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	B. SECONDARY Agriculture--Weeds	

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9. ABSTRACT

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I. Report Summary

- A. 1. Project title and contract number: WEED CONTROL RESEARCH IN LESS DEVELOPED COUNTRIES, csd 1442.
2. Principal Investigator, Contractor, and mailing address: Dr. Lyall F. Taylor ^{1/}, International Plant Protection Center, Oregon State University, Corvallis, OR 97331.
3. Contract period (as amended): Amendment #7, from April 1, 1972, to December 31, 1972, with contract originally beginning on July 1, 1966.
4. Period covered by Report: July 1, 1971, to December 31, 1972.
5. Total AID funding of contract to date: \$1,595,536.00 as of December 31, 1972.
6. Total expenditures and obligations through previous contract year: April 1971 through March 1972--\$1,353,033.43 plus \$2,538.86 = \$1,355,572.29.
7. Total expenditures and obligations for current year (nine months): April 1, 1972 through December 31, 1972 -- \$223,363.28 plus \$10,324.94 = \$233,688.22.
8. Estimated expenditures for next contract year: January and February 1973 (interim period) plus March 1, 1973 to March 31, 1974 \$422,615.00.

^{1/} Resigned October 31, 1972.

B. Narrative Summary of Accomplishments and Utilization:

The USAID/OSU project was established to assist LDCs initiate or strengthen weed control research programs with the ultimate aim of reducing yield losses, primarily in food crops, due to weed competition. Project-host institution cooperative research, counterpart training, short courses, and publication of results have been among project activities designed to expedite improved weed control. Weed research specialists in the field have worked closely with national organizations in a number of Latin American nations. Colombia and Ecuador, in particular, have now made significant strides toward self-sufficiency in weed control research. Active weed research programs are being conducted in several Central American nations as well. Since the project began, weed research programs in numerous other LDCs have been directly assisted by project personnel through many one- and two-day seminars and an extensive supporting effort of supplying technical information and research back up.

USAID/OSU csd 1442

Weed Control Research in Less Developed Countries

Annual Research Report - 1972

A. General Background.

Crop losses due to weeds have become a critical factor in the agricultural production of many LDCs. With increased usage of irrigation and fertilizer, competition from weeds has increased significantly. Losses due to weeds, where documented, have ranged from 30 percent to total crop devastation. Because many LDCs have either new weed research and control programs, inadequate ones, or none at all, a clear need has developed for research assistance.

B. Statement of Project Objectives as Stated in the Contract.

1. Train local personnel in weed research and demonstration techniques.
2. Identify weed problems in the LDCs.
3. Test known methods for weed control effectiveness.
4. Develop new methods and techniques of weed control.
5. Determine the economic feasibility of control methods.

6. Assist host countries to apply new weed control methods.
7. Increase weed research capabilities of local institutions.
8. Act as a source for technical information and available back up for other AID Missions.
9. Evaluate new problems and changes occurring in agricultural technology.

C. Continued Relevance of Objectives.

During the latter portion of the report period, project approach, objectives, and operations have been re-evaluated. Hence, original project objectives are in the process of being recast to reflect greater emphasis on socio-economic implications of the introduction of new weed control technology, especially in connection with small farms.

D. Accomplishments to Date.

One project staff member conducted research for two-thirds of this reporting period in Ecuador and Panama, while another man was active in Central America for the complete period. In both areas, research efforts were directed toward identifying weed control methods which could be offered as alternatives to those currently being used. Herbicides were emphasized, but such agronomic practices as use of clean seed, clean fallow, and crop rotation were not ignored. In all

cases the programs were conducted through the cooperation of local agricultural institutions. The approach was to work with assigned institutional counterparts so that they could become trained in weed control research methods. In this manner the project staff members were able to magnify their research output and prepare counterparts to conduct weed control research programs of their own.

In keeping with established goals of the project, problem solving research was emphasized. Research was conducted on most of the important food crops of the countries involved. This research resulted in the establishment of weed control recommendations for most of these crops of Ecuador and El Salvador. These recommendations have been, or are being, published. At the same time a popular magazine, AGRICULTURA EN EL SALVADOR, published by the Ministry of Agriculture, printed technical articles on controlling weeds in peanuts, corn, beans, and melons.

Of even greater importance than test results is the fact that complete weed control programs are functioning within existing national organizations in Ecuador and El Salvador where there were none before. The project has encouraged the naming of national counterparts at the Ph.D., M.S., and B.S. levels. These trained specialists have worked directly with the project staff member and, in some cases, have been sent to

U.S. universities for additional intensive training. During the time period covered by this report there were six full-time weed scientists working in INIAP (National Agricultural Research Institute) in Ecuador. Each of the Central American countries has one or two active weed scientists. Staff members also assisted in the training of university students by serving as advisors for thesis programs in weed control.

Weed control short courses were considered to be important activities during this reporting period. A four-day course was presented to 32 extension specialists, university professors, industry representatives, and farmers in Ecuador. Two short courses were conducted in Guatemala in November of 1971. A total of 40 extension agents attended the sessions. In November, another short course was presented to 32 extension agents in Nicaragua. In May 1972, a short course was held for 36 extension agents in El Salvador.

In Panama, the project leader planned and coordinated two short courses for 50 extension specialists, agricultural loan officers, farmers, and industry representatives. Personnel from the University of Panama, Ministry of Agriculture, and industry contributed significantly to the success of these short courses.

Mr. Kenneth Yoder, a Peace Corps volunteer with an M.S. in weed science, was assigned to the weed control project in El Salvador. He has actively participated in establishing effective extension methods in weed control.

Field days have proven to be an effective method of demonstrating the value of controlling weeds as well as some of the new techniques for so doing. In February 1972, over 200 farmers, extension agents, and research personnel attended a field day in El Salvador. Four field days were conducted in Ecuador to show weed control results.

During this reporting period the project financed and assisted trained taxonomists in both Ecuador and Central America. The efforts in Central America have led to a manuscript titled, WEEDS OF CENTRAL AMERICA, which is being prepared for printing in 1973. Full color plates of 278 weed species will be supported by detailed descriptions in Spanish and English. In Ecuador a taxonomist has collected and identified 125 of the most important weeds. These samples have been preserved as the start of a herbarium of economically important weeds of Ecuador.

An extensive test was conducted in El Salvador to determine optimum herbicide treatments for weed control in beans and also to assess advantages, if any, that herbicides have in

relation to mechanical control (machete). Results indicated that plots in which weeds were controlled by machete had a crop yield double that of the unweeded plots. In addition, 12 of the plots to which herbicides or herbicide combinations were applied had significantly greater bean yields than the hand-weeded plots.

Under research conditions in Ecuador, reductions in weed control costs of up to \$12 U.S. per hectare were demonstrated using herbicides for peanuts, soybeans, sesame, potatoes, corn, and cotton. Simultaneous production increases of up to 15 percent were recorded for the same crops.

Research conducted in Ecuador demonstrated that, through control of weeds in cotton which normally act as hosts for destructive insects, insect populations can be reduced, thereby eliminating the need for one or two early insecticide applications.

The use of herbicides in rice production has shown that the costly transplant system can be replaced by broadcast seeding.

Potatoes in the highlands of Ecuador are a long-term crop (6-8 months). By harvest time weeds can be so dense as to greatly impede the harvest process. Utilization of herbicides not only reduces yield losses and production costs, but also

expedites harvesting. The latter is considered the more significant weed control benefit.

E. Dissemination and Utilization of Research Results.

Field days and publications listed above.

1. Several publications have been developed and published in conjunction with the project (see Appendix 1).
2. Weed control information of a very general nature, can be transferred to areas other than that in which they were generated. However, specific weed control recommendations are not usually so readily transferrable.
3. Project members and counterparts have presented data at various meetings of professional societies in Latin America. Unfortunately, these societies have had only moderate success at publishing these papers.
4. Project support staff at Corvallis receive unsolicited inquiries from sources in LDCs concerning technical aspects of weed control. These range from fairly brief, specific questions to broad requests for assistance in how to organize a complete weed research program. The inquiries, flowing in at a rate of three to five per week, originate in all parts of the world.

5. The project has a history of close cooperation with host institutions and counterparts in LDCs. From the initial planning phase through implementation and project operation, nationals are consulted and deeply involved with project activity. The wishes of the host country, either expressed directly or through AID Mission personnel, constitute the key aspect of project concern and scope of research.

6. Multiple copies of all publications are sent to AID/W as they are published.

F. Statement of Expenditures and Obligation and Contractor Resources.

Totals paid by categories for the period July 1, 1971 through December 31, 1972 are listed below. This includes part of one budget period (4/1/71-3/31/72) and all of the next period (4/1/72-12/31/72).

Salaries and Wages -	On-campus.....	\$ 169,105.38
	Off-campus.....	42,665.97
	Total.....	(211,771.35)
Payroll Assessments.....		19,301.20
Indirect Costs -	On-campus.....	109,826.67
	Off-campus.....	26,018.02
Consultants.....		7,268.96

Travel, Transportation and Allowances.....	\$ 43,599.23
Other Direct Costs	7,603.16
Equipment, Vehicles, Materials and Supplies	28,972.13
Sub-Contracts.....	<u>15,000.00</u>
Total for 18-month period.....	\$ 469,360.72

Unpaid obligations at the end of December 1972, except salaries and wages are as follows:

Travel, Transportation and Allowances.....	\$ 1,075.55
Other Direct Costs.....	300.89
Equipment, Vehicles, Materials and Supplies	<u>4,948.50</u>
Total Unpaid Obligations.....	\$ 6,324.94

The budget has not been divided according to objectives, since a definite work plan had not been adopted nor required for the project in the past. The main problem in budgeting during this period has been the failure to place project specialists in the field and the consequent delay in purchasing equipment and vehicles.

G. Work Plan and Budget Forecast for Coming Year.

As mentioned in Section C, the project is currently re-evaluating objectives in the process of entering into a new contract. Many of the successful activities of the past will be continued, but with definite shifts in overall operation.

Greater emphasis will be placed on economic and social relationships for alternative weed control practices; increased project attention will be directed toward smaller farms.

A new project area has been identified in Brazil, initially in the Northeast region. Two weed research specialists are preparing for in-country assignment with headquarters at Recife. An experienced agricultural economist has joined the project staff to assume leadership for developing socio-economic data related to the methodology and impact of weed research and control in LDCs. Strong effort will be devoted to continued cooperation with local host country institutions and personnel. A work plan is in the process of being formulated at this writing.

All pertinent information will be disseminated as widely as is feasible within the constraints of the project parameters. This includes continued, and if possible, expanded programs of technical information exchange, as well as supply of back-up information to field staff, personnel in any LDC, and AID Missions.

Budget for 13 months, 3/1/73-3/31/74

Salaries and Wages.....	\$ 166,935
Consultants.....	3,500
Payroll Assessments.....	20,032
Indirect Costs.....	71,260

Travel and Transportation.....	\$ 48,667
Allowances.....	17,806
Other Direct Costs.....	12,125
Equipment, Vehicles, Materials and Supplies	<u>40,790</u>
Total.....	\$ 381,115

The budget for the interim period, January and February, 1973 has not been formalized (at this time) but is expected to be approximately \$40,500.

H. Appendixes.

Appendix I - Bibliography

✓ Bristow, J. M., J. Cardenas, T. M. Fullerton, and J. Sierra.
01-1406 MALEZAS ACUATICAS/AQUATIC WEEDS. 1972. Spanish and English. Instituto Colombiano Agropecuario and the International Plant Protection Center, Corvallis, Oregon. 116 p. Fifty of the most economically important aquatic weeds are presented with detailed descriptions in both English and Spanish as well as a full color plate for each. Information covers family, genus, species, and common names (bilingual), plus habitat, type of root, stem, leaf, inflorescence, fruit and seed, and other special characteristics. A glossary and bibliography (bilingual) are included.

✓ Cardenas, J., C. E. Reyes, J. D. Doll, and F. Pardo. TROPICAL
91.000 WEEDS/MALEZAS TROPICALES. 1972. Spanish and English.

Instituto Colombiano Agropecuario and the International Plant Protection Center, Corvallis, Oregon. 342 p. One hundred and fifty of the most economically important weeds are presented with detailed descriptions in both English and Spanish as well as a full color plate for each. Information covers family, genus, species, and common names (bilingual), plus habitat, type of root, stem, leaf, inflorescence, fruit and seed, and other special characteristics. A glossary (bilingual) and bibliography are included.

D.B. ✓
W-ADA-183 Deutsch, A. E., and A. P. Poole. MANUAL OF PESTICIDE APPLICATION EQUIPMENT. 1972. International Plant Protection Center, Corvallis, Oregon. 130 p. Contains information from 253 manufacturers in 15 countries for 30 categories of manual and powered applicators, major components, and operator-safety equipment, plus a table of equivalents and conversions (English and metric). Introduction and headings are in English, Spanish, and French. There is also an illustrated products section with photos or drawings and a brief technical description of representative units from each classification.

Appendix II - Discussion

From observations in Ecuador and all of Central America it was consistently noted that hand weeding is neglected in many food crops during the peak harvest periods of rice, sugarcane, coffee and other plantation crops. Research has shown that the greatest loss from weed competition often occurs over a very short period when the crops are small. Therefore, herbicides can be highly beneficial when used during these periods of labor shortage. However, widespread use of herbicides on these food crops may reduce hand labor requirements for all weeding and not just during the periods of peak demand by other crops. More detailed studies are needed for obtaining costs and benefits of various types of weed control systems as they relate to the entire production package. Experience has shown that commercial producers generally utilize a mixture of production inputs different from that of subsistence farmers.

It is the opinion of project members that a program which relies for the most part on counterparts cannot function well on a regional basis. It has been demonstrated three times during the life of this project that the program within the country in which the project leader resides progresses much more rapidly than that in countries visited periodically. AID, host-country government, and institutional support

simply is not sufficient when the project leader is not living close enough to seek, and offer, constant assistance for the counterparts. Numerous times counterparts have been named only to be assigned other duties a few days or months later. Simple support, such as vehicles or gasoline, is often lacking. A field-oriented, agricultural program cannot generate results with this lack of continuity.