WESTERN DIRECTORS' MEETING
WASHINGTON, D. C.

November 9-10, 1958

Meeting was called to order by Chairman Fleming at 9:00 a.m., November 9, in the Columbia Room of the Mayflower Hotel. The following were present during all or part of the meeting:

Name	State or Agency
A. H. Mick	Alaska
Harold E. Myers	Arizona
Richard K. Frevert	Arizona
Paul F. Sharp	California
D. E. Jasper	California
R. W. Hodgson	California
S. S. Wheeler	Colorado
M. M. Rosenberg	Hawaii
J. E. Kraus	Idaho
R. D. Ensign	Idaho
R. E. Huffman	Montana
J. A. Asleson	Montana
J. E. Adams	Nevada
C. E. Fleming	Nevada
R. H. Black	New Mexico
Albert S. Curry	New Mexico
F. E. Price	Oregon
R. W. Henderson	Oregon
D. W. Thorne	Utah
M. T. Buchanan	Washington
L. W. Rasmussen	Washington

N. W. Hilston	Wyoming
J. R. Vaughn	Wyoming
H. C. Knoblauch	SESD
Bennett S. White, Jr.	SESD
B. F. Beacher	SESD
H. M. Briggs	President, South Dakota
R. E. Hodgson	ARS
G. M. Browning	Iowa
Clyde McKee	Former Director, Montana
Robert E. Olson	Recording Secretary

Approval of Minutes July, 1958

Myers moved that the minutes of the July, 1958 meeting be approved as distributed. Passed.

Soil and Water Facility Needs

Buchanan moved that the report of the committee on Soil and Water Facility Needs in the Western United States be adopted as the statement of the Western Directors, and Thorne and the committee be commended for doing a good job. Passed.

/Text of report attached as Appendix B./

Report ESCOP

Curry reported on ESCOP discussion of:

1. Changes in Federal classification of some positions in ARS
2. Soil survey reports
3. USDA research contracts
4. Public Law 477
5. National Science Foundation survey to determine personnel and financial situation in scientific research
6. SESD salary survey to be issued annually
7. Administrative workshops
8. Staff exchanges between experiment stations and USDA now authorized by law
9. Pioneer laboratories
10. ARS insect survey

11. Recommendation soil and water laboratories be located at Land-Grant Colleges

12. Outlook for funds

13. ESCOP reestablished soil survey committee

14. USDA now has authority to grant funds in lieu of contracting for basic research - Public Law 934

15. National Science Foundation funds for basic and fundamental research

16. Proposal for communication workshop for Directors not approved

17. Favorable attitude toward expanded research in forestry

ARS Insect Survey

Buchanan moved, Myers seconded, that the Western Directors recommend their representative on ESCOP recommend that ESCOP request ARS to make available to Directors before submission to Congress copies of report on insect survey. Passed.

Recommend Committee to Work With NSF

Myers moved, Henderson seconded, that ESCOP consider the problem of a committee of Directors to work with National Science Foundation on all matters of policy. Passed.

1961 Grant Funds

Myers moved, Ensign seconded, that the Western Directors endorse a request for 14 million dollars increase in grant funds for 1961. Passed.

Legislative Sub-Committee ESCOP

Myers reported on activities of committee during past year and suggested committee utilize simple charts to make explanation of budget requests more effective.

Report Committee of Nine

Ensign reported on 1957-58 unexpended funds and allotments not certified for 1958-59 pending action by Committee of Nine.

ARS Study of Genetics of Inheritance for Percent Solids Not Fat in Milk

R. E. Hodgson, Director, Animal Husbandry Research Division, ARS, reported on plans for survey of about 5,000 animals followed by selection and breeding. Need national committee of specialists to coordinate efforts throughout the country.

North Central and Southern regions have designated one member each from regional technical committees. Thorne moved, Sharp seconded, that the Western Section of the American Dairy Science Association consider Hodgson's proposal at the next meeting and make recommendations to the Western Directors. Passed.

Participation of Alaska in WM Projects

Mick reviewed participation of Alaska in WM-15 and WM-36 and other regional work at the Alaska Station in cooperation with the North Central Region. He requested continued affiliation and support of the Western Region in economics and marketing. Several Directors stated they favored continuing the present WM allocation to Alaska. There was no other comment or action.

Committee on Regional Research

Thorne discussed the report of the Committee of Three. (Appendix A.)

Ten Year Review

Thorne moved, Rosenberg seconded, that there be a comprehensive review of each project or area of research that has been supported by regional research funds for ten years and that the recommendations of the Committee on Regional Research (Appendix A, page i) be approved as a policy statement. Passed.

Thorne moved, Rosenberg seconded, that next year's review cover the following areas which have been continued ten years:

W-1, Beef Cattle Breeding
W-6, Plant Introduction
W-7, Turkey Breeding
W-9, 28, 29, 30, 31 and 32, Soil and Water

And that the reports be in the hands of the Committee on Regional Research by October 1, 1959 and that reviews be made prior to the Land Grant College meeting (1959). Passed.

The meeting recessed at 5:00 p.m. and continued at 7:30 p.m. at the Statler Hotel.

Agricultural Research Institute

Frevert explained the functions of the ARI Committee which provides contact between industrial and agricultural research groups. Kraus now on the Committee.

White Muscle Project

Henderson moved that the Western Directors authorize a meeting of white muscle workers to facilitate coordination and increase effectiveness of several State programs. Passed.

Henderson and Oldfield will follow through.

Hannah Letter

There was discussion to the effect that no further actions are needed on the subject of the Hannah letter. (Minutes of July, 1958, page 11.)

Sharp moved that the committee be discharged with thanks. Passed.

Black Spot Meeting

Rasmussen reported the Black Spot meeting authorized (July, 1958 Minutes, page 14) has not been held. Meeting may not be needed.

Report of SESD

White reported on the following items:

1. Publication of ARS obligations by States and manual of ARS field stations and functions

2. Nomination of committees and officers

3. SESD comprehensive review program (SESD-OD-1191, November 1958).

4. Marketing research requirements by States (SES-OD-1074, November 7, 1958).

Beacher distributed Unexpended Balances of Federal Funds 1958 (SESD-OD-1136, November 6, 1958; Summary by Regions of Expenditures (SESD-OD-1192D, November 6, 1958) and presented the following report:

Certification for payment of RRF to the Western stations is complete with the exception of the P. & C. trust for W-61 and all 10 of the $300 P. & C. allotments for the recording secretary expenses. One transfer of funds within a station has been made this fall. (We attempted to get the RRF payments out to the States as soon as possible this year by using the allotments approved by the Directors at their Spring meeting. After the increase funds and revised allotment schedules were available, adjustments were made in follow-up certifications to conform to the latest recommendations of the Directors.) Funds for W-61 are being held in reserve pending approval of the regional project by the Directors, the Committee of Nine and SESD.

The reports of expenditures for fiscal year 1958 have been reviewed and summarized. Noticeable improvement has been made over the 1957 reports. The preliminary Western regional totals are:

	RRF	Hatch	Non-Federal Grant	Total
Marketing	$ 303,084.73	$173,119.62	$ 61,634.56	$ 537,838.91
Non-Marketing	1,075,736.01	578.475.32	1,042,871.83	2,697.083.16
	$1,378,820.74	$751,594.94	$1,104,506.39	$3,234,922.07

The unexpended balance of RRF is $3,764.26.

There are a number of technical committee reports and minutes of meetings which do not reach SESD. The technical committees should be reminded periodically, particularly when new officers take over, to review the instructions for transmitting regional project materials in Appendix E of ARS 23-3, Manual of Procedures for Cooperative Regional Research.

The annual reports are in process of development by most committees at this time. Generally the reports are

well-prepared and complete. Improvements can be made in a number of cases by avoiding repetitious citation of results and publications from year to year, by being more specific on the outstanding accomplishments and applications of the research, and by being more brief. Some of the reports are consistently wordy and generally of limited use in preparing budget justification material.

A reminder also to continue to notify SESD of the acceptance of contributing projects by the technical committees.

Federal-States Relations Committee

Price reported on the following items:

1. USDA contracts for research with other than Land Grant Colleges. Suggested desirability USDA inform State Director of proposed contract research.

2. Research in forestry

3. Extension research

Browning Reports on Soil and Water Laboratories

G. M. Browning (Iowa) reported on the activities of the committee he heads and commented on the findings of the committee. The committee has held 9 hearings.

New Areas of Research

Sharp moved, Rosenberg seconded, that the following procedure be followed in regard to proposed new areas for regional research:

1. By December 15, 1958 - Directors send to the recording secretary suggestions for new regional research to add to those previously proposed. (See Appendix A, pages e - h.)

2. January 1, 1959 - Recording secretary sends out list of project proposals.

3. Directors return list by February 1, 1959, rating 5 projects A, 5 as B and 5 as C.

4. Recording secretary tabulates results for Committee of Three and Directors at Spring meeting.

Passed.

Assignment of Administrative Advisors

Sharp moved, Henderson seconded, that the Committee of Three review all assignments of Administrative Advisors prior to Spring meeting and propose adjustments. Passed.

Meeting recessed at 10:00 p.m. and reconvened at 1:30 p.m., November 10, in the Conference Room, American Council on Education Building.

Action on Howard's Letter Amended

Curry moved, Sharp seconded, that the motion passed at the summer meeting (page 3, Minutes of July, 1958) be amended so as to substitute the words "within the Department of Agriculture" for "within the Agricultural Research Service, USDA." Passed.

/Amended motion reads "that the Western Directors go on record as favoring utilization research within the Department of Agriculture."/

Expenses of Recording Secretary

Myers moved, Price seconded, that all bills incurred by the recording secretary /to be charged to the trust fund at Montana/ be sent through Director Sharp for authorization of payment by the Montana Station. Passed.

Soil and Water Research

Thorne reported on conference of advisors to soil and water projects (Thorne, Price and Myers) requested at the summer meeting (page 16, Minutes of July, 1958). W-9, activated in 1949, had two major phases, (a) drainage and water application and (b) crop response to fertilizer and varying increments of water. Revision of work under W-9 was reorganized into W-28, irrigation and drainage, W-29, plants and crop response, and W-30, physical properties of soil.

Later, W-31 on nitrogen transfer (microbiologists and biochemists) and W-32 on hydrology were added. W-51, drainage design, was approved in May 1957 with limited funds for 1960.

Recommend assignment of project numbers to the following:

W- Soil Moisture - Plant Growth Relationships
W- Structural Stability of Soil
W- Water Movement in Soil
W- Revision of W-28, statement to come in.

Recommend complete review of soil and water research by next fall.

The report was discussed. Thorne moved, Henderson seconded, that the Western Directors delay assigning numbers and administrative advisors until the March meeting. Passed.

Thorne was requested to identify the projects involved for the committee on regional research.

Soil and Water National and Regional Committees

Buchanan moved, Price seconded, that the three administrative advisors in soils and water be designated as a committee from the Western Directors to review with appropriate USDA officials our Memorandum of Agreement relating to National and Regional soils

committees and make recommendations at a subsequent meeting of the Western Directors. Meanwhile the present memorandum is to remain in force. Notification of this action is to be given to the appropriate representative of other regions. Passed.

Eligibility for Payment of Expenses to Technical Committee Meeting

Question was raised concerning apparent conflict between Western Directors' policy of requiring approved contributing projects for station representatives to be eligible for reimbursement for travel expense from P. & C. funds (Minutes of March, 1958, pages 9 and 10) and the Manual of Procedures for Cooperative Regional Research (6.15, page 18). Beacher pointed out the Manual was permissive so the policy of the Western Directors prevails. No change was made in the policy statement. Suggestion was made that point 4 (allowing payment for invited consultants) would cover some cases and that decision should be the responsibility of the administrative advisor and the Director of the State involved.

WM-41 and W-62 Designated

Sharp moved, Myers seconded, that the Western Directors designate Farm Power and Machinery Costs W-62 and Cotton Marketing WM-41, and name Curry as administrative advisor for both projects. Passed.

Relation of WM-17 and WM-26

Reference was made to apparent overlap in scope of these projects stated in report of Committee on Regional Research (Appendix A, page d). Sharp reported the committees had exchanged projects and the chairmen when the projects were planned. Rosenberg was requested to ask the chairmen of the committees (now both at Oregon) to confer regarding the recommendation of the Committee of Three.

Regional Laboratory Collaborators Meeting

Rosenberg was appointed to represent the Western Directors at the spring meeting of the collaborators, ARS laboratory, Albany.

1959 Spring Meeting

Poll of Directors present indicated preference for March 2, 3, 4. /Time subsequently confirmed by Director Sharp./ Meeting to be at Berkeley with about one-half day spent at USDA Laboratory, Albany. Suggestion was made that the Committee of Three meet at least one day prior to the Directors' meeting.

1959 Summer Meeting

Henderson moved, Rosenberg seconded, that the summer meeting of the Directors be held in Oregon, July 9, 10, 11, 1959. Passed.

Myers moved to adjourn. Passed.

Respectfully submitted,

Robert E. Olson
Recording Secretary

APPENDIX A

REPORT OF WESTERN DIRECTORS PROJECT REVIEW COMMITTEE
Washington, D. C.
November 9, 1958

1. Proposals considered.

W- 5. Primary Avian Respiratory Diseases and their Interrelationships

A review of the work during the past five years was received. This should be revised to show what has been accomplished as well as what remains to be done under each of the regional project objectives.

The Committee notes that in the five years of this project none of the objectives have been fully accomplished. The The objectives listed for the revised project appear almost as broad and it seems doubtful that they can be completed. The Technical Committee is requested to plan the project proposal so that the objectives will have a reasonable chance of completion during the duration of the project.

The revised report and project must be in the hands of the Review Committee February 15 if the project is to be eligible for continuation next year.

W- 7. Infertility and Low Hatchability of Turkeys

The title should be reconsidered to define the areas of interest more clearly.

The review of the previous project states that the most important problem to be studied with respect to infertility is environment. It is suggested that the new project be reexamined in comparison with this statement.

The State projects are incomplete and should be finished before project approval.

This project has been in effect 10 years and in line with the Committee of Nine recommendation it should receive an extensive review. The Technical Committee is requested to revise their report to cover the 10-year program and to evaluate more fully the extent to which the regional objectives have been attained objective by objective. We recommend continuing for one year until the 10-year program review is completed.

W- 8. Rural Housing

Noted that the project is scheduled for termination.

W-22. Virus Diseases of Deciduous Fruit Trees

The revised proposal contains a statement of a few accomplishments of the old project but there is no critical review. This must be in the hands of the Review Committee by February 15

Objective 1 should be revised to give a clear statement of work to be done rather than being left as a catch-all area for the old project.

Some of the procedures (e.g. #2) are only restatements of the objectives and do not indicate how the problems stated in the objectives will be solved. Regional planning as related to the State projects is not made clear. The section on procedures should be revised.

The critical review and the revised project outline must be in the hands of the Review Committee by February 15. If approved along the lines proposed the revised project should continue with the number W-22.

W-61. Development of Selection Criteria for the Genetic Improvement of Carcass Merit in Sheep

The procedures are not cross referenced to show the nature of the work in the States. The State projects are generally similar. If this is necessary to secure adequate populations the regional project should show this and should specify ways and areas in which the data can be pooled. If data are to be pooled standardized procedures will have to be set up for these phases.

If there is to be some evaluation of genetic versus environment effects this Review Committee suggests some exchange of animals from breeding herds so they can be compared under similar environmental conditions.

There appears to be a need for further unification of thinking as to what constitutes "carcass merit."

This project was first proposed as a cooperative effort with the ARS Field Station at Dubois. We encourage the active participation of the Dubois Station with a participating project.

A budget by States is required at the levels of funds recommended by the Directors.

It is recommended that the project be approved until June 30, 1960 and that the W-61 Committee present a revised outline to the Project Review Committee on or before February 15, 1960. Work conducted during the first year should be on short time objectives only. The studies should be correlated with NC-50.

W- Soil Moisture-Plant Growth Relationships

The regional project outline and the State contributing projects are in a generally satisfactory condition. However, no critical review has been received and this should be submitted on or before February 15, 1959.

The regional project and State projects involve considerable plant physiology. It is recommended that plant physiologists be notified of the project and be brought in as participants in the contributing projects.

The ARS should be invited to submit a contributing project.

The Directors should act on an adviser and a number if this is to be eligible for activation on July 1, 1960.

W- Structural Stability of Soil

The project outline needs editorial attention to put it in standard form.

A critical review of preceding project W-30 should be in the hands of the Project Review Committee by February 15. A budget must be submitted in line with the Directors' allocations ($24,500, $26,285 and $33,250, assuming a transfer of $2,000 to W- Water Movement.)

The ARS should be invited to submit a contributing project.

The Directors should assign a number and an adviser if this project is to be eligible for activation on July 1.

W- Water Movement in Soil

The ARS should be invited to submit a contributing project.

The outline folder is in satisfactory condition for approval. Before this is done, however, a critical review should be submitted of studies on water movement under W-9, W-29 and W-30.

It is understood that this project will be supported primarily by State or grant funds and that by agreement the $5,000 of RRF funds comes $3,000 from W-29 and $2,000 from W-30. The Directors should approve the possibility of handling U. S. Army Signal Corps funds along the general line of RRF.

The Directors should assign a number and adviser if this project is to be eligible for activation July 1, 1959.

WM-17. Competitive Position of the Western Region in Marketing Frozen Fruits and Vegetables

The procedures and objectives need to be developed clearly so there is a procedure identified for each objective and the procedures should be cross referenced to State contributing projects.

This project and WM-26 should be checked for duplication and the work correlated. This might be done through a conference of the committee chairmen or of a joint meeting of the two committees. It is suggested that the two committees have the same administrative adviser.

The revised outline must be in to the Project Review Committee by February 15.

WM-24. Market Development for Selected Horticultural Crops

In line with the recommendations of the Technical Committee we recommend that the project be continued one more year and terminated June 30, 1960.

II. Projects scheduled for termination or revision June 30, 1959 and for which no proposals have been received. If these are to be considered for revision a critical review of preceding work and a revised project proposal must be received by the Project Review Committee by February 15, 1959.

W - 8, Rural housing
W -11, Weed control
W -12, Root rots of beans
W -16, Economics of range land development
W -28, Irrigation and drainage
W -33, Economics of water application
W -36, Harvesting seeded forage crops
W -42, Ground water laws

WM-13, Wheat price policies
WM-16, Insect control and grain marketability
WM-19, Fruit and vegetable handling
WM-21, Livestock market information
WM-27, Shrinkage and regain of cattle and sheep
WM-31, Marketing logs and stumpage

The following of the above projects have not been allocated funds for fiscal 1960:

W - 8	WM - 13	WM - 27
W - 33	WM - 19	
W - 36	WM - 21	

III. Projects approved but not funded.

W-51. Drainage design

Approved May 1957, limited funds for 1960.

W-52. Biochemistry of herbicidal action

Approved May 1957, limited funds for 1960.

W-53. Insects and mites of grasses

Approved June 1957, no funds at no increase for 1960.

W-55. Small fruit viruses

Approved May 1957, no funds at no increase for 1960.

W-56. Nematodes in root disease

Approved by Western Directors November 1956 and by Committee of Nine May 1958. P & C funds given for 1959.

IV. Projects pending.

W-59. Government Price Policies

An outline was submitted in November 1957 which was returned for revision. Huffman appointed administrative adviser March 1958. No revised outline received to date.

W-60. Textiles

Suggested as project in 1955, project proposal reviewed and returned for further consideration February 1956. Approved for planning July 1957 and Thorne appointed administrative adviser. An incomplete outline received March 1958 and action deferred. No final proposal has been received. Funded for 1960.

WM-34. Handling fluid milk to increase market appeal and meet modern distribution demands

Sharp appointed administrative adviser. Regional project statement developed, dated December 11, 1956.

V. New areas of research suggested. These should be considered on an equal basis for activation.

1. Ten areas of research in forestry proposed in Henderson's letter of October 21, 1958.

2. Curly top virus, see resolution Western Directors minutes p. 3, July 1958.

3. Fundamental concepts of population genetics.

   In July 1958 the Western Directors recommended this not be considered for an interregional project. Fleming proposed this as a Western regional project in September 1958.

4. Criteria for measuring red meat quality.

   Submitted as a proposed area for a project by the Western Section of American Society of Animal Production - see project WM-33.

5. Rootstalk problems.

   Suggested by W-22, see Western Directors minutes of March 1958.

6. The physiology and biochemical processes involved in nutrient utilization by ruminants.

   Proposed in letter from Ralph Bogart (July 1958) in behalf of Western Section of American Society of Animal Production.

7. Farm power and machinery costs.

   Suggested by WAERC in July 1958, funds listed for 1960.

8. Small watershed development.

   Suggested by WAERC in July 1958, funds listed for 1960.

9. Rehabilitation of irrigated areas.

   Suggested by WAERC in July 1958, funds listed for 1960.

10. Marketing western cotton.

    Suggested by WAERC in July 1958, funds listed for 1960.

11. International trade.

    Suggested by WAERC in July 1958, funds listed for 1960.

12. The following were listed in November 1956 for high priority in planning with no further definite action:

(a) Principles of mechanical equipment to enhance the efficiency of selected agricultural operations.

(b) Factors controlling the physiological activity of the gastro-intestinal tract and feed utilization in domestical animals (ruminants only?).

(1) To study the physical, humoral, and nervous factors involved in secretion and motility of the gastro-intestinal tract.

(2) To determine the relationship of rumen microflora to production performance.

(3) To study the absorption, conversion, and excretion of chemical substances in the gastro-intestinal tract.

(c) An additional project in animal diseases, probably in the pulmonary complex of diseases (shipping fever, pulmonary emphysema).

(d) Isolation requirements for field and/or crop seed production with special reference to the problem of pollen dispersal.

(e) A project in the area of poisonous plants in western range lands.

(f) Biology and control of snow mold in wheat.

(1) To obtain much needed information concerning the general biology of the organisms causing snow mold of wheat.

(2) To relate this information to the development of feasible control of the disease by possible modification of cultural practices.

(3) To make extensive and exhaustive tests of numerous chemicals to find one, if possible, more economically feasible than those currently in use.

(g) Etiology and physiology of the host-parasite relation to Verticillium wilt.

(1) To determine the pathogenic and pathological strains of Verticillium.

(2) Effects of nutrition on wilt disease.

(3) Physio-chemical aspects of the soil in relation to the incidence of the disease.

(h) Use of antibiotics as a means of control of plant diseases.

(i) Cost of operating and maintaining farm power and machinery in the western region.

(1) To develop standards of performance for selected machines of different sizes, ages, and in varying uses.

(2) To determine the unit power and machine cost of selected machines and selected farm operations.

(3) To publish a regional handbook of this information.

(j) Nature of the differential resistance of plants to insect damage.

(k) Clonal root stocks for deciduous fruit tree propagation.

(l) Factors influencing the motility of farm and ranch people between agricultural and non-agricultural pursuits.

(m) Improving the economy and effectiveness of agricultural communications.

(1) To determine the type of information wanted and needed by rural people.

(2) To determine the use made of released agricultural information.

(3) To ascertain the mediums most economical and effective in getting information to rural families.

VI. Ten year review of regional projects.

In line with the recommendation of the Committee of Nine the Project Review Committee recommends that there be a comprehensive review of each project or area of research that has been supported for regional research ten years.

In preparation for the review the Technical Committee or Committees should prepare a critical report covering

1. A history of the project or projects.

2. A statement of benefits of the research program citing new practices developed; new crops or strains of livestock and their adoption by agriculture; major instruments, techniques or break-throughs and their significance; new uses of agricultural products. Graduate training sponsored. Where possible attach a dollar value.

3. Summary of accomplishments under each regional project objective.

4. A critical analysis of the degree to which each objective has been accomplished.

5. A statement of uncompleted work or of areas needing further investigation.

6. A complete list of publications separated into major original research papers and into popular papers, abstracts, etc.

It is proposed that the Project Review Committee and the administrative adviser participate in the review.

The following areas of research have been continued ten years:

W-1, Beef cattle breeding
W-6, Plant introduction
W-7, Turkey breeding
W-9, 28, 29, 30, 31 and 32, Soil and water

It is recommended that reviews for the above areas be conducted in November 1960 and other reviews be made as other areas have been continued ten years. The Technical Committees' report should be in the hands of the Project Review Committee by October 1, 1959.

APPENDIX B

SOIL AND WATER FACILITY NEEDS IN WESTERN UNITED STATES

REGIONAL REPORT FOR THE ELEVEN WESTERN STATES AND HAWAII

Submitted to Western Director
November 9, 1958

PART I

POLICY STATEMENT

The western experiment stations urge increased support for research to insure the best use and conservation of soil and water resources. The increasing population and the expanding industry of the West must inevitably demand greater conservation and efficiency in their use. Although ground water is often depleted water supplies are generally renewable year by year. Soil is not a renewable resource. Yet the conservation and management of the two are inseparable.

The success of western agriculture depends on wise conservation and use of water in relation to soil resources and agricultural enterprise. On non-irrigated lands the primary problems are to retain and use water efficiently by economic plants, reduce erosion, or to conserve and divert water for irrigation of other lands. Problems of irrigation agriculture revolve around storage, conveyance and efficient use of water for maximum crop production and protection of soil resources. Increasing attention also is being directed to forest and range lands. In the development of an expanded soil and water research program we suggest that consideration be given to the following:

1. That soil and water research ultimately must be tied to a specific soil, climatic and management situation, even though some aspects are regional or national in scope.

2. That the research facts essential to the solution of most soil and water problems are many and varied, requiring cooperative research of scientists from many disciplines.

3. That since responsibility for conducting soil and water research is shared by several agencies, cooperation is essential for optimum results.

4. That most current research programs on soil and water in all agencies lack adequate budgets to make most efficient use of existing scientific talent and capital facilities.

5. That some soil and water problems require additional capital facilities for their solution.

6. That since soil and water research becomes profitable through applications of findings, a close relationship between the research agencies and educational agencies, both resident instruction and extension, is desirable.

7. That a close relationship between expanded research and graduate training programs is mutually advantageous in providing training for students and in furnishing capable personnel.

8. That conduct of research by or in association with land-grant colleges or universities has many unique advantages including:

(a) Availability of comprehensive library reference facilities.

(b) Availability of many expensive laboratory and computing facilities.

(c) Availability of competent scientists in related and supporting fields.

(d) Availability and contacts with extension service specialists to take findings to the people.

(e) Integration of new research information with teaching programs.

(f) Training future scientists.

(g) Availability of graduate students and other help.

Suggested Policies for Financing and Administering Expanded Soil and Water Research Programs

Several alternative methods of financing and administering soil and water research are now and likely will continue to be used. We encourage those methods or combinations of methods that appear to give the public the most benefits from increased public funds spent for soil and water research.

We suggest:

1. That increases in both federal and state funds will be necessary to meet the needs for expanded soil and water research.

2. That first priority be given to increased funds for research programs that can be handled in existing capital facilities. Most efficient and economic advances in nearly all soil and water research problems can be accomplished in this manner.

3. That after existing programs on important problems are strengthened to a reasonably optimum level, consideration be given to constructing new major capital facilities which are necessary for adequate development of research on important problems.

4. That increased appropriations to the experiment stations of the land-grant colleges for soil and water research appear to offer the most economical and effective method of increasing much of the basic and applied research needed.

The following procedures are recommended for expansion of soil and water research within existing capital facilities:

1. Increased appropriations of federal and state funds to the experiment stations of the land-grant colleges for soil and water research.

2. Increased appropriations of federal funds for regional research on soil and water following similar procedures in effect for regional research under the present Hatch Act, amended.

3. Increased appropriations to the U.S. Department of Agriculture for soil and water research.

The following procedures are recommended for implementing new capital facilities for soil and water research:

1. Appropriate federal funds to match state funds for construction and acquisition of needed soil and water research capital facilities in line with the principles set forth in proposed bill H.R. 12,234, 85th Congress, second session.

2. Appropriate increased funds for soil and water regional research that would provide necessary capital facilities for regional research.

3. Where federal financed and administered regional research centers or laboratories are implemented it is recommended that they be associated closely with the agricultural experiment stations in the area to be served. Some means of achieving this association are as follows: (1) Establish a Board of Collaborators made up of representatives of each cooperating state experiment station and other federal agencies concerned with soil and water research. (2) The Board of Collaborators would review research programs and make recommendations concerning distribution of funds. (3) The Board of Collaborators should be involved in review and recommendations from the start in developing the overall plans, programs, facility needs, etc. (4) Simultaneously with the initiation of such a facility in a region increased federal funds should be allocated to state experiment stations for support of cooperative research.

PART II

INCREASING SOIL AND WATER RESEARCH WITHIN EXISTING CAPITAL FACILITIES

Additional funds to employ more personnel (professional and sub-professional), purchase equipment, and for general operations will improve the efficiency and increase the output of soil and water research

within existing capital facilities. We estimate that total soil and water research output in the western states can be increased at least 50 percent simply by providing adequate funds to existent research agencies. This approach warrants first priority as it provides the most economical as well as the quickest method of expanding soil and water research programs in the West.

Improved efficiency or expansion is possible on many important soil and water problems at most locations and by all agencies. A few examples will illustrate some of the ways this can be accomplished.

(1) Providing a highly trained hydrologist with substantial funds to buy equipment and hire competent help will permit him to collect information on watershed management not now possible. (2) Funds for remodeling a corner of an experiment station laboratory along with operating funds will permit efficient and rapid processing of physical measurements on soils that are needed by at least 25 scientists from 5 different research agencies. The estimated cost is less than $10,000 for equipment and remodeling, plus an annual operating cost of about $10,000. Moreover this will release space in a constant temperature room to be used for basic research of regional and national significance.

Increased support of existing programs should especially increase the output of research of regional or national significance. Much research that is currently underway is restricted to limited local interpretation because the scientist in charge does not have funds to buy equipment, hire skilled technicians that are essential to collect the kind of information that will permit extension of the data to other areas. Moreover, many scientists now doing basic work of regional and national significance could greatly increase their output if they had adequate funds to buy equipment, hire skilled technicians and research assistants, and buy supplies. At many locations sufficient office and laboratory space is available to permit adding one or several top scientists to develop and direct badly needed research.

Although all research agencies have needs of this type, most of the possibilities for making better utilization of existing capital facilities is at state experiment station locations. This is logical since they provide most of the capital facilities for soil and water research. A marked increase in federal grant funds to state experiment stations and regional research for soil and water research would result in a marked increase in research of regional and national significance.

Although the estimates are far from complete they indicate additional needs in the Western Region of over $3,000,000 for salary and operations, and over $1,250,000 for equipment. Although new major facilities are needed at some experiment station locations to conduct some types of research, the evidence is clear that an approximate 50 percent increase or more in funds for salaries, operations and equipment can be used effectively within existing major facilities.

The classification of research used in compiling information about research in the West and a summary of specific requests for increased support for research within existing major capital facilities are given in tables 1 and 2 of the Appendix.

PART III

MAJOR NON-RECURRING CAPITAL FACILITY NEEDS FOR SOIL AND WATER RESEARCH

The major non-recurring capital facility needs for soil and water research proposed by the eleven western states and Hawaii have been selected on the basis of their regional application and further evaluated to determine those of the greatest importance in an expanded program of basic research. The most pressing capital facility needs are: (1) Experimental watersheds; (2) water supply, irrigation and drainage laboratories; (3) controlled environment facilities for plant growth studies; and (4) dryland water use efficiency laboratories. In addition, states have made other major capital proposals including facilities for tillage studies both on dryland and irrigated lands. All of these capital facilities should be located at or in cooperation with agricultural experiment stations and so operated as to maximize opportunities for use of facilities by federal and state research personnel in the conduct of federal, state, or federal-state cooperative research projects. More specific recommendations concerning these facilities, number of installations and their general geographic locations are given in the following sections.

Experimental Watersheds:

The rapid influx of population into the West has so increased the urgency of getting more water that some immediate answers to some of the problems of multiple use of our watersheds must be found. Such questions as the following need to be answered: What are the characteristics of climate and watersheds which affect peak rates of flow, water yields, and sediment production on all of the principal complexes? What happens to water which falls on a watershed? How can the maximum amount of usable water be obtained from a watershed? How can sediment movement be controlled? What is the cost of bringing a watershed into maximum production of water and economic and recreational returns? What is the best method for conveying and storing water obtained?

The great concern regarding this problem is indicated by the fact that the Western States and Hawaii placed a high priority, in most cases, on the need for major non-recurring capital facilities to investigate problems concerned with watershed hydrology and management.

Basic research must of necessity be done on well-selected, suitably instrumented, and carefully managed groups of experimental watersheds. Because of the broad spectrum of watershed conditions encountered in the West, a minimum of approximately four primary watershed installations should be located in the northwest, southwest, intermountain, and western great plains regions. These should be fully instrumented and staffed with research teams including engineers, soil scientists, and range and forest ecologists. To permit more accurate evaluation of hydrologic relations, a network of secondary experimental watersheds should be located in other typical situations. The overall research effort--including work at the basic laboratories--should be fully integrated through existing federal and state organizations including the regional research program of the agricultural experiment stations.

A proposed budget for the western states and Hawaii, for research facility needs for a watershed hydrology and management program is as follows:

	Recurring	Non-recurring
Salary	$1,000,000	
Operation	750,000	
Equipment		$4,000,000
Building, sq. ft.		150,000

The requests from the western states are summarized on a regional basis in table 3 of the Appendix.

Water Supply, Irrigation and Drainage Laboratories:

The cost, efficiency, and ultimate success of any irrigation project is in large measure related to the effectiveness of water control and measurement. Expenditures estimated at 6 billion dollars will be made within the next 50 years for irrigation projects in the West. A very large part will be required for water control structures and devices. Substantial savings in initial investments, operations and maintenance costs could be made by improvement in the performance characteristics of storage and diversion structures, canals, turnouts, water measuring devices, and irrigation equipment. Much of the developed supply of irrigation water fails to reach the crop. Inadequate control of water during storage, conveyance and distribution, and the use of inefficient irrigation equipment and practices not only waste valuable water but also are responsible for increasingly grave drainage problems on some of our potentially most productive soils. Solutions for these problems are dependent upon an expanded research program involving basic fluid mechanics and hydraulics, soil physics and related disciplines. These facilities are also needed to develop improved instrumentation and techniques essential for a fundamental and effective watershed research program.

While research made possible by these facilities would be directed toward the water supply, irrigation and drainage problems of the irrigated West, the basic information developed would have great value for water supply and irrigation projects throughout the world. Because the future growth of the West is so dependent upon water, few research programs, if any, have greater potential value to this area.

Facilities Needed

Major capital facilities for basic studies of surface and groundwater supply and utilization, and physical control involving measurement, storage, diversion, conveyance, delivery, and application of water were sought by Hawaii and 5 states and facilities for irrigation and drainage investigations, by Hawaii and 10 western states. Hydraulic laboratory facilities available for intensive research on problems of water supply, storage and distribution and irrigation and drainage as they relate to the western states are inadequate. While some university laboratories conduct limited research in this specific field, this is secondary. The laboratories of the federal construction agencies are concerned primarily with specific design problems relating to large individual works rather than research. Facilities and staff charged with the primary mission of studying the general hydraulic problems involved in water supply, irrigation and drainage for the West are therefore needed.

Considering (1) the vast area of the West, (2) the diversity of water supply and control problems, (3) the need to relate irrigation and drainage research to typical soil and crop conditions, (4) the desirability of developing at several agricultural experiment stations staff and graduate students actively engaged in basic water research, and (5) the relatively high cost of these facilities, it is recommended that there be established two primary laboratories for research on western water problems, one laboratory would emphasize research on hydraulics of supplying water to users; the, on hydraulics related to irrigation systems and drainage.

Support for expansion of several existing facilities and possibly for one or two smaller facilities at other locations is also desirable. This arrangement would provide a workable division of research responsibilities between the two primary laboratories and also a good balance between over-centralization and the economic disadvantages of excessive dispersal of such facilities.

Budget Needs:

	Two Primary Laboratories (totals)	
	Non-recurring	Recurring
Laboratory buildings (Industrial type construction) 70,000 sq.ft.		
Offices 6,000 " "		
Estimated Cost	$920,000	
Equipment	800,000	
Salaries: 10 Professional, 20 Sub-professional, 20 Graduate Assts.		$275,000
Operating budget		225,000
Supporting installations		50,000
Land and water rights (donated)		
	$1,720,000	$550,000

	Secondary Laboratories (totals)	
Buildings (15,000 sq.ft.)	150,000	
Equipment	75,000	
Personnel		75,000
Operating budget		75,000
	$225,000	$150,000

Controlled Environment Facilities For Plant Growth Studies:

Millions of dollars have been expended for separate research programs on soils, water and plants to determine the effects of these variables and others on the production of food and fiber. While many valuable recommendations have arisen from these research programs, the difficulties in extending this research information to other situations is increasingly being recognized. What is needed now are fundamental studies of

complex interrelationships and interactions among the numerous variables that determine soil management, water use and crop growth. Generally such basic information can be obtained only by studying plants in growth chambers or greenhouses equipped for control and measurement of light, temperature and humidity. Unless such facilities are available to the investigator, many costly years of work are often lost and many of the data are of questionable value. Information obtained from experiments conducted under controlled environment conditions should have national and international application and may be expected to save many years and millions of dollars in our search for solutions to some of our most pressing soil, water and crop production problems.

Needed Facilities:

Some controlled environment facilities should be available to all competent investigators who devote considerable time and money to research projects involving soil-water-plant interrelationships. Yet, it is recognized that such facilities are relatively costly. For these reasons, the directors recommend that at least minimal controlled environment facilities be provided at all research centers having competent personnel engaged in soil-water-plant studies and that major or primary controlled environment facilities be established at approximately four of the principal research centers in the West. These primary facilities would permit carefully planned experiments requiring more expensive environmental control. Plans for these experiments could be developed through regional coordination and resulting information disseminated similarly to workers in cooperating states.

Budget Needs:

Four Primary Facilities and Secondary Facilities (totals)

	Non-recurring	Recurring
Laboratory and Office 25,000 sq. ft.		
Growth Chambers	$500,000	
Equipment	350,000	
Salaries: 25 Professional		
25 Sub-professional		
25 Graduate Assts.		$450,000
Operating budget:		250,000
	$850,000	$700,000

Dryland Water Use Efficiency Laboratories:

A large portion of the semi-arid areas receive total amounts of precipitation that are theoretically adequate to produce satisfactory yields of crops. Nevertheless, the underlying problem of agriculture of the dryland areas is recurring deficiency of moisture for growth of crops. This deficiency is caused by excessive evaporation and runoff as well as unfavorable distribution and intensity of precipitation. The solution to this problem depends on increasing the amount of water stored for crop use, and making more efficient use of it. Since evaporation losses of up to two-thirds of the total precipitation are common, more knowledge is needed on the theory of evaporation, including film and vapor movement of water and the soil factors involved. In addition, factors affecting

the efficiency of moisture use by plants is a vital part of the problem. Drastic new approaches and intensive research effort are needed to make major accomplishments.

The western states have given a high priority to the research.

Area Involved:

The area to be served by the research includes the Great Plains, the Pacific Northwest, and the Intermountain areas of the West.

Value of Proposed Research:

It is expected that research results will help to stabilize production and farm income, by reducing the ravages of the recurring drought problems of the dryland areas.

Facilities:

Solutions to the complex problems proposed for study will require the combined efforts of scientists trained in a number of disciplines, and adequate facilities including some special equipment. Since it is intended that studies will be directed toward the establishment of basic principles which determine the gain and losses of water in particular, studies in both the laboratory and field will need to be conducted under controlled and measured conditions. Growth chamber, greenhouse, wind tunnel and lysimeter facilities will be required. Adequate land will be needed for field studies that will be conducted in parallel with laboratory investigations.

The western states recommend that one or more primary laboratories be established at experiment stations where adequate growth chambers, greenhouse and wind tunnel facilities can be constructed or made available. In addition the program should provide for facilities and funds that would enable other experiment stations to participate actively in coordinated phases of the research.

A statement of additional facilities needed follows:

Dryland Research Facilities Needed

	Need
Capital Facilities	
Office, laboratory	50,000 ft.^{2}
Shops and storage	7,000 ft.^{2}
Land	---
Greenhouses	15,000 ft.^{2}
Equipment (laboratory and field)	$150,000
Equipment (growth chambers)	$300,000
Equipment (wind tunnels	$800,000
Personnel	
Professional	25
Non-professional	30
Graduate assistants	20
Annual budget	
Salary	$450,000
Operations	$300,000

APPENDIX TABLE 1

Classes of Soil and Water Research

The following 5 classes were used to group soil and water problems or research through the state and regional reports.

1. Water supply, hydrology and watershed engineering

Includes problems such as those dealing with runoff and water yields, groundwater, hydraulics, water storage and conveyance, sedimentation, flood control, rainfall and snowmelt characteristics, and analysis of hydrologic data.

2. Irrigation and drainage

Includes problems such as those dealing with methods of irrigation, optimum soil moisture levels, consumptive use by field crops, water management on mountain meadows, methods for predicting yield of drains, durability of drains, design and installation of drains, and effects of drainage on crop production.

3. Basic soils

Includes problems such as those in soil chemistry, clay minerology, soil physics, soil genesis, morphology and classification, soil survey, and soil microbiology. The word "basic" is used here in a broad sense.

4. Soil environment and plant growth

Includes problems such as those dealing with soil moisture stress and plant growth, soil structure and plant growth, soil temperature and plant growth, soil ionic conditions and plant growth, soil conditions and critical levels of nutrients in plants, and ecological relationships of soils and plants such as range or forest site.

5. Soil and crop management

Includes problems related to the management of cultivated land, range land and forest land such as factors affecting soil erosion, methods of erosion control (including vegetative cover, plant residue management, terraces, contour tillage, strip cropping, etc.), efficiency of moisture utilization in crop production, soil fertility, soil acidity, sodic and saline problems, soil tilth, soil compaction, plant management (such as crop rotation, etc.).

APPENDIX TABLE 2

Partial Summary of Additional Needs to Increase Soil and Water Research Within Existing Facilities *

	Available						Additional Needs					
	Staff						Staff					
	Prof.	Non-Prof.	Grad. Assts.	Salary 1,000 dol's	Operation 1,000 dol's	Equipment 1,000 dol's	Prof.	Non-Prof.	Grad. Assts.	Salary 1,000 dol's	Operation 1,000 dol's	Equipment 1,000 dol's
Class 1. Water Supply, Hydrology & Watershed Engineering	2	2	1	24	11	31	11	10	7.5	146	31	83
Class 2. Irrigation & Drainage	11	5.5	0	100	36	52	24	22	14	315	101	155
Class 3. Basic Soils	18	8	20	248	61	205	27	29	27	409	257	345
Class 4. Soil Environment & Plant Growth	11	5	7	132	50	181	22	12	21	291	164	166
Class 5. Soil & Crop Management	32	19	16	361	99	188	43	50	27	655	392	515
Grand Total	74	39.5	44	865	257	657	127	123	96.5	1,816	945	1,264

* Due to shortage of time and variations in reporting only a portion of the additional needs to increase soil and water research within existing facilities is listed. Moreover, the estimates for existing facilities include only a fraction of the total soil and water research underway in the states reporting. The items reported under "Available" reflect only those available for the specific research problems on which additional needs are given. State reports were summarized from the 11 western states and Hawaii, except California. In most cases the estimates include cooperative work with USDA as well as the agricultural experiment stations.

APPENDIX TABLE 3

Watershed Hydrology and Management Research Facility Needs
Requested by Western States and Hawaii *

Region	Recommended No. of Principal Centers	Additional Needs							
		Staff			Salary	Operation	Equipment	Building	Land
		Prof.	Non-Prof.	Grad.Assts.	1,000 dol's	1,000 dol's	1,000 dol's	1,000 sq. ft.	acres
Southwest	6	24	54	18	400	250	1,750	60	500 purchased; remainder by agreement
Northwest and Hawaii	4	16	16	10	250	200	400	20	By agreement
Intermountain	3	12	12	3	130	70	150	15	By agreement
Western Great Plains	3	5	6	1	80	25	25	8	By agreement

* This table is incomplete as it is based on a partial reporting.