BIBLIOGRAPHIC DATA SHEET	1. CONTROL NUMBER	2. SUBJECT CLASSIFICATION (695)
	PN-AAH-763	AH60-0000-0000

3. TITLE AND SUBTITLE (240)

Weed control systems for representative farms in developing countries; annual report,1978/1979

4. PERSONAL AUTHORS (100)

5. CORPORATE AUTHORS (101)

Or. State Univ. Int. Plant Protection Ctr.

6. DOCUMENT DATE (110)	7. NUMBER OF PAGES (120)	8. ARC NUMBER (170)
1979	57p.	632.58.066c-78/79

9. REFERENCE ORGANIZATION (130)

Or. State

10. SUPPLEMENTARY NOTES (500)

(Research summary) (Financial support rendered through AID/ta-C-1295 and AID/ta-C-1303)

11. ABSTRACT (950)

12. DESCRIPTORS (920)

Weed control
Mulching
Information dissemination
Aquatic weeds
Weeds
Research
Herbicides

13. PROJECT NUMBER (150)	
931046300	
14. CONTRACT NO.(140)	15. CONTRACT TYPE (140)
AID/ta-C-1295	Res.
16. TYPE OF DOCUMENT (160)	
52	

AID 590-7 (10-79)

d Control Systems

1978-79 Periodic Report

Document 27-C-79

Periodic Report 1976-79

Weed Control Systems and Systems Utilization for Representative Farms in Developing Countries

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

Contents

PROJECT PROFILE

	Research	Technical Assistance
Project title	Weed Control Systems for Representative Farms in Developing Countries	Weed Control Systems Utilization for Representative Farms in Developing Countries
Contract numbers	AID/ta-C-1295	AID/ta-C-1303
Principal investigator	Dr. Stanley F. Miller Director, International Plant Protection Center Oregon State University Corvallis, OR 97331 / USA (503) 754-3541	Dr. Stanley F. Miller Director, International Plant Protection Center Oregon State University Corvallis, OR 97331 / USA (503) 754-3541
Contract period	April 1, 1976 through May 31, 1979	April 1, 1976 through May 31, 1979
Period covered by this report	April 1, 1978 through May 31, 1979	April 1, 1978 through May 31, 1979
Total project expenditures and obligations for the report period	$297,628.23	$403,285.17
Total AID funding for the entire contract	$686,818.74	$957,325.00
Cooperating with	CATIE (Centro Agronómico Tropical de Investigación y Enseñanza), Turrialba, Costa Rica; Director, Dr. Santiago Fonseca M. NCPC (National Crop Protection Center), Los Baños, Philippines; Director, Dr. Fernando F. Sanchez.	

Summary

Weeds remain a major force reducing world food crop yields. Weed control labor requirements exceed all other production processes, except harvesting. New weed control technologies often tend to be cost and labor reducing, the latter raising questions relative to appropriateness for traditional economies.

Oregon State University's International Plant Protection Center, under dual U.S. Agency for International Development contracts, cooperated with the National Crop Protection Center (Philippines) and the Centro Agronómico Tropical de Investigación y Enseñanza (Costa Rica) in an effort to develop, refine, and monitor appropriate weed control technologies that benefit the small, peasant agriculturalist and his community.

Research results from Costa Rica confirmed preplant vegetation control (mulch) as an effective weed control technique, and erosion retardant, as well as a labor and cost reducing method. A socio-economic study of the effects of the mulch system neared completion. An improved jab planter/fertilizer dispenser was designed, fabricated, and placed on test. Research investigated in-the-row granular herbicides and herbicide impregnated seed. An initial round of weed control for forestry appeared promising. Work was launched on the relationship of vegetation control and insect damage to crops.

IPPC/NCPC, in cooperation with the International Institute of Rural Reconstruction (Philippines), developed a range of weed control alternatives for Philippine upland rice growers that raised both yields and net return. Special work focused on the aggressive weed, *Rottboellia exaltata.*

An economic model (simulating Philippine production conditions) was designed to assess the effects of introducing weed control systems in terms of expected net farm revenue and associated risk.

Over 360 researchers participated in workshops and short courses conducted by IPPC staff. Additionally, a major, three-week weed control short course was presented to 32 individuals at NCPC's Los Baños headquarters. Three international weed scientists received advanced, specialized training at IPPC/Corvallis.

IPPC staff at the University of Florida provided individualized aquatic weed evaluation and control training for scientists from Malaysia, Botswana, Sudan, and Ghana; all returned to senior positions in their respective governments. An IPPC consulting team visited two weed-choked reservoirs in Ghana, evaluated the problem, and prepared detailed, coordinated action plans.

A wide variety of information dissemination activities were carried on by IPPC during the year including provision of publications, personal visits, and individually responding to requests for technical information. The Center broadened its worldwide linkages and communication network.

The Project in Focus

The advancement of agricultural technology has had mixed blessings. For small and medium-sized farming enterprises in many developing countries, the increased emphasis on requisite inputs (fertilizer, improved seed, irrigation) and their associated costs placed dramatic production increases cut of reach. Only the more affluent operators could stand the cost, not to mention the increased risk.

Advanced technology also contributed to the intensification of weed problems, both for adopters and non-adopters. Improved growing conditions for crops equated with improved conditions for weeds as well. And, it became evident that some of the newer, high-yielding cultivars did not compete with weeds as virogously as did many native varieties.

Studies in some developed countries revealed that weed flora shifts occurred in regions with a history of herbicide use. Populations tended to shift from relatively controllable broadleaf varieties to more pernicious grassy species which, once established, became more difficult to control.

The international development community grew increasingly concerned over the need for weed control in developing countries:

- To what extent do weeds limit production, either by direct competition with crop plants for available nutrients, light, and water, or by demands for the factors related to control, land (the need for additional land to compensate for fields over-run with weeds), labor, and capital?
- What realistic levels of agricultural technology could, or should, be introduced for weed control given the prevailing economic, social, and political restraints?
- What is the inter-relationship of weed control technology with other advanced technology inputs and what priorities emerge as a result?
- How do various weed control systems—including the absence of any control—economically and socially affect the small farmer, his family, the associated labor pool, and the community?

These concerns resulted in the AID-Oregon State University weed control project (a contractual relationship originated in 1966) being encouraged to study 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 evolving 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.

The project had become increasingly aware that aquatic weeds constituted a serious problem throughout the tropics and sub-tropics of the world, especially in developing countries. Since 1960 explosive growth of aquatic weed populations in major hydrological systems of several developing countries had reduced or restricted water availability. Where water systems serve multiple purposes, e.g., irrigation, transportation, cooking, sewerage disposal, and hygiene, in Southeast Asia, for example, loss of ready access to water would cause serious sociological problems.

Relative to agriculture, aquatic plants occupy space needed for water storage. Moreover, through transpiration, they accelerate the loss of water from a free water system three to eight times over that of a clear surface. This threat becomes especially pertinent for critically water-short regions such as the African Sahel.

To address aquatic weed problems, the AID-OSU weed program arranged for the University of Florida to conduct an aquatic weed activity under a sub-contract. An agreement was signed and work begun in April 1976. UF aquatic weed experts would offer technical assistance through short-term consultations with governments of developing countries as well as provide a reference and information center to the same group of nations.

Objectives

The AID-OSU weed 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 for reduction of food crop losses due to weed competition to the extent that production gains are justified economically and socially.

The program endeavors to work in close collaboration with local, regional, national, and international entities through sensitivity to stated needs and integration of activities. The goal involves productive collaboration with non-project colleagues and counterparts to ultimately increase effectiveness of weed science and control.

Attempts to develop and weigh 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, employment, and income distribution.

Other specific objectives include:

1. Training host country counterparts in appropriate weed control research methodology;

2. Promoting only practical and safe usage of herbicides (and other pesticides) through educational programs;

3. Encouraging evaluation of ecological and environmental aspects of weed control systems;

4. Fostering continued development and maintenance of a worldwide communication-information network for weed control linking the institutions and individuals concerned.

Specific objectives of the aquatic weed component include:

5. Identifying biological and socio-economic problems of aquatic weeds in agricultural production and related non-agricultural situations;

6. Providing short-term consultation for integrated weed control methods in developing countries;

7. Establishing general criteria for the assessment of aquatic weed problems;

8. Continuing to operate an extensive aquatic weed information and reference center and expand delivery of data therefrom.

9. Developing integrated control systems for important aquatic weeds.

Activities Review

I. Research

CENTRAL AMERICA

Zero tillage system emphasized

In collaboration with CATIE (Centro Agronómico Tropical de Investigación y Enseñanza, Turrialba, Costa Rica, major research emphasis continued to be directed toward testing and refining the zero tillage and mulching system of vegetation management for corn, beans, and cassava. Results substantiated project scientists' earlier belief that, for high rainfall areas such as eastern Costa Rica, low cost, effective weed control systems suitable for small farmers pivoted on improved methods of controlling vegetation before planting.

Experiments conducted at several sites continued to confirm advantages for pre-plant vegetation control systems that avoided tillage and utilized mulch (Table 1).

The preplant vegetation control approach based on mulch (and no tillage or hand-weeding) has important advantages for the small farmer even if the yields were no better than other systems. These benefits are:

1. less sensitivity to weather;
2. avoids dependence on expensive or scarce equipment;
3. reduces potential for damaging soil erosion;
4. reduces physical damage to crop roots from mis-directed hoeing;
5. reduces later season labor requirements;
6. may permit more intensive farming of more land.

Table 1
Corn Yields and Costs from Various Methods of Preplant Vegetation Management.

system	description	shelled corn tons/ha*	cost**
1	conventional plowing & 2 hand weedings post-emergence	1.0	1040
2	mulch & postemergence directed paraquat	4.9	158
3	preplant application of glyphosate & mulch	6.2	555

* average of 3 replicatic-- ** colones/ha

Improved planter under design

The zero tillage-mulch system, while providing benefits through improved vegetation control, increases the difficulty of planting seed using the traditional sharpened stick. Also, researchers have encountered problems of where and how to place fertilizer during the planting operation when fertilizer is an integral element of a technology package.

As a rule, fertilizer (if used) needs to be placed near the crop seed to be efficient, but not in direct contact with it (to avoid damaging the germinating seed).

The project has addressed the dual problem by designing several

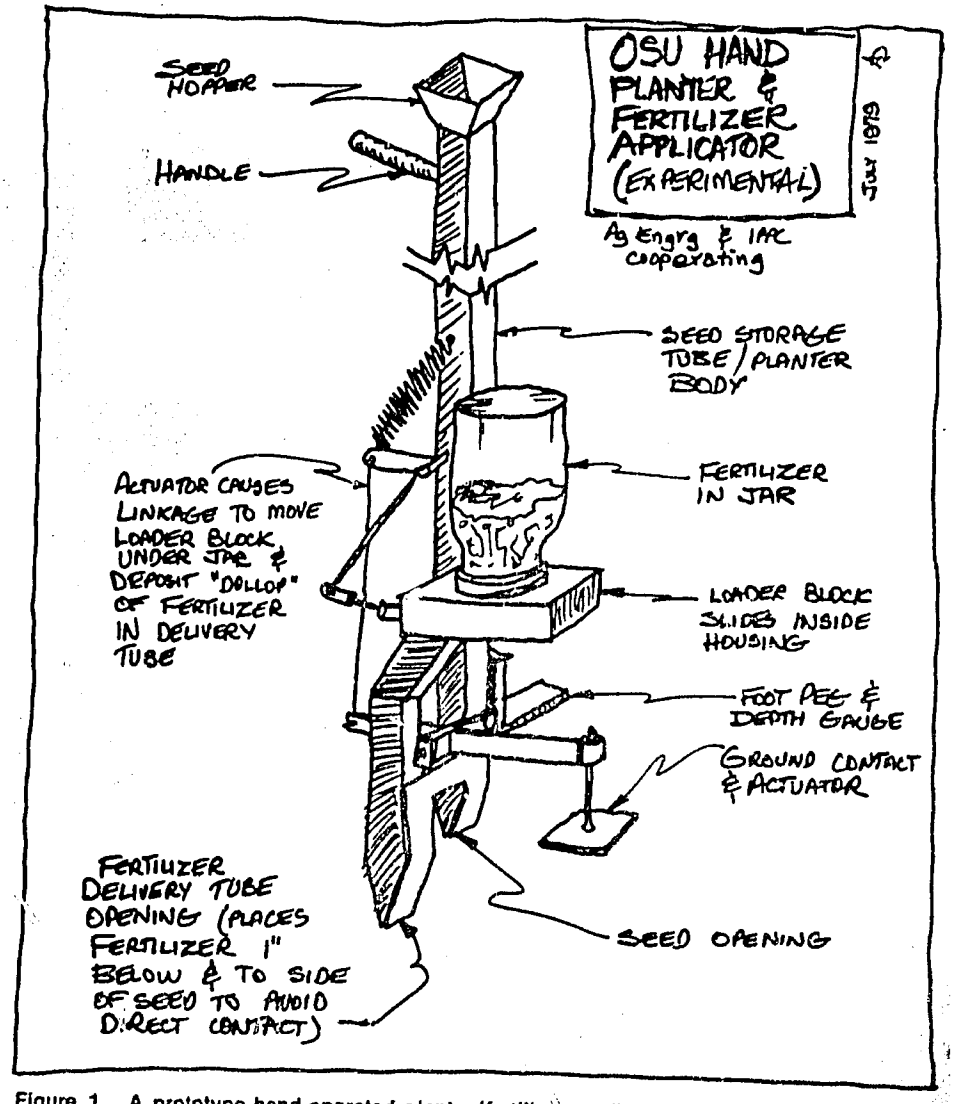


Figure 1. A prototype hand-operated planter/fertilizer applicator.

jab planters including units that simultaneously dispense both seed and fertilizer in separate pockets in the soil. While early initial tests have been encouraging, a program of more complete testing and modification is anticipated for the coming year, both in Costa Rica and at Corvallis.

New methods hold promise

USDA weed scientist Dr. J. H. Dawson's research based on using small amounts of the thiocarbamate herbicide EPTC to achieve effective in-row field bean weed control led the AID-OSU weed project to invite Dr. Dawson to test and evaluate the method under Central American conditions.

During September and October, 1978, Dr. Dawson and project agronomist M. D. Shenk established experiments with the new methods at three locations in Costa Rica and one location in El Salvador.

EPTC can be applied as either granule or liquid along with field beans as planted in rows or hills. The beans tolerate the herbicide, while weeds growing in the row—those most damaging to the crop seedlings—are controlled. A further refinement developed by Dr. Dawson involves coating the bean seeds with herbicide impregnated lime. The herbicide dissolves out of the coating to create a treated area around the seed.

The Central American experiments resulted in complete control of the grassy weed *Sorghum halepense* in a 50 to 80 mm wide band straddling the seed row. The EPTC treatment worked effectively on the heavy, medium, and sandy soils used for the tests.

Figure 2. Selective control of *Sorghum* in field beans on a light sandy soil at San Andreas, El Salvador with granular EPTC applied in the row with the crop seed.

Both methods of EPTC application—granules in the row or herbicide impregnated seed—offer advantages to the small-plot bean farmer:

A. Less herbicide is needed as only a small portion of the land, as little as 10 to 20% of the field, receives treatment.
B. Reduced amounts of herbicide result in lower input costs.
C. Use of granules or coated seed avoids potential problems associated with mixing and spraying chemicals.
D. In-the-row weed control reduces weed-seedling competition and allows for less costly methods of weed control between the rows (hoeing, or mechanical weed control).
E. Neither method requires any additional equipment as herbicide placement occurs simultaneously with seeding.
F. No additional passes across the field are needed to soil-incorporate the volatile EPTC.

The treated seed method is more convenient for the farmer as he works with just seed. However, a factory operation to coat and impregnate the seed would be needed. In contrast, applying granules in the row with untreated seed allows the farmer to use his own seed and commercially available granular herbicides.

The collaborative research conducted in Central America on the two methods during 1978 established feasibility and confirmed the promise of the two methods.

Vegetation control and insect damage

Insect damage to crops in high-rainfall tropical zones can be devastating. Along with improved weed control systems, project scientists, in cooperation with an entomologist at CATIE investigated the interaction between weed management systems and insect damage.

Results of field trials conducted in Costa Rica revealed that losses in corn yield due to insect damage were greater in plots with

Table 2
Interaction Between Weed Manageme
Systems and Insect Damage.

weed management system	tons/ha shelled corn	
	insects controlled	no insect control
1. weeds cut at ground level, glyphosate on regrowth after 20 days	4.1	4.0
2. weeds cut at 40-60 cm height, glyphosate on re-growth after 20 days	4.39	3.3
3. weeds cut at ground level on planting day, farmers' mixture of herbicides directed between corn rows 22 days after planting	4.3	2.7
4. weeds cut at ground level on planting day, hand-weeded 22 days after planting	3.9	3.4
5. conventional tillage (plow and disc), handweeded 22 days after planting	2.7	1.5

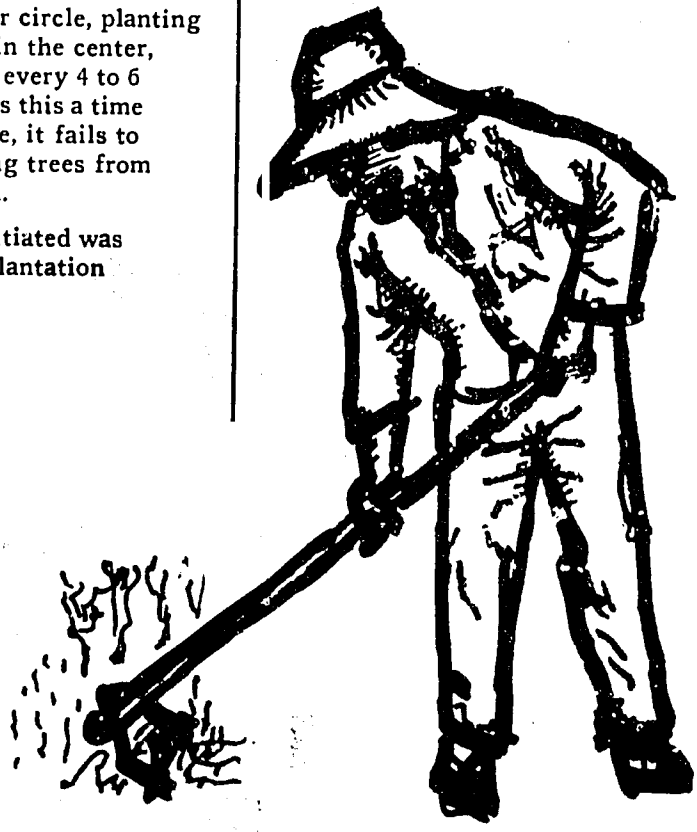
mechanically prepared seedbed (tilled) compared to various forms of zero tillage (Table 2).

Weed control for forestry establishment

The AID-OSU project has begun research with another segment of CATIE to determine whether some of the vegetation management systems devised for annual crops would have application in the establishment of pine plantations.

Normal practice involves cutting all vegetation at ground level in a one meter diameter circle, planting the pine seedling in the center, and hand-weeding every 4 to 6 months. Not only is this a time consuming practice, it fails to protect the seedling trees from severe competition.

The first trial initiated was destroyed by the plantation weeding crew at a time when the herbicide treatment was beginning to show benefits compared to the normal practice. A second experiment was begun, (hopefully with better security) with results expected to be reported in 1979-80.



Farmer survey pinpoints weed control practices

Analysis of an in-depth survey of 25 small farmers in the North Atlantic zone of Costa Rica indicates that 20-45% of the sample would benefit economically by adopting weed control treatments designed and tested by AID-OSU project agronomists. The survey, almost a case study, used 21 randomly selected farmers plus four others.

The survey revealed that, if all sampled farmers adopted the project's proposed weed control systems, the following conditions would prevail:

—20% would realize reductions in both cash and labor requirements;

—25% would experience labor cost reductions exceeding increases in cash expenditures, and;

—55% would find that cash cost expenditure increases exceeded labor cost reductions.

Most of the suggested treatments involve herbicides. Therein lies the economic hurdle for the 55-80% who, while benefitting from the weed technology effects, would not realize an economic advantage. The likelihood of farmers (in this region) adopting improved weed control technology depends on the farmer's resource constraints and the availability of credit.

Project economist Thomas McCarty, who designed and managed the survey, observed that the poorest farmers in terms of resources (especially cash), would not be helped by weed control systems technology because of simply not being able to afford some of the requisite inputs.

Data from the survey were tabulated and analyzed to link project research with actual small farmer practices. The goal: answering the questions as to what would be the agronomic, economic, and social results if weed control treatments devised and tested by the project were to be used on small farms along with current farming practices.

Figure 3. Handweeding a *Rottboellia exaltata* infested corn field in the Philippines.

PHILIPPINES

Cavite area research yields weeding alternatives

The project, in close cooperation with the National Crop Protection Center (NCPC), Los Baños, conducted research in the Cavite area that resulted in identification of several weed control alternatives for upland, small farm rice culture that improved yields as well as net return to the farmer.

Weed systems blending manual, animal traction, and chemical control were designed and tested, all based on the University of the Philippines' new, improved C-22 rice cultivar. Whereas national Philippine upland rice production averages approximately .88 metric T/ha, and the fertile Cavite area about 1.5 T/ha, all the improved weeding systems produced greater yields. The highest yield surpassed 4T/ha. Net returns to farmers, when some of the systems were used, nearly doubled current income.

Benefits and advantages of the approach include:

1. yield increases that more than cover increased input costs;
2. flexibility for the farmer to choose among various weed control methods depending on available cash, time, equipment, and off-farm employment opportunities, plus access to hired labor;
3. emphasis on blending various weed control techniques (manual, cultural, chemical).

The improved yields (Table 3) stem from use of the new rice cultivar C-22 which competes more strongly with weeds than traditional varieties and, therefore, can be planted in wider spaced rows permitting better access for weeding.

Table 3
Yields and Returns for Various Upland Rice Weed Control Systems

system	cultivar	weeding inputs			yield	return	
		handweeding	cultivation	chemical		gross	net
				(kg a.i. per ha)	(kg/ha)	(pesos)	
Traditional							
1	old	2, farmer	0	0	3,000	3,330	3,330
2	old	2, hired	0	0	3,000	3,330	2,730
Improved							
3	C-22	1, farmer	0	1.33	3,940	4,373	4,262
4	C-22	1, hired	0	1.33	3,940	4,373	4,044
5	C-22	1, farmer	0	2.00	4,070	4,517	4,350
6	C-22	1, hired	0	2.00	4,070	4,517	4,147
7	C-22	1, farmer	2, farmer	0	3,680	4,084	4,084
8	C-22	1, hired	2, farmer	0	3,680	4,084	3,932
9	C-22	1, hired	2, hired	0	3,680	4,084	3,864
10	C-22	2, farmer	0	0	4,320	4,795	4,795
11	C-22	2, hired	0	0	4,320	4,795	4,485

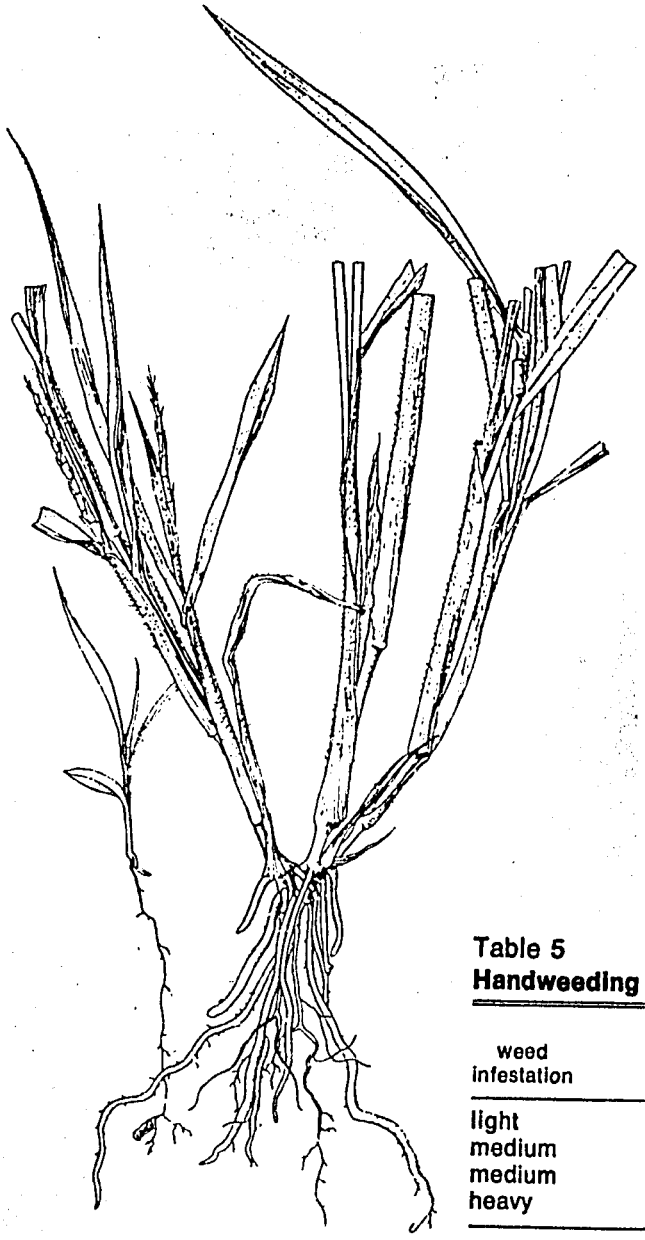
Rottboellia exaltata control in corn

The weed *Rottboellia exaltata* poses a serious threat to many tropical agricultural areas through its prolific seed production and growth. Once established in a field, the weed is difficult to control. In corn growing regions of the Philippines, *R. exaltata* holds added significance in that only one herbicide tolerated by corn will control the weed (pendimethalin). However, where *R. exaltata* is not a problem, other herbicides gave good results.

Table 4
Promising Treatments for Controlling Weeds in Corn

trial	compounds	application method	rate (kg/ha
Los Baños			
A	atrazine	preemergence	2, or 3
B	pendimethalin	preemergence	1
C	pendimethalin, and	preemergence	1
	2,4-D	postemergence	.5
D	atrazine, and	preemergence	2
	pendimethalin	preemergence	1
Central Luzon			
A	linuron	preemergence	1, 2, & 4
B	butylate	preplant-incorporate	2, 3, & 4
C	atrazine, and	preemergence	2
	butylate	preplant-incorporate	1, 2, & 3
D	atrazine	preemergence	1, 2, & 4

Figure 4. (Below) The character of *Rottboellia exaltata.*



Two herbicide screening trials were conducted by the AID-OSU project in fields not yet infested with *R. exaltata*. The first was established near Los Banos in late December, 1978. The second was also conducted during the dry season in Central Luzon. Table 4 summarizes the treatments that produced yields equal to, or better than, a hand-weeded check plot.

Battling a serious weed problem

Call it itchgrass, corn grass or "aguingay" (in the Philippines), *Rottboellia exaltata* is a rank, aggressive, annual grass that is creating a burgeoning problem worldwide.

R. exaltata, among its endearing charms, has the ability to grow taller than most crops, can produce a flush of growth at any time during the crop season (after weed plant population has become great); grows well in shade or sun, and produces stiff, barb-like hairs that

Table 5
Handweeding *Rottboellia exaltata* in Mindanao

weed infestation	crop	weedings required per crop	man-hours required per ha per weeding
light	corn	1	96
medium	corn	2.8	139
medium	corn/mungbean	1	247
heavy	corn	4	263

are extremely irritating to human skin.

Once established, it becomes difficult to control in a crop. As *R. exaltata* populations build, germination cycles begin to overlap leading to year-round germination. Table 5 suggests why handweeding can be a crushing burden.

Perhaps the only weakness attributable to *R. exaltata* is that its seed ceases to be viable after 3 to 4 years in the soil. Therefore, researchers feel that investments in effective continuous control programs can pay off.

In the corn growing sectors of Mindanao, *R. exaltata* has become the main weed menace. Results from handweeding experimental plots reveal that local farmers are suffering a 24% average corn crop loss from this weed alone when the normal procedure of one cultivation and a hilling operation are practiced.

The cultivation misses weeds in the crop row and handweeding is not a common practice. Also, *R. exaltata* competes throughout the season and can exert its most damaging effect late in the season. Monocrop corn and the associated cultural practices tend to encourage weed expansion. And, regional corn-growing farms generally fall in the 3 to 5 hectare range thus precluding sufficient time or labor to adequately weed the planted area.

In addition to the herbicide treatments tested (mentioned above), two other approaches for control were investigated. Adding one correctly timed handweeding to the present cultivation-hilling routine could cut weed-caused yield losses to the neighborhood of 5%. Growing a mungbean crop between the corn rows not only reduced the weed competition compared to current conditions, it provided additional income as mung sells at 6 to 10 times the value of corn.

However, even the tested controls began to lose their effectiveness as the season worn on, reported project agronomist Herb Fisher.

One development that project personnel believe may hold potential involves use of a hand-held "weed wiper" to apply non-selective herbicides on *R. exaltata* growing between the corn rows. This operation could be conducted rapidly at any stage of weed growth and would help reduce weed seed production and carryover.

Stale seedbed offers potential

In the Philippines the performance of preemergence herbicides is at best unpredictable because of inadequate seedbed preparation and rainfall extremes. The stale seedbed approach—delayed planting until the first weed flush emerges and has been controlled with a contact herbicide—offers potential. Rainfall occurring during the delay melts the soil down to a much more suitable surface for preemergence herbicide application.

Preliminary results with corn indicate that use of either paraquat or glyphosate as the contact herbicide produces yields nearly equal to a weed-free check plot or the farmers' practice. In these cases the supplemental preemergence herbicide was unnecessary.

While the system warrants further investigation, there are problems which may prevent wide adoption by farmers. Early planting of corn seems to be a key factor in minimizing downy mildew infestations. Early planting is also necessary in some areas for corn plants to attain sufficient size to avoid serious loss to typhoons later in the season. The delay for allowing the first flush of weeds to emerge may not be practical under these conditions.

Economic model being developed

The socio-economic study of small, upland farming practices in two representative regions of the Philippines moved from data collection to economic model development during the report period.

Starting with five years of on-farm data collected by staff of the International Rice Research Institute, AID/OSU project economist Dennis O'Brien designed an economic model to analyze the data, plus additional supplementary material, and address these objectives:

1. Describe and analyze the role of weed management in existing cropping systems of Cale area farmers. (The Cale area was selected because of its highly representative physical and social characteristics, plus the accumulation of data by IRRI staff.) Examine various states of farm size, tenure, family size, as well as cash and credit constraints through a decision model.
2. Identify those elements of newer weed control systems technology manifesting greatest potential for adoption by small farmers.
3. Examine the effect of hypothetically introducing newer weed control systems technology on expected farm net revenue and associated risk, impact on farm labor relative to activities, and ultimate influence on types and varieties of crops grown and extent of farm size.
4. Predict the regional socio-economic implications for farmers, and others of

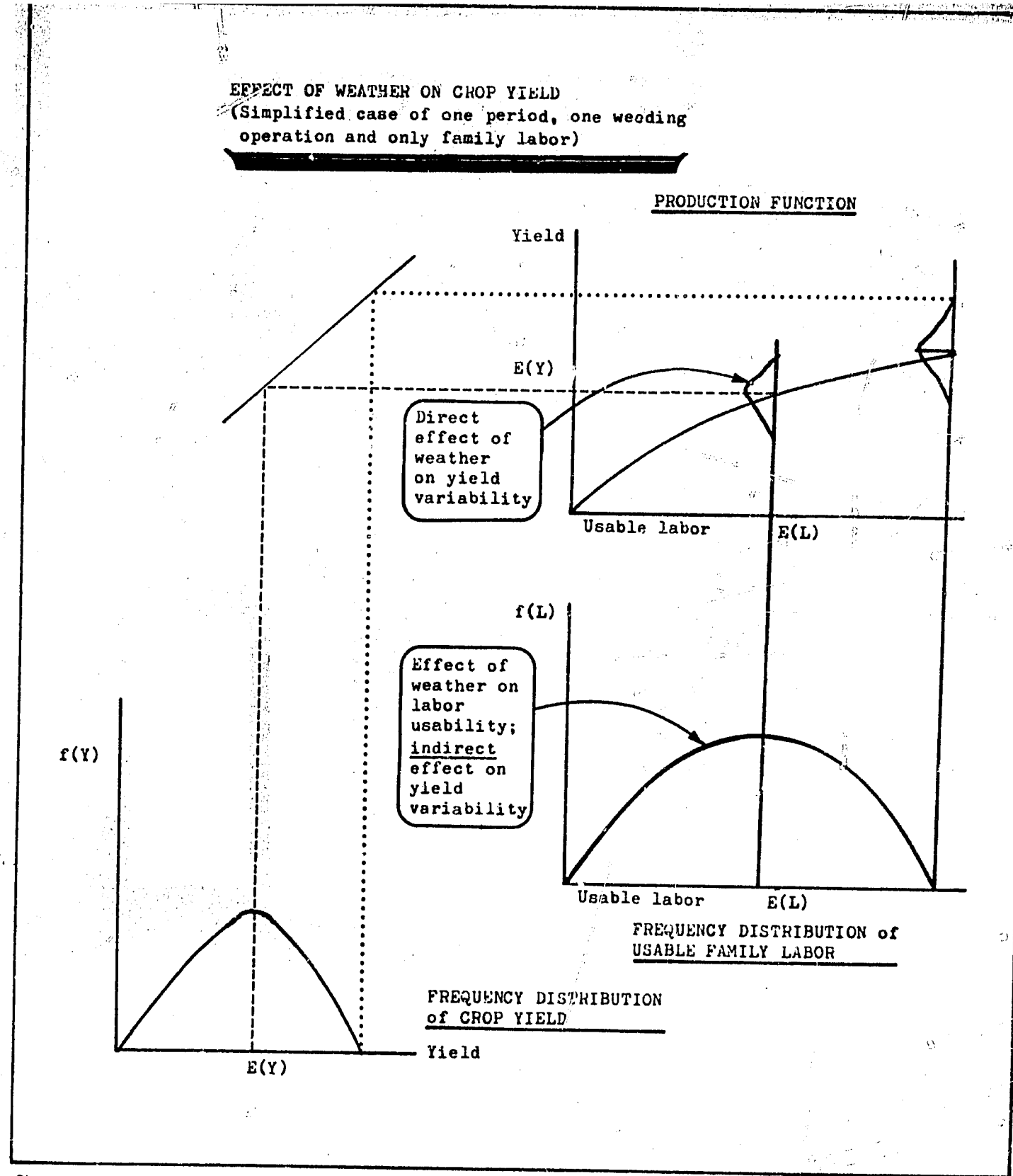


Chart 1. An instance of crop-weather relationships.

potential widespread adoption of newer weed control systems.

The survey determined that less than 5% of Cale area small farmers employed herbicides in weed control operations opting mainly for manual-mechanical systems. Concern over adverse effect of herbicides on other crops in the prevailing multiple crop sequence, financial constraints, and insufficient labor reduction to permit advantageous off-farm income appeared as major reasons for traditional weed control.

The model employs various strategies varying production inputs, planting dates, cultural operations, and labor allocations. The variability in crop yield for a specific strategy is then hypothesized to occur due to weather variability bearing directly on yield, and indirectly through permitting or limiting the performance of operations. Chart 1 depicts an instance of the inter-relationships.

CORVALLIS

Controlled droplet herbicide applicator

A hand-held, spinning disc herbicide applicator is marketed in many countries as a relatively low-cost device that also significantly reduces the amount of water required for applying herbicides in comparison to a conventional sprayer. It also drastically reduces the amount of herbicide drift.

Since units were already being used by small farmers, especially in Africa, project staff recognized the need to gain familiarity with this type of applicator and attempt to evaluate its performance. The project obtained several machines and retained Charlotte Eberlein, a Crop Sciences Department graduate student, to conduct field tests.

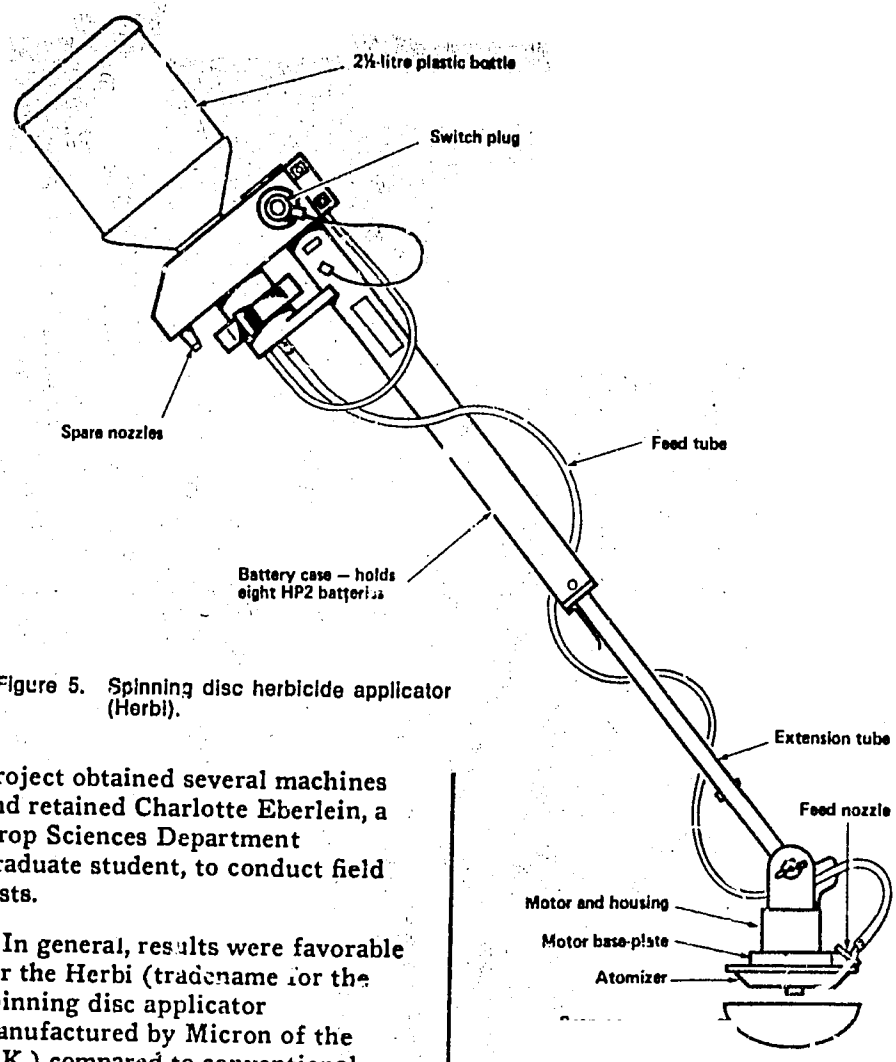


Figure 5. Spinning disc herbicide applicator (Herbi).

In general, results were favorable for the Herbi (tradename for the spinning disc applicator manufactured by Micron of the U.K.) compared to conventional application equipment. While the Herbi proved to be rather fragile, difficult to calibrate, and quick to wear out dry cell batteries, it yielded results superior to standard spray nozzles in all cases.

A trial performed in Oregon compared control of a perennial grass, *Agropyron repens* (quackgrass) using the Herbi and a conventional plot sprayer. Plots with established weed populations were treated with varying concentrations of the herbicide glyphosate, replicated, and then visually evaluated two months later. While the Herbi used a total volume of .71 gal./ac., the conventional method required 41 gal./ac.

Results from three replications (Table 6) indicated that glyphosate exhibited greater control at low dosages when applied with the Herbi.

Table 6
Glyphosate Applied to *Agropyron repens* with Herbi and a Conventional Plot Sprayer

treatment	rate lb/A	percent quackgrass control			
		RI	RII	RIII	avg.
glyphosate	.5 Herbi	50	40	40	43
glyphosate	.5 conventional	0	0	0	0
glyphosate	1.0 Herbi	70	70	40	60
glyphosate	1.0 conventional	30	40	20	30
glyphosate	2.0 Herbi	85	85	90	87
glyphosate	2.0 conventional	85	90	80	85
check	-	0	0	0	0

Additional experiments involving annual weeds and other postemergence herbicides yielded similar results.

In the Philippines a trial was carried out to compare weed control by various rates of preemergence applied atrazine using the Herbi and a knapsack sprayer. Visual evaluation of weed control and subsequent corn yield (the crop involved) revealed no difference between the two application methods.

Work continued with knapsack sprayers

The project's experimentation with knapsack sprayers (used widely in developing countries) advanced during the year. The project produced a series of multi-nozzle booms and evaluated them for potential use in weed control work.

Table 7 presents a comparison of various booms.

Table 7
Evaluation of Multi-Nozzle Booms for Knapsack Sprayers

boom	materials	overall performance	estimated availability of material	estimated relative cost of fabrication
A	1/8" aluminum pipe, with 1/8" anodized aluminum aircraft fittings.	excellent	difficult	very high
B	3/8" copper (refrigeration) tubing and fittings.	very good, but impractical to disassemble	very good	very low
C	3/8" copper tubing with polypropylene flareless fittings.	good	good	low
D	3/8" copper tubing with brass flareless fittings.	poor due to excessive weight	good	high
E	Bamboo with split eyelet nozzle bodies.	good	good	low
F	Commercial: all plastic.	poor: lacks durability and versatility in swath width options	very good	very low
G	Commercial: thin wall aluminum tubing with plastic fittings.	poor: lacks durability and versatility in swath width options	very good	very low

Herbicide trial yields data

A herbicide screening trial involving 14 experimental compounds and 9 standard treatments was conducted during the spring season at the Hyslop Research Farm near Corvallis. Products from five companies were applied across 17 crops and seven weed species to assess efficacity and potential toxicities.

The activity provides useful information for project staff in that it affords an opportunity to maintain awareness of new products and retain contact with major herbicide manufacturers.

Activities Review

II. Technical Assistance

PHILIPPINES

Major short course conducted at Los Baños

The AID-OSU program organized and conducted a three-week weed science short course during January and February 1979 at the Philippine National Crop Protection Center, Los Baños. In addition to NCPC and the AID-OSU program, support emanated from the Philippine Council for Agriculture and Resources Research (PCARR), the Weed Science Society of the Philippines (WSSP), and various departments at UPLB.

Thirty two individuals representing 13 institutions—government agencies, several colleges and universities, and one commercial firm—attended as participants. Attendees all held a BSc degree, or higher and were nominated by a committee composed of individuals from several entities.

The course met for 105 hours of lectures, laboratory exercises, demonstrations, field work, and field trips spread over 21 days. Subject matter ranged widely, encompassing broad theory as well as very specific practical information. The concept of "what is a weed" and all the numerous ways weeds can be controlled preceded discussions on the socio-economic costs and implications of weed control. Participants were exposed to classroom instruction followed by reinforcing "hands-on" lab and field experience.

Instructional time during the 15 working days equalled 105 hours comparing favorably with approximately 70 hours of class time allotted the regular weed control class at Oregon State University.

Figure 6. IPFC's Larry Burrill explains a weed control technique during the Los Baños short course.

Course objectives included:

- raising the level of overall weed science comprehension;
- providing a learning experience in weed control research techniques and programs;
- helping participants gain confidence in the selection and application of research apparatus and equipment;
- creating a network of professional contacts among Philippine weed workers.

A 20-question examination was administered during the first day of the course. Scores averaged 48.6% with a range of 21 to 83%. The last day, participants completed a second 20-question quiz including five questions that had appeared on the earlier exam. Scores improved to an average of 74.7% (95% high, 47% low). Scores on the five repeat questions improved 36.2%, while the best overall improvement between the two tests was 56%.

Fifteen people functioned as instructor/leaders during the three-week course. They were drawn from UPLB, NCPC, and the Philippine Bureau of Plant Industry, as well as the International Rice Research Institute, the University of Hawaii AID, and OSU.

PCARR has requested that a series of similar courses be conducted over the next few years. The basic outline developed by the AID-OSU group could be employed, but with inclusion of additional emphasis on field activities.

Project supports R. exaltata information dissemination

Project agronomist Herb Fisher collaborated with counterparts and World Bank Consultant Dr. Dale Goodell to help formulate an information dissemination campaign focused on *Rottboellia exaltata* as part of the plant protection education effort conducted by regional crop protection centers.

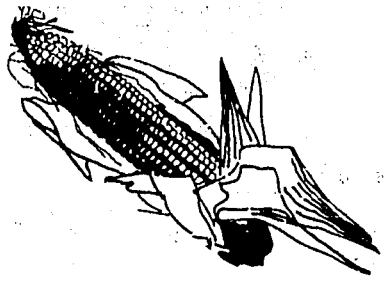
First priority was assigned to increasing farmer awareness about

the weed's seriousness through radio, pamphlets (in local dialect) and field days. Major objectives outlined were: 1) to make farmers and technicians aware of the seriousness of "aguingay" *R. exaltata* in upland crops; 2) to teach these persons how to identify the plant, understand its growing habits and the relationship of aguingay to cultural practices, especially in corn; 3) to teach farmers, not only practical control measures, but how to prevent spreading the weeds within the farm and to new areas; 4) to obtain understanding and support from related governmental agencies and agri-business.

A series of questions and laymnan's answers was prepared and then used in a radio interview of a Philippine weed scientist. This interview will be repeated and new ones developed.

Workshop and minicourse series presented

In addition to the major short course, AID-OSU personnel presented a number of workshops and minicourses covering both specific aspects of weed control systems technology and general familiarization. Several sites were utilized. Some participants attended more than one event. Table 8 lists the workshops and minicourses.



Other Activities

Dr. Philip Motooka co-coordinated two one-day sessions on weeds in the University of California/AID-FAO-IRRI-BPI sponsored Short Course on Integrated Pest Control for Irrigated Rice in South and Southeast Asia, Oct. 16-Nov. 17, 1978. This one-month course was attended by 40 participants from Indonesia, Malaysia, Thailand, Bangladesh, India, Sri Lanka, and the Philippines. Other resource speakers came from several American universities, FAO, IRRI, the West German Mission, and Philippine universities and agencies.

The Weed Science Society of the Philippines elected Dr. Motooka to its Board of Directors and subsequently elected him vice president of the Society. By virtue of being a director and officer of the WSSP, he automatically became a director of the Pest Control Council of the Philippines and the Federation of Professional Associations of Food Agriculture and Forestry (PAFAF). He was also appointed editor of the *Philippine Journal of Weed Science.*

CENTRAL AMERICA

Formal training programs

Project personnel engaged in a number of training activities during the year. Table 9 lists the formalized events.

Technical assistance provided by project

Project agronomist M. D. Shenk travelled to Panama, Honduras, El Salvador, and Guatemala in the process of assisting those nations with weed control research efforts. He collaborated with regional CATIE staff and governmental officials.

The assistance took the form of consultation or, in some cases, physical participation in designing weed control experiments and laying out research plots.

Agronomist Shenk also taught two special weed control classes at CATIE for CATIE-University of Costa Rica students.

In addition, he attended the 1978 and 1979 annual meetings of the Programa Cooperativo Centro-americano para el Mejoramiento de Cultivos Alimenticios in San Salvador and Tegucigalpa respectively.

He also presented a paper entitled Preplant Vegetation Control for Minimum and Zero Tillage Systems (co-authored by E. Locatelli, L. Burrill and T. McCarty) at the 3rd Symposium on Weed Control in Tropical Crops held during September 1978 in Dakar, Senegal.

Table 8

Workshops and Minicourses Conducted in the Philippines, 1978-79.

date	event	number of participants	held at
Apr. 11-14, 78	First Mindanao Weed Science Workshop	26	Central Mindanao Univ., Musuan
Apr. 24-27, 78	Herbicide Application Minicourse	17	NCPC, Los Banos
May 31-June 2, 78	Second Mindanao Weed Science Workshop	20	Xavier Univ., Cagayan de Oro City
Aug. 15-18, 78	Herbicide Properties and Behavior Minicourse	15	NCPC
Sept. 27-29, 78	Third Mindanao Weed Science Workshop	30	Central Mindanao Univ.
Oct. 2-4, 78	Weed Ecology and Identification Minicourse	15	IIRR, Silang,
Mar. 12-14, 79	People's School Weed Control Workshop	15	IIRR, Silang, Cavite
Mar. 19-23, 79	Fourth Mindanao Weed Science Workshop	42	BPI, Davao City

Table 9
Project participation in short courses and workshops in Central America

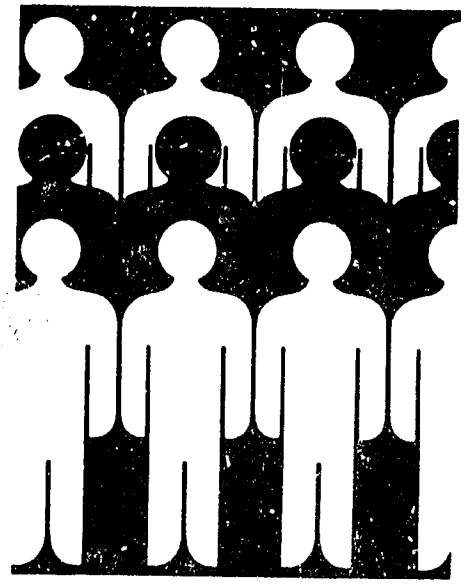
date	site	activity
July 18-19, 78	San Pedro Sula, Honduras	Participate in 3-day training seminar for 34 agricultural advisors for Central Bank of Honduras.
Aug. 18, 78	La Lola Exp. Stn., Costa Rica	Present 1/2-day weed control workshop (cacao emphasis).
Nov. 2, 78	CATIE, Turrialba, Costa Rica	Present 1/2-day session to 50 participants at a 6-week short course on Management and Utilization of Tropical Pastures.
Dec. 4-6, 78	San Salvador, El Salvador	Co-present 1-week Weed Management short course to 36 participants from CENTA and other agencies.
Jan. 22, 79	La Lola Exp. Stn., Costa Rica	Present 1-day workshop to 11 participants (including 6 Peace Corps Volunteers) as part of a 15-day cacao training program.
Apr. 16-21, 79	Comayagua, Honduras	Present 5-day short course at request of Secretariat of Renewable Natural Resources.
May 7, 79 May 24, 79	La Lola Exp. Stn., Costa Rica	Present two 1/2-day programs on calibration of pesticide application equipment and safety precautions to 21 and 31 participants (respectively) as part of week-long training session for agricultural agents.

AQUATIC WEED PROGRAM

International representatives trained in Florida

Goh Ah Keat, Malaysia, and J. Davison Mukuwa, Botswana, participated in a two month training program during July and August, 1978, involving aquatic weed identification, ecology and utilization; problem assessment; biological, mechanical, and chemical control techniques; and water quality. In addition to instruction provided by University of Florida faculty in Gainesville, the participants received training from scientists at Ft. Meyers and Ft. Lauderdale, Florida, and Baton Rouge, Louisiana.

Tag El Seed, Sudan, received on-the-job training and support from the University of Florida. The aquatic weed program contributed funds toward supplies and in-state travel while he was researching water hyacinth ecology. He was retained as a visiting professor by the U. F. Department of Agronomy from September 1977 to September 1978, and is now Director of the Hydrobiology Unit in Khartoum.



Nene Amegatcher, Ghana, attended a training course in aquatic weed control and water quality management at the Aquatic Weed Center from October 2 to November 17, 1978. He also received practical training from scientists at Ft. Lauderdale and Ft. Meyers, Florida. Upon his return to Ghana, he became the maintenance officer for Weija and Barekese, the country's main reservoirs.

Aquatic macrophyte information system

The aquatic weed program functions as an international repository and distribution center for information related to macrophytes inhabiting fresh and brackish waters. More than 10,000 journal articles, books, technical reports, and unpublished papers have been catalogued and entered into a computer, cross-indexed under selected specific categories and plant names. Computer-generated reference lists may be produced for a particular topic, a specific plant (4,340 species are listed), an author, a date of publication, or a combination of these.

Sources of information include complimentary reprints from researchers and agencies with whom the Aquatic Weed Center maintains contact, photocopies of library copies, and articles ordered through Inter-library Loan. The SEA Current Awareness Literature Service, a listing of articles available through the Department of Agriculture's National Agricultural Library, has also proved helpful. Reference lists at the end of all catalogued articles are checked for literature related to aquatic weeds, and 20 journals are monitored for more current information. More than 600 journals are represented in the collection.

Since the computer system began functioning in April 1978, 74 different bibliographies have been retrieved, and 196 requests from all over the world have been serviced (see Appendix No. 5).

Computer print-outs of bibliographies are photocopied and

the print-outs kept on file. Each person who requests a bibliography also receives a user guide and a request form for quarterly updates. Every 3 months more than 300 references are added to the data base. Those who return update sheets receive quarterly updates containing recent supplementary material. Feedback from system users indicates that they find the service to be a valuable one, and to date 78 updates have been requested.

A request for information is answered with a general explanatory letter and a list of categories under which material has been entered into the computer system. If information regarding the best choice of topics or topic combinations is requested, a more specific advisory letter is mailed.

Requests for bibliographies that have already been retrieved from the computer can be answered within a week, while new bibliographies usually require longer. A record of each request is kept, including the date that the initial bibliography and subsequent updates are mailed.

Aquatic weed problems in Ghana assessed

In response to a request by the Ghana Water and Sewerage Corporation (GWSC), Aquatic Weed Program Coordinator George E. Allen, along with consultant John Gaudet, conducted an assessment of water weed problems at Weija and Barekese reservoirs in Ghana during July, 1978.

The major aquatic pest species in Ghana, *Pistia stratiotes* (water lettuce), forms sudds (floating islands) covering 60% of both large reservoirs which supply potable water to 1,085,000 people. The aquatic plants thrive, partly due to high concentrations of nutrients regularly entering both reservoirs. Also, dam systems have slowed the annual floods which normally limit weed growth.

Table 10

Schedule of Activities for Control of Aquatic Weeds in Two Ghanian Reservoirs

date	stage	activity
March 79	Preparation	Infra-red photography of both Weija and Barekese Reservoirs.
April 79	Mobilization	Equipment check-out, herbicide stockpile, helicopter and consultant alert, assembly of mobile and shore crews.
May 79	Testing	Helicopter dry run, herbicide spot tests.
July 79	Control I	Barekese:
1st		– first aerial application
2nd		– first follow-up operation
15th		– second aerial application
17th		– second follow-up operation
August 79	Control II	Weija:
1st		– first aerial application
3rd		– first follow-up operation
15th		– second aerial application
18th		– second follow-up operation
29th		– third aerial application (subsequent applications will be based on immediate progress)
February 80	Assessment	Second infra-red photography of both reservoirs, weed team tour of reservoirs, Regional Manager's monthly reports from Barekese.
April 80	Management	Monthly weed situation reports from Reservoir Management officer and assessment reports by the weed team are evaluated prior to next flood season.

A major problem could result when large masses of floating aquatic material break away and choke spillway siphons, threatening the stability of the dams by causing more stress than their design allows. Aside from the potential physical damage, a significant water quality loss already has occurred.

Effectiveness of current control methods was evaluated and recommendations formulated for future efforts, including a management program. The Reservoir Maintenance Officer attended a training course in aquatic weed control at the IPPC Aquatic Weed Center, University of Florida. His training syllabus included principles of aquatic weed management, chemical, mechanical and biological control, and herbicide residue analysis.

The $260,000 annually spent for water treatment could easily cover the cost of the program, but GWSC needs some funding assistance. The World Bank, which provided funds for dam construction, has shown an interest in working with GWSC and USAID in developing a long-range program.

The aquatic weed assessment review proposed a timetable for a control program as shown in Table 10.

CORVALLIS

Training programs

Individualized, intensive, advanced weed science training programs were conducted at Corvallis for three participants during the report period. The participants were:

Dr. Soepadiyo, Indonesia, Weed scientist, Balai Penelitian Perkebunan, Medan

M. Sundaru, Indonesia, Weed researcher, Bogor

M. Lall, India, Officer in charge of weed science, Central Plant Protection Training Institute, Hyderabad.

The broad goal, in each case, was to gain first-hand familiarity with herbicide screening procedures.

Each man's training was adjusted to emphasize specialized needs as expressed by the participant. Each man engaged in all phases of weed research trial work, from initial planning through final evaluation.

Weed science teaching outline prepared

Responding to an indicated need in many developing countries, the AID-OSU project prepared a comprehensive weed science teaching outline. The outline, assembled utilizing a wide variety of sources, according to project senior agronomist L. C. Burrill, compliments material previously printed in the project publication ***Field Manual for Weed Control Research.***

The outline was prepared in 3-ring binder format so that additional material can be supplied to outline users from time to time. The first two copies were supplied to CIMMYT.

Visitors

Dr. S. V. R. Shetty, weed scientist, International Crops Research Institute for the Semi-arid Tropics (ICRISAT), visited the project and presented a seminar to staff and students at Oregon State University. He reiterated an earlier message delivered to the international session of the Weed Science Society of America meeting: both research and extension must consider and adjust to agricultural and socio-economic realities to be effective. For developing countries, small plots, multiple cropping, and often transient farming are real life factors to be faced.

Earlier, Dr. Jerry Grant, representing the International Agricultural Development Service (IADS), met with project staff to explain program goals in Ecuador. Dr. Grant was interested in project publications and requested multiple copies of several titles for use in the IADS Ecuadorian effort.

The project engaged in an informal brief review on June 19, 1978, when Keith Byergo, Chief, Crops Division, Office of Agriculture, Development Support Bureau, AID, visited Corvallis.

INFOLETTER expands reach in response to requests

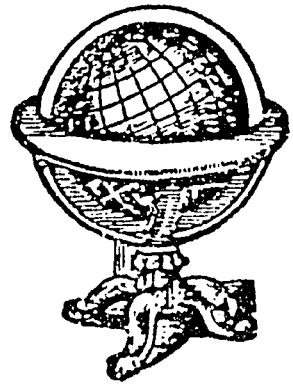
INFOLETTER has been published continuously since its inception in February 1970. Forty issues of the free periodical have been distributed to all who request it. IPPC publishes the newsletter with major financial support from the AID-OSU technical assistance weed control systems contract.

There are presently 4,436 recipients in 145 countries receiving INFOLETTER. This represents an increase of 536 recipients or 14% since December 1975, despite sharp drops in several Latin American countries during 1976-77 as a result of revising the INFOLETTER mailing list. For a comparison of country-by-country distribution see Appendix 2.

A sampling of news items that appeared in the five issues of INFOLETTER published during the report period includes:

- A 3-part series on safety (in handling, use, and storage of pesticides, with emphasis on herbicides)
- India launches research effort
- Weed fieldmen needed
- Dual cropping shade slows weeds
- Aquatic plant data system now on stream
- LDC pesticide markets seen
- AID team reviews weed systems program
- IWSS begins third year
- Dry area weed: a crop?
- Study clears phenoxys
- AID names project manager
- Weed science growing worldwide
- U.S. farms tilled less
- Aquatic plant harvest costs

Each issue of INFOLETTER continues to carry both "In Print" and "Dates and Events" sections



listing items believed to be of interest to the international weed science community.

Additionally, the regular "Equipment" section featured 22 items during the report period; IPPC received 411 requests for

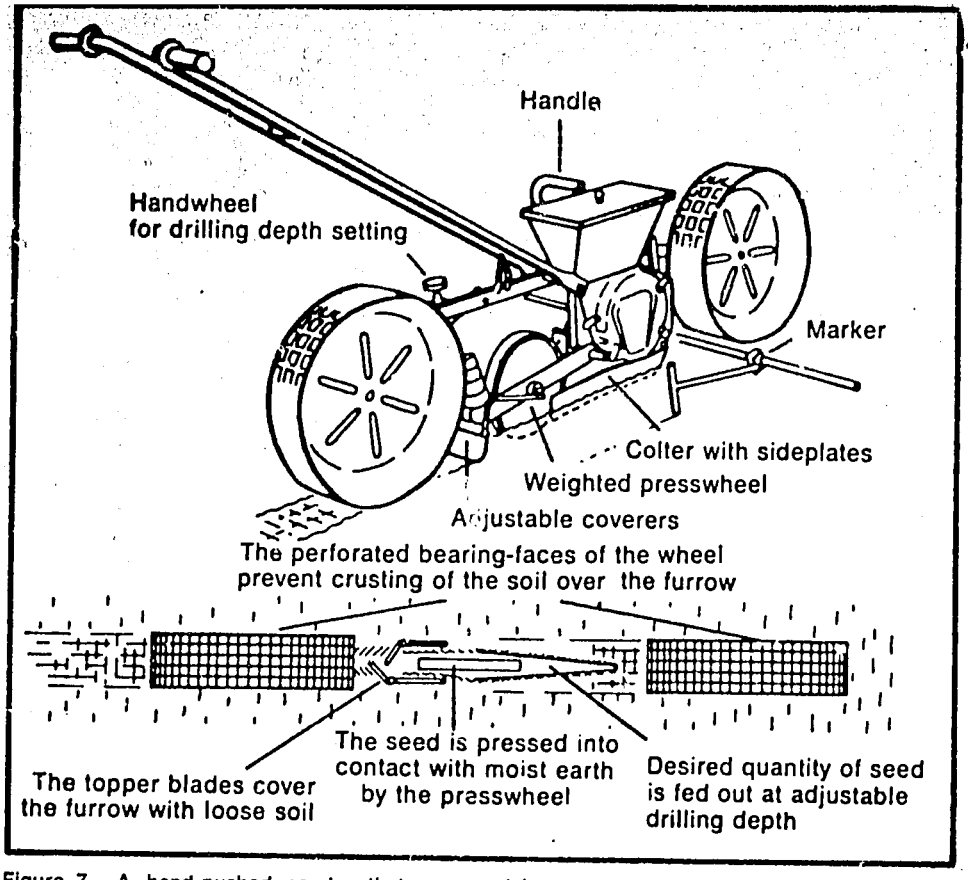


Figure 7. A hand-pushed seeder that appeared in a past issue of INFOLETTER.

addresses of manufacturers of items mentioned and responded to every request, usually the same day. Among the items that appeared in "Equipment" were: two hand-pushed seeders; two aquatic weed harvesters; two knapsack sprayers, one powered and one hand-pumped; a one-row plot combine; a simple bird scarer; an inexpensive and effective container rinser; a fence (wire) tightener; a wind-powered water pump (with a pump that needn't be directly over the water source); an adjustable (folding) diesel tractor; two spray lances with built-in pressure gauges; and a two-wheeled, multi-purpose vehicle.

The five issues of INFOLETTER issued during the report period mentioned 43 various publications (other than IPPC Papers) from 36 sources. In each instance a cost (if known) and publisher's address was included for reader convenience.

The lead story in the August 1978 issue of INFOLETTER, "Storing pesticides," was used verbatim as a major story in the October 1978 issue of *Modern Agriculture and Industry-Asia* published in Manila.

Titles added to reprint series

The IPPC Papers series of reprints continued to be a popular source of information judging from the 1,936 copies of papers requested (and provided without cost) during the report period. Three new titles were added:

Approaches to weed control in cropping systems, by Plucknett, Rice, Burrill, and Fisher;

Controlled drop application—what does it all mean, by Cussans and Taylor; and,

Selecting appropriate weed control systems for developing countries, by Young, Miller, Fisher, and Shenk.

The series now contains 85 titles with more in the wings notes project information specialist Allan Deutsch. A complete listing of titles and distribution appears in Appendix 4.

Project/IPPC help to expand literature

Another avenue IPPC has employed to expand international utilization of important and informative literature (aside from IPPC Papers) involves acting as a secondary distributor, by purchasing items in bulk and then making copies available free to requestors.

Informative material and clear four-color photos contained in *Diagnosis & Prevention of Herbicide Injury*, a Michigan State University extension bulletin by Lockerman, Putnam, Rice, and Meggitt, coupled with limited local distribution, produced a rich opportunity for the AID-OSU project, through IPPC, to provide a valuable service to the worldwide weed community. Well over 100 copies have been mailed from Corvallis since mention in the February 1979 INFOLETTER.

Earlier, the same approach was used with *Herbicide Injury Symptoms and Diagnosis*, a similar full-color publication from the North Carolina Agricultural Extension Service.

Multiple copies of other selected publications have been acquired by IPPC, using project funds, and subsequently provided to *bona fide* weed researchers in developing countries.

Project responds to variety of requests

IPPC received requests for a variety of information other than publications or equipment (mentioned in INFOLETTER). Appendix 5 lists the requests and the responses.

Inquiries of various nature from 38 FAO project managers and personnel worldwide were received. Materials and information of some sort were supplied to every major international agricultural research center ranging from training manuals for CIMMYT to a manufacturer's address for CIP.

Travel and participation in conferences and symposia

During the report period, project personnel travelled extensively to conduct or direct project-related activities. Appendix presents a summary of travel including date, destination, traveler, and activity.

Participation in conferences, symposia and professional meetings provides important linkages for the project. The events attended, the level of participation, and the project members involved are set out in Appendix 7.

IPPC continues as IWSS secretariat

The International Plant Protection Center continued to function as the secretariat for the International Weed Science Society. IPPC's Larry Burrill serves as IWSS secretary.

During the year IWSS published a 12-page leaflet describing weed science activities at eight major international agricultural research centers. IPPC assisted in editing, designing, printing, and distributing the leaflet.

The publication meets one of the Society's objectives, to promote and assist the development of weed science and weed control technology by disseminating relevant information. Copies are available (free) from IWSS.

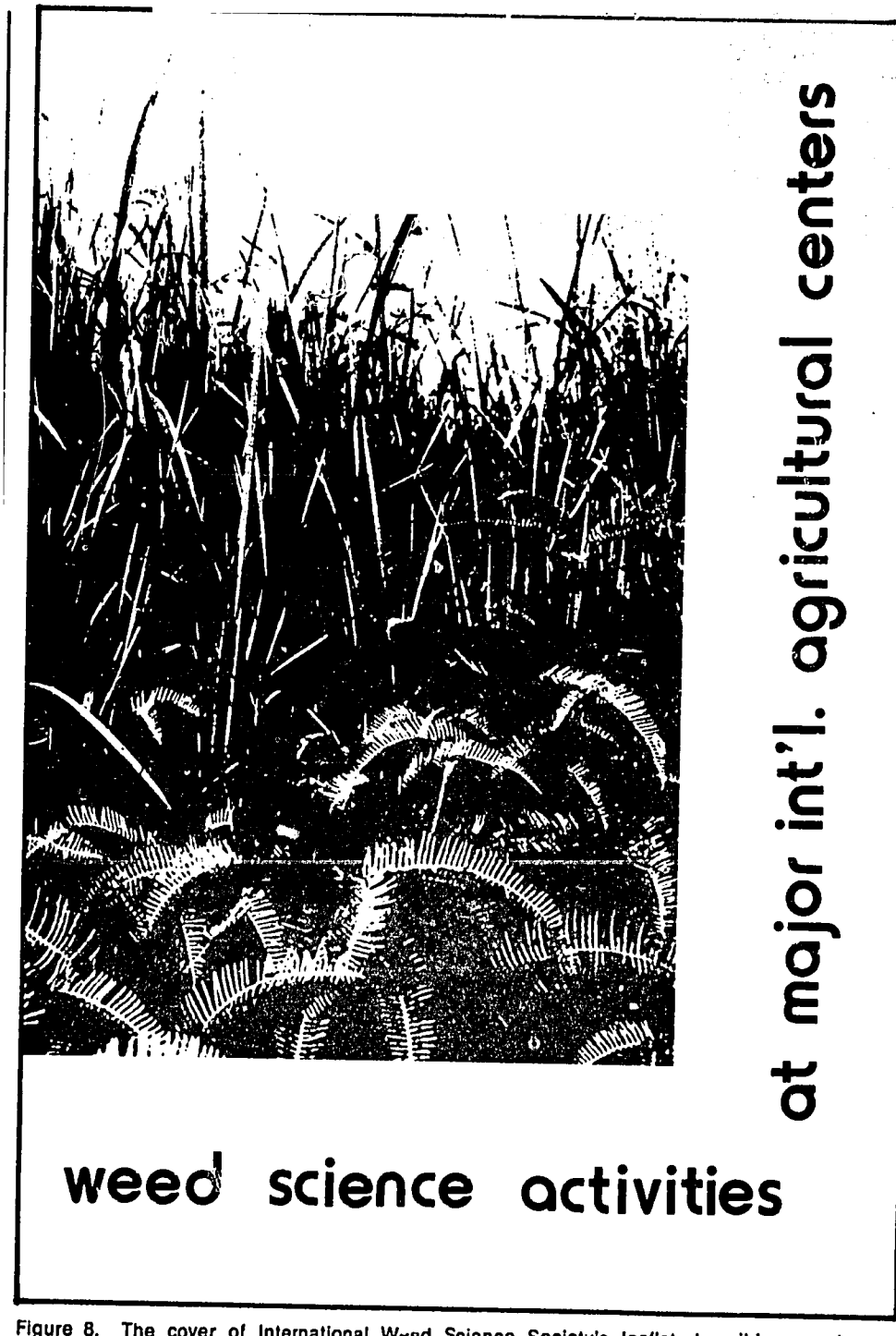


Figure 8. The cover of International Weed Science Society's leaflet describing weed science activities at eight of the world's major agricultural research centers.

III. Other activities

AID conducts project review

An intensive project review was conducted in the field at CATIE (Turrialba, Costa Rica) and Gainesville, FL, on August 21-25, 1978, by an AID review team.

The team included: Dr. Earl Heady, member of AID's Research Advisory Committee (RAC); James Murphrey, USAID/San José; Blair Allen, AID Latin American Bureau; Dr. Fred Warren, AID project liaison and manager; and Keith Byergo, Chief, Crops Section of AID's Development Support Bureau/ Agriculture Division. In addition to project staff, Dr. John Davis, Agricultural Experiment Station Director at Oregon State University, took part in the review.

Project personnel presented information concerning both research and technical assistance efforts. Agronomic and economic data was shared with the review team. One short field trip, plus a second, day-long field trip to research plot sites and discussion with AID officials in San José, rounded out the Costa Rican segment of the review. The team then flew to Gainesville and spent a full day in reviewing the aquatic weed (subcontract) portion of the project.

The review not only provided a constructive exchange of information and viewpoints, it produced a number of conclusions and recommendations for shifts in activity emphasis. The team endorsed extending both research and technical assistance efforts for several additional years beyond the March 31, 1979, termination.

AID approves project continuation

A comprehensive project proposal for continuation of both the weed systems research and technical assistance (utilization) efforts was prepared and submitted to AID. A slightly revised version was ultimately accepted by AID and the two contracts extended with termination on June 30, 1982.

The scope of work envisioned continues along current lines, but with increased economic emphasis. Program and budget provisions stipulate an on-site economist in Costa Rica. A second agronomist working with CATIE would be stationed in Central America, but not at Turrialba.

Weed science proposal prepared

As an outgrowth of recommendations from various sources, project personnel devoted time to drafting a proposal to the National Agricultural Chemicals Association (of the US) to consider funding a long-term, project-associated OSU staff position for weed training and technical assistance.

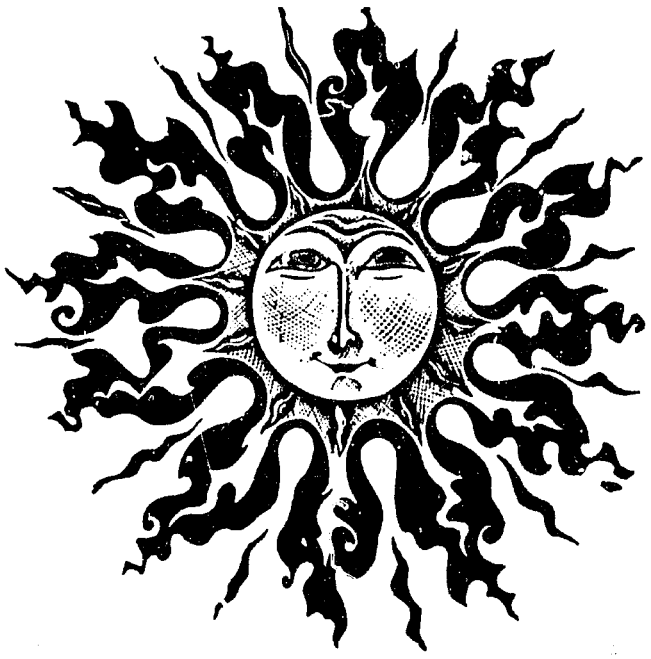
Major emphasis would be directed toward training less developed countries' personnel.

A preliminary draft was prepared for discussion purposes. After minor revision, the proposal will be forwarded for industry comment and eventual consideration.

Project staff related activities

Project director Dr. Stan Miller was named to represent Oregon State University as a member of the board of the Consortium for International Crop Protection (CICP). Members of the Consortium may become involved in helping to implement Title XII crop protection activities.

The Western Society of Weed Science (USA) in March 1979 selected project agronomist Larry Burrill as Society president. Burrill also serves on the International Affairs committee of the Weed Science Society of America.



Work Plans

Weed control contracts between OSU/IPPC and AID/Washington have been extended for an additional three years, June 1979 to May 31, 1982. Comprehensive work plans have been developed for the entire three years. These plans may be obtained from IPPC upon request. This section contains only those activities scheduled and anticipated for the 1979-80 project year.

Central American Regional Program

1. Increase staff by the addition of an economist to be stationed in Costa Rica and an agronomist to be stationed in Honduras or another suitable Central American country.

2. Continue evaluation and modification of chemical seedbed preparation techniques as a method of weed and erosion control in Costa Rica.

   a. Experiments in North Atlantic Zone will focus on interactions between the mulch weed control system and other inputs.

   b. Farmer field trials will be established on 10 cooperating farms in the North Atlantic Zone.

   c. The mulch system will be tested in a drier, less tropical zone in Costa Rica.

3. Initiate preplant vegetation control system research in Honduras.

4. Develop and evaluate new weed control application techniques.

   a. Tests of seed coating with herbicides versus band application of granular herbicides will continue.

5. Establish and monitor farm field trials of chemical seedbed preparation techniques.

6. Identify the economic, agronomic and social factors which influence adoption of the chemical seedbed techniques. Previously conducted farm interviews of ex-post adoption conditions will be supplemented by ex-ante interviews and economic evaluations.

7. Continue collaboration with CATIE-ROCAP Small Farm Cropping Systems Project.

8. Provide consultation, advisory service, and training to Central American countries. Short courses will be presented in Honduras, Costa Rica, and Nicaragua.

Asian Regional Program (Philippines)

1. Replace and increase staff in the Philippines to include two agronomists and one agricultural economist.

2. Continue field experiments and economic evaluations to develop weed control technologies for small farmers.

3. Define agronomic and economic role of zero tillage and mulching as a weed control technique on upland crops.

4. Conduct tests to determine the most efficient method of controlling extremely noxious weeds such as Rottboellia exaltata.

5. Conduct intensive farm interviews to serve as a basis for economic monitoring of improved weed control systems.

6. Encourage the installation of a "core" experiment for RCPC weed control personnel in all zones of the Philippines. It will serve as a teaching tool and as a standard experiment for eventual weed control recommendation.

7. Provide training experiences, both formal and on-job, for RCPC weed control staff.

8. Conduct a formal four-week short course in Los Banos during the first trimester of 1979.

9. Encourage the formation of an NCPC Advisory Committee for Weed Control to be composed of representatives from UPLB, PCARR, BPI, and NCPC.

10. Foster strong linkages with the Weed Science Society of the Philippines

Corvallis Program

1. Agronomic

   a. Develop improved jab planters for mulch planting.

   b. Develop new herbicide application equipment for use by small farmers in developing countries.

   c. Evaluate promising herbicides.

   d. Provide support for IPPC foreign-based agronomists.

   e. Maintain consulting and advisory service on weed control procedures.

f. Participate in the Title XII integrated crop protection effort, CRSP.

g. Continue as secretariate for IWSS.

2. Economic

a. Complete and publish evaluations of weed control methods of small farmers in the North Atlantic Zone of Costa Rica.

b. Evaluate the socio-economic impact of mulch preplant weed control systems in NAZ of Costa Rica.

c. Estimate weed control protection function for upland rice and corn in the Cavite area of the Philippines.

d. Determine crop yield and net revenue for alternative production techniques affecting resource mix and weeding methods using simulation.

e. Estimate and publish risk-profit frontiers for a representative upland small farm from new weed control technologies.

3. Information

a. Publish review of world literature on weed competition.

b. Publish and disseminate no less than four issues of IPPC INFOLETTER.

c. Publish utilization and modification of backpack sprayers.

d. Distribute publications and reprints in response to requests.

e. Service requests for technical and general weed control information.

Aquatic Program

1. Evaluate feasibility of establishing part time economist in Thailand to assist in development of benefit cost criteria for evaluating aquatic weed infestation.

2. In collaboration with Thai officials, select a watershed for intensive study of aquatic weed monitoring, control, and evaluation.

3. Assist Thai agencies to generate, gather, and evaluate necessary physical and economic data for benefit-cost assessment.

4. Conduct regional short course on aquatic weeds in Ghana.

5. Conduct intense aquatic weed control training program in Florida.

6. Expand and maintain aquatic weed information system.

7. Provide short term consultation with government agencies of developing countries.

Financial Review

The following four tables list expenditures and obligations related to the AID-OSU weed projects' broad work areas.

Table A and B cover the period April 1, 1978 through May 31, 1979, the report period.

Table C and D present data for the total contractual period, April 1, 1976 through May 31, 1979.

TABLE A - Research (AID/ta-C-1295)

Weed Control Systems for
Representative Farms in
Developing Countries
(04-01-78 thru 05-31-79).

Category	Corvallis: head-quarters	Central America	Southeast Asia	Corvallis publications	Category totals
Salaries and wages	$78,375.46	$25,719.85	$21,403.05	$5,756.45	$131,254.81
Fringe benefits	12,792.10	5,019.86	3,971.31	978.52	22,761.79
Indirect costs					
on-campus	38,837.74	-	-	2,323.80	41,161.54
off-campus	-	11,276.51	12,156.44	-	23,432.95
Total	38,837.74	11,276.51	12,156.44	2,323.80	64,594.49
Allowances	-	6,238.37	8,505.80	-	14,744.17
Travel and transportation	12,285.00	11,298.72	18,985.31	-	42,569.03
Other direct costs	5,354.94	4,148.91	3,873.17	-	13,377.02
Equipment, vehicles, materials and supplies	4,536.65	3,160.03	603.01	27.23	8,326.92
Totals	$152,181.89	$66,862.25	$69,498.09	$9,086.00	$297,628.23

TABLE B - Technical Assistance (AID/ta-C-1303)

Weed Control Systems Utilization
for Representative Farms in
Developing Countries (04-01-78 thru 05-31-79)

Category	Corvallis: head-quarters	Central America	Southeast Asia	Corvallis publications	Category totals
Salaries and wages	$67,587.54	$19,425.89	$29,356.87	$27,367.40	$143,737.70
Fringe benefits	11,556.87	3,249.36	5,486.34	4,655.57	24,948.14
Indirect costs					
on-campus	38,351.51	-	-	16,671.14	55,022.65
off-campus	-	7,412.57	13,754.07	-	21,166.64
Total	38,351.51	7,412.57	13,754.07	16,671.14	76,189.29
Differential and allowances	-	-	11,129.03	-	11,129.03
Travel and transportation	14,942.05	7,762.84	14,490.84	1,508.73	38,704.46
Other direct costs	10,048.14	4,046.43	3,068.17	2,175.74	19,338.48
Equipment, vehicles, materials and supplies	7,817.07	480.38	1,346.46	12,852.74	22,496.6
Aquatic weed sub-contract	66,741.42	-	-	-	66,741.42
Totals	$217,044.60	$42,377.47	$78,631.78	$65,231.32	$403,285.17

TABLE C - Research (AID/ta-C-1295)

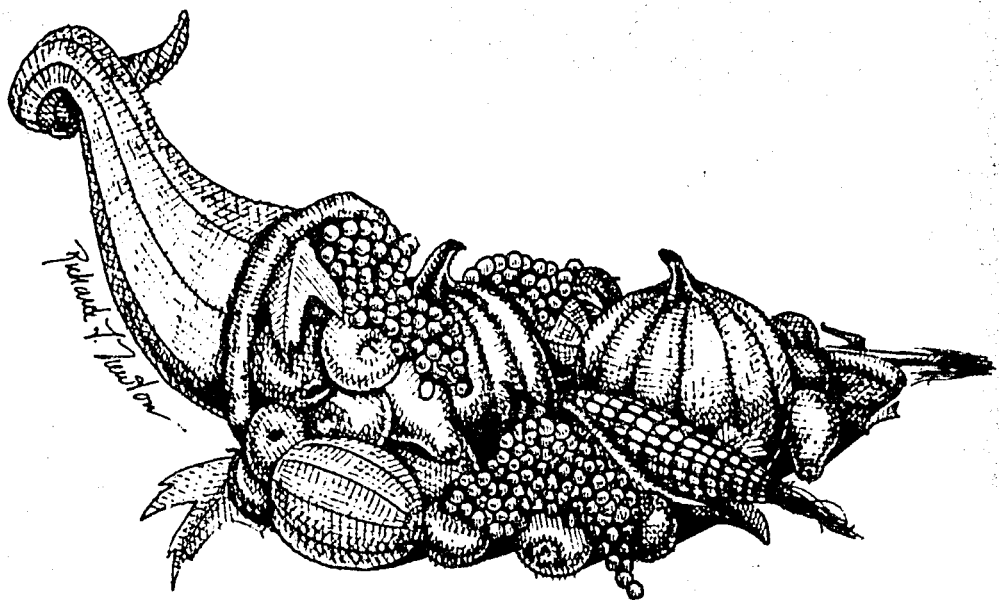
Weed Control Systems for
Representative Farms in
Developing Countries (04-01-76 thru 05-31-79)

Category	Corvallis: head-quarters	Central America	Southeast Asia	Corvallis publications	Category totals
Salaries and wages	$190,629.86	$60,893.11	$40,859.63	$14,940.26	$307,322.86
Fringe benefits	29,752.00	11,041.80	7,312.06	2,391.05	50,496.91
Indirect costs					
on-campus	95,814.54	-	-	6,622.26	102,436.80
off-campus	-	24,121.18	25,254.76	-	49,375.94
Totals	95,814.54	24,121.18	25,254.76	6,622.26	151,812.74
Allowances	-	12,929.91	21,695.35	-	34,625.26
Travel and transportation	23,298.97	29,343.45	42,477.21	-	95,119.63
Other direct costs	8,128.64	5,838.69	4,995.99	132.91	19,096.23
Equipment, vehicles, materials and supplies	8,070.16	10,208.62	9,706.46	359.87	28,345.11
Totals	$355,694.17	$154,376.76	$152,301.46	$24,446.35	$686,818.74

TABLE D - Technical Assistance (AID/ta-C-1303)

Weed Control Systems Utilization
for Representative Farms in
Developing Countries (04-01-76 thru 05-31-79)

Category	Corvallis: head-quarters	Central America	Southeast Asia	Corvallis publications	Category totals
Salaries and wages	$180,042.17	$50,036.43	$49,061.70	$73,810.31	$352,950.61
Fringe benefits	28,844.02	8,151.37	9,146.36	11,800.47	57,942.22
Indirect costs					
on-campus	93,741.81	-	-	41,875.88	135,617.69
off-campus	-	19,841.91	24,391.53	-	44,233.44
Totals	93,741.81	19,841.91	24,391.53	41,875.88	179,851.13
Differential and allowances	-	8,335.40	22,193.49	-	30,528.89
Travel and transportation	27,073.47	22,866.99	28,026.28	1,759.52	79,726.26
Other direct costs	11,895.29	6,566.43	3,824.90	6,105.96	28,392.58
Equipment, vehicles, materials and supplies	13,263.03	6,215.64	7,860.63	23,064.05	50,403.35
Aquatic weed sub-contract	177,529.96	-	-	-	177,529.96
Totals	$532,389.75	$122,014.17	$144,504.89	$158,416.19	$957,325.00

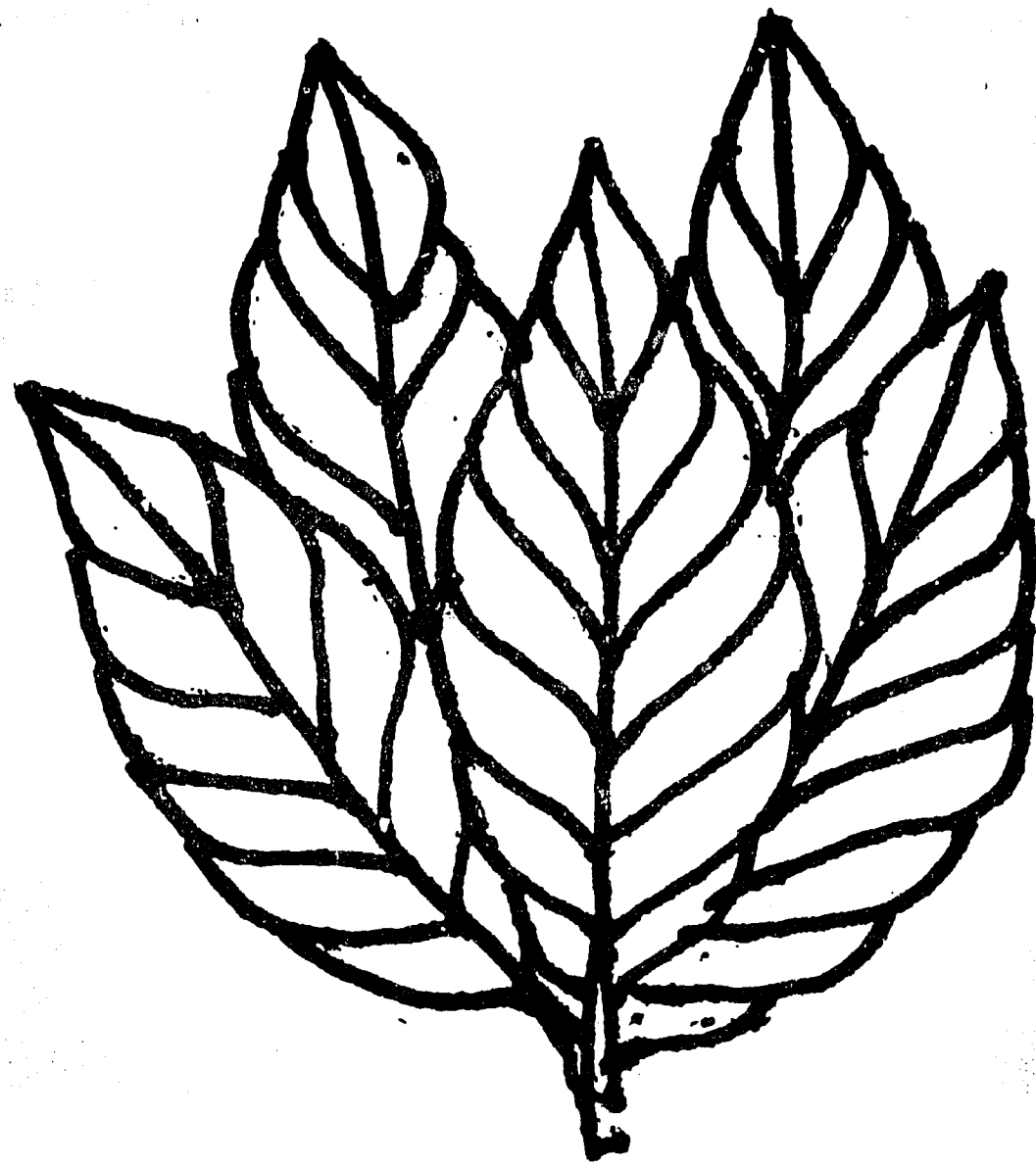


Notes

1. Oregon State University, in compliance with Titles VI and VII of the Civil Rights Act of 1964, Executive Order 11246, Title IX of the Education Amendments of 1972, and Section 504 of the Rehabilitation Act of 1973, does not discriminate on the basis of race, color, national origin, religion, sex, or handicap in any of its policies, procedures, or practices. This nondiscrimination policy covers admission and access to, and treatment and employment in, University programs and activities, including but not limited to: academic admission, financial aid, educational services and employment.

2. In conducting the AID-OSU weed program, administrators widely publicize any professional opportunities with the program. All qualified candidates are, and will be, considered for any available position.

Appendixes



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2. DISTRIBUTION OF INFOLETTER

country	recipients as of Dec. 1975	Apr. 1978	May 1979
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Aden	1	1	1
Afghanistan	15	13	13
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Angola	2	2	0
Antigua	2	2	2
Arab Rep. of Egypt	9	11	14
Argentina	213	131	141
Australia	59	63	68
Austria	5	5	6
Bahamas	1	1	1
Bangladesh	4	4	4
Barbados	2	2	3
Belgium	11	12	28
Belize	8	8	7
Benin	1	1	2
Bermuda	1	1	1
Bolivia	21	29	27
Botswana	3	3	3
Brazil	183	186	179
Brunei	3	3	3
Bulgaria	2	2	2
Burma	3	3	3
Cameroon	4	5	6
Can___	101	108	100
Canary Is.	1	1	1
Cape Verde Is.	0	1	1
Caroline Is.	1	0	0
Cayman Is.	0	1	1
Cent. African Rep.	1	1	1
Chad	3	5	5
Chile	37	37	41
People's Rep. of China	0	1	2
Colombia	166	92	93
Cyprus	3	2	3
Czechoslovakia	8	10	10

country	Dec. 1975	Apr. 1978	May 1979
Denmark	9	10	19
Djbouti	0	1	1
Dominican Rep.	10	11	12
Ecuador	45	46	47
El Salvador	18	10	12
England	113	120	148
Ethiopia	20	25	25
Fiji	4	3	3
Finland	8	9	17
France	22	27	69
French W. Indies	0	0	1
Gabon	1	8	1
Gambia	2	5	4
Germany (East	2	1	1
Germany (West	38	41	59
Ghana	22	24	24
Greece	16	24	28
Guatemala	29	8	13
Guinea	1	1	1
Guyana	2	3	2
Haiti	3	3	3
Honduras	34	18	18
Hong Kong	4	4	4
Hungary	4	4	7
India	161	183	203
Indonesia	88	86	90
Iran	10	12	12
Iraq	2	3	3
Ireland	7	7	7
Israel	18	18	20
Italy	19	27	31
Ivory Coast	4	5	6
Jamaica	11	11	11
Japan	52	53	53
Jordan	7	8	8
Kenya	28	28	26
Korea	12	15	14
Laos	7	7	7
Lebanon	8	7	7

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Liberia	7	8	7
Libya	1	2	5
Malagasay Rep.	1	1	1
Malawi	5	6	7
Malaysia	56	59	58
Mali	1	2	3
Malta	3	3	4
Mariana Is.	1	0	0
Mauritania	0	2	2
Mauritius	2	2	3
Mexico	126	56	63
Morocco	3	3	3
Mozambique	2	2	2
Nepal	0	2	2
Netherlands	15	17	29
New Caledonia	4	4	4
New Guinea	15	17	16
New Hebrides	2	2	2
New Zealand	21	30	26
Nicaragua	29	16	19
Niger	0	1	1
Nigeria	28	38	52
Norway	10	10	14
Pacific Is.	2	3	1
Pakistan	14	21	19
Panama	26	15	16
Paraguay	9	10	10
Peru	74	73	75
Philippines	67	139	182
Poland	9	9	10
Portugal	5	7	10
Romania	2	2	4
St. Kitts	0	1	3
St. Lucia	1	0	0
Samoa	1	0	0
Saudi Arabia	6	6	5
Scotland	4	4	7
Senegal	11	18	20

country	Dec. 1975	Apr. 1978	May 1979
Seychelle Is.	1	2	1
Sierra Leone	4	4	7
Singapore	14	13	12
Solomon Is.	2	2	2
Somalia	0	1	1
South Africa	0	2	3
South Vietnam	11	11	11
Spain	9	14	22
Sri Lanka	11	15	18
Sudan	9	13	12
Surinam	4	4	4
Swaziland	2	2	2
Sweden	13	16	27
Switzerland	27	26	29
Syria	2	6	8
Tahiti	3	3	3
Taiwan R.O.C.	18	8	17
Tanzania	12	13	15
Thailand	40	45	48
Togo	1	1	2
Trinidad	15	17	19
Trucial States	1	1	1
Tunisia	4	4	5
Turkey	16	15	19
Uganda	5	5	5
Upper Volta	2	5	5
Uruguay	18	22	20
United States*	1,213	1,356	1,482
U.S.S.R.	4	4	4
Venezuela	50	53	53
Western Samoa	6	7	6
Yemen	0	1	1
Yugoslavia	5	6	8
Zaire	3	3	3
Zambia	8	7	8
TOTAL	3,873	3,998	4,436

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3. DISTRIBUTION OF PUBLICATIONS

Identification Key

symbol	title
Aquatic	MALEZAS ACUATICAS/AQUATIC WEEDS
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Aquatic Biblios	AQUATIC PLANT BIBLIOGRAPHIES
Campo	MANUAL DE CAMPO PARA INVESTIGACION EN CONTROL DE MALEZAS
Field Manual	FIELD MANUAL FOR WEED CONTROL RESEARCH
PWOCA	
Trucos	ALGUNOS "TRUCOS" UTILES EN ESTADISTICA/ SOME USEFUL TRICKS IN STATISTICS
Weed Seeds	SEMILLAS DE MALEZAS TROPICALES I Y II/ TROPICAL WEED SEEDS I AND II
WW List	A WORLDWIDE CATEGORIZED PARTIAL LISTING FOR MANUFACTURERS OF PESTICIDE APPLICATION EQUIPMENT/UNA LISTA PARCIAL MUNDIAL Y CLASIFICADA DE FABRICANTES DE EQUIPOS PARA LA APLICACION DE PESTICIDAS

WORLD DISTRIBUTION OF PUBLICATIONS

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Algeria	-	-	-	-	1	-	-	1	1
Argentina	3	30	-	71	5	-	4	8	2
Australia	-	-	14	-	4	-	-	-	1
Bangladesh	-	-	-	-	-	-	-	-	1
Barbados	1	1	-	1	2	-	-	2	-
Belgium	-	-	-	-	1	-	-	-	-
Belize	-	13	-	15	2	-	-	15	2
Bolivia	-	30	-	49	2	2	3	30	1
Brazil	5	15	11	18	4	-	9	8	5
Cameroon	-	-	-	-	1	-	-	-	-
Canada	-	-	7	1	8	-	1	1	5
Chile	-	6	-	8	3	-	2	1	1
Colombia	4	17	1	21	3	-	505	1	2
Costa Rica	4	36	-	43	7	34	27	16	9
Cyprus	-	1	-	-	1	-	-	-	1
Denmark	-	-	-	1	1	-	-	-	-
Dominican Rep	-	9	-	10	2	-	-	-	-
Ecuador	-	53	-	60	2	2	13	90	4
El Salvador	4	8	-	8	2	3	12	15	1
England	1	3	3	3	30	-	-	2	11
Ethiopia	-	-	-	-	-	-	-	-	1
Fiji	-	-	1	-	-	-	-	-	-
Finland	-	-	-	-	1	-	-	-	-
France	1	1	1	-	2	-	1	-	3
Fr. West Indies	-	1	-	-	1	-	1	1	-
Gambia	1	-	-	-	1	-	-	1	-
Ghana	-	-	-	-	-	-	-	-	1

WORLD DISTRIBUTION OF PUBLICATIONS

Country	Aquatic	Biblio	Aquatic Biblios	Campo	Field Manual	PWOCA	Trucos	Weed Seeds	WW List
Greece	-	1	-	-	2	-	-	-	1
Guatemala	-	7	-	7	2	2	1	5	1
Guyana	-	-	-	-	2	-	-	-	1
Honduras	3	18	1	24	4	5	6	21	3
Hungary	-	-	-	-	1	-	-	-	1
India	9	7	7	-	19	2	1	15	7
Indonesia	2	2	3	-	6	1	-	2	1
Italy	1	2	-	1	2	-	1	1	6
Kenya	2	-	-	-	2	-	-	1	
Korea	-	-	-	-	-	-	-	-	3
Lesotho	-	1	-	1	1	1	1	1	1
Liberia	-	-	-	-	1	-	-	1	-
Libya	-	-	-	-	1	-	-	-	-
Malawi	-	1	-	-	4	-	-	1	1
Malaysia	3	1	-	1	8	1	-	2	1
Mexico	6	58	2	310	111	2	7	9	4
Netherlands	-	-	1	1	3	1	-	-	-
New Guinea	-	-	-	-	1	-	-	-	-
New Zealand	-	-	2	-	-	-	-	-	2
Nicaragua	1	18	-	41	-	3	1	19	-
Nigeria	-	-	-	-	2	-	-	1	2
Panama	4	23	-	30	3	5	3	27	1
Panama Canal Zone	-	-	2	-	-	-	-	-	-
Paraguay	-	17	-	23	1	-	1	17	-
Peru	3	43	-	53	3	1	5	26	3
Philippines	26	12	4	9	92	12	12	27	14
Portugal	1	1	-	2	-	-	2	1	-

WORLD DISTRIBUTION OF PUBLICATIONS

Country	Aquatic	Biblio	Aquatic Biblios	Campo	Field Manual	PWOCA	Trucos	Weed Seeds	WW List
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St. Kitts	-	-	-	-	-	1	-	-	1
St. Lucia	-	-	-	-	1	-	-	-	-
Senegal	1	-	-	-	-	-	-	-	1
Sierra Leone	2	-	-	-	2	1	-	1	2
Singapore	1	1	-	-	1	-	-	1	1
South Africa	-	-	6	-	1	-	-	-	-
Spain	2	1	-	2	-	-	-	-	2
Sri Lanka	2	-	-	-	3	-	-	2	2
Suriname	-	-	-	-	-	-	-	-	1
Swaziland	-	-	5	-	-	-	-	-	1
Switzerland	-	-	-	-	62	-	-	-	-
Taiwan, R.O.C	-	-	-	-	1	-	-	-	1
Tanzania	-	-	-	-	-	-	-	-	1
Thailand	5	1	-	1	5	2	-	1	2
Trinidad	1	-	-	-	2	1	-	1	-
Turkey	2	3	-	-	4	-	-	1	1
Uganda	1	-	-	-	-	-	-	1	1
Uruguay	-	5	1	9	1	-	-	1	1
United States	52	21	-	34	182	66	20	17	69
Venezuela	4	6	-	10	4	3	2	6	1
Vietnam	-	1	-	-	1	-	-	2	-
West Germany	-	-	2	2	3	-	-	-	-
Western Samoa	-	-	1	-	-	-	-	-	-
Yugoslavia	-	-	-	-	1	-	-	-	-

4. IPPC PAPERS REQUESTED AND DISTRIBUTED

No. of copies requested during report period	Date written, title, authors, source, date published
57	1971, Weed control in cacao, M.D. Shenk, WORLD FARMING, 1971.
116	1972, New weed control equipment and techniques, A.E. Deutsch, AGRICULTURAL MECHANIZATION IN ASIA, 1972.
105	1972, Spray adjuvants make pesticides do a better job, L.F. Taylor, WORLD FARMING, 1972.
38	1972, El papel de la ciencia de malezas en paises en desarrollo, C. Parker, Weed Science Society of America meeting, 1972.
91	1972, Reviewing the small applicators, A.B. Deutsch, WORLD FARMING, 1972.
125	1973, New techniques in weed control, L.C. Burrill, Asian-Pacific Weed Science Society meeting, 1973.
67	1974, Small pesticide application equipment--its selection, use and maintenance, A.E. Deutsch, WORLD FARMING, 1974.
35	1974, Equipos pequenos para aplicar plaguicidas..., A.E. Deutsch, AGRICULTURA DE LAS AMERICAS, 1974.
17	1974, Con los plaguicidas--evite peligros, A.E. Deutsch, AGRICULTURA DE LAS AMERICAS, 1974.
106	1974, Problems of herbicide use in peasant farming, J.L. Hammerton, Weed Science Society of America meeting, 1974.
85	1974, Crop varieties: can they suppress weeds?, R.D. Sweet, et. al., NEW YORK LIFE SCIENCES QUARTERLY, 1974.
106	1974, Biological suppression of weeds: evidence for allelopathy in accessions of cucumber, A.R. Putnam and W. Duke, SCIENCE, 1974.
81	1975, Weed control with plant pathogens, R. Charudatten, AGRICHEMICAL AGE, 1975.
70	1974, Calibrating and adjusting granular row applicators, J. Siemens, WORLD FARMING, 1974.
47	1975, Statement on 2,4,5-T and TCDD, Dost et. al., Oregon State University, 1975.

No. of copies requested during report period	Date written, title, authors, source, date published
99	1976, Herbicides used in and around water for management of aquatic vegetation, JOURNAL OF AQUATIC PLANT MANAGEMENT, 1976.
37	1976, Residuos de herbicidas en el suelo, E. Locatelli, REVISTA COMALFI, 1976.
106	1976, Weed control problems causing major reductions in world food supplies, C. Parker and J. Fryer, FAO PLANT PROTECTION BULLETIN, 1975.
30	1976, Problemas que presenta el control de las malezas..., C. Parker and J. Fryer, FAO BOLETIN FITOSANITARIO, 1975.
11	1976, Lutte contre les mauvaises herbes occasionnant..., C. Parker and J. Fryer, FAO BULLETIN PHYTOSANITAIRE, 1975.
63	1976, Purple nutsedge: tropical scourge, R. William, HORTSCIENCE, 1976.
131	1975, The beautiful blue devil, N. Vietmeyer, NATURAL HISTORY, 1975.
123	1976, Approaches to weed control in cropping systems, D.L. Plucknett et. al., Cropping Systems Symposium at the Int'l. Rice Research Institute, 1976.
113	1978, Controlled drop application - what does it all mean?, G. Cussans and W. Taylor, ARABLE FARMING, 1978.
137	1978, Selecting appropriate weed control systems for developing countries, D. Young et. al., WEED SCIENCE, 1978.
1,996 TOTAL	

Requests for Information Received and Handled by the AID Weed Project

requestor	request	action by project
Head, Agric. Sciences Gambia High School Gambia	Visual aids and information on pests and diseases of crops.	Sent wide selection of publications, added to mailing list.
CARE Director of Procurement New York	Information on off-road vehicles under adverse conditions.	Letter with information on two specific units, plus listing of others, plus offer of further help.
Research Fellow Univ. of West Indies St. Johns, Antigua	Information on small tractors.	Sent addresses for two units, plus list of others.
Researcher Corp. Farm Venezuela	Information on bird and insect control for sorghum.	Letter referring him to specialist in sorghum at ICRISAT.
Library Technician Agric. Canada Regina, Sask.	Want information on weed loss survey in North Africa and Middle East.	Referred to article mentioning survey that appeared in CIMMYT Today, and provided address for CIMMYT.

requestor	request	action by project
Seed Specialist USAID Thailand	Data on weed control using geese.	Searched literature collection, photocopied two items and sent with cover letter.
Researcher IFAS, U. of Florida	Information on New Zealand Pest Control meeting.	Photocopy of relevant announcement sent.
Individual Pelotas, RGS, Brazil	Information and literature on "devel grass."	Letter indicating willingness to search literature if genus and species name could be provided.
Researcher Comm'l. Ag. Service St. Louis, MO.	Data concerning Cyperus rotundus.	Referred to specific proceedings of Southern Weed Sci. Soc., and sent name, address of editor.
Asst. Prof., Zoology Guru Nanak College Madras, India	Information on the effect of pesticides on the genetic system, plus extensive data on all pesticides.	Letter indicating scope of project, plus offer to provide data for specific herbicides, or herbicide-weed relationships.
Research Worker Smallholder Project Malaysia	Any new information concerning weed research and control technology.	Provided back issues of INFOLETTER, publications list, IPPC Papers list.
Researcher Agric. Canada Brandon, Man.	Details for Symposium on Wild Oats, Yugoslavia.	Sent photocopy of symposium announcement.

requestor	request	action by project
Equipment Mfr. Lyallpur, Pakistan	2 requests: mfr's. names, addresses for wide variety of ag. equipment; same for animal-pulled units.	Sent equipment list publication, name/addresses of specific firms, ideas for applying pesticides to tall-growing crops, name of publication with numerous animal-pulled units listed.
Crop Prot. Spclst. UC/AID Pest Mgmt. Proj Berkeley, CA	Requested review of Acronym List of Int'l. organizations.	Review performed, numerous additional acronyms and organizations provided.
Commercial Plantation Kuala Lumpur Malaysia	Sought information on bio-control of Mikania cordata in tea.	Conducted literature search; letter describing findings, suggestions, plus photocopies of pages from publications on tropical weed control.
Weed researcher Plant Prot. Institute Poznan, Poland	Contacts with specialists in U.S. so could stay longer after attending Int'l. Plant Prot. Congress.	Letter, plus list of industry reps.
Weed researcher Private firm Argentina	Competing for a position at University in Mexico, needed more background on aerial application.	Sent copy of publication, Use of Aircraft in Agriculture.
Secty. Caribbean Food Crops Society, Puerto Rico	Full particulars for IX International Plant Prot. Congress.	Photocopied documents and sent
Staff member DS/DIU, AID Washington	Several requests for multiple copies of AID-OSU project's previous reports.	Provided.

requestor	request	action by project
Staff Member USICA Washington	Info on aquatic weed harvesters for a Burmese official in Rangoon.	Photocopied and updated out-of-date publication and sent to USICA for forwarding.
Representative Comm'l. firm England	Information to help estimate total annual worldwide sales of knapsack sprayers.	Sent copy of IPPC pub. listing 58 firms that mfr. knapsack units, plus letter suggesting contacting several of the larger firms for data.
Weed scientist Madison, WI	Need for list of major weeds in Brazil and Mexico.	Provided key contacts for both countries.
Industry rep. Tacoma, WA	Literature concerning aquatic weeds (submerged) in Egypt.	Unable to provide. Referred to two contacts in Egypt.
Commercial firm Argentina	Who to write for proceedings of weed control symposium in Germany.	Name and address provided.
Farm Chemicals Mag. U.S.	Data for international meetings plus specific contacts for several specific events.	Provided.
Weed scientist MARDI Malaysia	Data and contact for Int'l. Plant Prot. Congress.	Provided in letter.
UC/AID Pest Mgmt. Proj. Berkeley, CA	Copies of weed project reports.	Provided.

requestor	request	action by project
Senior engineer Water Resources NSW, Australia	Requested general data related to various forms of aquatic weed control.	Packet of literature provided; cover letter referring to Aquatic Weed group at U. of Florida.
Representative Econ. Devel. Bur. Tanzania	Data on grain storage and pest control in tropical countries.	Photocopy of article, cover letter with several contacts and suggested sources.
Weed scientist Ag. Res. Institute Indonesia	Details for completing hand-held spray boom for research plots.	Letter, data, and sketches provided.
Food Crop Agronomist Nat'l. Ag. Corp. St. Kitts, Anguilla	All available data concerning mini-cultivators and hand-pushed seeders.	Photocopies of literature for 4 hand-pushed seeders sent; cover letter offered to try to help with cultivators (file contains more than 50 firms) if needs were more specific.
Staff member Weed Res. Org. England	Need for information concerning Terra Tires for designing wetlands spray applicator.	Photocopies of various information provided as well as data obtained from manufacturer.
Nurseryman-owner Allentown, NJ	Where to purchase plans or literature for pedal or treadle operated water pumps.	Referred to ag. eng. dept. at IRRI, plus publication by Intermediate Tech. group of U.K.
Staff member Plant Path. Dept. U. of Florida	Requested AID-OSU project to review Biological Control Directory publication.	Review conducted and comments forwarded.

Travel by AID Weed Project Staff, April 1978 through May 1979

dates	staff member(s)	travel to	activity
Apr. 1-9, 78	Conklin	Costa Rica	Review economics program.
Apr. 9-18, 78	Fisher	Mindanao	Coordinate weed sci. workshop.
Apr. 9-18, 78	Deutsch	U. of Fla., Costa Rica	Review programs and collect material for publications.
Apr. 10-25, 78	Burrill	Costa Rica	Review research sites, liaison with IPPC and CATIE staffs.
May 2-5, 78	Miller	Charleston, WV	Attend BIFAD-related meeting.
May 16-19, 78	Shenk	Nicaragua	Plan coop. research.
May 19-26, 78	Fisher	Mindanao	Check on research.
May 26-June 3, 78	Chase	El Salvador, Bolivia	Review weed program in El Salvador, present paper.
June 2-3, 78	Fisher	Mindanao	Participate in weed sci. workshop.
June 3-8, 78	Shenk	Guatemala, Honduras	Contact CATIE rep., review weed work.
June 20-24, 78	Fisher	Mindanao	Review weed research work.

dates	staff member(s)	travel to	activity
June 27-30, 78	Miller	Philippines	Discuss program with various officials.
June 28-July 9, 78	Burrill	Nigeria	Attend conference, review contacts with IITA.
July 8-13, 78	Allen	Ghana	Assess aquatic weed problems.
July 11-13, 78	Shenk	El Salvador	Attend meeting, present paper.
July 18-19, 78	Shenk	Honduras	Participate in a training program.
July 30-Aug. 4, 78	Shenk	Nicaragua, Honduras	Thesis review, research planning and design.
Aug. 19-25, 78	Miller, Conklin Burrill	Costa Rica, Fla.	Participate in intensive AID on-site review at CATIE and Florida.
Sept. 12-15, 78	Fisher	Mindanao	Review research progress.
Sept. 13-26, 78	Shenk	Senegal	Attend weed symposium, present paper.
Oct. 17-18, 78	Shenk	Guatemala	Review research.
Dec. 4-6, 78	Shenk	El Salvador	Help present short course.
Jan. 8-10, 79	Fisher	Mindanao	Review research.
Jan. 10-Mar. 3, 79	O'Brien	Philippines	Work on economic model, collect data.
Jan. 15-18, 79	Fraser	California	Attend weed meeting.
Jan. 8-Feb. 4, 79	Burrill	Philippines	Attend, help coordinate short course.
Jan. 28-Feb. 2, 79	Miller	Philippines	Review program with NCPC.
Feb. 4-8, 79	Burrill, Deutsch	San Francisco	Attend Weed Sci. Soc. of America meeting.

dates	staff member(s)	travel to	activity
Feb. 5-10, 79	Fisher	Mindanao	Review research.
Feb. 25-Mar. 2, 79	Miller, Burrill	Costa Rica	Review program with CATIE.
Mar. 6-9, 79	Shenk	Panama	Attend research planning meeting.
Mar. 19-22, 79	Burrill	Boise	Program chm. at WSWS meeting.
Mar. 26-30, 79	Shenk	Panama	Install experiments.
Apr. 16-21, 79	Shenk	Honduras	Present short course.
May 2-11, 79	Conklin	New Orleans, Wash. D.C., Costa Rica	Attend meeting, discuss program with AID, review economic program with CATIE.
May 16-19, 79	Shenk	El Salvador	Establish experiment.
May 28-31, 79	Shenk	Panama	Observe research.

Participation/Attendance by AID Weed Project Staff at Conferences, Symposia

date	staff member(s)	event	activity
May 78	Motooka	9th Annual Conf. of Pest Control Conference of the Philippines, Manila.	Attended meeting
June 78	Chase	2nd meeting, Asociacion Boliviana de Control de Malezas, Santa Cruz.	Presented paper
July 78	Burrill	International Weed Symposium, Ibadan, Nigeria (IITA).	Presented paper
July 78	Jones, Monsour	Aquatic Plant Management Soc. annual meeting Jacksonville, FL.	Explained data retrieval system
July 78	Shenk	Reunion Anual del Programa Cooperativo Centroamericano para el Mejoramiento de Cultivos Alimenticios, El Salvador.	Presented paper
Sept. 78	Shenk	International Weed Science Conference, Dakar, Senegal.	Presented paper
Dec. 78	Motooka	Professional Assn. of Food Agric. and Forestry, Manila.	Attended conference
Jan. 79	Fraser	California Weed Conference.	Attended meeting
Feb. 79	Allen, Burrill, Deutsch	Weed Science Society of America Annual meeting, San Francisco.	Attended international session
Mar. 79	Burrill	Western Society of Weed Sci. annual meeting, Boise.	Program chairman of meeting

8. PROJECT PERSONNEL

Project staff members served for the period covered by this report, or as indicated. R = research, TA = technical assistance, FTE = full-time equivalent.

STANLEY F. MILLER	Oregon, director	50% FTE, R/TA
GEORGE E. ALLEN	Florida, aquatic program coordinator	33% FTE, TA
KOFI K. APRAKU	Oregon, agric. economist	50% FTE, R July 1, 78 to Feb. 28, 79
LARRY C. BURRILL	Oregon, weed research specialist/support agronomist	R/TA
RICHARD L. CHASE	Oregon, weed res. spec.	50% FTE, TA Apr. 1, 78 to July 28, 78
FRANK S. CONKLIN	Oregon, agric. economist	50% FTE, R
VICKI CORLEY	Florida, secretary	TA
ALLAN DEUTSCH	Oregon, information/admin.	R/TA
HERBERT FISHER	Philippines, weed res. spec.	R
FRANK FRASER	Oregon, technician	R/TA
CAROLYN JOHNSON	Oregon, secretary	50% FTE, R
KATHY JONES	Florida, information spec.	TA, May 26, 78 to date
GEORGENA S. KNAPP	Oregon, fiscal/translation	R/TA
MAUREEN S. KRISSEK	Oregon, secretary	R/TA, Mar. 12, 79 to date
KAREL M. LESLIE	Oregon, secretary	R/TA, Dec. 1, 78 to Mar. 7, 79
EDUARDO LOCATELLI	Costa Rica, weed res. spec.	25% FTE, TA Apr. 1, 1978 to date
THOMAS V. McCARTY	Oregon, agric. economist	50% FTE, R
ANNE M. MICHALSKI	Oregon, clerical spec.	R/TA, June 12, 78 to date
MIMI MONSOUR	Florida, information spec.	TA
PHILIP S. MOTOOKA	Philippines, weed res. spec.	TA
DENNIS O'BRIEN	Oregon, agric. economist	50% FTE, R
SYLVIA SAN MARTIN	Florida, information spec.	TA, Apr. 1, 78 to June 1, 78
MYRON SHENK	Costa Rica, weed res. spec.	R
CAROLYN A. WALLS	Oregon, secretary	R/TA, Apr. 1, 78 to May 20, 78
PAT WICKMAN	Oregon, secretary	R/TA, May 30, 78 to Nov. 30, 78

BUREAU OF PLANT INDUSTRY
BAGUIO EXPERIMENT STATION

PHILIPPINE-GERMAN SEED POTATO PROGRAM

Correspondence Address
c/o Bureau of Plant Industry
P.O. Box 34
Baguio City 2601
Tel.: 50-04

RECEIVED AUG 1978 IPPC

Our Ref. Baguio City

Ref: Mr. Larry C. Burrill
International Plant Protection Center
Oregon State University
Corvallis, Oregon 97331
U. S. A.

Dear Larry,

I hope you haven't forgotten me, one of your students during the Weed Science Research Short Course in NCPC, University of the Philippines, Los Baños, Laguna last 15 January to 2 February. I should have written to you a long time ago but the work with our farmer-cooperators in the mountains of Benguet Province didn't permit me to do so.

The knowledge I've gained in the short course impressed my superiors and co-researchers in the program. In fact, I held a one-day seminar regarding weed control to my fellow researchers here. They were so enthusiastic that some even offered their help in the performance of the weed control in potatoes study I will handle by October of this year. As we have rainy season now and cannot plant potatoes I'm doing a survey-collection and identification of the different weeds found in potato fields of Benguet Province. My only regret though, regarding this study is that the weeds here are very much different from the weeds of low-elevation areas . We have a semi-temperate climate here and I cannot find enough references on semi-temperate weeds.

As all the reading materials on weed control you've given me are accessible to all my fellow researchers, the Philippine-German Seed Potato Program managers, Dr. Cay-Dietrich Hentz (one of our German specialists) and Mr. Valentino G. Balacing are extending their gratitude to the IPPC, Oregon State University especially to you. Ramon Bugaoan who was with me also during the short course is extending his thanks and regards to all of you there. Personally, I want to thank you for all the help you've extended to us in the field of weed control. It's an honor to know you and learn through you.

Thank you so much.

Very truly yours,

A. A. Abrenica

ANNABELLA A. ABRENICA

Banco Central de Honduras

San Pedro Sula, Cortés
9 de agosto de 1978

RECEIVED AUG 1978 IPPC

Dr. Sanley F. Miller
Director Office of International Agriculture
Oregon State University
Corvallis, Oregon 97331

Apreciado Dr. Miller:

Con motivo de la realización de un curso para profesionales del sector agropecuario, dentro del Convenio de Asistencia Técnica entre el CATIE y el Banco Central de Honduras, se solicitó la participación del Dr. Myron Shenk, quien dió una excelente disertación sobre el tema: "SISTEMAS DE CONTROL DE MALEZAS Y USO DE HERBICIDAS", el día 19 de julio del presente año.

Deseamos extender a su Institución y, por su intermedio, al Dr. Shenk nuestros agradecimientos por su oportuna y eficiente colaboración en esta actividad.

Atentamente,

Jaime Pineda M.
Coordinador Convenio
B.C.H./CATIE.

cc: Dr. Santiago Fonseca, CATIE. Turrialba
Dr. Myron Shenk, CATIE. Turrialba
Archivo

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

ORGANISATION DES NATIONS UNIES POUR L'ALIMENTATION ET L'AGRICULTURE

ORGANIZACION DE LAS NACIONES UNIDAS PARA LA AGRICULTURA Y LA ALIMENTACION

OFICINA REGIONAL PARA AMERICA LATINA

PROVIDENCIA 871 - TELEFONO 482061 - CABLES TELEX FOODAGRI SANTIAGO - CASILLA 10095 - SANTIAGO DE CHILE

RLAT/AGPP/40 6 March 1979

Dear Dr. Deutsch:

This is to acknowledge receipt of both your kind and informative letter of 2.2.79 and copies of printed matter of our interest published by IPPC.

I have requested cancellation of your invoice regarding post charges to our administrative section and cheque will be forwarded to you under separate cover.

Please accept our gratitude for sending those useful and important papers free of cost and placing our name in your INFOLETTER mailing list.

We also appreciate and take good note of your offer of possible cooperation. We will be very pleased to reciprocate on the same lines whenever possible.

Very truly yours,

Mario Vaughan
Regional Plant Protection Officer

Dr. Allan Deutsch
Information Services/Administration
International Plant Protection Center
Oregon State University
Corvallis, Oregon 97331
U. S. A.

RECEIVED

AGENCY FOR INTERNATIONAL DEVELOPMENT

REGIONAL DEVELOPMENT OFFICE FOR CENTRAL AFRICA
AMERICAN EMBASSY
B. P. 817 YAOUNDE - CAMEROON

APR 1979 IPPC RECEIVED

March 22, 1979

International Plant Protection Center
Oregon State University
Corvallis, Oregon 97331

Dear Sir:

I would like to be placed on the mailing list for your newsletter INFOLETTER.

I'm an employee of the U.S.A.I.D. and am working in eight countries in West Africa on USAID's Sahel Food Crop Protection Project.

As the Regional Director of training for this project, I feel your publication would be a most useful addition to our Crop Protection Training Center Library.

This Center is located in Yaounde, Cameroon, West Africa and is bilingual, using materials in both English and French.

Your favorable consideration of this request would be appreciated. The mailing address that would assure prompt receipt is:

John A. Franklin
Sahel Food Crop Protection
YAOUELE - Dept. of State
Washington, D.C. 20520

Are any back copies available? If so, could you please send us a set?

Very truly yours,

John A. Franklin
Sahel Food Crop Protection
Regional Training Officer

JAF:jbf

DIRECCION DE AGRICULTURA Y GANADERIA
DIRECCION GENERAL DE GANADERIA
CENTRO DE DESARROLLO GANADERO
"CEGA - IZALCO"
APARTADO POSTAL NO. 10 TEL. 81-0477
SONSONATE, EL SALVADOR, C. A.

No 12 CEGA IZALCO, 10 DE MAYO DE 1978.

MAY 1978 IPPC RECEIVED

SRES: INTERNATIONAL PLANT PROTECTION CENTER,
P R E S E N T E .-

EL OBJETO DE LA PRESENTE ES PARA ACUSAR RECIBO DEL LIBRO TITULADO " MALEZAS PREVALENTES DE — AMERICA CENTRAL", EL CUAL USTEDES MUY AMABLEMENTE ME ENVIARON.

NO OMITO MANIFESTARLES QUE DICHA LITERATURA NOS SERÁ DE MUCHA UTILIDAD EN LOS PROGRAMAS DE — INVESTIGACIÓN QUE SE REALIZAN EN LA DIRECCIÓN GENERAL DE GANADERÍA.

ATENTAMENTE,

DIOS, UNION Y LIBERTAD,

Ing. Dalmiro Herrera,
JEFE SECC. DE INVESTIGACIÓN,
CEGA - IZALCO.

/PJH.

DIRECCION GENERAL DE GANADERIA DEPARTAMENTO DE DESARROLLO GANADERO SECCION DE INVESTIGACION

The Library
NUEVA VIZCAYA STATE INSTITUTE OF TECHNOLOGY
Bayombong, Nueva Vizcaya 1501
Philippines

November 4, 1978

NOV 1978 IPPC RECEIVED

International Plant Protection Center
Oregon State University
Corvallis, Oregon 97331
United States of America

S i r :

This will acknowledge receipt of the two books you sent our library. These are really very relevant to our students and instructors.

Please send us also one copy each of the following:

- # 3 - Spray Adjuvants make pesticides do a Better Job.
- # 6 - New Techniques in Weed Control.
- # 11- Crop Varieties: can they suppress weeds?
- # 12-Biological suppression of weeds: evidence for Allelopatoy in accessions of cucumber.
- # 13- Weed control with plant pathogens.

Thank you for your attention on this request.

Very truly yours,

ENRIQUETA T. CAYABAN
Librarian

NOTED:

CANDIDO V. ROSARIO, Ph.D.
Dean of Colleges, OIC