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ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR AFRICA

THROUGH: AFR/DP, H. J. Nissenbaum

HJN

3/20/68

FROM: AFR/NA, Willard H. McInerney

W. McInerney

Attached for your review is a Non-Capital Project Paper for a seven-year, \$870,000 program of assistance to the Ministry of Agriculture of the Government of Morocco. An IAD for \$141,000 to fund FY 1968 needs is also attached.

Problem: During recent years average annual cereals production in Morocco has remained at about 1,230,000 metric tons, while the population has increased by 3.2 percent annually. This has resulted in Morocco becoming a net deficit country in cereals. In 1964, a "normal" year, Morocco imported 272,000 MT's, although a net surplus of 240,000 MT's occurred in 1960. The drought for the past two years has further aggravated the cereals shortage, raising Morocco's import requirement to 820,000 MT's for CY 1968. This project aims at eliminating fundamental weaknesses in the methods of cereals production; its target is to raise the average annual output to about 1,830,000 MT's by 1974 -- an increase of about 600,000 MT's, or almost 50 percent of the production levels of recent years.

Discussion: The strategy to be used in realizing the production goal draws from successful programs in Turkey, Mexico, Pakistan, and India. Basically, the project seeks to increase the yield per hectare by combining better and increased use of fertilizers, seed varieties, tillage methods and agricultural credit with the teaching of farmers by extension demonstrations and formal training of agronomists.

The project is very important in Morocco's development effort. Agriculture is the number one priority in the Government's development plans and cereals production covers about 90 percent of all cultivated land in Morocco. Recent studies by the IBRD (1964) and the Stanford Research Institute (1965 and 1967) gave high priority to food production in relation to other investments available to Morocco. The SRI study specifically recommended that the most efficient investment in agriculture would be in the improvement of dryland crops production (principally cereals) and of agricultural irrigation perimeters already under development. This would yield greater returns, sooner, and at less cost.

ATC-012

This project will be coordinated with a regional project to provide specialized research and training assistance in seed improvement. Negotiations are in process with CIMMYT, the Rockefeller-sponsored

BEST AVAILABLE DOCUMENT



**NON-CAPITAL PROJECT PAPER**

**PART I. SUMMARY**

**Country:** Morocco

**Project Title:** Increase in Cereals Production

**U.S. Obligation Span:** FY 1968 through FY 1974

**Physical Implementation Span:** FY 1968 through FY 1974

**Gross-Life-of-Project Financial Requirements:**

<b>U.S. Dollars (B)</b>	
Country Funds . . . . .	\$ 870,000
Regional Funds . . . . .	414,000
<b>U.S. Owned or Controlled</b>	
Local Currency . . . . .	33,480,000
COM Cash Contribution . . . .	<u>37,500,000</u>
<b>Total</b>	<b>\$78,273,000*</b>

This bilateral project will be coordinated with a regional wheat improvement project in North Africa. The regional project will provide certain technical, material, and training assistance. As noted on page 8 of this paper, A.I.D. is now negotiating for specialized technical assistance for the Rockefeller Foundation, sponsor of the International Center for Corn and Wheat Improvement (CIMMYT) in Mexico. If this assistance is not available through CIMMYT, then A.I.D. will contract for it with a university or other qualified source.

In this paper, the figure for the specialized research assistance is based on our estimate of the cost of such assistance for Morocco alone, regardless of whether it is furnished by CIMMYT or another contractor. The cost for Morocco alone--\$414,000--is now included in the cost of the regional project.\*\* The cost of the regional project will be \$538,000 for five years, and will cover Tunisia, as well as Morocco. All or a portion of this may be financed by Ford or Rockefeller Foundations. To the extent that it is not, funds will be separately requested for the regional project.

\* Separate additional Peace Corps contribution \$1,480,000  
 The Peace Corps completed training for 35 volunteers in January, 1968, and they are expected to arrive in Morocco by February 1. The volunteers will be assigned to Moroccan agricultural extension units.

\*\* Although it is included in the tables showing total contributions to this project, funds for it are not now being requested.

## I. SUMMARY DESCRIPTION

The purpose of this project is to increase the annual production of wheat in Morocco by 50 percent by FY 1974. The present production of wheat in a normal year averages 1,230,000 MT's. The project is intended to achieve gradual annual production increases to reach a target production of approximately 1,830,000 MT's by FY 1974. It is expected that this project will result in significantly decreasing Morocco's dependence on wheat imports by 1974, when the project will be terminated.

Recent studies by the IBRD (1964) and the Stanford Research Institute (SRI) in 1965 recommended that Morocco give high priority to food production over the next several years. This project is consistent with these recommendations and is responsive to the SRI finding that the most efficient investment in agriculture in Morocco would be improvement of dryland crops production (principally cereals) and of agricultural irrigation perimeters already under development.

A team from the Tennessee Valley Authority (TVA) conducted a study in 1966 of fertilizer and other agronomic requirements for a comprehensive program to increase wheat production. 1/ Their findings indicate that Morocco could profit greatly from the use of fertilizers particularly when combined with good agronomic practices and improved seed. Their recommendations form the basis of this proposed project. SRI, in an analysis of specific agriculture investment possibilities completed in October 1967, confirms TVA's and their own earlier conclusions, and recommends investment in dryland farming as the top priority for additional U.S. investment in Moroccan agriculture. 2/

The principal elements required to bring about the substantial increases in wheat production shown in Table I are:

- A. Increased use of fertilizers;
- B. Introduction or development of high-yielding varieties;
- C. Expansion of production and use of high quality seed;
- 1/ D. Training of Moroccan wheat scientists;
- E. Training farmers through an agricultural extension program to use the improved production technology and better seeds; and
- F. Expansion of the agricultural credit program at the local level.

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1/Tennessee Valley Authority: Morocco: Role of Fertilizer in Agricultural Development, 1967.

2/Stanford Research Institute: Analysis of Selected Programs.

An indication of the GOM's self-help efforts is reflected in its rapid and positive response to the recommendations of the first TVA team. In July 1966, this team developed guidelines for an immediate program of wheat fertilization. The following month the GOM launched "Operation Engrais" based on the recommendations of the TVA team, research data from the GOM agriculture research center and demonstration results from the FAO. The GOM is firmly committed to this action program which will serve as a starting point for the Cereals Production Project. "Operation Engrais" in 1966-67 concentrated on the timely delivery and application of chemical fertilizers on 180,000 hectares of the better wheat lands in Morocco; whereas the proposed long-range project will emphasize not only the use of fertilizer to maximum advantage but also the introduction of improved wheat varieties, more productive cultural practices, and expanded credit facilities. The target area for "Operation Engrais" in 1967-68 is 335,000 hectares.

Success of the project will require expertise in the areas of fertilizers, agronomy, extension methods, extension information, agricultural credit, varietal improvement and seed multiplication.

## II. SETTING

Agriculture contributes about 30 percent of the GNP of Morocco which was valued at \$2.6 billion in 1965. Nearly 70 percent of Morocco's 13.5 million people are directly dependent on agriculture for their livelihood. Wheat and barley occupy about 70 percent of all seeded land and have a combined value averaging \$150 million annually. Cereals occupy more than 90 percent of the cultivated land area, but because of low yields, contribute less than 25 percent of the value of total crops. The average annual yields have ranged from 2 to 9 quintals per hectare, (4.5 to 13.5 bushels per acre) and Morocco ranks 54th among 80 countries for which yield records are available.

Average annual cereal production has remained almost stagnant in recent years although there are wide fluctuations depending upon the weather (from 0.61 to 1.31 million tons for wheat production, for example). At the same time, the population has increased at the rate of 3.2 percent annually, causing Morocco to change from net exporter to net importer of cereals. The SRI Report of 1965 indicated that Morocco showed a net surplus of cereals in 1960 of 240,000 MT and a net deficit in 1964 of 272,000 MT. A projected deficit of from 340,000 to 800,000 MT by 1970 was predicted if production rates do not change appreciably and population growth continues at the current rate. Bread and other cereal products make up at least 50 percent of the national diet.

Among measures recommended by the TVA team to improve wheat yields significantly, fertilization and good seed bed preparation are given first attention because these practices have the potential for immediate

impact and lie within the capabilities of the existing infrastructure. In order to attain any significant increase in yield per unit of area, wheat crops in Morocco must be fertilized. Most soils are depleted of N and P due to the long history of crop production with virtually complete removal of straw and grain from the land.

Fertilizer studies by the FAO and the Agronomic Research Institute indicate that in the areas of better rainfall, fertilizers give good returns in most years.

### III. STRATEGY

Successful wheat improvement projects in other countries have certain common features. These can be summarized as follows:

- A. Applied research to develop and introduce high-yielding varieties;
- B. Improvement of production technology; use of fertilizers, better tillage methods, weed control, pure seed, etc.;
- C. A broad extension demonstration program to teach farmers the new technology;
- D. An adequate credit program to enable farmers to procure the needed production inputs; and
- E. Comprehensive training of cereal agronomists to enable them to carry out on a continuing basis an applied research program to develop new varieties, to cope with plant disease and pests, and to refine and improve the new wheat production technology.

In our view, there is no alternative to the above strategy to achieve an increase in wheat production of 600,000 tons by 1974. It is the same strategy that worked so remarkably well in Mexico and is currently being followed with outstanding success in Turkey, Pakistan and India.

### IV. PLANNED TARGETS AND RESULTS

The project will concentrate on wheat in those areas receiving 350 mm or more rainfall annually. Within this area the wheat improvement program will reach all modern farms and those traditional farms with 10 or more cultivated hectares, for a total of 590,000 hectares. There is already close contact between government agricultural representatives and many of the farms in the modern sector, largely farms which were formerly owned by colons. Thus, the main effort of the agricultural extension program to improve cropping practices and follow fertilizer recommendations must be directed toward traditional farms in the project area.

Traditional farmers with less than 10 hectares would not be excluded from the program if they wish to participate but the major efforts will be on farms with more than 10 hectares. The project will start with the 335,000 hectares planned for "Operation Engrais" in 1967-68. The area receiving fertilizer, improved seed, and improved tillage practices will be expanded year by year and will reach 590,000 hectares by 1973-74.

The project is expected to result in an increase in annual wheat production of about 600,000 tons by 1974.

Improved production levels for other crops such as barley, corn, and forages are also expected through the general improvement of farming practices, even though these crops will not be directly involved in this project.

Below are estimates of the increases in wheat yields to be achieved during the period FY 1968 to FY 1974.

Table I  
CEREALS PRODUCTION PROGRAM <sup>1/</sup>  
(Estimates of Yield and Value Increases)

Fiscal Year	Hectares to be fertilized	Total yield Increase (MT)	Increased Yield Per Hectare (MT)	Cost of Fertilizer Per Hectare \$ <sup>2/</sup>	Increased Yield Per Hectare \$ <sup>3/</sup>	Average Gain Per Hectare \$
1968	335,000	128,600	0.367	11.08	25.72	14.64
1969	350,000	171,800	0.429	11.51	30.06	18.55
1970	400,000	200,000	0.434	11.82	30.46	18.63
1971	460,000	226,400	0.439	12.10	31.07	18.97
1972	510,000	260,000	0.464	12.37	32.52	20.15
1973	560,000	526,900	0.893	23.97	62.52	38.54
1974	600,000	605,700	0.963	25.56	67.25	41.69

<sup>1/</sup> Based on data in TVA report, Morocco: Role of Fertilizer in Agriculture Development, 1967, p. 185.

<sup>2/</sup> Cost of fertilizer based on \$260/MT for N and \$180/MT for P<sub>2</sub>O<sub>5</sub> + K<sub>2</sub>O.

<sup>3/</sup> Value of increase based on \$70/MT for wheat (1955-65 average for soft wheat).

## V. COURSE OF ACTION

### A. Responsible Offices and Services

This project will depend primarily on the Agricultural Development Division (DMV) and the National Agronomic Research Institute (INRA) of the Ministry of Agriculture for direction and implementation, with close USAID assistance. Improved seed, produced by private farmers on GOM lands under the control and supervision of INRA, will be made available to participating farmers through the existing government outlets (SOCAM's). The GOM will also make available fertilizers and make recommendations on their use. The DMV will be responsible for the extension of these recommendations to the farmers. The Ministry of Interior will coordinate activities on the local level in cooperation with the Ministry of Agriculture. Basic credit for implementation of the project will be channeled through the National Bank for Agricultural Credit (CNCA). The provincial credit societies will provide credit-in-kind to participating farmers. Credit institutions will thus also play an important role in this project.

### B. Required Inputs

The inputs required over the length of this program will be in the form of: (1) personnel -- 5 direct-hire American technicians and 2 experts on contract or under a PASA with the U.S. Department of Agriculture, 40 Peace Corps Volunteers, 8 GOM extension specialists, 54 GOM extension agents, 9 GOM research specialists, and 16 GOM research aides; (2) commodities -- vehicles, audio visual van, training aids (including television sets and audio visual equipment, fertilizer and small farm implements; (3) improved varieties of wheat; (4) seed multiplication; (5) participant training; and (6) provision for agricultural credit.

### C. Personnel

The U.S. will provide technical assistance as shown in Table 2 which follows. The present USAID Agronomist (seed improvement) will be the U.S. project leader. In addition to overall responsibility for U.S. participation in the project, he, together with the research specialists, will train Moroccan technicians in varietal improvement and will assist and advise in expanding facilities for seed multiplication and processing.

Table 2

U.S. PERSONNEL REQUIREMENTS

<u>USAID Direct-Hire</u>	<u>FY 68</u>	<u>FY 69</u>	<u>FY 70</u>	<u>FY 71</u>	<u>FY 72</u>	<u>FY 73</u>	<u>FY 74</u>
Agronomist (Seed Improvement)	1	-	-	-	-	-	1
Agronomist (Extension)	1	-	-	-	-	-	1
Extension Advisor (Information)	1	-	-	-	-	-	1
Agronomist (Fer- tilizer Specialist)	1	-	-	-	-	-	1
Extension Advisor (Training)	1	-	-	-	-	-	1
<u>Research (Contract or PASA*</u>							
Cereal Breeding Specialist	1	-	-	-	-	-	1
Cereal Production Specialist	1	-	-	-	-	-	1
<u>Peace Corps</u>							
PCV's (Agriculture oriented)	40	-	-	-	-	-	40

\* Regional funded.

At the end of each year of project operation, the USAID and the GOM will review the progress of the project and staffing requirements for future years can then be determined. An earlier phase-out of some U.S. technicians, as GOM capabilities develop, is feasible but would be impossible to plan at this stage of the project. However, it is likely that additional U.S. staffing (not to exceed recommendations in the TVA report) will be required as the project develops. This will be dependent on GOM staffing increases and the success of the PCV program.

Of the five direct-hire technicians required, four are currently on board and assigned to the respective services of the Ministry of Agriculture which will be responsible for implementing the project. An Agronomist (Fertilizer Specialist) experienced in the role of a fertilizer extension specialist will need to be recruited. Two direct-hire local assistants will also be needed in FY 1968 and four from FY 1969-1974.

Research assistance to develop high yielding wheat varieties and to train wheat scientists will be required. Preferably this assistance would be provided by the International Center for Corn and Wheat Improvement (CIMMYT), Mexico City, under a contract with AID. Should it be impossible to develop a contract with CIMMYT or a U.S. land grant college, a PASA with the U.S. Department of Agriculture is a possible alternate source of research assistance. AID/W expects, however, that a contract will be negotiated with CIMMYT providing for two agronomists. Initially, one man will be stationed in Tunisia, but will be available for work in Morocco as well. In addition to two full-time specialists the contractor would provide short term consultants as needed.

Moroccan wheat agronomists would receive special training in wheat improvement at CIMMYT in Mexico City. This Center, established under auspices of the Rockefeller Foundation, is recognized as an outstanding institution for training specialists in all aspects of wheat production.

One Peace Corps Volunteer will be assigned to each of the 40 key Worker Centers involved in the cereals program to work with the GOM agricultural extension service. Most PCV's will have had agricultural experience and all will receive intensive training in agriculture extension methods. The volunteers will work with USAID technicians and will be provided with GOM counterparts. In addition to working with farmers, the PCV's and their counterparts will supervise demonstrations of improved wheat production practices on land operated by the Work Centers.

The GOM personnel requirements are given in detail in Table 3 below.

Table 3

GOM PERSONNEL REQUIREMENTS

<u>RESEARCH:</u>	<u>On</u>							
	<u>Hand</u>	<u>FY 68</u>	<u>FY 69</u>	<u>FY 70</u>	<u>FY 71</u>	<u>FY 72</u>	<u>FY 73</u>	<u>FY 74</u>
<u>Specialists</u>								
Cereal Breeding	1	2	3	3	3	3	3	3
Cereal Production	0	0	1	1	1	2	2	2
Soil Fertility	1	3	3	3	4	4	4	4
Land Management	0	0	0	1	1	1	1	1
Soil Testing	2	2	2	2	3	3	3	3

	<u>On</u> <u>Hand</u>	<u>FY 68</u>	<u>FY 69</u>	<u>FY 70</u>	<u>FY 71</u>	<u>FY 72</u>	<u>FY 73</u>	<u>FY 74</u>
Technical Aides	<u>8</u>	<u>14</u>	<u>18</u>	<u>19</u>	<u>-</u>	<u>23</u>	<u>24</u>	<u>24</u>
Sub-total	12	21	27	29	35	37	37	37
<u>EXTENSION:</u>								
<u>Specialists</u>								
Fertilizer Use	0	1	1	1	2	3	3	3
Cereals Agronomist	0	1	1	1	2	3	3	3
Information (Audio Visual)	0	1	1	1	1	2	2	2
CT Agents <sup>1/</sup>	366	366	366	376	393	420	420	420
CMV Agents <sup>2/</sup>	<u>220</u>	<u>220</u>	<u>220</u>	<u>220</u>	<u>220</u>	<u>220</u>	<u>220</u>	<u>220</u>
Sub-total	586	589	589	599	618	648	648	648
<u>SEED</u>								
<u>MULTIPLICATION:</u>								
Phytopathologist	0	0	0	0	0	0	1	1
Lab Technician	0	0	0	0	0	0	2	2
Field Inspectors	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>6</u>	<u>6</u>	<u>8</u>
Sub-total	4	4	4	4	4	6	9	11
GRAND TOTAL	<u>602</u>	<u>614</u>	<u>620</u>	<u>632</u>	<u>657</u>	<u>691</u>	<u>694</u>	<u>696</u>

1/ Agents at Work Centers (dryland).

2/ Agents at Land Development Centers (irrigated lands).

The GOM will recruit the additional professional level staff from the graduates of the Agricultural School at Meknes and from those students now undertaking degree level study abroad, largely in France. Review of the number in each category indicates that adequate personnel will definitely be available for recruitment to meet the specific needs of this project.

#### D. Activities

Extension. Success of this program, to a great extent, will depend on the ability of the GOM to demonstrate and to convince farmers that cereals production can be profitably increased through the application of fertilizers and the use of modern farming techniques.

A great deal of good research on fertilizer requirements and management practices has been done by the National Agronomic Research Institute. However, much of the research has been carried out on experiment stations, under cultural conditions different from those existing on individual farms. More applied research on farmers fields are urgently needed. Moreover, the results have generally not been adequately demonstrated or made available to farmers through agricultural extension.

The USAID has demonstrated in the Forage Project that extension methods can be used effectively in Morocco when employed in an economically and technically sound action program. The extension program will emphasize result demonstrations employing the "package of inputs" concept. These demonstrations will be installed on lands of traditional farmers and will include fertilizers, better land preparation, improved seed and use of a mechanical drill for seeding.

The USAID direct-hire Extension Training and Information Advisors, now funded under the Forage Development for Animal Production Project, will be assigned to this project and will devote full time to the in-service training of local agents, as well as providing technical backstopping. This will include the preparation of movies for television broadcasts, instruction pamphlets, and all other modern communications media material necessary for a complete agriculture extension analysis and preparation of extension information from data supplied by the research service (INRA).

Improved Varieties and Pure Seed Production. The development of high-yielding wheat varieties which will efficiently utilize high levels of fertility is a major target of this project. In order to attain the projected production levels by 1974, it will be necessary to have available sufficient seed of such improved varieties to plant the entire fertilized hectareage. These varieties will not be available before 1971-1972. A limited program toward this goal has already been initiated. Seed of 50 varieties which have done well in Mexico, Pakistan, and India has been obtained by USAID from the International Center for Maize and Wheat Improvement in Mexico City.

Initially, the project will accelerate production of seed of the best of the varieties now available in Morocco. It is anticipated that after three years of testing at least two or three will prove distinctly superior to local varieties and merit the importation of a substantial tonnage to initiate a seed multiplication program. Testing of the most promising Mexican as well as Italian and Moroccan varieties will be carried out by INRA in all the major soil and climatic zones and will continue throughout the life of the project.

Although expansion of the acreage in seed multiplication farms will be required, the USAID and GCM anticipate that this could be done rather easily. Recuperated lands now controlled by the GCM would be logical

sites for new seed farms. Several U.S. seed companies and other commercial agricultural interests are exploring the possibility of participating in a seed production enterprise in Morocco.

The seed multiplication and control section of the National Agronomic Research Institute has eleven staff members who have participated in a USAID-sponsored short course in seed production in the U.S.A. One participant will complete his degree training in seed technology at Mississippi State University in February 1968 and will return to take charge of a seed multiplication farm and seed processing plant, furnished by USAID, at Merchouch. This seed processing plant, expected to be in operation in FY 1968, is designed for the preparation of foundation seed as well as for training and demonstration purposes and is not intended to process seed on a commercial scale.

The present capacity for certified seed processing is in excess of 30,000 MT, which will meet seed requirements through FY 1968. The GOM will need to add two field inspectors in FY 1972, two lab technologists and a plant pathologist in FY 1973, and two additional field inspectors in FY 1974 to their seed multiplication staff to handle the increased production of certified seed.

Fertilizer. The total requirement for fertilizer for this program is dependent on rainfall, farming methods and varieties. Based on the TVA recommendations, total requirements in terms of plant nutrients are shown in Table 4 for each year of the project. Although the fertilizer facilities at Safi, Berrechid and Casablanca have an estimated annual capacity of 57,000 MT of N, contrasted to a maximum requirement of 34,000 MT of N for 1973-74, all of this production at present is in the form of diammonium phosphate which is not satisfactory for top dressing of wheat.

The requirements for nitrogen fertilizer for top dressing will be met through importation of ammonium sulfate or urea for at least the first two years of the project. A.I.D. is now considering a possible Development Loan for the expansion of the Safi facilities which would then have the capacity to produce ammonium sulfate from imported nitrogen in quantities sufficient for the needs of the program. Facilities at Berrechid for potash production will be sufficient to supply the needs of the program until the introduction of improved varieties. The increased nutritional needs of these varieties will require importation of potash at that time unless the facilities at Berrechid can be expanded. Annual phosphate production is far in excess of anticipated needs throughout the duration of the project.

In addition to the separate Development Loan for the Safi facilities, A.I.D. is considering an Agricultural Sector Loan which could cover importation of fertilizers in addition to other agricultural commodities. The GOM fully recognizes the priority to be given fertilizer and is

prepared to continue to allocate foreign exchange for the importation of required fertilizers for the project, as it has done in 1966 and 1967, should the proposed loans and other developments not materialize.

Table 4  
ANNUAL FERTILIZER NEEDS <sup>1/</sup>  
(Metric Tons)

Nutrients	FISCAL YEAR						
	1968	1969	1970	1971	1972	1973	1974
N (at planting)	4,300	5,050	5,800	6,540	7,300	11,180	11,800
N (top dressing)	4,100	4,960	5,800	6,650	7,509	19,420	20,600
P <sub>2</sub> O <sub>5</sub>	12,100	14,300	16,400	18,440	20,600	22,680	24,000
K <sub>2</sub> O		480	900	1,140	1,400	21,520	21,890

<sup>1/</sup> The fertilizers used to supply most of these nutrients will be of various formulae, making it difficult to express needs in terms of fertilizer, rather than in terms of nutrients. Nitrogen for top dressing will be in the form of ammonium sulfate or urea.

Table 5  
IMPORTATION REQUIREMENTS AND COSTS OF FERTILIZER  
(In 000 MT's of fertilizer & \$000) <sup>1/</sup>

Year	Fertilizer (N) <sup>2/</sup>	Cost	Fertilizer (K <sub>2</sub> O) <sup>3/</sup>	Cost
67/68	19.5	1,170	-	-
68/69	23.6	1,416	-	-
69/70	27.6	1,656	-	-
70/71	31.7	1,902	-	-
71/72	35.7	2,142	-	-
72/73	92.4	5,544	32.3 <sup>4/</sup>	2,422
73/74	98.0	5,880	33.0	2,475
Totals	328.5	19,710	65.3	4,897

<sup>1/</sup> Cost based on \$60/MT for ammonium sulfate and \$75/MT for potash.

<sup>2/</sup> Nitrogen fertilizer as ammonium sulfate for top dressing.

<sup>3/</sup> Capacity of 3,600 tons annually at SMEP will satisfy needs until 72/73.

<sup>4/</sup> New varieties will come into production in 1972. These will require potash and will be able to utilize greater amounts of nitrogen than current varieties.

Equipment. Initial U.S.-financed and manufactured commodities for the first year of the project will consist of: four vehicles, one audio visual van training aids for extension, and seed and fertilizer spreaders for demonstrations. In addition to the new van, an audio-visual van now used in the Forage Development Project will be assigned to this project. Anticipated commodity needs for the remaining years of the project will include only materials for training purposes.

In addition the above, there will be a requirement for locally purchased equipment in two basic categories: (1) small implements such as plows, harnesses, grain drills, animal-drawn spreaders, harrows, and hand operated seed/fertilizer spreaders; (2) television receivers, film, and related audio materials for use in the extension aspect of the program. These will be provided by the GOM from their own budget. The foreign exchange costs of this equipment will be covered from the proposed U.S. agriculture sector loan. They will be imported through commercial import channels and purchased locally by the GOM agencies concerned.

Training. Basic training courses will be established for all agricultural agents involved in the program. The courses to be conducted with USAID extension advisors will be intensive, lasting from three to five days and covering such subjects as land preparation, use of fertilizers, planting methods, top dressing, harvesting, extension techniques, etc. These courses will be held throughout the year at various points within the wheat areas according to the subject and the situation and will be phased into the crop cycle. All agents to be trained are already employed at provincial work centers and are assigned to the cereal production program.

Participant training is essential for the success of the program. Beginning in FY 1968 six Work Center Directors will participate each year in the TVA four-month course in fertilizer technology and use. In addition, each of the additional GOM research and extension specialists recruited under this project will receive their specialized training in 6-12 month assignments either in the U.S. or at the International Center for Maize and Wheat Improvement. There are no plans at present for degree training at either graduate or undergraduate level, although this might well be considered at a later date. Table 6 gives a schedule of participant training and costs.

Table 6

PARTICIPANT TRAINING SCHEDULE AND COSTS

	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>All Years</u>
CT & CMV Directors	6	6	6	6	6	6	4	40
<u>Specialists:</u>								
Cereal Breeding	1	1						2
Cereal Production		1			1			2
Soil Fertility	2			1				3
Land Management			1					1
Soil Testing				1				1
Fertilizer	1			1	1			3
Cereals Agronomist	1			1	1			3
Information	1				1			2
Phytopathologist						1		1
Laboratory Technicians						2		2
Total	12	8	7	10	10	9	4	60
Cost (\$000)	60	40	35	50	50	45	20	300

Agricultural Credit. Credit requirements for farmers to purchase fertilizers, seeds and other inputs for wheat production are based on the experience of "Operation Engrais" during the 1966-67 wheat campaign. Credit-in-kind totaled 25.3 million DH, reached 180,000 hectares, and included three basic expenditures: (1) fertilizer (12.5 million DH), (2) seeds (11.5 million DH), and (3) land preparation costs (1.3 million DH). It may be assumed that future expenditures will increase as the program expands because of increased mechanical tillage and especially with the availability of improved varieties which will require increased amounts of fertilizer. Table 7 gives USAID estimates of total hectareage, 1967-74, total credit requirements for the GOM agricultural credit revolving fund, and annual inputs required to keep the fund going.

U.S. credit support will be in the form of annual 104(f) loans or GOM allotments from local currency proceeds of PL 480 sales on dollar credits. There will be annual additions to the GOM revolving credit fund in order to provide credit for additional hectares brought into the program and for increased per hectare costs to the farmer resulting from application of increased amounts of fertilizer and increased mechanical tillage.

Table 7 assumes a per hectare cost of 160 DH in FY 1968 and FY 1969, 180 DH in 1970 and 1971, 200 DH in 1972, and 240 DH in 1973 and 1974. U.S.-owned or controlled local currency will be used for the total requirement in FY 1968 due to exceptional credit defaults as a result of the severe drought during 1966-67. U.S.-owned or controlled local currency inputs in subsequent years will cover the costs of the increased hectareage brought into the program each year. The GOM will contribute additional resources each year sufficient to offset any defaults by farmers, thus maintaining the revolving fund at the required level. The GOM inputs are calculated on the basis of an estimated 10% annual default rate. In addition to inputs to the revolving fund, the GOM is expected to spend approximately 40 DH per hectare for operation and maintenance of equipment. This amounts to an expenditure of 136,400,000 DH over the span of the project.

Table 7  
AGRICULTURAL CREDIT REVOLVING FUND REQUIREMENTS

Fiscal Year	Hectares	Required Fund Level (million DH)	Total	Annual Inputs (million DH)	
				GOM	US-owned or Controlled
1967	180,000	25.3	39.4	-	39.4
1968	335,000	54.1	40.0	-	40.0
1969	350,000	56.0	7.3	4.9	2.4
1970	400,000	72.0	21.6	5.6	16.0
1971	460,000	82.8	18.0	7.2	10.8
1972	510,000	102.0	27.5	8.3	19.2
1973	560,000	134.4	42.6	10.2	32.4
1974	590,000	141.6	20.6	13.4	7.2

E. Resume of Tasks to be Carried Out and the Responsible Action Agency

1. Identification of the areas to be treated and kinds and amounts of fertilizers required. This was done for the 180,000 hectares covered in "Operation Engrais" in 1966-67 and final plans are being made for a similar operation in 1967-68 covering 335,000 hectares (Ministries of Agriculture and Interior).
2. Negotiation of technical services contract with CIMMYT (AID/W). AID/W is negotiating with the CIMMYT (International Center for Corn and Wheat Improvement) and Ford Foundation for their assistance in a regional project for research on seed improvement which would provide an essential research input for the project.

3. Plan extension program with emphasis on the training of agents and the use of visual aids including television. (Division of Agricultural Development and USAID).
4. Preparation of training materials. One educational film is now in progress and will be used in advance of the spring top dressing. This activity began with the assistance of two communications specialists under contract to USAID from RTV International (November 1966 - February 1967) and will be continued under the direction of the USAID Extension Information Advisor. (Division of Agricultural Development and USAID).
5. a) Design and begin field plots for on the farm fertilizer response tests. (National Agronomic Research Institute and USAID).  
b) This research will be followed the next year by more intensive field demonstration plots in conjunction with FAO efforts in the field. (Division of Agricultural Development)
6. Establishment of revolving fund for credit covering farmer purchases. (Ministry of Agriculture and National Agricultural Credit Bank)
7. Testing and multiplication of improved wheat varieties. Fifty varieties imported from the Rockefeller Foundation Wheat Improvement Center in Mexico arrived during November and December 1966 and were planted immediately. Tests should be run for at least three years for proper selection of those varieties best adapted to Morocco. (National Agronomic Institute, Ministry of Agriculture)
8. Placement of orders for small farm implements with local manufacturers. (Ministry of Agriculture).
9. Employment of the additional GOM staff required. The technical aides and extension agents can be recruited from graduates of the Moroccan agricultural schools. The specialists needed for the program during the next four years will most likely be Europeans recruited under present GOM policy. Specialists for the long term can be trained in the U.S. and return to work on this program as early as 1971. (Ministry of Agriculture)
10. Placement of orders for diammonium phosphate with supplier, Maroc-Chimie, in time for delivery to regional distribution centers by September of each year (Ministry of Agriculture).
11. Annual measurement and evaluation of results (USAID and Ministry of Agriculture).

## VI. Measurement and Evaluation of Results

Given the complexity of this project, a systematic means of measuring and evaluating project progress is critical. Three major steps will be employed. First, a detailed work plan covering all project elements will be drawn up with the GGI agencies involved (including the Ministries of Development and Plan and Finance). Secondly, the Peace Corps Volunteers assigned to each of the principal extension work centers participating in the program will help to maintain adequate records for the project, as well as for the demonstration plots cultivated by the Center itself. Thirdly, in addition to continuing supervision by the A.I.D. project officer and the leader of the research team (contract or PASA) periodic review meetings will be held with all participating GGI agencies to assess accomplishments, identify problems, and determine corrective steps if necessary.

A statistical evaluation of 1966-67 wheat yields was prepared by the USAID in cooperation with the Ministry of Agriculture.

An annual evaluation of the project will be made after each campaign and will include a report on:

1. Acreage seeded;
  - a. fertilizers used
  - b. percentage of areas using better cultural practices
  - c. use of better seed
2. Yields according to treatments above and as related to rainfall areas; and
3. Overall effect on national production.

NON-CAPITAL PROJECT FUNDING  
(obligations in \$000)

Page 1 of 2 Pages  
Project Title: Increase in  
Cereals Production  
Country: Morocco

Prop Date: \_\_\_\_\_  
Original: \_\_\_\_\_ Rev. No.: \_\_\_\_\_  
Project No.: 608-11-130-058

<u>Fiscal Years</u>	<u>Ap</u>	<u>L/G</u>	<u>Total*</u>	<u>Cont 1/</u>	<u>Personnel Services</u>			<u>Participants</u>		<u>Commodities</u>		<u>Other Costs</u>	
					<u>AID</u>	<u>PASA</u>	<u>CONT 2/</u>	<u>U.S. Agencies</u>	<u>Cont 2/</u>	<u>Dir U.S. Agencies</u>	<u>Cont</u>	<u>Dir &amp; **</u>	<u>US Agcy</u>
Prior through Actual FY													
Operational FY 1968	TC	G	141	24	58		19	55	5	24			4
Budget FY 1969	TC	G	117	74	76		64	30	10	3			8
B + 1 FY 1970	TC	G	118	71	73		71	35	0	2			8
B + 2 FY 1971	TC	G	136	60	76		60	50	0	2			8
B + 3 FY 1972	TC	G	127	65	73		60	45	5	1			8
All Subs.	TC	G	231	120	149		120	65	0	1			16
Total Life			870	414	505		394	280	20	33			52

1/ Memorandum (non-add) column

\* Excludes Total Peace Corps contribution of \$1,480,000 over life of project and regionally funded contract technicians.

\*\* For one-half salaries of local hire employees.

2/ Regionally funded.

Page 2 of 2 Pages

Project No. & Title: 608-11-130-058,

Increase in Cereals Production

Country: Morocco

Exchange Rate = \$1.00 = 5.00 DH

<u>Fiscal Years</u>	<u>AID-Controlled</u>		<u>Other Cash Contribution Cooperating Country</u>	<u>Other Donor Funds (\$ Equiv)</u>	<u>Food for Freedom Commodities</u>		
	<u>U.S.- Owned</u>	<u>Country Owned</u>			<u>Metric Tons (\$000)</u>	<u>CCC Value &amp; Freight (\$000)</u>	<u>World Market Price (\$000)</u>
Prior through FY 1967		7,880	1,440				
Operational FY 1968	3,800	4,200	2,706				
Budget FY 1969	280	200	3,820				
B + 1 FY 1970	1,800	1,400	4,363				
B + 2 FY 1971	1,100	1,060	5,366				
B + 3 FY 1972	2,000	1,840	5,790				
All Subs.	4,400	3,520	14,024				
Total Life	13,380	20,100	37,509				

BREAKDOWN OF BASIC COSTS FOR CEREALS PRODUCTION PROJECT  
FROM 1967 - 1974 (\$000)

	<u>FY 1967</u>	<u>FY 1968</u>	<u>FY 1969</u>	<u>FY 1970</u>	<u>FY 1971</u>	<u>FY 1972</u>	<u>FY 1973</u>	<u>FY 1974</u>	<u>TOTAL</u>
<u>U.S.</u>									
Direct Hire (including one-half local employees salary) <u>1/</u>		62	84	81	84	81	84	81	557
Contract <u>2/</u>		19	64	71	60	60	60	60	394
PCV		280	120	280	120	280	120	280	1,480
Commodities		24	3	2	2	1	1	-	33
Participants		60	40	35	50	50	45	20	300
Credit Support (Title I)	<u>7,880</u>	<u>8,000</u>	<u>480</u>	<u>3,200</u>	<u>2,160</u>	<u>3,840</u>	<u>6,480</u>	<u>1,440</u>	<u>33,480</u>
Sub-total	7,880	8,445	791	3,669	2,476	4,312	6,790	1,881	36,244
<u>GCM</u>									
Trust Fund	-	26	40	43	46	50	51	53	309
Oper & Equipm <u>3/</u> (40 DH per Ha)	1,440	2,680	2,800	3,200	3,880	4,080	4,480	4,720	27,280
Addition to Credit Fund (10 percent default)	-	-	980	1,120	1,440	1,660	2,040	2,680	9,920
Sub-total	<u>1,440</u>	<u>2,706</u>	<u>3,820</u>	<u>4,363</u>	<u>5,366</u>	<u>5,790</u>	<u>6,571</u>	<u>7,453</u>	<u>37,509</u>
Grand Total	<u>9,320</u>	<u>11,151</u>	<u>4,611</u>	<u>8,032</u>	<u>7,842</u>	<u>10,102</u>	<u>13,361</u>	<u>9,334</u>	<u>73,753</u>

1/ Fifty percent of salaries of two direct-hire local technical assistants in FY 1968 and four local technical assistants in FY 1969 through 1974. The other 50 percent is carried by the GCM under the Trust Fund.

2/ Regional funded.

3/ Refers to the budgetary expense incurred by the GCM in support of the project, primarily for operation and maintenance of work centers (CT's and CMV's) involved in the program.

BALANCE OF PAYMENTS PROJECTIONS FY 1968  
(\$000)

<u>Project Title &amp; Number</u>	<u>Technician Off- Shore Expenses</u>	<u>Project Local Costs</u>	<u>Third Country Costs</u>	<u>U.S. Costs</u>
Increase in Cereals Produc- tion, 608-11-130-058	17.4	4	10	108.6