

CLASSIFICATION
PROJECT EVALUATION SUMMARY (PES) - PART I

Report Control
Symbol U-447

1. PROJECT TITLE MOROCCO - Winter Snowpack Augmentation Project		2. PROJECT NUMBER 608-0190	3. MISSION/AID/W OFFICE USAID/Rabat
		4. EVALUATION NUMBER (Enter the number maintained by the reporting unit e.g., Country or AID/W Administrative Code, Fiscal Year, Serial No. beginning with No. 1 each FY) <u>608-85-05</u>	
		<input checked="" type="checkbox"/> REGULAR EVALUATION <input type="checkbox"/> SPECIAL EVALUATION	
5. KEY PROJECT IMPLEMENTATION DATES A. First PRO-AG or Equivalent FY <u>84</u> B. Final Obligation Expected FY <u>86</u> C. Final Input Delivery FY <u>89</u>		6. ESTIMATED PROJECT FUNDING A. Total \$ <u>12.6 M</u> B. U.S. AID \$ <u>6.0 M</u>	
7. PERIOD COVERED BY EVALUATION From (month/yr.) <u>4/84</u> To (month/yr.) <u>4/85</u> Date of Evaluation Review <u>6/9-22/85</u>			

8. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

A. List decisions and/or unresolved issues; cite those items needing further study. (NOTE: Mission decisions which anticipate AID/W or regional office action should specify type of document, e.g., airgram, SPAR, PIO, which will present detailed request.)	B. NAME OF OFFICER RESPONSIBLE FOR ACTION	C. DATE ACTION TO BE COMPLETED
See Attached Documents: 1) Project Evaluation Summary (PES) - Part I 2) Project Evaluation Summary (PES) - Part II 3) Changnon, Stanley A., Jr.; Rose, R. Lynn and Warburton, Joseph A. 1985. <u>An Evaluation of the Winter Snowpack Augmentation Project in Morocco - April-May, 1985.</u> Prepared for the Bureau of Reclamation under Contract No. CR-81-06500. 46 pages. 4) Project Al Ghait/Winter Snowpack Augmentation Project, Project Steering Committee Meetings June 12 and 18, 1985, Review of Recommendations of the External Evaluation Team (Dated June 19, 1985). 15 pages. 5) Winter Snowpack Augmentation Project (608-0190) - Review of External Evaluation Team Report (Dated June 10, 1985). 12 pages and 3 attachments.		

9. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS

<input type="checkbox"/> Project Paper	<input checked="" type="checkbox"/> Implementation Plan e.g., CPI Network	<input type="checkbox"/> Other (Specify) _____
<input type="checkbox"/> Financial Plan	<input type="checkbox"/> PIO/T	_____
<input type="checkbox"/> Logical Framework	<input type="checkbox"/> PIO/C	<input type="checkbox"/> Other (Specify) _____
<input checked="" type="checkbox"/> Project Agreement	<input type="checkbox"/> PIO/P	_____

10. ALTERNATIVE DECISIONS ON FUTURE OF PROJECT

A. Continue Project Without Change

B. Change Project Design and/or Change Implementation Plan

C. Discontinue Project

11. PROJECT OFFICER AND HOST COUNTRY OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Names and Titles)

Steve Lintner, ANE/PD/ENV *S. Lintner*

Samir Zoghby, Project Officer, USAID/Rabat *Samir Zoghby*

John Giusti, Evaluation Officer, USAID/Rabat *J. Giusti*

12. Mission/AID/W Office Director Approval

Signature *R. Chase*

Typed Name Robert Chase, Director

Date 11/29/85

PROJECT EVALUATION SUMMARY (PES) - PART IWinter Snowpack Augmentation Project (608-0190)8. Action Decisions Approved by Mission

A. List of Actions	B. Officer Responsible For Action	C. Date Action To Be Completed
1. Clarification and prioritization of project objectives.	AID and Bureau of Reclamation Scientific Advisors	Statement of objectives and their priority developed by Scientific Advisors adopted by Mission on 6/11/85 and Project Steering Committee 6/12/85.
2. Identification of a full-time Moroccan Project Director.	Director, National Meteorological Organization, and Resident Scientific Advisor	Upon receipt of staffing chart to be developed by Resident Scientific Advisor the Director will appoint a full-time Project Director. To be completed by 9/85.
3 A. Training of Moroccan Pilots Royal Moroccan Air Force to review with National Meteorological Organization the assignment of meteorologists to aircraft to assist pilots in scientific and technical aspects of cloud seeding operations.	Project Director, Royal Moroccan Air Force and Director, National Meteorological Organization	Decision on assignment of personnel by 10/85.

8. Continued

A. List of Actions	B. Officer Responsible For Action	C. Date Action To Be Completed
<p>3 B. Change of Aircraft Type</p> <p>Royal Moroccan Air Force to review possible provision of 2 King Air 100 aircraft for cloud seeding operations during the 1985-1986 season.</p>	<p>Project Director, Royal Moroccan Air Force</p>	<p>Royal Moroccan Air Force to make decision on aircraft by 10/85.</p>
<p>3 C. Improvements in Aircraft Navigation Equipment</p> <p>Improved navigation systems to be adopted for use in 1985-1986 operational season to include VOR, DME, RNAV, IFF and OMEGA systems. Field tests to be conducted 6/85-9/85.</p>	<p>Bureau of Reclamation Scientific Advisors and Project Director, Royal Moroccan Air Force</p>	<p>Equipment to be available for use 10/85 - 12/85.</p>
<p>3 D. Change in the Base of Aircraft Operations</p> <p>Royal Moroccan Air Force will base project aircraft at Casablanca Anfa Airport.</p>	<p>Project Director, Royal Moroccan Air Force</p>	<p>Royal Moroccan Air Force representatives agreed to this change on 6/18/85.</p>
<p>3 E. Ground Generator Network</p> <p>The Bureau of Reclamation will prepare a design for the field testing of ground generators. The Royal Moroccan Air Force will buy ground generators and seeding material.</p>	<p>Bureau of Reclamation and Royal Moroccan Air Force</p>	<p>Ground generators will be tested in the 1985-1986 season.</p>
<p>3 F. Seeding Material Change</p> <p>Bureau of Reclamation has recommended a change of seeding material.</p>	<p>Royal Moroccan Air Force</p>	<p>Recommended seeding will be purchased after current supplies are used.</p>

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8. Continued

A. List of Actions	B. Officer Responsible For Action	C. Date Action To Be Completed
<p>3 G. Radar Operations</p> <p>The Government of Morocco wishes to move the weather radar inside the Khoribga air terminal. AID will require a release form waiving any claims for damage from movement of the radar to be signed by Director, National Meteorological Organization.</p>	<p>Bureau of Reclamation; AID Regional Legal Advisor; and Director, National Meteorological Organization</p>	<p>Following review of documents prepared by Bureau of Reclamation and AID a decision will be made.</p>
<p>3 H. Rotation of Operations Directors</p> <p>Operations directors will serve at Khoribga on a rotational basis.</p>	<p>Resident Scientific Advisor and Director, National Meteorological Organization</p>	<p>Upon receipt of staffing chart to be developed by Resident Scientific Advisor the Director will review the needs for rotational assignments. To be completed 9/85.</p>
<p>4. Cloud Physics Aircraft Data Collection Program</p> <p>Changes will be made in the aircraft basing, clearance process and navigational systems.</p>	<p>Bureau of Reclamation and Project Director, Royal Moroccan Air Force</p>	<p>Changes to be prior to start of 1986 cloud physics data collection program.</p>

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B. Continued

A. List of Actions	B. Officer Responsible For Action	C. Date Action To Be Completed
5 A. Selection of Computers	Bureau of Reclamation and Director, National Meteorological Organization	Recommended change adopted by Mission on 6/11/85 and Project Steering Committee on 6/12/85.
Project to procure 5 micro-computers rather than 1 minicomputer for data analysis.		
5. B Participation of Moroccan Scientists in International Meetings	Bureau of Reclamation and Director, National Meteorological Organization	Proposal to broaden training program adopted by Mission on 6/11/85 and Project Steering Committee on 6/12/85. The Bureau of Reclamation will provide a detailed training plan for review by 10/85.
The project will broaden the scope of training elements in the project to place a greater emphasis on seminars.		
6. English Language Training	AID Project Manager and Resident Scientific Advisor	AID Project Manager and Resident Scientific Advisor to discuss changes in approach with Director of Peace Corps before new volunteer(s) assigned.
Classes to be better coordinated with program operations. More intensive training to be obtained from American Language Center.		

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8. Continued

A. List of Actions	B. Officer Responsible For Action	C. Date Action To Be Completed
<p>7. Logistical Support for Program</p> <p>Project implementation suffers from inadequate housing for personnel and vehicles to support operations.</p>	<p>Director, National Meteorological Organization</p>	<p>Government of Morocco will continue its efforts to address these problems.</p>
<p>8. Bridge Funding</p> <p>Implementation of project has proceeded ahead of of schedule, creating a need for additional FY 1985 funds for a Project Amendment to fund a PASA Amendment with Bureau of Reclamation.</p>	<p>Mission Program Officer; Mission Project Officer and AID Scientific Advisor</p>	<p>Mission to determine availability of funds. If available, the Mission and AID/W will process Project Amendment and PASA Amendment.</p>
<p>9. Review of Contracts</p> <p>While recognizing that the Bureau of Reclamation will continue to serve AID's procurement agent, all future annual work and procurement plans will be examined by AID and the Government of Morocco to determine which items either party wishes to review.</p>	<p>Bureau of Reclamation; Mission Project Officer; Director, National Meteorological Organization and Project Director, Royal Moroccan Air Force</p>	<p>Mission and Government of Morocco will identify all items to be reviewed during examination of annual work and procurement plans.</p>

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PROJECT EVALUATION SUMMARY (PES) - PART II

Winter Snowpack Augmentation Project (608-0190)

13. Summary

The Winter Snowpack Augmentation Project is designed to increase the manageable water resources in Morocco through implementation of a scientifically based weather modification project on a demonstration basis. The project is designed to develop within the Government of Morocco an ability to design, plan, implement, monitor and evaluate scientifically based weather modification programs. It should be emphasized that this project seeks to present weather modification as one or a variety of techniques which can be used in a national program of water resources management.

Project implementation is presently in advance of the schedule established in the Project Agreement. This situation is due to both the extremely high level of support being provided to the project by the Government of Morocco and the high quality of the technical assistance and procurement program being administered by the Bureau of Reclamation. Major accomplishments during the first year of the project include:

- Procurement, shipment and installation of all major equipment required for the project;
- Development of an interdisciplinary and interagency project team;
- Successful initiation of cloud seeding activities in the project area.

The primary problems encountered during project implementation concern a range of logistical issues. These include:

- Problems in assignment of Moroccan personnel to field sites due to inadequate housing;
- Problems in operations due to an inadequate number of vehicles being available for Moroccan personnel;
- Problems with the operation of ground and aircraft based navigational systems which affected both seeding operations and the cloud physics data collection program; and
- Problems with the flight capabilities of seeding aircraft and availability of pilots.

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14. Evaluation Methodology

An interdisciplinary team of three senior American scientists with expertise in weather modification and water resources management prepared a routine evaluation as planned in the Project Paper during April and May, 1985. Preparation of the assessment was conducted in three phases which included: (a) review of project documents, (b) interviews and discussions with representatives of AID, Bureau of Reclamation and contractors in the United States and (c) interviews and discussions with AID, Bureau of Reclamation, Government of Morocco and project funded contractors in Morocco. The evaluation closely followed the scope of work for project assessment provided in the Project Paper.

15. External Factors

Implementation of the project has been influenced by both general conditions in the Moroccan economy and requirements for Royal Moroccan Air Force personnel created by military activities in the southern portion of Morocco. Project implementation has been affected through the reduced ability of the Government of Morocco to provide either local currency and/or foreign currency to meet project costs for housing, vehicles and selected equipment. It should be noted that all foreign currency costs associated with actual cloud seeding operations are to be funded by the Government of Morocco under the terms of the Project Agreement. On a limited number of occasions Royal Moroccan Air Force personnel and equipment have not been available due to higher demands created by operations being conducted in southern Morocco. It is not believed by either the External Evaluation Team or the AID Mission that these problems will significantly alter the probability of successful project implementation.

16. Inputs

During the first year of project implementation the following inputs have been made to the project:

Government of Morocco

- . Complete renovation of the air terminal at Khoribga;
- . Provision of improved offices and facilities for project operations;
- . Assignment of personnel from both the National Meteorological Organization and Royal Moroccan Air Force to the project;

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- . Assignment of personnel for short-term training in the United States and Morocco.

A.I.D. and Bureau of Reclamation

- . Procurement, shipment and installation of major pieces of scientific equipment in Morocco (weather radar, rawinsonde, etc.);
- . Provision of technical assistance on a long-term basis through the assignment of a Resident Scientific Advisor to Morocco and a wide range of short-term assistance;
- . Provision of short-term training programs for Moroccan personnel in both the United States and Morocco;
- . The initiation of a series of scientific studies to support scientifically based weather modification, including the first season of data collection using a cloud physics aircraft.

National Oceanographic and Atmospheric Administration

- . Provision of advanced weather satellite equipment and associated training.

Peace Corps

- . Provision of 2 Peace Corps Volunteers to the National Meteorological Organization to teach scientific and technical English.

17. Outputs

Major project outputs have included:

- . Development of a significantly improved capability within the National Meteorological Organization to observe and forecast weather in Morocco due to the provision of advanced weather monitoring equipment and training provided by AID and NOAA;
- . Development of an improved understanding of the objectives and techniques used in scientifically based programs of weather modification through both training and operational experience;
- . The successful conduct of a series of controlled cloud seeding operations in the project area;

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- . Development of improved capabilities in logistical management of weather modification operations and in the maintenance of electronic equipment;
- . Development of an interdisciplinary and interagency project team.

18. Purpose

As stated in the Project Paper, the purpose of the project is "to increase the manageable water resources in Morocco through implementation of a scientifically based weather modification project on a demonstration basis. It is anticipated that the project will increase precipitation in the project area by 10 percent on an annual basis. The project will also improve the availability of water to users by allowing for additional water to be stored in reservoirs and through increased groundwater storage."

On the basis of implementation progress made during the first year of the project, it is believed that the project will be successful in fulfilling its purpose. The successful conduct of a series of cloud seeding operations in the first year provides the basis for an expanded program in future years. It should be observed, however; that until the streamflow model is developed and tested during the second and third year of the project it will not be possible to measure amounts of precipitation and run-off attributable to the project.

19. Goal/Subgoal

As stated in the Project Paper, the goal of the project is "to develop within the Government of Morocco an ability to design, plan, implement, monitor and evaluate scientifically based weather modification programs. Weather modification programs will be developed as an integral part of overall management of water resources in Morocco. The project will support development of this capability through the transfer of technology, provision of technical assistance, execution of special analyses, provision of scientific equipment and training.

It is fully anticipated that this goal can be achieved during the course of project implementation. During the first year of the project the Government of Morocco has made major advances which fully support achievement of these goals, these include the significant improvement in the ability to: (a) observe and forecast weather in Morocco due to the provision of advanced weather monitoring equipment and training; (b) to understand the objectives and techniques used in scientifically based programs of weather modification through both training and operational experience; and

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(c) the development of an interdisciplinary and interagency project team.

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20. Beneficiaries

A. Primary: It is too early in the implementation of the project to assess impacts in the project area due to an increase in available water resources. As noted before, until the streamflow model is developed and tested during the second and third year of the project it will not be possible to measure amounts of precipitation and run-off attributable to the project.

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B. Secondary: The first year of project implementation has had significant impact on the capabilities of the Government of Morocco to: (a) observe and forecast weather in Morocco due to the provision of advanced weather monitoring equipment and training and (b) to understand the objectives and techniques used in scientifically based programs of weather modification through both training and operational experience.

21. Unplanned Effects

Implementation of the project to date has not resulted in any unplanned effects.

22. Lessons Learned

To date, two significant lessons have been learned through project implementation:

- . Implementation of scientifically complex projects requires, an understanding by all participating organizations, that such projects require substantial time to collect data in order to verify impacts from interventions such as weather modification;
- . The major constraint to the implementation of scientifically based weather modification projects is the provision and coordination of appropriate logistical support.

23. Special Comments or Remarks

Attachment A. Changnon, Stanley A., Jr.; Rose, R. Lynn and Warburton, Joseph A. 1985. An Evaluation of the Winter Snowpack Augmentation Project in Morocco - April-May 1985. Prepared for the Bureau of Reclamation under Contract No. CR-81-06500. 46 pages.

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- Attachment B. Project Al Ghait/Winter Snowpack Augmentation Project, Project Steering Committee Meetings June 12 and 18, 1985, Review of Recommendations of the External Evaluation Team (Dated June 19, 1985). 15 pages.
- Attachment C. Winter Snowpack Augmentation Project (608-0190) - Review of External Evaluation Team Report (Dated June 10, 1985). 12 pages and 3 attachments.

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WINTER SNOWPACK AUGMENTATION
608-0190

USAID/RABAT

PROJECT DESCRIPTION: The project develops within the Government of Morocco an ability to design, plan, implement, monitor and evaluate scientifically based weather modification programs, as an integral part of overall management of water resources in Morocco. The project accomplishes this through technology transfer, technical assistance, execution of special analyses, provision of scientific equipment, and training.

AUTHORIZATION DATE AND U.S. LOP FUNDING AMOUNT April 4, 1984 \$6.0 M	PES NUMBER 68-85-05	PES DATE Nov. 27, 1985	PES TYPE <input checked="" type="checkbox"/> Regular <input type="checkbox"/> Other (Specify) <input type="checkbox"/> Special <input type="checkbox"/> Terminal
ABSTRACT PREPARED BY, DATE Samir Zoghby Nov. 15, 1985 Steve Lintner, ANE/PD/ENV John Giusti, Evaluation Officer	ABSTRACT CLEARED BY, DATE Robert C. Chase Mission Director		

A 2-week project evaluation by a 3-person external review team was conducted in April 1985 to assess the progress and problems and to develop recommendations needed to improve the scientific, technical and institutional aspects of this 5-year demonstration project.

The project's goal is to develop and use a scientifically-based weather modification project to improve Moroccan water supplies. The purpose is to develop capabilities within the Government of Morocco to design and execute a scientifically-based weather modification program in Morocco.

After one year of implementation, the project is revealing excellent progress. The U.S. equipment installations, staffing, and training are on schedule, and Moroccan commitments of facilities, equipment and staffing have largely been fulfilled. Field operations including cloud seeding missions on 16 days were accomplished in the winter-spring seasons of 1984-85. These operations have served as an excellent shakedown and training period, and have yielded badly needed weather data sets (radar, satellite, and aircraft) for planning future operations and the scientific research which is just beginning in the U.S. and Morocco. Progress in training and technology transfer is on-schedule with rapid learning by well-trained and highly motivated Moroccan meteorologists and technicians. In addition to its excellent progress, the supporting agencies are still committed to the project, and the project management bodies and individuals are reasonably well organized.

The major problems encountered in the first year were (a) difficulties in coordinating field operations, and (b) inadequacies of the cloud seeding system. The major field activities were located and operated at four widely scattered sites. Poor communications between sites led to inferior operations during many precipitation periods and kept project personnel from all important interactions needed for learning and planning. The cloud seeding was accomplished by Moroccan Air Force aircraft that for various technical reasons were limited for long-period and night operations.

Major recommendations of the evaluation include:

- Consolidate operations by locating project aircraft at Casablanca, and by performing numerous other site actions to improve communications, training, maintenance, and general coordination.
- Do airborne seeding with aircraft capable of all weather flight conditions; provide for installation of special meteorological systems on 2 aircraft; train at least 2 pilots in cloud seeding techniques; and initiate data collection and studies by U.S. scientists to develop, install, and test a ground-based cloud seeding system in the mountains to supplement the aircraft seeding.