mexico 6, D.F., Mexico
* CATIE, Turrialba 7170, Costa Rica
* Escuela Panamericana, Apartado 93, Tequcigalpa, Honduras

CIP, Apartado 5969, Lima, Peru

* CIAT, Apartado 67-13, Cali, Colombia
* COMALFI (Colombian Weeds/Pests Society), AA 29688, Bogota, D.F., Colombia

ICA, Inst. Colombiano Agropecuario, AA 151123, Bogota, Colombia

EMBRAPA, C.P. 1316, 70.000 Brasilia, DF, Brazil

IAPAR, C.P. 1331, 86.100 Londrina, PR, Brazil

* ESALQ, C.P. 9, 13.400 Piracicaba, SP, Brazil

CSIRO, C.P. 322, 80.000 Curitiba, PR, Brazil

* Fitotecnia, Fac. de Agro., Univ. Catolica de Chile, Casilla 114-D, Santiago, Chile
* INIAP, Apartado 2600, Quito, Ecuador

CENTA, Apartado Postal 885, Santa Tecla, El Salvador

Min. of Agric., Weed Control Section, Port-au-Prince, Haiti

* Dept. of Agric., P.O. Box 149, Belize City, Belize
* Min. de Desa. Agro., Apartado 5390, Panama, Panama
* CARDI, P.O. Box 971, Castries, St. Lucia, WI

Dept. of Crop Science, Univ. of the West Indies, St. Augustine, Trinidad & Tobago, WI

ASIA

* AVRDC, P.O. Box 42, Shanhua, Tainan 741, Taiwan, ROC
* IRRI, P.O. Box 933, Manila, Philippines
* National Crop Protection Center, College, Laguna, Philippines
* University of The Philippines, Weed Science Group, College, Laguna, Philippines
* ICRISAT, Patancheru P.O., Andhra Pradesh 502 324, India

Dept. of Agriculture, Bandar Seri Begawan, Brunei

Directorate of Agric., 72 Shwedagon Pagoda Rd., Rangoon, Burma

Canada-IRRI-Burma Project, P.O. Box 1369, Rangoon, Burma

Nanjing Agric. College, Dept. of Agron., Nanjin, People's Republic of China

Dept. of Agric., P.O. Box 358, Suva, Fiji Islands

Dept. of Agron., Haryana Agric. Univ., Hissar, Haryana, India

Indian Council of Ag. Research, New Delhi 1, India

Indian Agr. Res. Institute, New Delhi 110012, India

* Central Plant Protection Training Institute, Hyderabad 500030, A.P., India
* BIOTROP, P.O. Box 17, Bogor, Indonesia
* MARDI, P.O. Box 2301, Kuala Lumpur 01-02, Malaysia

FAO South Pacific Commission, P.O. Box 9, Noumea, New Caledonia

Min. of Ag. P. Bag, Palmerston North, New Zealand

* Agron. Dept., Univ. of Agric, Faisalabad, Pakistan
* NARC, Islamabad, Pakistan
* Nat'l Weed Research Ctr., Dept. of Agric., Bangkok, Thailand
* Nat'l Bio. Cont. Res. Center, P.O. Box 9-52, Bangkok 9, Thailand
* Dept. of Agron., Kasetsart Univ., Bangkok, Thailand

NEAR, MIDDLE EAST, N. AFRICA

Inst. National Agron., El Harrach, Alger, Algeria

Volcani Institute, P.O. Box 6, Bet Dagan 50200, Israel

Plant Prot. Dept., P.O. Box 7054, Hakirya, Tel-Aviv, Israel

Dir. de la Rech. Agron. Phyt., B.P. 415, Rabat, Morocco

Inst. Nat. de Rech. Agron., Ave de l'Independence Ariana, Tunisia

* Fac. of Agri., Weed Control, Amer. Univ. of Beirut, Beirut, Lebanon

AFRICA

* IITA, PMB 5320, Ibadan, Nigeria

* WARDA Box 1019, Monrovia, Liberia

ISABU, B.P. 795, Bujumbura, Burundi

Directorate of Agric., Min. of Agric., Yaounde, Cameroon

Dept. of Agric., Cape St. Mary, Gambia

Inst. for Ag. Resch., Ahmadu Bello Univ., Zaria, Nigeria

Weed Sci. Soc. for E. Africa, P.O. Box 43340, Nairobi, Kenya

* University of Nairobi, Crop Science Dept., P.O. Box 30197, Nairobi, Kenya

* Mount Makulu Research Station, P/B 7, Chilanga, Zimbia

INTERNATIONAL & OTHER

* FAO, Plant Protection Div., Via delle Terme di Caracalla, 00100
Rome, Italy

* CID (Consortium for Intl. Devel.), 5151 E. Broadway, Tucson, AZ 85711

ISNAR, P.O. Box 93375, 2509AJ The Hague, The Netherlands

* Weed Research Organization, Begbroke Hill, Yarnton, Oxford OX5 1PF, U.K.

* GTZ, Postfach 5180, D-6236 Eschborn 1, F. R. Germany

  Winrock, Petit Jean Mountain, Morrilton, AK 72110

  IDRC, P.O. Box 8500, Ottawa, Ont. K1G 3H9, Canada

* World Bank, 1818 H St. NW, Washington, DC 20433

* IBS Weed Control, P.O. Box 14, Wageningen, Netherlands

Appendix 2. Worldwide distribution of INFOLETTER

Country	Recipients as of Dec. 1975	May 1979	May 1981	May 1984
Abu Dhabi	1	1	1	1
Aden	1	1	1	-
Afghanistan	15	13	12	11
Africa	-	-	-	1
Algeria	2	4	3	7
Angola	2	-	1	1
Antigua, W. I.	2	2	2	2
Arab Rep. of Egypt	9	14	16	23
Arabian Gulf	-	-	1	-
Argentina	213	141	158	179
Australia	59	68	87	110
Austria	5	6	5	6
Bahamas	1	1	1	2
Bangladesh	4	4	8	16
Barbados	2	3	3	2
Basseterre, W. I.	-	-	1	2
Belgium	11	28	29	31
Belize	8	7	6	10
Benin	1	2	2	1
Bermuda, W. I.	1	1	1	1
Bolivia	21	27	28	26
Botswana	3	3	4	11
Brasil	183	179	192	206
Brunei	3	3	3	3
Bulgaria	2	2	2	2
Burma	3	3	4	7
Burundi	-	-	2	2
Cameroon	4	6	7	10
Canada	101	100	138	153
Canal Zone	-	-	-	3
Canary Islands	1	1	1	1
Cape Verde Island	-	1	1	3
Cayman Island, W.I.	-	1	1	1
Cent. African Rep.	1	1	1	1
Chad	3	5	4	2
Chile	37	41	45	46

Country	Recipients as of Dec. 1975	May 1979	May 1981	May 1984
People's Rep. of China	-	2	4	7
Colombia	166	93	97	94
Comores	2	2	2	2
Congo	-	-	-	1
Cook Islands	-	-	-	3
Costa Rica	54	71	76	82
Cuba	1	2	1	3
Cyprus	3	3	4	6
Czechoslavakia	8	10	12	12
Denmark	9	19	20	21
Djbouti	-	1	1	1
Dominican Rep.	10	12	15	16
Ecuador	45	47	49	52
El Salvador	18	12	11	12
Ethiopia	20	25	27	32
Fiji Islands	4	3	5	14
Finland	8	17	18	16
France	22	69	74	84
French W. Indies	-	1	1	-
Gabon	1	1	1	1
Gambia	2	4	4	6
Germany (East)	2	4	1	1
Germany (West)	38	59	59	60
Ghana	22	24	31	41
Greece	16	28	27	28
Grenada	-	-	-	1
Guadeloupe, W.I.	-	-	-	1
Guatemala	29	13	15	18
Guinea	1	1	1	8
Guyana	2	2	4	5
Haiti	3	3	3	5
Honduras	34	18	21	31
Hong Kong	4	4	5	4
Hungary	4	7	8	7
India	161	203	232	300
Indonesia	88	90	97	123

Country	Recipients as of Dec. 1975	May 1979	May 1981	May 1984
Iran	10	12	12	2
Iraq	2	3	3	3
Ireland	7	7	7	8
Israel	18	20	21	29
Italy	19	31	32	35
Ivory Coast	4	6	9	8
Jamaica	11	11	10	10
Japan	52	53	58	60
Jordan	7	8	8	8
Kenya	28	26	35	57
Korea	12	14	13	12
Kuwait	-	-	2	2
Laos	7	7	7	7
Lebanon	8	7	6	-
Lesotho	2	2	3	3
Liberia	7	7	7	12
Libya	1	5	5	5
Madagascar	-	-	-	1
Malagasay Rep.	1	1	1	1
Malawi	5	7	7	13
Malaysia	56	58	65	76
Mali	1	3	3	6
Malta	3	4	4	4
Mauritania	-	2	2	5
Mauritius	2	3	3	4
Mexico	126	63	69	88
Montserrat	-	-	1	1
Morocco	3	3	3	5
Mozambique	2	2	2	3
Nepal	-	2	2	7
Netherlands	15	29	36	44
New Caledonia	4	4	4	4
New Guinea	15	16	14	-
New Herbrides	2	2	2	2
New Zealand	21	26	26	31
Nicaragua	29	19	19	20

Country	Recipients as of Dec. 1975	May 1979	May 1981	May 1984
Niger	-	1	3	4
Nigeria	28	52	55	69
Niue	-	-	-	1
Norway	10	14	12	12
Oman	-	-	-	1
Pacific Islands	2	1	2	2
Pakistan	14	19	20	66
Panama	26	16	17	21
Papua New Guinea	-	-	-	18
Paraguay	9	10	11	12
Peru	74	75	77	83
Philippines	67	182	198	207
Poland	9	10	9	10
Portugal	5	10	11	14
Qatar	-	-	-	2
Romania	2	4	4	4
St. Kitts	-	3	3	3
St. Lucia	1	-	-	2
St. Vincent	-	-	2	3
Saudi Arabia	6	5	6	11
Scotland	4	7	4	-
Senegal	11	20	22	24
Seychelle Is.	1	1	1	1
Sierra Leone	4	7	6	7
Singapore	14	12	10	12
Solomon Islands	2	2	3	5
Somalia	-	1	1	1
South Africa	-	3	5	7
South Atlantic	-	-	-	1
South Pacific	-	-	-	2
South Vietnam	11	11	7	-
Spain	9	22	25	26
Sri Lanka	11	18	18	26
Sudan	9	12	17	24
Surinam	4	4	6	7
Swaziland	2	2	2	4

Country	Recipients as of Dec. 1975	May 1979	May 1981	May 1984
Sweden	13	27	28	27
Switzerland	27	29	28	28
Syria	2	8	9	8
Tahiti	3	3	3	2
Taiwan R.O.C.	18	17	17	19
Tanzania	12	15	17	20
Thailand	40	48	60	96
Togo	1	2	2	4
Tonga	-	-	-	1
Trinidad & Tabago	15	19	21	27
Trucial States	1	1	1	1
Tunisia	4	5	5	7
Turkey	16	19	23	25
Uganda	5	5	5	6
United Kingdom	113	148	169	206
United States	1,213	1,482	1,661	1,854
Upper Volta	2	5	6	10
Uruguay	18	20	23	27
U.S.S.R.	4	4	4	6
Venezuela	50	53	59	63
Western Samoa	6	6	9	15
Yemen Arab Rep.	-	1	3	2
Yugoslavia	5	8	8	12
Zaire	3	3	4	4
Zambia	8	8	10	10
Zimbabwe	-	-	1	6
TOTAL	3,930	4,511	4,931	5,735

Appendix 3: Publications, articles, presentations

(in chronological order)

Major Publications

CROP PRODUCTION USING COVER CROPS AND SODS AS LIVING MULCHES - Edited by J. C. Miller and S. M. Bell

Proceedings of a workshop held in Corvallis, Oregon, were published in cooperation with an on-campus coordinating group. 123 pages, softbound. 1982.

NO TILLAGE CROP PRODUCTION IN THE TROPICS - Edited by I. O. Akobundu and A. E. Deutsch.

The AID project published the proceedings of an international symposium held in Monrovia, Liberia, in 1981. The publication was a collaborative effort of the project, the International Weed Science Society, and the West African Weed Science Society. 235 pages, softbound. 1983.

MIMOSA PIGRA MANAGEMENT - Edited by G. L. Robert and D. H. Habeck

This publication presented the proceedings of an international symposium held in Chiang Mai, Thailand, in 1982. The event was organized by the International Plant Protection Center in cooperation with several Thai governmental agencies. 140 pages, softbound. 1983.

COMMUNICATION OF WEED SCIENCE TECHNOLOGIES IN DEVELOPING COUNTRIES - Edited by R. D. Williams.

Proceedings of a 1983 symposium sponsored by the International Weed Science Society and the Weed Science Society of America, published on behalf of the Societies by the International Plant Protection Center. 214 pages, softbound. 1983.

Articles, presentations, co-authorship

1982-83

Burrill, L.C. 1982. The weed science society. Background paper prepared for FAO/IWSS Expert Consultation on Weed Management Strategies of the 1980s. English.

Burrill, L.C. 1983. Research progress report. Paper presented to Weed Science Society of America.

Cooper, A.S., C.E. Munroe, D.T. O'Brien, and F.A. Lopez. 1982. Corn varietal response to traditional and integrated weed control practices in Bukidnon, Mindanao. Working paper.

Miller, S.F. 1982. Economics of weed control in the Tropics and subtropics. Proc. Br. Crop Prot. Conf., V.II, 679-687.

Miller, S.F. 1982. The effects of weed control technological change on rural communities. Outlook on Agric. 11(4) 172-178.

Munroe, C.E., A.S. Cooper, and A.R. Samiano. 1982. Response of upland rice (Oryza sativa L.) to various weed control practices. Paper presented at the 13th annual conference of the Pest Control Council of the Philippines, Baguio City, May. English.

O'Brien, D.T. and A.G. Nelson. 1982. Evaluation of potential weed control technology using a sequential-stochastic decision model. Paper submitted to Am. Jrl. of Ag. Econ. English.

O'Brien, D.T. and E.C. Price. 1982. Interaction between fertilizer and weed control methods in Philippine upland rice: estimates from farmers' fields. IRRI Research Papers.

O'Brien, D.T., A. S. Cooper, C. E. Munroe, and A. R. Samiano. 1982. Economic analysis of weed control practices in upland rice in Batangas and Cavite Provinces of the Philippines. Working draft.

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Appendix 4. Worldwide distribution of publications (June 1982 - May 1983, and June 1983 - May 1984)

Identification Key

Symbol	Title
AQ	AQUATIC PLANT BIBLIOGRAPHIES
B	BIBLIOGRAPHY
C	COMMUNICATION OF WEED SCIENCE TECHNOLOGIES IN DEVELOPING COUNTRIES
CPM	CROP PRODUCTION USING COVER CROPS AND SODS AS LIVING MULCHES
FM	FIELD MANUAL FOR WEED CONTROL RESEARCH
IPM	ECONOMICS OF INTEGRATED PEST MANAGEMENT
KS	KNAPSACK SPRAYERS; USE, MAINTENANCE, ACCESSORIES
MDC	MANUAL DE CAMPO PARA INVESTIGACION EN CONTROL DE MALEZAS
MP	MIMOSA PIGRA MANAGEMENT
NT	NO TILLAGE CROP PRODUCTION IN THE TROPICS
RM	RESEARCH METHODS IN WEED SCIENCE
SF	SMALL FARM WEED CONTROL
T	ALGUNOS "TRUCOS" UTILES EN ESTADISTICA/SOME USEFUL TRICKS IN STATISTICS
TWS	SEMILLAS DE MALEZAS TROPICALES I Y II/TROPICAL WEED SEEDS I AND II
WCC	WEED-CROP COMPETITION: A REVIEW

DISTRIBUTION OF PUBLICATIONS (JUNE 1982 THROUGH MAY 1983)

COUNTRY	AQ	TWS	B	IPM	FM	RM	MDC	T	WCC	SF	KS
ALGERIA	-	-	1	1	1	-	1	1	-	1	1
ARGENTINA	10	4	1	4	1	4	3	3	4	8	3
AUSTRALIA	8	-	-	1	1	14	-	-	8	-	-
AUSTRIA	2	-	-	-	-	-	-	-	-	-	-
BANGLADESH	-	3	-	3	3	-	1	-	3	2	3
BELGIUM	2	-	-	-	-	-	-	-	-	-	-
BELIZE	-	1	1	1	2	-	1	1	1	1	2
BOLIVIA	-	-	-	-	2	-	-	-	-	-	-
BOTSWANA	1	-	-	-	1	-	-	-	-	2	-
BRASIL	3	6	1	6	1	5	6	7	6	5	4
BRUNEI	-	-	-	1	-	1	-	-	-	1	-
BURUNDI	1	-	-	-	1	1	-	-	1	1	1
CANADA	10	-	-	9	12	2	2	-	7	1	1
CHILE	1	-	-	-	-	1	-	1	7	2	-
CHINA	2	-	1	-	-	-	-	-	-	-	-
COLOMBIA	3	-	-	9	-	4	2	1	1	1	-
COSTA RICA	-	6	1	3	-	3	5	4	8	7	1
CYPRUS	-	-	1	-	1	1	-	-	1	1	1
CZECHOSLAVAKIA	4	-	-	-	-	1	-	-	-	-	-
DENMARK	1	-	-	-	-	-	1	-	-	-	-
DOMINICAN REPUBLIC	-	-	1	1	-	1	-	-	-	3	-
ECUADOR	-	-	-	-	-	-	1	-	-	-	-
EGYPT	3	-	-	-	-	-	-	-	-	-	-
EL SALVADOR	-	-	1	-	-	1	3	-	2	-	2
ETHIOPIA	1	-	-	2	2	1	-	-	2	2	2
FED REP OF GERMANY	4	1	-	1	1	2	-	-	3	-	-
FIJI ISLANDS	-	2	-	1	2	-	-	-	2	2	2
FINLAND	2	-	-	-	-	-	-	-	-	-	-
FRANCE	6	3	1	2	2	1	-	-	2	1	2
GAMBIA	-	-	-	-	-	-	-	-	-	1	-
GERMAN DEM REP	3	-	-	-	-	-	-	-	1	-	-
GHANA	3	1	2	1	2	3	-	-	4	5	4
GREAT BRITAIN	11	-	-	1	2	2	-	-	6	51	-
GUADALOUPE	-	-	-	-	-	-	-	-	-	1	-
GUATEMALA	-	-	-	-	-	1	-	-	-	-	-
GUYANA	1	-	-	-	-	-	-	-	-	2	-
HONDURAS	1	1	1	1	1	1	6	1	4	3	1
HUNGARY	2	-	-	-	-	-	-	-	-	-	-
INDIA	26	9	-	9	9	21	1	1	7	22	5

JUNE 1982 THROUGH MAY 1983 (CONT)

COUNTRY	AQ	TWS	B	IPM	FM	RM	MDC	T	WCC	SF	KS
INDONESIA	-	1	2	1	4	5	2	-	6	3	1
IRAN	-	1	-	-	1	-	-	-	1	-	-
IRELAND	-	-	-	-	-	1	-	-	-	-	-
ISRAEL	4	-	-	1	-	-	-	-	1	-	-
ITALY	2	-	-	-	-	1	-	-	-	-	-
JAPAN	9	-	-	-	-	1	-	-	-	-	-
JORDAN	-	-	-	-	-	1	-	-	-	-	-
KENYA	-	10	-	1	2	-	-	-	2	1	2
KOREA	2	-	-	-	-	1	-	-	-	-	-
LIBERIA	-	-	-	-	-	-	-	-	-	1	-
MALAWI	-	-	-	-	-	-	-	-	-	1	1
MALAYSIA	-	3	-	3	5	3	-	1	6	2	3
MALI	-	-	-	1	-	1	-	-	-	1	-
MAURITIUS	-	-	-	-	-	-	-	-	-	1	-
MEXICO	6	4	1	4	100	2	21	5	6	3	-
MOROCCO	-	1	-	1	1	-	-	-	1	-	1
MOZAMBIQUE	1	-	-	-	-	-	2	-	-	-	-
NEPAL	-	-	1	-	1	-	-	-	1	1	1
NETHERLANDS	6	3	-	1	2	-	-	3	2	-	1
NEW ZEALAND	7	-	-	-	1	3	-	-	-	-	1
NICARAGUA	-	3	-	2	1	1	8	3	6	2	4
NIGERIA	-	2	-	2	3	9	-	1	5	7	3
PAKISTAN	-	1	1	-	1	1	-	-	5	3	1
PANAMA	-	-	-	-	-	3	-	-	1	-	-
PAPUA NEW GUINEA	-	-	1	-	1	-	-	-	1	1	1
PERU	1	2	-	1	1	3	-	2	1	3	-
PEURTO RICO	-	1	-	-	-	-	-	-	-	-	-
PHILIPPINES	2	6	-	9	44	9	1	1	6	10	8
POLAND	10	-	-	1	-	-	-	-	1	-	-
PORTUGAL	-	-	-	-	-	1	-	-	-	-	1
ST. HELENA ISLAND	-	-	-	-	-	-	-	-	-	1	-
ST. LUCIA	1	-	-	1	1	1	-	-	1	-	1
SAMOA	-	-	-	1	-	-	-	-	1	1	1
SAUDI ARABIA	-	-	-	-	-	1	-	-	-	-	-
SENEGAL	-	4	-	-	5	4	-	-	2	2	4
SIERRA LEONE	-	-	-	-	-	3	-	-	1	-	1
SINGAPORE	-	-	-	-	-	1	-	-	-	-	-
SOLOMON ISLANDS	-	-	-	1	-	1	-	-	-	-	-
SOUTH AFRICA	4	-	-	-	4	-	-	-	12	1	-

JUNE 1982 THROUGH MAY 1983 (CON'T)

COUNTRY	AQ	TWS	B	IPM	FM	RM	MDC	T	WCC	SF	KS
SOUTH ATLANTIC	-	-	-	-	-	1	-	-	-	-	-
SOUTH PACIFIC	-	-	1	-	1	-	-	-	-	-	-
SPAIN	3	1	-	-	-	-	-	1	1	-	-
SRI LANKA	2	3	-	5	5	4	-	-	5	2	4
SUDAN	-	2	-	2	2	-	-	-	2	1	-
SURINAM	-	-	-	-	-	-	-	-	-	1	-
SWEDEN	2	-	-	-	-	1	-	-	-	-	-
SWITZERLAND	2	-	-	-	-	-	-	-	1	-	-
SYRIA	-	-	1	-	-	1	-	-	-	-	-
TAIWAN R.O.C.	-	-	-	1	1	1	-	-	1	-	2
THAILAND	2	7	1	3	4	4	-	-	7	5	4
TRINIDAD & TOBAGO	-	2	1	4	1	-	1	-	2	1	1
TURKEY	-	-	1	-	-	1	-	-	1	3	-
UGANDA	-	1	-	1	1	1	-	-	1	2	1
UNITED KINGDOM	3	2	1	1	2	6	-	-	4	100	1
UNITED STATES	162	16	35	30	84	17	39	3	325	65	64
UPPER VOLTA	-	-	-	-	-	-	-	-	-	1	-
URUGUAY	-	-	-	-	-	1	1	1	-	-	-
USSR	3	-	-	-	-	-	-	-	-	-	-
VENEZUELA	-	2	-	5	1	2	2	3	1	2	1
VIRGIN ISLANDS	-	-	-	-	-	-	-	-	1	-	-
YUGOSLAVIA	3	-	-	-	-	1	-	-	-	-	-
ZAMBIA	-	1	-	1	1	1	-	-	1	3	1
ZIMBABWE	-	-	-	1	1	-	-	-	1	1	-
TOTALS	348	116	60	142	329	170	110	44	498	358	150

NUMBER OF PUBLICATIONS SENT (JUNE 1983 through MAY 1984)

COUNTRY	AQ	SF	WCC	KS	T	TWS	FM	MDC	B	NT	CPM	MP	C	IMP
AFRICA	1	1	2	2	-	-	1	-	2	2	1	1	1	-
ALGERIA	-	-	-	-	-	-	-	-	1	-	-	-	-	-
ARAB REPUBLIC OF EGYPT	-	1	-	2	-	-	2	-	-	1	-	-	-	1
ARGENTINA	7	2	3	3	2	1	-	5	-	1	2	2	2	-
AUSTRALIA	7	-	-	-	-	1	4	-	2	-	-	2	-	-
AUSTRIA	1	-	1	-	-	-	-	-	-	-	-	-	-	-
BANGLADESH	1	-	1	-	-	-	-	-	-	-	-	-	-	-
BOLIVIA	-	-	-	-	3	3	-	1	-	1	-	-	-	-
BOTSWANA	1	-	1	3	-	6	1	-	-	-	-	-	1	1
BRASIL	2	-	2	-	-	-	-	-	-	1	2	5	1	-
BRUNEI	-	-	2	2	-	2	2	-	-	-	-	-	-	-
BURUNDI	-	-	-	-	-	-	-	-	-	-	-	-	1	-
CANADA	9	1	6	2	-	2	2	-	1	-	1	-	3	-
CHILE	-	1	1	1	-	-	-	-	-	-	-	-	-	-
CHINA	5	-	-	-	-	-	1	-	-	-	-	-	-	-
COLOMBIA	-	1	-	1	-	1	-	-	-	1	2	3	2	1
COSTA RICA	-	10	8	2	4	5	1	3	1	11	1	1	1	-
CZECHOSLOVAKIA	3	-	-	-	-	-	-	-	-	-	-	-	-	-
DENMARK	1	-	2	-	-	-	-	-	-	-	-	-	-	-
DOMINICAN REP.	-	-	1	-	1	1	-	1	-	-	-	2	-	-
ECUADOR	1	-	-	1	1	-	-	1	-	-	-	-	-	-
EGYPT	2	-	-	-	-	-	-	-	-	-	-	-	-	-
EL SALVADOR	2	-	-	-	-	-	-	-	-	-	-	-	-	-
ETHIOPIA	-	3	1	2	-	1	3	-	-	-	-	1	-	-
FIJI ISLANDS	-	-	-	-	-	-	-	-	-	1	1	-	-	-
FINLAND	1	-	-	-	-	-	-	-	-	-	-	-	-	-
FRANCE	7	-	-	-	-	-	2	-	-	-	-	-	1	-
GHANA	1	1	2	7	1	9	2	1	5	-	-	-	1	-
GUAM	-	-	1	-	-	-	-	-	-	-	-	-	-	-
GUATAMALA	-	1	1	1	1	2	1	1	-	-	-	-	-	-
GUYANA	1	-	-	-	-	-	-	-	-	-	-	1	-	-
HONDURAS	-	2	3	4	3	4	2	4	1	1	1	1	1	2
HUNGARY	1	-	-	-	-	-	-	-	-	-	1	-	-	-
INDIA	17	5	13	5	-	5	4	-	1	4	5	6	6	2
INDONESIA	1	2	7	1	1	4	6	-	-	3	5	6	-	-
IRELAND	-	-	1	-	-	-	-	-	-	-	-	-	-	-

JUNE 1983 THROUGH MAY 1984 (CON'T)

COUNTRY	AQ	SF	WCC	KS	T	TWS	FM	MDC	B	NT	CPM	MP	C	IMP
ISRAEL	2	-	-	-	-	-	-	-	-	1	1	-	1	-
ITALY	3	-	-	-	-	-	-	-	1	-	-	-	-	-
JAMAICA	1	-	-	1	-	-	2	-	-	-	-	-	-	-
JAPAN	5	-	1	-	-	-	1	-	-	-	-	-	-	-
KENYA	-	1	5	4	-	-	3	-	1	-	-	-	-	-
KOREA	1	-	-	-	-	-	-	-	-	-	-	-	-	-
LEBANON	-	-	-	-	-	-	-	-	-	-	-	-	1	-
MALAWI	-	1	-	1	-	-	-	-	-	-	-	1	-	-
MALAYSIA	2	1	3	1	-	2	1	-	2	1	-	3	-	-
MEXICO	2	2	4	1	3	2	1	2	-	-	2	-	1	-
MOZAMBIQUE	-	1	-	-	-	-	-	-	-	-	-	-	-	-
NETHERLANDS	4	-	-	-	-	-	-	-	-	2	-	-	-	-
NEW CALEDONIA	-	-	-	-	-	-	-	-	-	-	-	1	-	-
NEW GUINEA	-	-	1	-	-	-	-	-	-	-	-	-	-	-
NEW ZEALAND	4	-	-	-	-	-	-	-	-	-	-	-	2	-
NICARAGUA	-	-	1	-	1	1	-	-	-	-	-	-	-	-
NIGERIA	2	3	3	2	-	2	1	1	-	2	3	1	1	-
OMAN	-	1	-	-	-	-	-	-	-	-	-	-	-	-
PAKISTAN	-	1	-	-	-	-	-	-	-	-	-	-	-	-
PERU	1	-	-	-	1	2	-	-	-	-	-	-	-	-
PHILIPPINES	-	2	5	4	1	4	5	1	1	6	7	7	4	-
POLAND	5	-	-	-	-	-	-	-	-	-	1	-	-	-
PORTUGAL	-	-	-	-	-	-	-	-	1	-	-	-	-	-
PUERTO RICO	-	1	-	-	-	-	-	-	-	1	-	-	-	-
ROMANIA	2	-	-	-	-	-	-	-	-	-	-	-	-	-
SAUDI ARABIA	-	-	1	1	-	-	1	-	-	-	-	-	-	-
SIERRA LEONE	-	1	-	-	-	-	-	-	-	1	-	-	-	-
SINGAPORE	-	-	-	1	-	-	1	-	-	-	-	-	-	-
SOLOMON ISLANDS	-	1	1	1	-	1	1	1	-	1	1	2	-	-
SOUTH INDIA	-	1	-	1	-	-	1	-	-	-	-	-	-	-
SOUTH PACIFIC	-	1	1	-	-	1	1	-	-	-	-	1	-	-
SPAIN	-	-	1	-	1	1	-	1	-	-	2	-	-	-
SRI LANKA	1	-	-	-	-	-	-	-	-	-	-	1	1	-
SUDAN	1	-	-	-	-	1	1	-	-	-	-	-	-	-
SWEDEN	4	-	2	1	-	-	1	1	1	-	-	-	-	-
SWITZERLAND	6	-	2	2	2	2	-	-	-	-	-	-	-	-
TAIWAN	-	1	1	1	-	1	1	-	1	-	1	1	1	-
TANZANIA	-	-	-	-	-	-	1	-	-	-	-	-	2	-
THAILAND	2	1	2	1	-	-	2	-	2	1	-	2	1	-

JUNE 1983 THROUGH MAY 1984 (CON'T)

COUNTRY	AQ	SF	WCC	KS	T	TWS	FM	MDC	B	NT	CPM	MP	C	IPM
TONGA	-	1	1	1	-	-	1	-	-	1	-	-	-	-
TURKEY	-	-	-	-	-	-	-	-	-	-	-	3	-	-
UNITED KINGDOM	9	102	3	1	-	-	1	-	-	2	1	-	1	-
UNITED STATES	133	50	128	438	7	45	104	8	69	12	14	6	311	11
URUGUAY	-	-	1	-	1	-	-	-	-	-	-	-	-	-
VENEZUELA	-	-	1	-	-	-	-	-	-	1	-	-	-	-
WEST GERMANY	5	-	3	-	-	-	-	-	-	-	-	2	2	-
WEST INDIES	1	-	1	-	-	-	-	-	-	-	-	-	1	-
WESTERN SAMOA	-	-	-	-	-	-	-	-	-	1	1	2	-	-
YUGOSLAVIA	2	-	-	-	-	-	-	-	-	-	-	-	-	-
ZAMBIA	-	-	-	-	-	-	-	-	-	1	1	-	-	-
ZIMBABWE	1	-	1	-	-	-	-	-	-	-	-	-	-	-
TOTALS	271	204	232	502	34	112	165	32	93	62	57	64	351	17

Appendix 5 IPPC Papers Distribution

Date written, title, authors, source, date published	Copies Distributed
1971, Weed control in cacao, M. D. Shenk, WORLD FARMING, 1971.	56
1972, Spray adjuvants make pesticides do a better job, L. F. Taylor, WORLD FARMING, 1972.	96
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Appendix 6: Travel Log (chronological order)

Staff member	Date, Location, Purpose
Burrill	July 3-15, 1982, Sri Lanka: to participate in Symposium on Tropical Agriculture / Bangladesh: to become familiar with people working in various Bangladeshi and foreign agriculture organization and alert them to potential for support from IPPC.
Burrill	August 30-September 11, 1982/Rome, Italy/nine days were spent at FAO in Rome for two related activities. Two days were devoted to drafting suggestions aimed at promoting weed management in Africa. A week was spent participating in the "FAO/IWSS Expert Consultation on Weed Management Strategies for the 1980's for the LDC's".
Deutsch	September 13-15, 1982/Berkeley, Albany, Davis and Winters, CA/attended various activities at the Consortium for International Crop Protection, USDA and University of California, Davis, Biological Control of Weeds labs, University of California and Bio. Integral Research Center.
Haller	September 18-October, 1982/Novi Sad, Yugoslavia: attend 6th annual International Symposium on Aquatic Weeds and the 2nd International Symposium on Herbivorous Fish / Rome, Italy: meet with officials at FAO / Nairobi, Kenya: establish contacts for a future aquatic weed short course in Kenya to involve several East African countries.
Miller	November 20-December 3, 1982/England: Gave paper at British Crop Protection Conference / Pakistan: conducted a weed course short course in Islamabad.
Shenk	November 13-December 10, 1982/Pakistan: participate in joint IPPC-CIMMYT-PARC weed control training course.
Ramey	December 7-9, 1982/Chicago, IL: attend 1st annual Conference on Computers in Science.
Burrill	December 12-19, 1982/Rome: plan weed management training activities for Africa as a follow-up to recommendations made by a group of weed scientists meeting in Rome in September.
Fisher	January 10-February 5, 1983/Indonesia: provide training/refresher shortcourses on herbicide application at five Indonesian food and estate crops research institutes and at the Seameo Regional Center for Tropical Biology (BIOTROP) / Bangkok, Thailand:

Staff member	Date, Location, Purpose
	give technical assistance in weed control as requested, arranged for possible future IPPC weed science shortcourses/seminars with Indonesian and Thai weed science society officers, visit with Thai weed group at Kasetsart Univesrity and at the National Weed Research Center, visit Agricultural Spraying Machinery Evaluation Center (ASMEC) to observe testing of knapsack sprayers, interview recent Thai agronomy graduate wishing to pursue Masters studies in Weed Science at OSU.
Charudattan* (U.F.)	February, 1983/Hyderabad, India: attend Waterhyacinth Conference; collect plants. (IPPC/AWP contributed $500 toward this trip).
Shenk	March 7-29, 1983/Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica and Panama: consultant to the ROCAP/CATIE Small Farmer Systems Research project.
Burrill Appleby*	April 1-13, 1983/Chiang Mai, Thailand: attend the first conference of the Weed Science Society of Thailand and presented two papers / Rome, Italy: prepare budgets and plans for collaborative FAO/IPPC weed management training courses.
Shenk	May 15-28, 1983/Guatemala, El Salvador, Costa Rica: evaluate ROCAP/CATIE Farming System Research program in Guatemala; consult with the USAID/Ministry of Natural Resource Reforestation Program in El Salvador; and participate in ROCAP, CICP Integrated Crop Protection Planning seminar for Central America in CATIE.
Burrill	May 21-30, 1983/Nairobi, Kenya: attend 9th Biennial Conference of Weed Science Society for Eastern Africa. Discuss arrangements for weed management training course scheduled for September.
Shenk	July 25-29, 1983/Turrialba, Costa Rica: participate in writing CATIE/ROCAP FSR tech pac recommendations
Cooper	July 11-12, 1983/Kutztown, PA and University Park, PA: observe research and exchange ideas and information on living mulch cropping systems.
Burrill Shenk Miller	August-September, 1983/Nairobi, Kenya: prepare for a weed management training course / Cairo, Egypt: explore interest in a weed management training course for Egypt / Rome, Italy: report on training course and discuss further cooperative training efforts.

Staff member	Date, Location, Purpose
Haller	September 26-October 6, 1983/Thailand: met with Dr. Napompeth, Director National Biological Control Research Center and Mr. John Neave of USAID. Discussed Mimosa work and observed other biocontrol programs in waterhyacinth / Sri Lanka: Met with Mr. Eric Loken and Dr. I. Balasooriya of the University of Kelaniya. Discussed aquatic weed problems and assistance in Sri Lanka.
Deutsch	November 15-27, 1983/Rome, Italy: hold discussions with contacts relative to FAO's scope of crop protection activities and possible future AID/OSU-IPPC involvement / United Kingdom: attend the International Congress of Plant Protection.
Miller Burrill	November 25-December 3, 1983/Philippines: participate in conference of Asian Pacific Weed Science Society.
Burrill	December 6-18, 1983/Lusaka, Zambia: help prepare for and teach weed management training course.
Shenk	December 3-15, 1983/Costa Rica, Honduras: work out details for intensive weed control short course in CATIE, and study request from PAS for IPPC support during the next 28 months.
Miller Burrill	March 27-April 7, 1984/Washington, D.C.: discuss future contract with AID/W, CICP, and University of Florida / Nairobi, Kenya: attend meeting of FAO Panel of Experts on Weed Management.
Haller Joyce*	April 22-29, 1984/Quito, Ecuador: met with Darell McIntyre, USAID Ecuador, and Dr. Fausto Maldonado Agricultural Program specialist with USAID Ecuador; investigate waterhyacinth problem in agricultural areas near Guayaquil and in a 24,000 ha reservoir project under construction on the Daule and Peripa Rivers in central Ecuador.
Shenk Miller	May 6-11, 1984/Turrialba, Honduras: elaborate memorandum of understanding at Panamerican Agricultural School (PAS) / San Jose, Costa Rica: finalize plans for an IPPC/FAO/CATIE weed management short course in November / Gainesville, Forida: review the University of Florida/IPPC Aquatic Weed Control program with Director W. T. Haller.

* Consultants receiving travel support from the project

Appendix 7: Visitors

name	date	background
Dr. Mark Smith	16-17 Aug. 82	AID project monitor.
Dr. B. L. Pollack	28-30 Sept. 82	AID project monitor (replacing Dr. Smith).
Ms. J. Mt. Pleasant	3-7 Jan. 83	Graduate student en route to NCSU soils project in Peru, seeking weed control technical data.
Dr. D. Bottrell	17-18 Jan. 83	Discussed plans for a publication and sought IPPC involvement with editing process.
Ms. Mary Cherry	28-29 Apr. 83	BBC reporter and free lance journalist; taped interviews with project staff, later aired on international BBC program, "Farming World."
Dr. Joseph Vavra	4 May 83	Discussed forthcoming assignment in Yemen and requested various project publications.
Dr. Murray Dawson	28 Aug. 83	Discussed possibility of IPPC involvement with future project in Pakistan.
Dr. Robert Jackson Ms. Mary Mozynski	19-23 Sept. 83	Prepresentatives of S&T/AGR conducted intensive review of AID/OSU weed research project.
Mr. M. Shulman	7 Dec. 83	Extension agent in Israel; sought technical weed control information; utilized project technical literature collection.
Dr. R. Reynolds	13 Dec. 83	Industry representative provided prototype hand-operated spray applicator for project familiarization and information.
Dr. K. Hunyadi	9 Jan 84 22 Feb. 84	IREX fellow and Hungarian weed scientist interested in teaching methods, education and research systems, and general information related to international weed science.

name	date	background
Dr. I. Akobundu	16-20 Mar. 84	IITA weed scientist, visited IPPC to discuss possibility and details of spending a year's sabbatic leave at IPPC.
Mr. A. Upritchard	23 May 84	Extension agent, New Zealand, interested in various aspects of weed control.

Appendix 8: Staff/Student Roster

Project Staff

Project staff members served for all or part of the period covered by this report, either full time or as indicated.

Stanley F. Miller	Project Director	50%
W. T. Haller	Aquatic project director	
Larry C. Burrill	Senior Weed research spec./ support agronomist	
Myron D. Shenk	Weed research scientist	
Allan E. Deutsch	Communication/administration	
Herbert H. Fisher	Weed research assistant	50%
Alan S. Cooper	Weed research assistant	50%
Victor Ramey	Aquatic plant information spec.	
Susan G. Larson	Secretary	
Ruth M. Carr	Word processing specialist	
Karen Bruder*	Secretary	
Cindy Roy-Brown*	Word processing specialist	
Donna Castillo*	Fiscal affairs	25%
Mary Welsh*	Word processing specialist	
Bobbie Jean Biles	Aquatic project support	

Students

Herbert H. Fisher	PhD, Horticulture
Alan S. Cooper	MS, Crop Science
Albert Fischer	PhD, Crop Science
Raouf Cherif	MS, Crop Science
Mark Peterman	MS, Crop Science

* Left during the report period