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Terminal Report

WEED CONTROL SHORT COURSE

Sponsored by the
U. S. Agency for International Development (AID)
Washington, DC / USA

Jointly organized by



Centro Internacional de Agricultura Tropical (CIAT)
Cali / Colombia

and the



International Plant Protection Center (IPPC)
Oregon State University



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Report 15-C-75

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I. OVERALL SUMMARY

An intensive 4-week weed control short course sponsored by AID and held at CIAT (Centro Internacional de Agricultura Tropical), Cali, Colombia, in collaboration with IPPC (International Plant Protection Center) at Oregon State University, was presented to 31 weed researchers from 12 Latin American nations.

A joint CIAT/IPPC team of instructors presented information, all in Spanish, covering subject matter ranging from basic definitions to sophisticated research technology. A variety of activities included classroom lectures and group discussions (71%), field trips (13%), plus laboratory exercises and actual plot work (16%).

Participants attending the June 15-July 12 course represented governmental experiment stations (15), educational institutions (7), and private industry and other (9). Twenty were provided full financial support by AID and 11 were self-supporting. All held an Ing. Agr. degree or higher and had experience in agricultural research.

Two 2-hour written examinations were given participants; the first day of the course, and again at the end of the course. The second exam contained material 75 percent identical to the first. There was a 25 percent overall improvement in the group's test scores. One individual increased his score from 2 points to 70. A before-and-after laboratory practical exam was also given resulting in a 37 percent average overall improvement.

A course evaluation form filled out by each participant indicated that 82 percent of activities were rated 80 or higher on a 0-poor, 100-excellent scale. Eighty-six percent of the participants stated that a similar course should be offered at least every other year, if not yearly. Participating CIAT and IPPC staff also expressed strong interest in conducting similar courses in the future.

The course culminated in an awards banquet held at CIAT. Group and individual prizes were awarded and a chrome-bladed mini-machete presented to each participant. □

- Report prepared September 1975 by
International Plant Protection Center
with information supplied by
CIAT and IPPC

II. NARRATIVE REPORT

A. Background

Professional weed research personnel on both the CIAT and IPPC staff had participated in numerous, relatively brief weed control short courses in various developing countries and noted the generally positive impact. However, time, facilities, or other constraints often limited the scope of material presented and thereby its utility. There appeared to be strong potential for a carefully planned, intensive short course aimed at selected intermediate level weed control specialist/researchers.

Dr. Jerry Doll, weed research specialist at CIAT, indicated that CIAT was receptive to hosting a month long course and providing the necessary meeting and living facilities. The AID-Oregon State University weed control program in developing countries, coordinated through IPPC, was identified as a logical vehicle for a weed control short course. CIAT and IPPC jointly proposed the concept of an AID-sponsored weed control short course in Colombia and secured approval in 1974.

The proposal called for full support of 20 participants, including their travel, per diem, and tuition. In addition, since several major cooperating firms expressed interest in the course, 10 self-supporting positions were created for a total of 30 (which grew to 31 at final count).

B. Course objectives

The overall objective of the course: to provide an intensive exposure to all aspects of weed control research technology for a selected group of intermediate level weed researchers and technical personnel from developing countries in Latin America.

An implied secondary goal embraced the expectation that, given the experience, contacts, and knowledge derived from the course, the participants could in turn help to expedite improved weed control research programs within their own countries.

Thirdly, organizing the course and preparing the material was anticipated to afford the CIAT-IPPC team an opportunity to evolve several highly effective teaching techniques (participant involvement, open discussion, challenge, etc.). The same approach, with only slight modification or tailoring, could then be used with equal effect for future programs.

C. Identification and selection of participants

The course was designed for presentation to people with the minimum of an undergraduate degree and some previous experience related to weed control. With the exposure gained from the course, this group would be in position to contribute to improved weed control research within the various participating countries.

IPPC contacted each AID mission in Latin America, as well as several other entities, informing them of the course and the parameters for participant

selection, and offering them the opportunity to submit names for consideration.

A total of 34 people were nominated, twenty of whom were selected for "becas" or scholarships. Because of the interest shown by various industrial firms and others, space was provided for an additional 11 participants on a self-supporting basis.

The total count by country and type of support was:

country	beca	self-support	total
Argentina	2	-	2
Bolivia	3	-	3
Brasil	2	4	6
Colombia	1	5	6
Costa Rica	1	-	1
Ecuador	2	-	2
Guatemala	1	-	1
Honduras	1	-	1
Panama	1	-	1
Paraguay	-	1	1
Peru	5	-	5
Venezuela	1	1	2
	<hr/>	<hr/>	<hr/>
TOTAL	20	11	31

A list of participants and their affiliations is attached as Appendix I.

D. Subject matter and activities, and scheduling

Twenty three days of lectures, discussion, laboratory and field plot exercises, and field trips were scheduled including three Saturday mornings and numerous evening sessions. An hour-by-hour, day-by-day schedule for each of the four weeks is attached as Appendix II.

There were approximately 124 hours of classroom lecture and discussion, 28 hours of group project work (laboratory), and four field trips totalling 22 hours.

Subject matter (all presented in Spanish) began with the definition of a weed and progressed through a wide variety of topics directly impinging on weed control research. An outline of subject matter is attached as Appendix III.

In addition to visiting a local branch of the Colombian national agricultural research station, a manufacturer of pesticide application equipment, and a pesticide distributor, the entire group spent one day exploring the conditions of small farmers in a community some distance from CIAT. Participants and small farmers held an open discussion which was followed by a visit to several small plots and a first hand look at weed problems and control methods (or their absence).



1

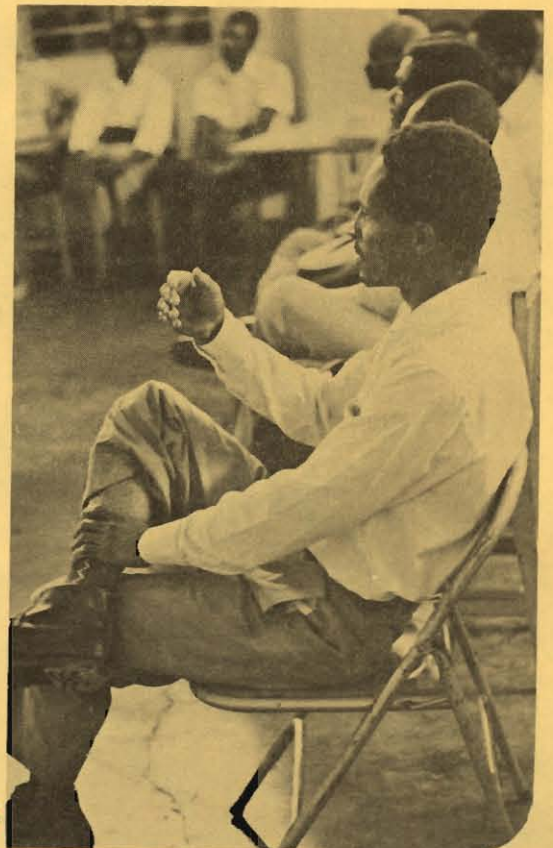
2



3



4



5

1. Course participants listen as CIAT weed researcher Wilson Piedrahita (far right) discusses the fine points of controlling weeds in maize and beans.
2. During practical laboratory exercises two participants grapple with herbicide formulation.
3. IPPC instructor Eduardo Locatelli (chin in hand) and a group of participants display a variety of expressions while viewing a weedy test plot.
4. CIAT's Dr. Jerry Doll (with hat) checks figures on a rate calculator such as those provided participants.
5. One of a group of small farmers discusses weed control problems at a meeting with course participants during a field trip.



III. FINANCIAL INFORMATION

A. Estimated budget

Consultants:----- \$4,500.00

This item will pay fees for two professional instructors who are not at present on the OSU/AID Weed Control budget. Salaries for other OSU staff members will be paid from the basic contract.

Travel:

Travel costs for 20 participants, est. at \$500.00 each----- 10,000.00

Board and room during short course at CIAT, for 20 participants, est. at \$300.00 each----- 6,000.00

Other travel including excess baggage allowance for students to return home with short course materials----- 1,750.00

Total travel costs 17,750.00

Material and supplies:

Instructional materials, agricultural chemicals and supplies for laboratory practice----- 2,000.00

Total estimated budget \$24,250.00

B. Income

Special grant from the Agency for International Development----- \$24,250.00

Contributions from chemical companies and others for students not receiving "becas"----- 600.00

Total \$24,850.00

C. Actual expenditures

- by CIAT (Centro Internacional de Agricultura Tropical):		
for transportation of participants, housing, and		
miscellaneous course expenses-----		\$ 15,579.05
- by IPPC/Oregon State University:		
Travel for course instructors-----	5,572.27	
Consultants' salaries-----	3,000.00	
Course materials and supplies-----	<u>698.68</u>	
		<u>9,270.95</u>
	Total	\$24,550.00

Note: A limited amount of unspecified additional contributions were provided and were utilized by CIAT to offset, in part, certain costs associated with the short course.

IV. COURSE EVALUATION

A. Test scores

Two examinations--a written test and a laboratory "practical" quiz--were presented the first day of the course and repeated the last week. The second 2-hour written exam contained material approximately 75 percent identical to the first with the addition of new and more difficult questions.

The group had an overall 25 percent improvement in written exam test scores. One individual with a first test score of 2 achieved a 70 on the second exam. The lab practical resulted in a 37 percent average overall improvement. The greatest improvement was one man's 61 point increase.

Only one person experienced lower scores on both of the second tests. The highest scoring individual on both of the second tests had 96 and 92 respectively.

B. Evaluation by participants

To better gauge the usefulness and interest of the course, the organizers requested the participants to complete a comprehensive evaluation touching all the activities of the course. The results revealed the following ratings.

(Note: 100=excellent, 0=terrible, or a percent is given.)

<u>SEGMENT</u>	<u>RATING</u>
<hr/>	
Practical Part	
<hr/>	
1. Spray equipment, its use and calibration	90
2. Herbicide formulation	83
3. Field activities	92
4. Group projects	91
5. Weed identification	84
6. Field trips to other centers and zones	81
7. Panels and evening discussions	70
Theoretical Part	
<hr/>	
1. Chemical herbicide groups	88
2. Weed control in crops and pastures	89
3. Weed control in aquatic and industrial areas	97
4. Methodology of research and analysis of results	93
5. Extension and communication	73
6. Were the presentations of scientific papers by the participants worthwhile?	96% yes
7. Economics and cost/benefit analysis	77
8. Weed identification	91

General Aspects

1. The course should be given:	every year	43%	(response of the partici- pants)
	two years	43%	
	three years	9%	
	four years	4%	
2. The site should be:	CIAT	57%	
	other countries	43%	
3. The duration should be:	two weeks	4%	
	three weeks	13%	
	four weeks	35%	
	other	48%	
(48% said it should last from 5 to 12 weeks with an average of 7 weeks).			
4. What percent of the participants should be:			
	researchers	48%	
	educators	17%	
	commercial company personnel	14%	
	extensionists	20%	
	others	1%	

The results are self-evident and very much reflect the ideas and observations of the instructors. There should be more time allotted to the practical aspects, the evening sessions should be reduced and the panel discussions better organized. The extension and communications lecture should be made more relevant. A few thought the economics lectures were not essential and that lowered the overall rating, however, the majority gave it a high rating.

Equal numbers thought the course should be given every year or every two years (43% each). Interestingly, many (43%) also thought the course

should be taught in different countries. There are probably a few sites which would be nearly as ideal as CIAT but they would be reduced in number. Understandably, few of the participants know how much behind the scene preparation and work went into the course and it is doubtful that many other centers in Latin America could organize and host a course of this nature as easily. This does not mean that it could not or should not be held elsewhere, only that CIAT is a very well equipped and structured center for such activities.

Nearly half the participants thought it should be longer than four weeks (seven weeks was the average duration desired by 48% of them). It would seem to be a good sign that they wanted a longer course, but it can probably be made somewhat less intensive without lengthening the time. From the instructors' point of view, four weeks is long enough, but if a considerable increase in field activities and practical exercises were decided necessary, the course could be lengthened to five weeks.

The participants thought that future courses should consist of nearly the same proportions of researchers, educators, extensionists and commercial people as this course had. Many mentioned the beneficial aspects of having people from various phases of weed control work present to share experiences and give insight from different points of view. No one mentioned what might be a good alternative for the future: courses tailored for specific groups of people. For example, the orientation and understanding a weed control extensionist needs is significantly different from that of a full-time researcher and thus a course could be designed and modified as needed.

Other relevant and repeated comments of the participants in their evaluation of the course include:

1. There should be more time for the practical aspects, especially formulation and application of herbicides.
2. It should be less intensive, especially at night.
3. The panel discussions should be more objective and arrive at specific conclusions or be discontinued.
4. The session on extension and communication should be made more practical and arrive at some conclusion.
5. Overall, the organization was excellent as were the facilities in CIAT.
6. The group projects were the highlight for many participants.
7. More field time is needed on weed identification,
8. Perhaps the visit to an area of small farmers should be changed to one of larger farmers and the general visit to ICA should be dropped.
9. More detail should be given concerning weed control recommendations in crops and pastures.
10. A visit to a herbicide formulating plant should be included.
11. The last week of the course should not depend so much on the presentations of the participants, but rather be mixed with other activities.
12. In general, all the lectures were well organized and given.
13. The dialog method of teaching was usually very effective.

D. Evaluation by course organizers

The course lecturers spent a good deal of time discussing the various aspects of the course. The general conclusion was that the course was excellent and met the expectations of all concerned. A course of this type is only successful as the result of an infinite number of details being attended to. However, a key to the success of this course was that it was designed for a certain type of participant and the participants were chosen with this in mind.

There were some techniques, teaching methods, and discussions held during the course which are worthy of comment:

1. Realizing that hours of straight lectures become a hardship under the best of conditions led to a commitment to maximize student involvement. Nearly every lecture was designed to encourage and even demand discussion by the participants. Students were not inclined to be distracted or lose interest when they expected questions from the lecturer at any time. This was a very effective technique which resulted in considerable exchange of information.
2. Another successful form of student participation was the presentation of a scientific paper by each individual. The presentations were criticized in hopes of improving the level of formal papers at future conferences.
3. The course organizers have noted a general weakness in research techniques in their Latin American travels. In particular the people responsible for the research do not know how to do the physical activities involved with field research. During the four weeks the participants actually went through all of

the steps in a field experiment from calculations to evaluating results. This was considered to be a very useful part of the course. The field activities could have been more fruitful if the participants had been given more detailed instructions before going to the field.

4. It was found that none of the 31 participants had ever conducted an experiment in a greenhouse or screenhouse. This was done during the course and the results were very rewarding. Those with teaching responsibilities were interested in the teaching possibilities available in the greenhouse.
5. The decision to encourage a mixture of government, university and industry personnel provided an added ingredient to the course. This should be attempted in future courses.
6. Whenever possible all the lecturers were present during the course activities. The resulting exchange of ideas and information proved to be very useful.
7. The basic format of the course was to teach principles which are critical to the understanding of research results and which will remain valid as herbicides, crops, weeds, and techniques change. To encourage clear understanding of these principles and their relationships, certain "situations" were presented for discussion. The situations were chosen to demonstrate the principles involved. The technique proved to encourage participant involvement in all of the lectures.
8. Whenever possible during the course, attempts were made to transmit some basic philosophy of sound research. A special effort

was made to encourage the participants to admit not knowing answers to questions. They were advised to think through a problem and attempt to use the principles which had been presented. Progress was slow in this regard and perhaps the greatest impact was made by the lecturers often admitting that they did not know.

9. There was general agreement that the exams were an effective teaching tool. The early exam demonstrated to most of the participants that they needed additional instruction. It also helped the lecturers set the general level of instruction. The final exam was useful to quantify the improvement in knowledge levels.
10. A special effort was made to coordinate the subject matter presented by each lecturer. This worked very well for the main lecturers. However, when people were invited to speak on their area of expertise there was some duplication of material already presented. In future courses more control should be maintained on invited lectures.
11. There was considerable discussion of the total amount of time needed for a course of this type. As long as field work is a part of the course four weeks is about a minimum time. Additional time could be well spent but it is doubtful that it can be justified when the total picture is considered.
12. CIAT was a near perfect location for such a course. The isolation served to reduce distractions and the facilities and support capability were extremely important to the success of the course.

The overall opinion of the course organizers and lecturers is that the course was conducted even above the expectations and should be used as a model for future courses.

V. RECOMMENDATIONS

There is a need for future weed control short courses. This is apparent from the student evaluation as well as our own review. Three levels of need have been identified. They are: administrators, general agronomists, and weed scientists. The joint CIAT/OSU short course was a success. It served the need for the weed scientists in attendance. But the demand for scholarships to participate in the course greatly exceeded the number of scholarships that were available. Even the demand by paying participants exceeded the positions available. A similar course could justifiably be held every year at least for the next three to four years, and it is our recommendation that a similar course be held again during the 1975-1976 fiscal year.

The general awareness of the need for good weed control is not adequately understood by agricultural administrators in developing countries. The competition between the weeds and crops is not clearly understood. This often results in inadequate financing of weed research, or even ill-conceived legislation which restricts improvement techniques. Nicaragua is an example where inadequate funding has completely stopped weed research.

A special course needs to be developed to "tell the story" of weed control to administrators. It is recommended that consideration be given by USAID to authorization of such a course. Once developed it could be taken to a number of different countries. One day of intensive instruction and discussion should be adequate to achieve the objective of the course.

Weed control cuts across all agricultural disciplines. Therefore, it is necessary that all agricultural extensionists and researchers be familiar with basic weed control concepts. The need is especially evident in developing countries where many agronomists have had little exposure to formal weed control courses and instruction. The recommendation from the participants and instructors of the course is that a short course be developed for this group. Properly developed, the course could be given to selected groups or organizations within and between countries. One week of intensive study would be adequate to provide weed control fundamentals to graduate agronomists.

Appendix I

PARTICIPANTES AL CURSO CORTO POSGRADUADO DE
ADiestRAMIENTO PARA
INVESTIGADORES EN CONTROL DE MALEZAS

ARGENTINA

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1a. SEMANA Appendix II

Día del curso: 1
Junio
Fecha: 16

	2 Junio 17	3 Junio 18	4 Junio 19	5 Junio 20	6 Junio 21	
8 am ↓ 10	Introducción al curso E. L. J. D.	Características de malezas H. F.	Identificación de malezas H. F.	Principios de control - Prevención - Erradiación - Mecánico - Biológico - Cultural - Químico J. C.	Control Químico - Química orgánica - Características de herbicidas J. C.	Película: "Equipo y su calibración"
↓ 12	Gira por el CIAT y la biblioteca (2 grupos de 15 pers. cada uno)	Identificación de malezas H. F.			Práctica de calibración J. D. W. P	
1 pm ↓ 3	Definición y costo de las malezas E. L. Discusión	Película: "Hambre en el mundo" Discusión	Factores de competencia E. L. Diseño de ensayos para estudiar competencia J. D. Discusión	↓	Viaje ICA - CIAT Identificación de malezas H. F. J. C. E. L. J. D.	LIBRE
↓ 5	Evaluación de conocimientos de los participantes	Formación de grupos y selección de proyectos		Ayudas visuales y asignación de los trabajos a presentarse J. D.		
7 ↓ 9	Cocktel y comida de Inauguración	Reunión de grupos para planear los proyectos	LIBRE	BIBLIOTECA	LIBRE	

2a. SEMANA

Día del curso: 7
Junio
Fecha: 23

		8 Junio 24	9 Junio 25	10 Junio 26	11 Junio 27	12 Junio 28
8 am ↓ 10	Factores que afectan herbicidas foliares J.D. (3 horas) Discusión	Aplicaciones post-emergentes <i>en EL CAMPO</i>	- Benzoicos - Bipiridilium - Aminotriazol - Propanil - Arsenicos E.L.	- Triazinas - Ureas - Uraciles J.C. Discusión	- Dinitroanilidas E.L. (2 horas) - Acetanilidas J.C. (2 horas) Discusión	Métodos de evaluación de herbicidas preemergentes J.D. (<i>en el campo</i>)
	Factores que afectan herbicidas aplicados al suelo E.L. (3 horas)		Técnicas del invernadero L.B.			
1 pm ↓ 3		Herbicidas hormonales J.C.	Instalar los proyectos de grupo	Demostración de la formulación de herbicidas L.B.	Control de malezas acuáticas y en áreas no agrícolas J.S.	LIBRE
	Resultados del ensayo de sintomatología (casa de mallas) J.D.			Discusión	Identificación de malezas acuáticas J.S.	
7 ↓ 5	Mesa redonda: "Problemas de equipo de los diferentes países"	LIBRE	LIBRE	Surfactantes y su uso J.S.	LIBRE	

3a. SEMANA

Día del curso: 13 Junio
Fecha: 30

	13 Junio	14 Julio	15 Julio	16 Julio	17 Julio	18 Julio
8 am ↓ 10	Herbicidas Misceláneos: - glifosato - dalapon - bentazon - otros J.D.	Control de malezas en cultivos perennes J.D.	Visita al norte del Cauca (zona de pequeños agricultores)	Diseños de campo E.L.	Análisis de resultados E.L.	Panel: "control de malezas en fincas pequeñas"
↓ 12	Herbicidas Revisión de la selectividad de herbicidas J.C.	Control de malezas en hortalizas E.L.	↓	Consideraciones socio-económicas S.M.	Control de malezas en potreros J.D.	LECTURAS Evaluación de proyectos de cada grupo
1 pm ↓ 3	Visita al CNIA, ICA, Palmira	Observación de los herbicidas recomendados en varios cultivos: arroz - soya - fríjol - maíz - yuca		Control de malezas en cultivos de secano H.F. (3 horas)	Análisis de costos y beneficios S.M.	LIBRE
↓ 5			CONTROL EN Arroz de riego W.P. (1 hora)	Discusión		
7 ↓	LIBRE	Panel: "Estudios biológicos de malezas"		Panel: "Política de registro de productos" (los participantes)		

Ao. SEMANA

Día del curso: 19 Julio
Fecha: 7

		20 Julio 8	21 Julio 9	22 Julio 10	23 Julio 11	24 Julio 12
8 am ↓ 10	Presentación de las soluciones a problemas particulares del Campo	Evaluación de las aplicaciones postemergentes	Visita al Centro Experimental de CetaMerck	Presentación de los resultados de los proyectos en grupo	Uso y precauciones con los herbicidas E.L.	V I A J E DE REGRESO
↓ 12					Revisión de exámenes	
1 pm ↓ 3	↓	Presentación de trabajos (de los participantes)	Visita a TRIUNFO	Presentación de trabajos (de los participantes)	LIBRE ? Otra actividad?	
↓ 5	Exámen de conocimientos					
7 ↓	Problemas especiales: coquito - pasto Johnson Rottboellia - others J.D.				Comida de clausura	

Appendix III

SHORT COURSE SUBJECT OUTLINE

- I. Introduction
 - a. Why weed control; damage, etc.
 - b. Definitions
- II. Biology of Weeds
 - a. Classification and identification
 - b. Physiology and characteristics
 - c. Prevention of weeds
- III. Chemical Control
 - a. Physiology of herbicides
 - b. Residuals
 - c. Equipment
- IV. Mechanical Control
 - a. Equipment
 - b. Manual methods
 - c. Mulches, screens, etc.
- V. Biological Control
 - a. Natural predators
 - b. Consorciated crops
- VI. Economics of Weed Control
 - a. Direct costs and benefits
 - b. Indirect costs and benefits

- VII. Government Control
 - a. Regulation and certification
 - b. Pricing and restriction policies
 - c. Social welfare
- VIII. Research Methods
 - a. Methodology
 - b. Statistics
- IX. Dissemination of Information
 - a. Extension methods
 - b. Visual aids
 - c. Paper presentation.