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PART II - APPENDICES

VOLUME 2

TIPTON AND KALMBACH-SCHICK INTERNATIONAL
DENVER SALT LAKE CITY

MARCH, 1979

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UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

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AGRICULTURAL DEVELOPMENT OF THE AKKAR PLAIN

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AKKAR PLAIN AGRICULTURAL DEVELOPMENT PROJECT

APPENDIX AIV

INFRASTRUCTURE

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APPENDIX AIV

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APPENDIX AIV

INFRASTRUCTURE

Need for Improvement

Over 50 villages are presently on or adjacent to the Akkar Plain Project which have a total population of approximately 15,000, Figure AIV-1. Population of the villages ranges from less than 50 to approximately 2,000 at Safsafeh. Other large villages are Karto (1,200) Hamidyeh (1,500) and Arab Shati (1,300). Adequate infrastructure is important for a balanced social and economic development of the villages. Project planning proposals would anticipate the desired level of development in each village and provide for it. The intensity of population growth and rate of economic development would be a direct function of project inputs.

In general, present infrastructure in the villages is inadequate to meet the needs of the people and would require new facilities and expansion, and upgrading of existing facilities to be adequate under full project development. At present both farmers and non-farmers living on the Akkar Plain must go to Tartous, Homs or other cities to obtain many essential infrastructure facilities. It is anticipated that minimum basic facilities presently established at the villages would be increased commensurate with development under the project. Improvements would help insure that benefits, due to the commitment of additional capital resources, would reach their full potential.

Educational Facilities

The government has placed a high priority on advancement of education

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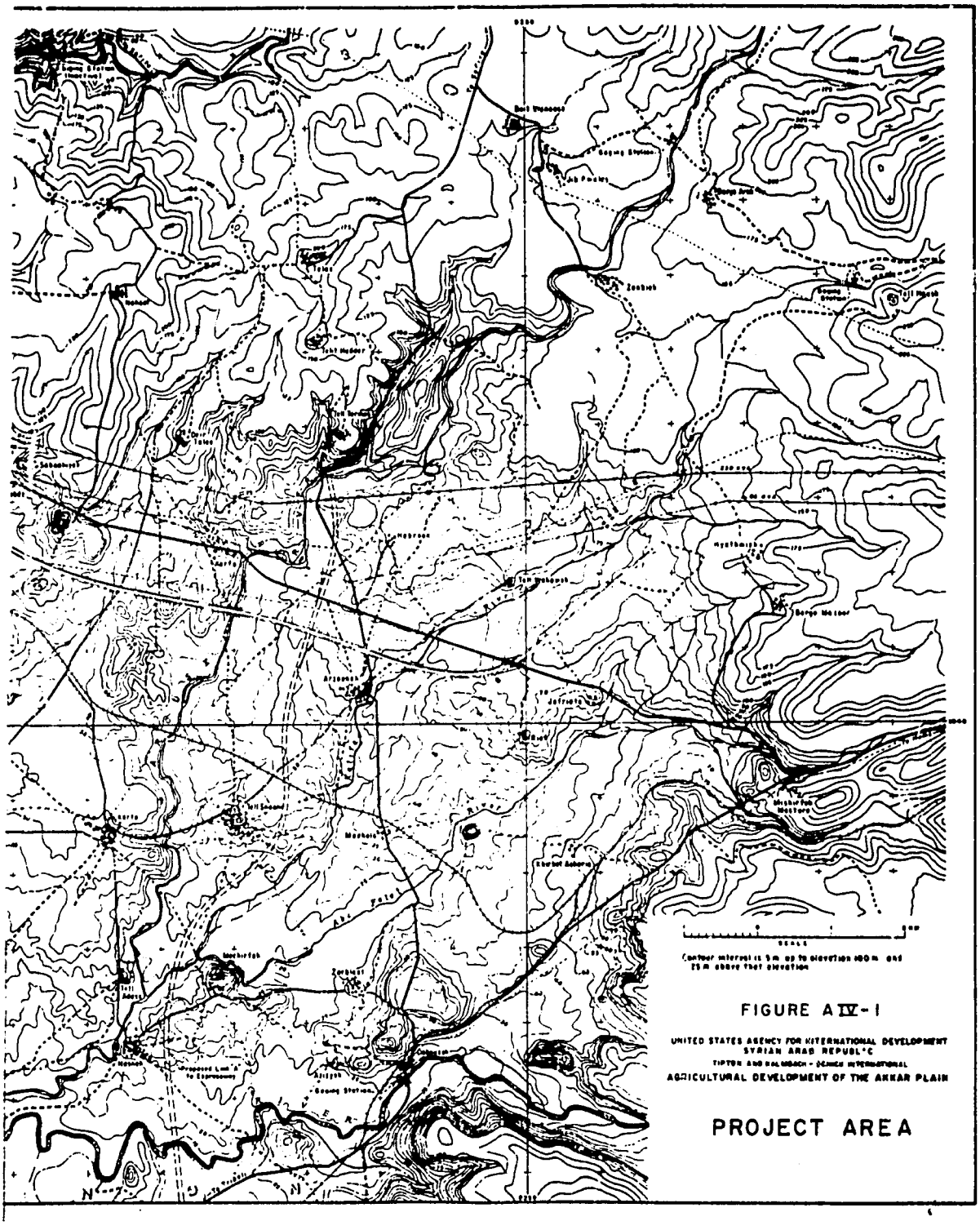

FIGURE A IV - 1

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PROJECT AREA

since 1967, and has made public education free and compulsory through the primary grades. Those desiring to complete their education are deferred from compulsory military training. The universities are supported by the government and are tuition-free. There is presently a renewed interest in education with an estimated 1,800,000, students at all levels. The Syrian Government has been unable to expand public school facilities at a rate sufficient to meet the demand for education. The literacy rate is increasing and now stands at 51%. Literacy for women is about double that for men and is considerably higher in urban areas than rural areas. The school system is divided into 6 years of primary school (ages 6 to 12); 3 years of intermediate school (ages 2 to 15); and 3 years of secondary school (ages 15 to 18) to prepare students for university entrance.

Educational facilities available to project villages includes a primary school in most villages; intermediate schools at Arizooneh, Hamidyeh, and Safasfeh; and secondary schools at Safsafeh and Karto. Secondary schools are available at Tartous and are attended by some students from the project area. Universities are located at Latakia, 90 km to the north; Alleppo, 273 km to the northeast; and Damascus, 251 km to the southeast.

School facilities available in the project area are inadequate under present conditions and unless improved, would be more inadequate under full project development. School buildings are, in general, undersized and inadequate. Classrooms are overcrowded and must accommodate several grades. The number of students per teacher is high; school supplies are inadequate; sanitary facilities are poor; and playground or physical development

facilities are inadequate or non-existent especially in primary schools. Students attending intermediate and secondary schools walk long distances due to lack of private and public transportation. Therefore, it would be necessary to upgrade existing schools and/or provide additional new schools and auxiliary facilities. The estimated cost of providing adequate educational facilities under full project development is 7,293,000 SP or $1,870,000, Table AIV-1. This would include enlarging and upgrading approximately 30 primary schools, 3 secondary schools and 2 intermediate schools.

The possibility of consolidating the primary schools into several new schools and busing the students should be considered. Busing students would be feasible with the proposed new and upgraded project roads and better school facilities could be provided with a more desirable ratio of students per teacher.

Farm-to-Market Roads

When fully developed, the Akkar Plain Project would supply agricultural products to major cities in Syria and neighboring Arab countries. Since a number of products produced would be perishable a good system of roads would be required to move products to market centers without delay and minimum damage.

Existing roads on the Akkar Plain are inadequate for full project development. Construction and maintenance of roads on the Plain are under the Transporation Department at Tartous. A network of graded and gravel-surfaced roads with an asphalt binder or tack coat serves the main villages.

Table AIV-1. Required Educational Facilities

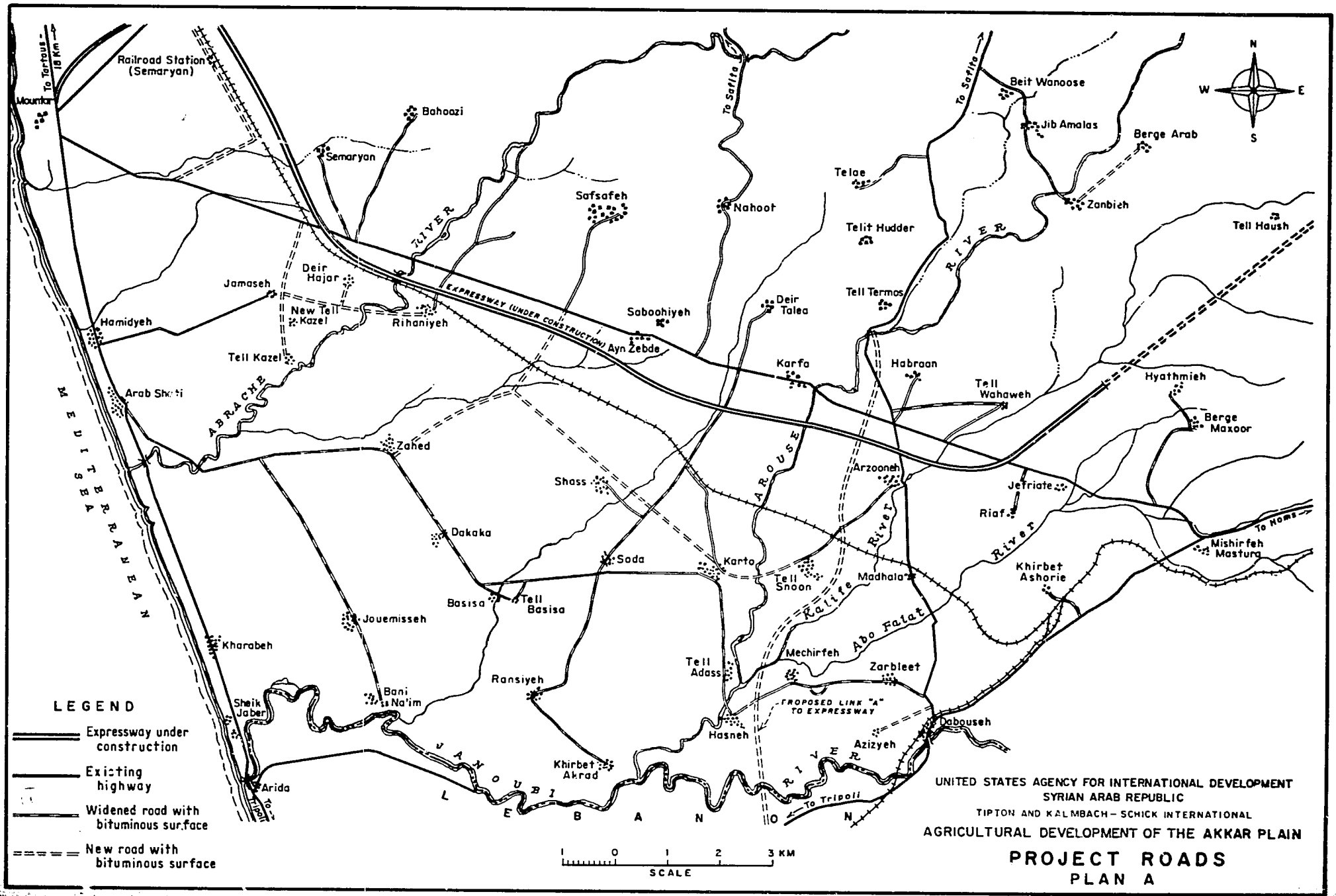
Description	Number	Unit Cost	Unit Cost	Estimated Total Cost	Estimated Total Cost
		U.S. $	SP	U.S. $	SP
Secondary Schools					
Enlarge and upgrade	3	$250,000	SP 975,000	$ 750,000	SP 2,925,000
Supplies and equipment	3	10,000	39,000	30,000	117,000
Physical education facilities	3	25,000	97,500	75,000	292,500
Intermediate Schools					
Enlarge and upgrade	2	100,000	390,000	200,000	780,000
Supplies and equipment	2	7,500	29,250	15,000	58,500
Physical education facilities	2	10,000	39,000	20,000	78,000
Primary Schools					
Enlarge and upgrade	30	20,000	78,000	600,000	2,340,000
Playgrounds and equipment	30	3,000	71,700	90,000	351,000
Supplies and equipment	30	3,000	11,700	90,000	351,000
			Total	$1,870,000	SP 7,293,000

These roads have a surface width of approximately 4 meters which would classify them as single lane. The subgrade is usually limestone rock which is adequate, but lack of proper sealing and drainage of the road surface cause softening of the subgrade which results in large scale break-up during the rainy season. Damage is high to vehicles and products transported on the rough roads. The remainder of the villages are not accessible by motor vehicles during the 3 to 4 month rainy season. Travel to these isolated villages, at the present time, is by foot, burro and tractor. Use of tractors on the ungraded and unsurfaced roads creates deep ruts which become impassable for automobiles and small trucks and in extreme areas even four-wheel drives.

Construction costs in Syria are increasing rapidly due to the increasing cost of imported materials and equipment and a high rate of inflation. Some construction costs equal or exceed similar work in the United States. Because of high cost, two alternate project road systems have been studied, which are described below.

PLAN "A"

This plan would provide an all season road system totaling 89 km which would permit unrestricted transportation of agricultural products from farm to markets and the flow of traffic between villages, the proposed project centers at Karto, Zahed and major cities, Figure AIV-2. Two-lane bituminous surfaced roads would be constructed to all major villages under the project. These roads would connect to existing primary and secondary highways including the Homs - Latakia expressway which is scheduled for completion by 1980 and



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PROJECT ROADS
PLAN A

FIGURE AIV-2

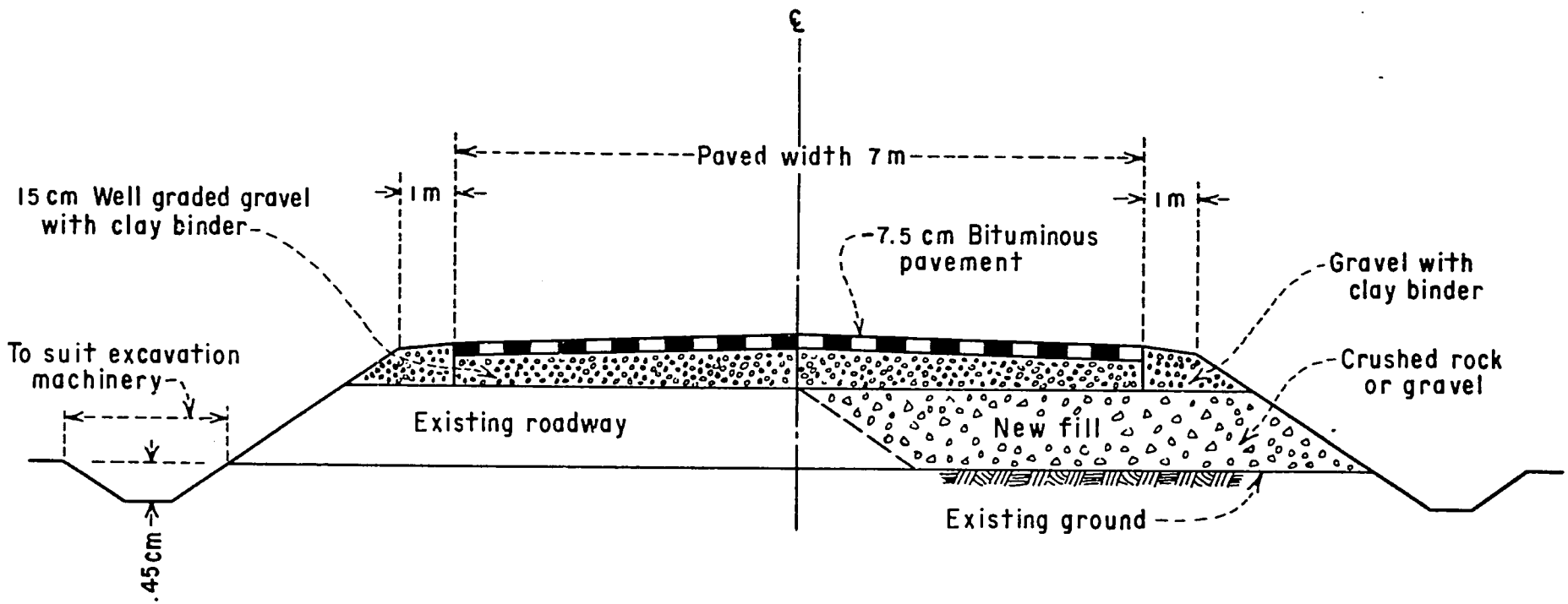
the new railroad station at Semaryan.

Existing roads which have been graded and gravel surfaced would be regraded and widened to provide a roadway surface width of 7 meters and would be paved with bituminous concrete 7.5 cm thick, Figure AIV-3. Additional new roads would be constructed with a minimum grade of one meter above existing ground with similar width and surfacing, Figure AIV-4. The estimated cost of the work including bridges and culverts would be 31,022,106 SP ($7,954,385), as itemized in Tables AIV-2 and AIV-3.

PLAN "B"

This plan would provide a two-lane bituminous surfaced highway east to west through the project from Arzooneh to Arab Shati. The highway would connect with the Safita-Lebanon Highway on the east and the Tartous-Lebanon Highway on the west. These highways would provide access to the Homs-Latakia Expressway, presently under construction, and the new railroad at Semaryan. The proposed highway would pass near Karto and Zahed where it is proposed to locate grain elevators, food processing plants, an Agricultural Service Center, and health care facilities. A connecting highway would pass over the expressway to a junction with the present Tartous-Homs Highway near the west center of the project, Figure AIV-5. The overpass will be constructed with the expressway. Graded and gravel-surfaced roads would be constructed to provide an all-weather road to all main villages within the project area.

The total construction program would comprise widening approximately 8 km of existing road and applying new bituminous surfacing, Figure AIV-3; construction of 11 km of new bituminous surfaced highway, Figure AIV-4; and



EXISTING ROAD WIDENED AND RESURFACED

Akkar Plain Project

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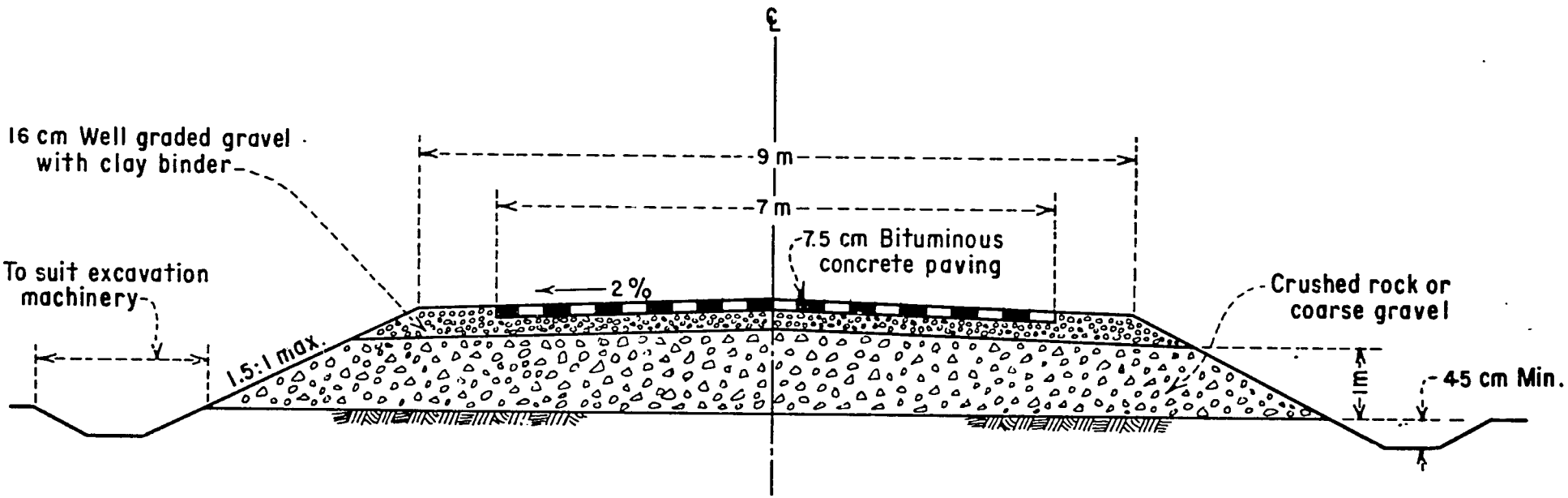
FIGURE A IV-3



NEW HIGHWAY
BITUMINOUS CONCRETE SURFACE
Akkar Plain Project

TIPTON AND KALMBACH-SCHICK INTERNATIONAL

FIGURE A IV-4

Table AIV-2. Farm-to-Market Roads Cost Estimate - Drainage Structure, Plan "A"

Location of Road	Structure	No.	Size	Total Lineal Meters	Cost Lineal Meter	Cost SP	Cost U.S. $
Hamidyeh to Jamaseh	Culvert	2	100 cm	34	150	5,100	1,308
Jamaseh to Rihaniyeh	Bridge	1	20 m	20	10,000	200,000	51,282
Arab Shati to Zahed	Widen Bridge	1		10	6,000	60,000	15,385
Arab Shati-Zahed Jct. to Jouemisseh	Culvert	1	100 cm	15	280	4,200	1,077
Jouemisseh to Beni Na'im	Culvert	17	100 cm	255	280	71,400	18,308
Zahed to Dekaka to Soda	Culvert	4	100	110	280	30,800	7,897
Zahed to Dekaka to Soda	Box Culvert	1	8x10	15	2,500	37,500	9,615
Homs Tartous Hwy. to Shass to Zahed	Culvert	2	100	65	280	18,200	4,667
Homs Tartous Hwy. to Soda	Culvert	2	100	20	280	5,600	1,436
Soda to Ransiyeh to Akrad	Culvert	2	100	20	280	5,600	1,436
Tell Adass to Hasne	Bridge	1		L.S.		200,000	51,282
Hasne to Mechirfeh to Zarbleet to Hwy.	Culvert	1	100	10	280	2,800	718

Table AIV-2 continued. Farm-to-Market Roads Cost Estimate - Drainage Structure, Plan "A"

Location of Road	Structure	No.	Size	Total Lineal Meters	Cost Lineal Meter	Cost SP	Cost U.S. $
Karto to Tell Snoon	Bridge	1		L.S.		200,000	51,282
Tell Snoon to Arzooneh	Culvert	1	100	20	280	5,600	1,436
Berge Maxoor to Tartous Homs Hwy.	Culvert	1	100	20	280	5,600	1,436
Zanbiell to Jib Amalas to Biet Wanoose to Safsafeh Hwy.	Bridge	1		L.S.		200,000	51,282
Tell Wahaweh to Tartous Homs Hwy.	Culvert	1	100	20	280	5,600	1,436
Tartous Homs Hwy. to Bahooz North	Culvert	2	100	20	280	11,200	2,872
Tartous Homs Hwy. to Semaryan	Culvert	1	60	10	150	1,500	385
Tartous Homs Hwy. to Railroad Station Link "A"	Culvert	1	100	20	280	11,200	2,872
Tartous Homs Hwy. to Tell Kazel	Culvert	1	100	20	280	11,200	2,872
		Total				1,093,100	280,284
		Contingencies 10%				109,310	28,028
						1,202,410	308,312
		Engineering & Overhead 20%				240,482	61,662
						1,442,892	369,974
		TOTAL (Rounded)				1,443,000	370,000

Table AIV-3 Farm-to-Market Roads Plan "A" - Cost Estimate

Location	Desc.	Lineal Meters	Unit Cost Lineal Meter SP	Road Cost SP	Road Cost U.S. $	Drainage Structures Cost SP	Drainage Structures Cost U.S. $
Hamidyeh to Jamaseh	W.A.S.	3,185	235	748,475	115,090	5,100	1,308
Jamaseh to Rihaniyeh	N.C.A.S.	2,865	404	1,157,460	296,785	200,000	51,282
Arab Shati to Zahed	W.A.S.	5,730	235	1,346,550	345,269	60,000	15,385
Arab Shati-Zahed Jct. to Jouemisseh	W.A.S.	3,820	235	897,700	230,179	4,200	1,077
Jouemisseh to Beni Na'im	N.C.A.S.	1,590	404	642,360	164,708	71,400	18,308
Zahed to Dekaka to Soda	W.A.S.	5,570	235	1,308,950	335,628	68,300	17,512
Homs Tartous Hwy. to Shass to Zahed	N.C.A.S.	8,760	404	3,539,040	907,446	18,200	4,667
Homs Tartous Hwy. to Soda	W.A.S.	5,415	235	1,272,525	326,288	5,600	1,436
Soda to Ransiyeh to Akrad	W.A.S.	4,936	235	1,159,960	297,425	5,600	1,436
Soda to Karto	W.A.S.	2,230	235	524,050	134,372	-	-
Karto to Jct. at Railroad	W.A.S.	2,230	235	524,050	134,372	-	-
Karto to Tell Adass	W.A.S.	1,910	235	448,850	115,090	-	-

Table AIV-3 continued. Farm-to-Market Roads Plan "A" - Cost Estimate

Location	Desc.	Lineal Meters	Unit Cost Lineal Meter SP	Road Cost SP	Road Cost U.S. $	Drainage Structures Cost SP	Drainage Structures Cost U.S. $
Tell Adass to Hasne	G. & G.S.	955	293	279,815	71,747	200,000	51,282
Hasne to Mechirfeh to Zarbleet-Hwy.	W.A.S.	3,890	235	914,150	234,397	2,800	718
Arizyeh to Dabouseh	N.C.A.S.	960	404	387,840	99,446	-	-
Kirbet Asharie to Lebanon Hwy.	N.C.A.S.	1,240	404	500,960	128,451	-	-
Karto to Tell Snoon	N.C.A.S.	1,910	404	771,640	197,856	200,000	51,282
Tell Snoon to Arzooneh	W.A.S.	4,770	235	1,120,950	287,423	5,600	1,436
Berge Maxoor to Tartous Homs Hwy.	W.A.S.	2,660	235	625,100	160,282	5,600	1,436
Zanbieh-Jib Amalas-Biet Wanoose Saf. Hwy.	W.A.S.	3,503	235	823,205	211,078	200,000	51,282
Habroon to Tartous Homs Hwy.	W.A.S.	955	235	224,425	57,545	-	-
RIAF to Tartous Homs Hwy	N.C.A.S.	960	404	387,840	99,446	-	-
Tell Wahaweh to Tartous Homs Hwy.	W.A.S.	3,530	235	829,550	212,705	5,600	1,436
Tartous Homs Hwy. to Bahooz, North	W.A.S.	2,870	235	674,450	172,936	11,200	2,872

Table AIV-3 continued. Farm-to-Market Roads Plan "A" - Cost Estimate

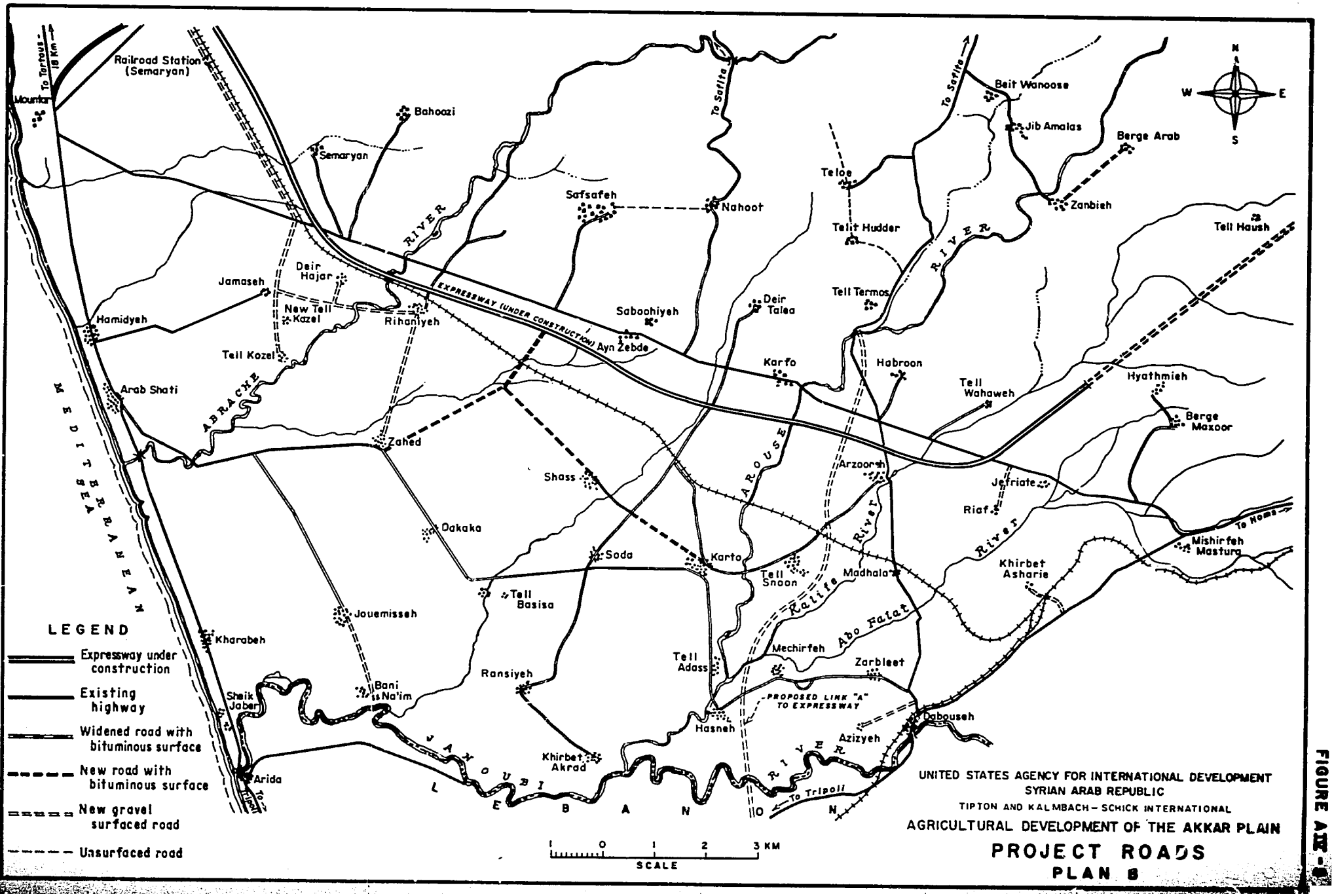
Location	Desc.	Lineal Meters	Unit Cost Lineal Meter SP	Road Cost SP	Road Cost U.S. $	Drainage Structures Cost SP	Drainage Structures Cost U.S. $
Tartous Homs Hwy. to Semaryan	W.A.S.	1,910	235	448,850	115,090	1,500	385
Tartous Homs Hwy. to Railroad Station Link "A"	N.C.A.S.	4,940	404	1,995,760	511,733	11,200	2,872
Tartous Homs Hwy.	N.C.A.S.	2,710	404	1,094,840 1/	280,728 1/	11,200	2,872
	TOTAL			24,649,345	6,320,342	1,202,410	308,312 1/
	Drainage Structures			1,202,410	308,312		
	Total			25,851,755	6,628,654		
	Engineering & Overhead 20%			5,170,351	1,325,731		
	GRAND TOTAL			31,022,106	7,954,385		

1/ Includes 10% contingencies.

W.A.S. - Widen and Asphalt Surface Existing Graded Road.

N.C.A.S. - New Constructed Asphalt Surfaced Highway.

G. & G.S. - Graded and Gravel Surfaced New Road.



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PROJECT ROADS

PLAN B

FIGURE XII-8

construction of 22 km of new gravel-surfaced road, Figure AIV-6. The estimated cost of the proposed project road system would be 13,159,000 SP ($3,374,000) as itemized in Tables AIV-4 and AIV-5. The cost of rights-of-way was not included. Construction and maintenance of the road system would be under the Transportation Department at Tartous.

Construction of roads in the Tartous area utilizes a large amount of hand labor. Construction of project roads would be beneficial to the farmers by utilizing surplus farm labor which would result in additional cash flow to the villages.

Agricultural Services

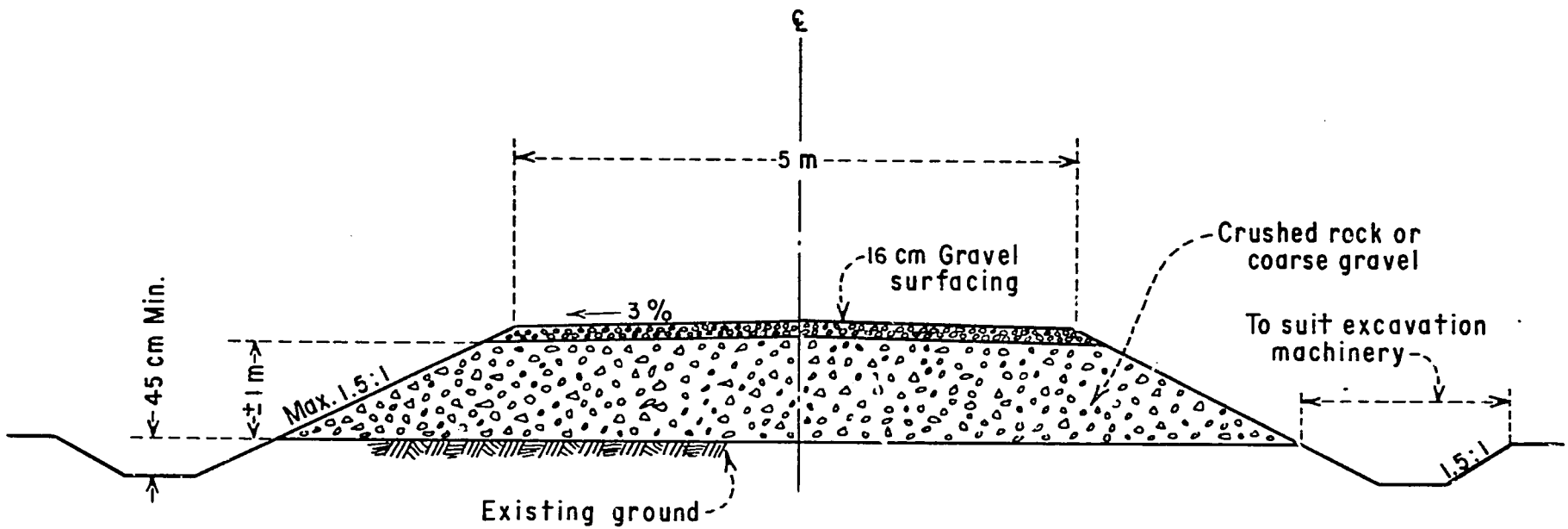
The Department of Agriculture under the Ministry of Agriculture and Agrarian Reform, with a district office at Tartous, furnishes agricultural research services to the farmers on the Akkar Plain. The organization chart for the Department (DA), Figure AIV-7, follows. Under the district office, there is an office in each Montika which is staffed with an agricultural engineer and assistant. The district office conducts a two-phase program which consists of: (1) conducting demonstrations or experiments in each Mohafozat (district), which includes the introduction of new fruits and vegetables in experimental or demonstration tracts; and (2) holding meetings with village leaders and farm cooperatives to disseminate information and data regarding:

a. New varieties of plants and fruits

b. New cultivation methods and machinery

c. Insecticides and their application

d. Pruning



GRAVEL SURFACED ROAD

Akkar Plain Project

TIPTON AND KALMBACH – SCHICK INTERNATIONAL

FIGURE A IV-3

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Table AIV-4. Farm-to-Market Roads Cost Estimate - Drainage Structures, Plan "B"

Location of Road	Structure	No.	Size	Total Lineal Meters	Cost Lineal Meter	Cost SP	Cost U.S. $
Arab Shati to Zahed	Widen Bridge	1	-	10	6,000	60,000	15,385
Zahed to Homs Tartous Hwy. and Karto	Culvert	2	100	30	280	8,400	2,154
Homs-Tartous Hwy. to Karto	Culvert	5	60	75	150	11,250	2,885
Homs-Tartous Hwy. to Karto	Culvert	1	100	15	280	4,200	1,077
Karto to Tell Snoon	Bridge	1	-	-	L.S.	200,000	51,282
Tell Snoon to Arizooneh	Culvert	1	100	30	280	8,400	2,154
Link "A" via Railroad to Jct. Tartous-Homs Hwy.	Culvert	3	60	45	150	6.750	1,731
Link "A" via Railroad to Jct. Tartous-Homs Hwy.	Culvert	2	100	30	280	8,400	2,154
Homs-Tartous Hwy. to Tell Kazel	Culvert	1	100	15	280	4,200	1,077
Jamaseh to Rihanyeh	Bridge	1	-	-	L.S.	200,000	51,282

Table AIV-4 continued. Farm-to-Market Roads Cost Estimate - Drainage Structures, Plan "B"

Location of Road	Structure	No.	Size	Total Lineal Meters	Cost Lineal Meter	Cost SP	Cost U.S. $
Rihanyeh to Zahed	Culvert	1	100	30	280	8,400	2,154
Tell Adass to Hasne	Bridge	1	-	-	L.S.	200,000	51,282
Jouemisseh to Beni Na'im	Culvert	17	100	255	280	71,400	18,308
		Total				791,400	202,925
		Contingencies 10%				79,140	20,293
		TOTAL				870,540	223,218

Table AIV-5. Farm-to-Market Roads, Plan "B" - Cost Estimate

Location	Desc.	Lineal Meters	Cost Lineal Meter SP	Road Cost		Drainage Structures	
				SP	U.S. $	Cost SP	Cost U.S. $
Arab Shati to Zahed	W.A.S.	5,095	235	1,197,325	307,006	60,000	15,385
Zahed to Homs Tartous Hwy. to Karto	N.C.A.S.	3,740	404	1,510,960	387,426	8,400	2,154
Homs Tartous Hwy. to Karto	N.C.A.S.	5,860	404	2,367,440	607,036	15,450	3,962
Karto to Tell Snoon	N.C.A.S.	1,715	404	692,860	177,656	200,000	51,282
Tell Snoon to Arizooneh	W.A.S.	2,860	235	672,100	172,333	8,400	2,154
Link "A" Via Railroad to Jct. Tartous Homs Hwy.	G. & G.S.	5,095	166	845,770	216,864	15,150	3,885
Homs-Tartous Hwy. to Tell Kazel	G. & G.S.	2,870	166	476,420	122,159	4,200	1,077
Jamaseh to Rihaniyeh	G. & G.S.	3,185	166	528,710	135,567	200,000	51,282
Rihaniyeh to Zahed	G. & G.S.	2,550	166	423,300	108,538	8,400	2,154
Tell Adass to Hasneh	G. & G.S.	950	166	157,700	40,436	200,000	51,282
Arizyeh to Dabouseh	G. & G.S.	960	166	159,360	40,862	-	-
Khirbet Ashari to Homs Lebanon Hwy.	G. & G.S.	1,115	166	185,090	47,459	-	-

Table AIV-5 continued. Farm-to-Market Roads, Plan "B" - Cost Estimate

Location	Desc.	Lineal Meters	Cost Lineal Meter SP	Road Cost SP	Road Cost U.S. $	Drainage Structures Cost SP	Drainage Structures Cost U.S. $
Homs-Tartous Hwy. to Riaf	G. & G.S.	960	166	159,360	40,862	-	-
Berge Arab to Zanbieh	G. & G.S.	2,100	166	348,600	89,385	-	-
Jouemisseh to Beni Na'im	G. & G.S.	2,230	166	370,180	94,918	71,400	18,308
	TOTAL			10,095,175 1/	2,588,506 1/	870,540 1/	223,218 1/
	Drainage Structures			870,540	223,218		
	Total			10,965,715	2,811,724		
	Engineering & Overhead 20%			2,193,143	562,345		
	GRAND TOTAL			13,158,858	3,374,069		

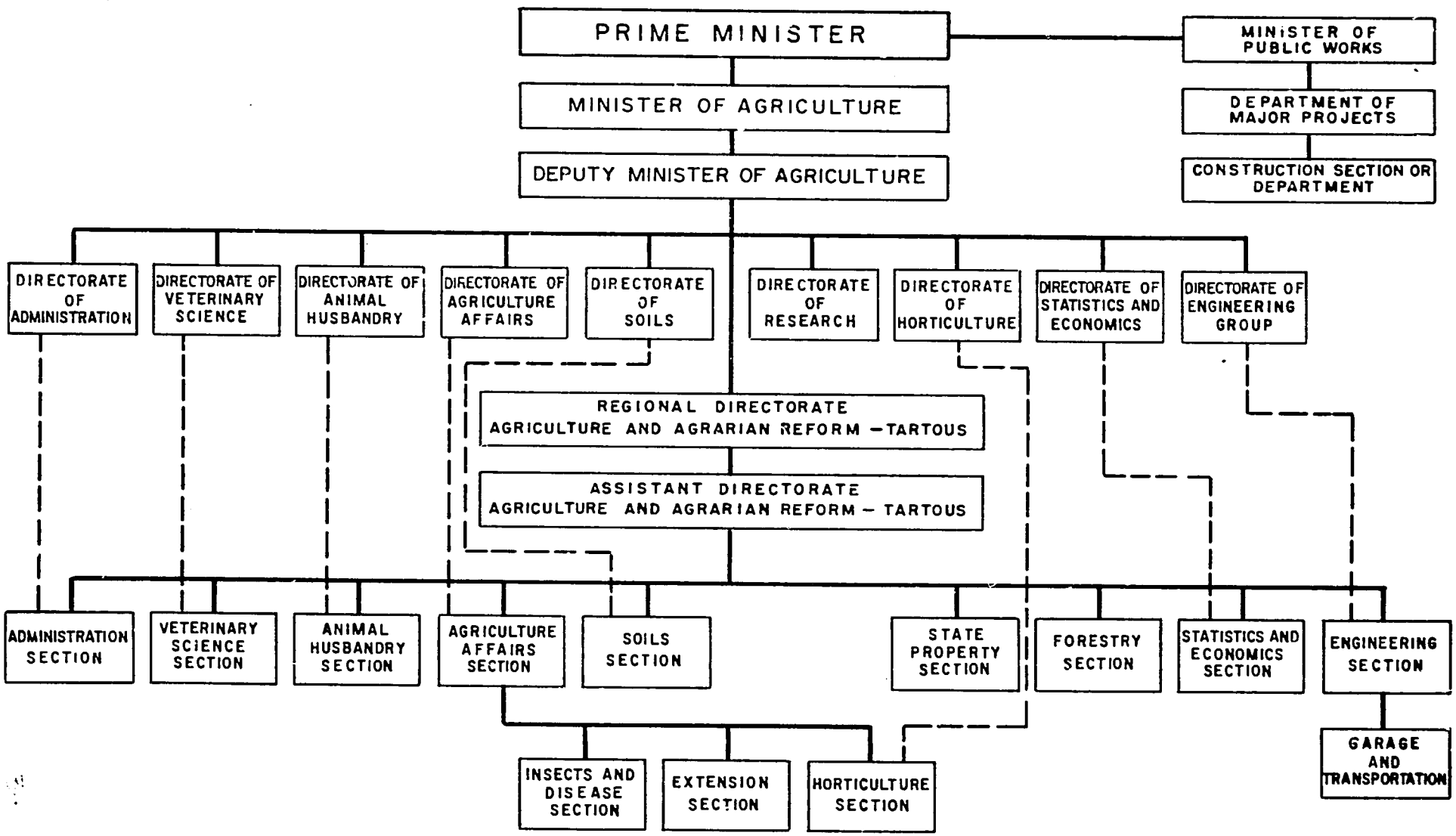
1/ Includes 10% contingencies.

W.A.S. - Widen and Asphalt Surface Existing Graded Road.

N.C.A.S. - New Constructed Asphalt Surfaced Highway.

G. & G.S. - Graded and Gravel Surfaced New Road.

MINISTRY OF AGRICULTURE ORGANIZATION CHART



TIPTON AND KALMBACH – SCHICK INTERNATIONAL

FIGURE AIV-1

e. Grading and marketing

f. Fertilizers and their use

g. Show demonstration movies

h. Distribute pertinent agricultural publications

i. Harvesting

j. Plant diseases

The research service does not cover home canning, food storage, or family health. It is considered that home canning and food storage is of prime importance to the family where a large proportion of the family food supply comes from the farm. The District Office has plans to set up a full scale demonstration farm on the Akkar Plain consisting of a research building or office at either Safsafeh or Hamidyeh. However, lack of funds has curtailed this program as well as the regular program. The D A has not made plans for expansion of agricultural research services as required under full development of the Akkar Plain Project. It has been expressed that cooperation would be given to the extent possible but the general lack of funds, under present budgeting, would be a serious restraint.

Present Agricultural Research

Two research stations are located in Tartous: one called the Tartous Nursery; the other, the Amrit Nursery. Both are concerned with citrus and are primarily engaged in providing grafted trees and ungrafted seedlings for local citrus growers. Only very limited citrus plantings are found on the Akkar Plain.

Various kinds of other fruit trees (non-citrus, apples, pears, and peaches)

are also being produced at the Tartous Nursery. Evergreen trees are also grown. Neither of the stations conducts any research on vegetable or field crops. The nearest research station doing any vegetable work is at Jable, some 75 km north of the project. Again at this station, a major interest is in citrus. The vegetable work (summer) is on variety testing. There is some work on time of planting summer squash. Some limited information could possible be available which would be applicable to the Akkar Plain. This is not likely to happen since it is located in a different district. It should also be pointed out that the soils appear to be quite different from most of those of the Akkar Plain. The distance would likely preclude farmer visits and farmers would be less likely to accept results than if they could see demonstrations in their own sub-district.

The Research Director in Tartous is now placing major emphasis on fertilizer trials on citrus and groundnuts and on variety testing on sorghum and groundnuts. The work is being done on cooperating farmers' land, none of which is located in the project area.

The district office receives agricultural publications from Damascus for free distribution to farmers. These publications are of the technical bulletin-type and, for the most part, represent translations of English and other languages. However, the bulletins are too expensive and complicated for mass distribution. Recommendations and methods treated should be tested locally before dissemination to farmers.

Future Under Project

The economic viability of the Akkar Plain Project will be determined to a

considerable extent by the rapidity of adoption of improved agricultural practices by local farmers. Thus, the improvement of agricultural research and application thereof are of major importance in enhancing the possibility of project success. Farmers are generally receptive to new ideas and show initiative in the use of improved varieties and methods.

To achieve full project development, sound research is essential to provide information on major crops in the following areas:

(1) Fertilization - kind, rate and time of application

(2) Pest control - chemical and biological

a. disease

b. insect

c. weeds (herbicides)

(3) Irrigation Practices - application and drainage

(4) Variety Testing - vegetable and field crops

(5) Plant Improvement - where suitable varieties do not exist

a. selection

b. development of new varieties by breeding

(6) Cultural Practices and Soil Management

a. plowing

b. seed-bed preparation

c. weed control - cultivation

(7) Diagnosing causes of crop failure, especially those that appear to be due to plant pathogens

(8) Livestock and dairy production

(9) Storage and preservation of foods for home use during the off season

a. dehydration

b. pickling

c. canning

d. storage in common root cellars, etc.

To meet this requirement in a timely and practical way, it is recommended that an "Agricultural Service Center" be established on the project. It should be multi-functional and be under administration of the District Office at Tartous. After evaluation of the many factors involved it appears that Karto would be the most desirable location for the center for the following reasons: It is centrally located with connecting roads to other major villages, has a newly installed domestic water system, has telephone service for communication with higher offices, is scheduled for electric service by 1980, and has a new secondary school which would furnish graduates for training and employment. Also, other important infrastructure facilities are proposed for Karto.

It is recommended that the center include from 25 to 30 hectares of suitable land for experimental use. This size would permit the land to be well cared for and still be adequate for rotation, some seed increase, etc. There should be some land where trainees, professionals, farmers, interns and so forth, could obtain actual practice in all types of cultural operations such as planting and in handling of machinery. Adequate greenhouses should be also be provided.

Competent personnel is the key to success of the center and the Akkar Plain Project. With even average support, high quality personnel can effectively influence the agriculture, the economy and ultimately the lives of the people in the area.

It is recommended that the following staff be assigned to the Agricultural Services Center:

(1) Horticulturist - Farm Manager - with experience with vegetable crops under irrigated conditions - with a capacity to conduct experimental work especially variety trials, seed increase. He should also be familiar with weed control methods.

(2) Research Training Specialist - Coordinator - this staff member would coordinate all training activities, arrange field days, coordinate meetings and other educational experiences and arrange for resource people that might come from the Ministry of Agriculture or from the universities. He would be the primary contact for other research-type personnel and for farmers who come to the center. Experience in communication and a knowledge of transfer techniques would be desirable. He would also supervise village workers (agents) and arrange for local in-service training at the center.

(3) Agricultural Engineer - (Irrigation and Soils) - this staff member would work on irrigation and soils research and backstop village agents in the areas of his competence.

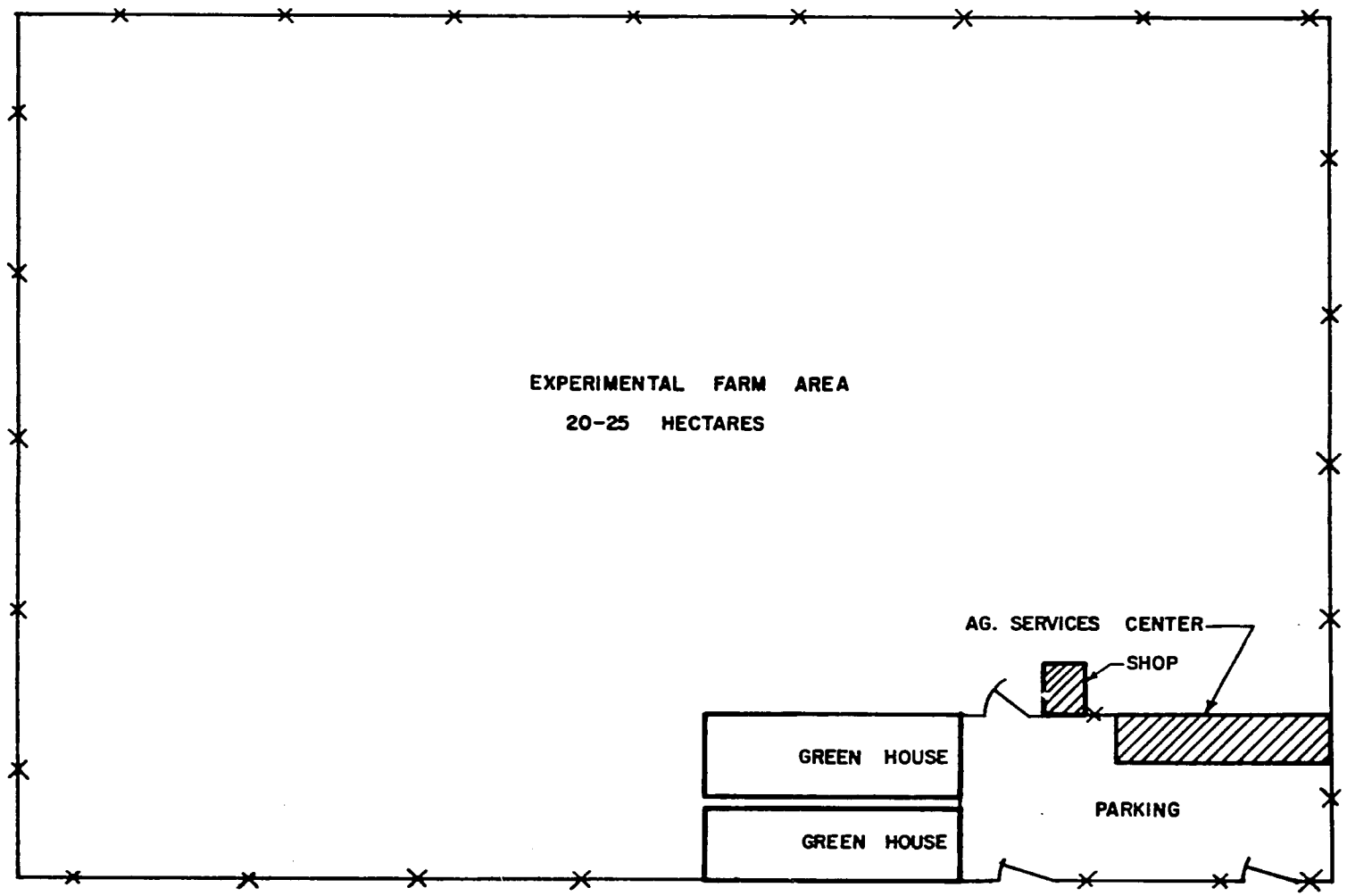
(4) Pest Control Specialist - first priority should be for disease

control. He should have some knowledge of entomology and weed control. He will conduct pertinent research and back-stop field agents in the areas of his competence.

(5) Secretarial - these are only minimal personnel requirements. Others could and should be added as justified and funding permits. These professionals could be used in advising on other programs in Syria.

To adequately service the needs of the project area farmers, it is recommended that agents be assigned to four key villages in the project area. These agents would be responsible for supervising demonstration plots on farmers' fields using information generated at the Agricultural Services Center. They would be the primary contact between the center and the farmers, relaying information concerning improved practices, soliciting help on problems in their area, and in generating interest in field days, demonstrations, new seeds, pest control chemicals available, etc. The field agents should be assigned to major villages where strong farmer cooperatives are present such as Zahed, Arizooneh, Hamidyeh, Karto or others.

The center should include adequate office space for the staff members outlined, and include a horticulture laboratory, lecture and visual aids room, library, and shop for training key farmers in repair of motors and farm machinery, and parking facilities, Figures AIV-8, AIV-9, AIV-10. The estimated cost of the agricultural service center including the shop and two greenhouses is 1,113,000 SP ($287,900) as itemized on Table AIV-6. (not including land). Foreign purchase cost is itemized on Table AIV-6A.



PLOT PLAN

FIGURE AIV-8

AGRICULTURAL SERVICES CENTER
AKKAR PLAIN PROJECT

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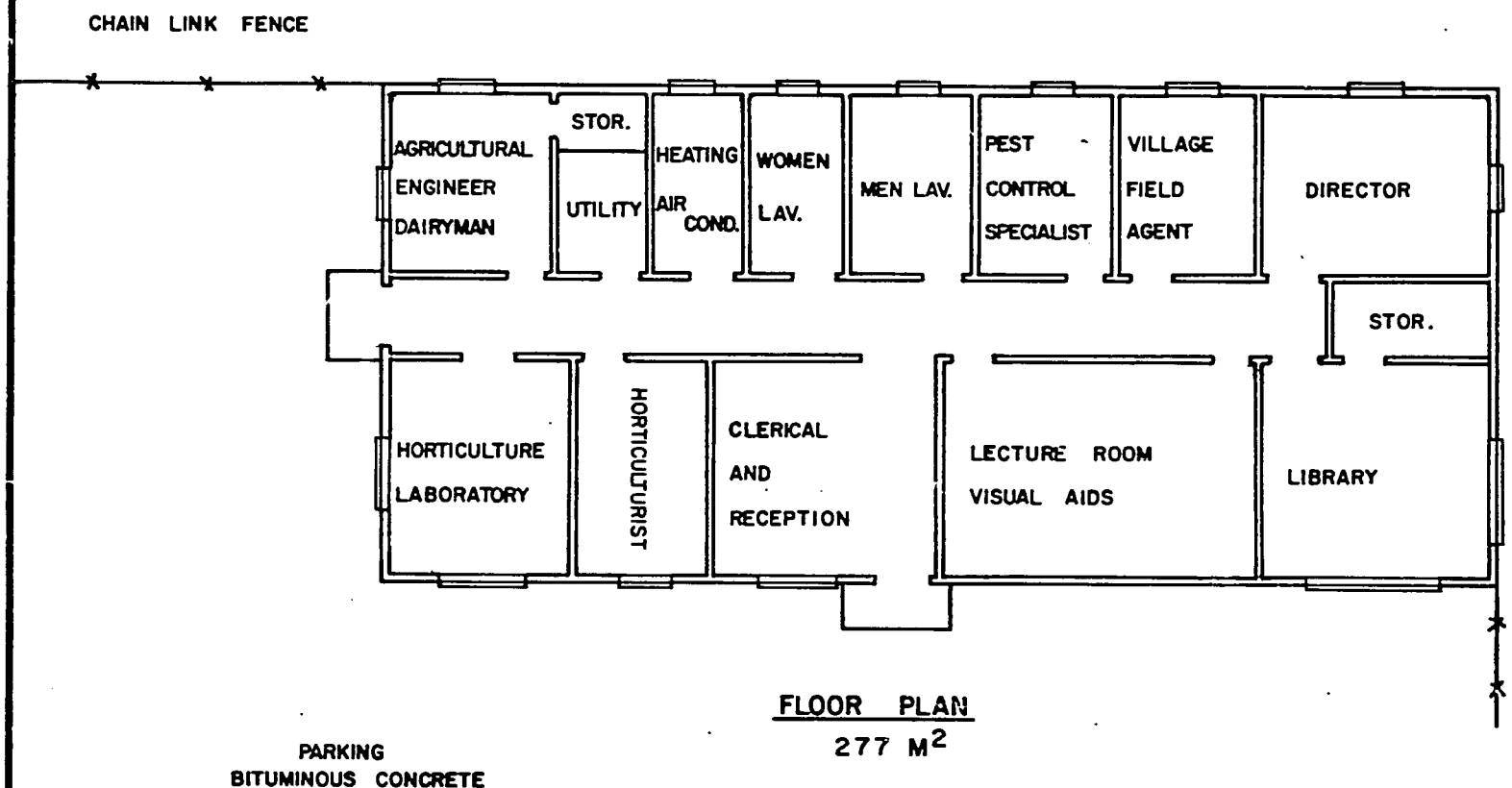
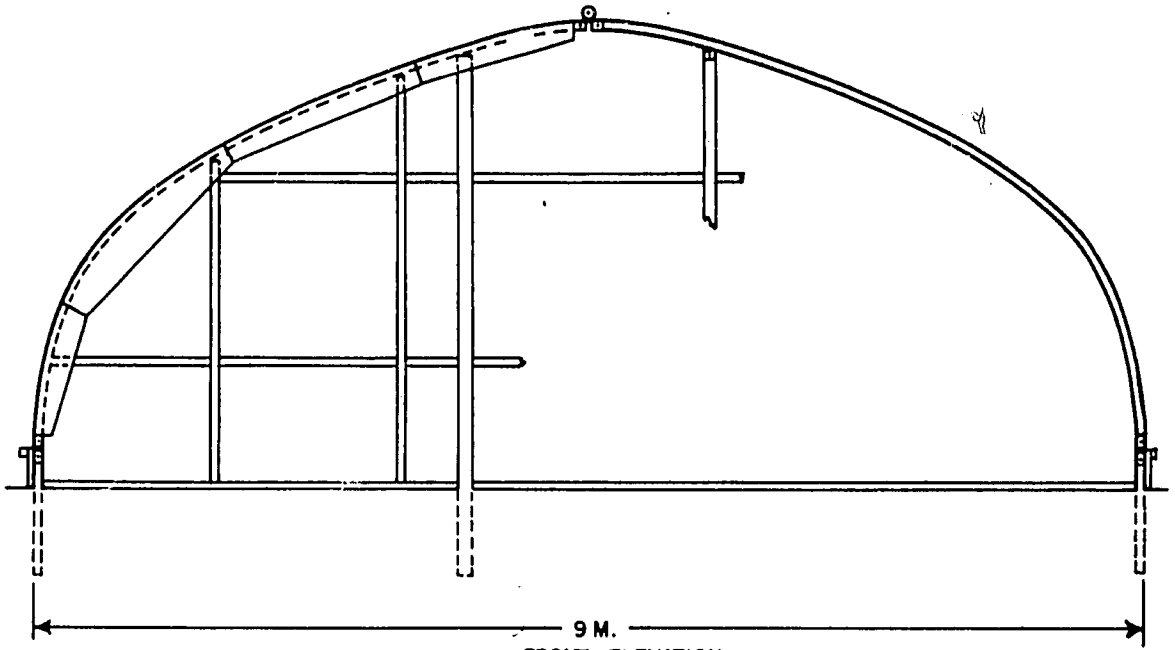


FLOOR PLAN
277 M^2

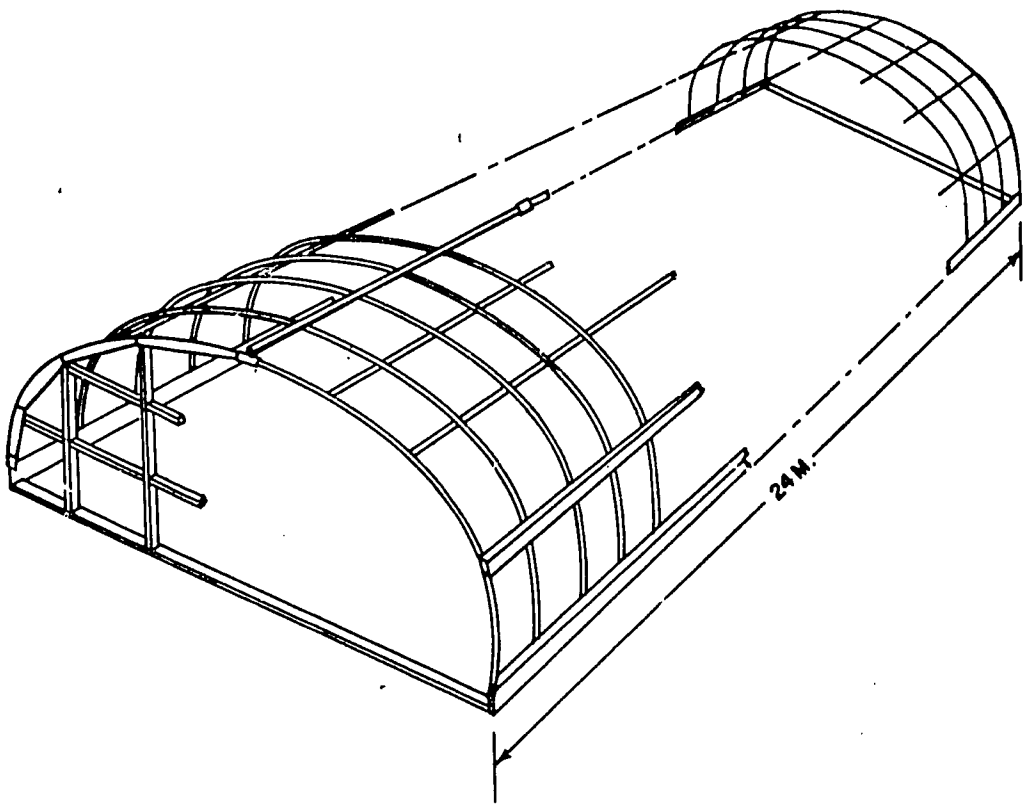
FIGURE A IV-9

AGRICULTURAL SERVICES CENTER
AKKAR PLAIN PROJECT

TIPTON AND KALMBACH — SCHICK INTERNATIONAL



FRONT ELEVATION



ISOMETRIC VIEW

FIGURE A IV - 10

GREEN HOUSE

AKKAR PLAIN PROJECT

TIPTON AND KALMBACH — SCHICK INTERNATIONAL

Table AIV-6. Agricultural Services Center and Experimental Farm - Cost Esimate

Description	Units	No. Units	Unit Cost S.P.	Unit Cost U.S. $	Cost S.P.	Cost U.S. $
Agricultural Services Building	m2	277	1,404	360	388,908	99,720
Shop with Equipment	m2	70	1,170	300	81,900	21,000
Greenhouse	ea.	2	58,500	15,000	117,000	30,000
Office Furniture	L.S.	-	39,000	10,000	39,000	10,000
Fencing, chain link	m	84	30	7.69	2,520	646
Paving, asphalt	m2	1,500 2/	16	4.10	24,000	6,150
Field fencing	2,000	m	8	2.05	16,000	4,100
Field vehicles	ea.	4	23,400	6,000	93,600	24,000
Office vehicles	ea.	2	23,400	6,000	46,800	12,000
Bus (25 pass.)	ea.	1	78,000	20,000	78,000	20,000
			Foreign Purchase		376,920	96,646
			Local Supplied		510,808	130,970
			TOTAL		887,728	227,616
			Contingencies 10%		88,773	22,762
					976,501	250,378
			Eng. & overhead 15%		146,475	37,557
					1,122,976	287,935 1/
			Round to		1,123,000	287,900

1/ Does not include site.

2/ Rounded.

Table AIV-6A. Agricultural Service Center, Foreign Cost

Item	Foreign Purchase $ Cost	SP Cost
Greenhouse (2)	30,000	117,000
Office Furniture and Equipment	10,000	39,000
Fencing, chain link	646	2,520
Field Vehicles (4)	24,000	93,600
Office Vehicles (2)	12,000	46,800
Bus	20,000	78,000
	96,646	376,920
Contingencies 10%	9,665	37,692
	106,311	414,612
Overhead and Engineering 10%	10,631	41,461
Foreign Purchase	116,942	456,073

Marketing Structure

Agricultural products produced on the Akkar Plain are marketed throughout Syria. Because of the favorable climate and lower elevation, crops mature earlier than at Homs, Hama, Allepo, Damascus and other inland market centers, and thus bring higher early season prices. Farmers market their products in the above cities depending on current prices. Farm products are also sold at Tartous and from small stands along the main highways. Farm products sold in Tartous are sold mainly from the central cooperative market which consists of covered produce stalls which are rented to wholesalers. The cooperative is administrated by the Mohafazat (government). Farm products are bought and sold daily so there is no storage or holdover capacity. Grading of fruits and vegetables is almost wholly by the farmer or buyer.

There are no food processing or canning facilities in Tartous or near vicinity of the project. The nearest major food canning and processing facilities are located at Jable and Latakia, which are located approximately 82 and 110 km north of the northwest end of the project, respectively. Products canned at these locations include tomatoes, beans, apricots, pears, and apricot, orange and tomato juice.

Farmers slaughter their own meat which consists of cattle, sheep, goats and poultry. These products are also sold in minor amounts and bartered for other products. The principal meat product (beef) is imported from Australia and Argentina

The principal dairy and animal processing facilities serving the project

area are located at Homs 97 km to the northeast.

Approximately 40 percent of the wheat, maize and other small grains produced is utilized for the farmers own use. Essentially all of the grains are stored on the farm.

The government is taking a renewed interest in agriculture. Plans are underway to control both export and import of agricultural products. A new marketing facility is being constructed in Tartous by the Mohafazat. When completed, stalls or space in the facility will be rented to individual farmers or farmer-operated cooperatives. This will enable farmers to sell directly to consumers. The present system of wholesalers will be phased out over a few years. The Mohafazat sets and controls prices under directions from the Department of Agriculture and Agrarian Reform in Damascus. Crops in excess of local demand will be exported to other provinces or Arab countries.

A cold storage warehouse (capacity 5,000 m^3) has been constructed at the port by the government to handle vegetables, meat and other perishables. This facility handles products being imported and exported but additional capacity is available for rent to farmers and wholesalers. Grain silos are under construction at the port. The first unit of 25,000 metric tons is scheduled for completion during 1978. Three additional units of the same capacity will follow making a total storage capacity of 100,000 metric tons within the next 3-5 years. The elevators will be used mainly to facilitate loading and unloading of ships used for export and import.

It is expected that the government will be a major factor in marketing

and establishing prices for products produced on the project.

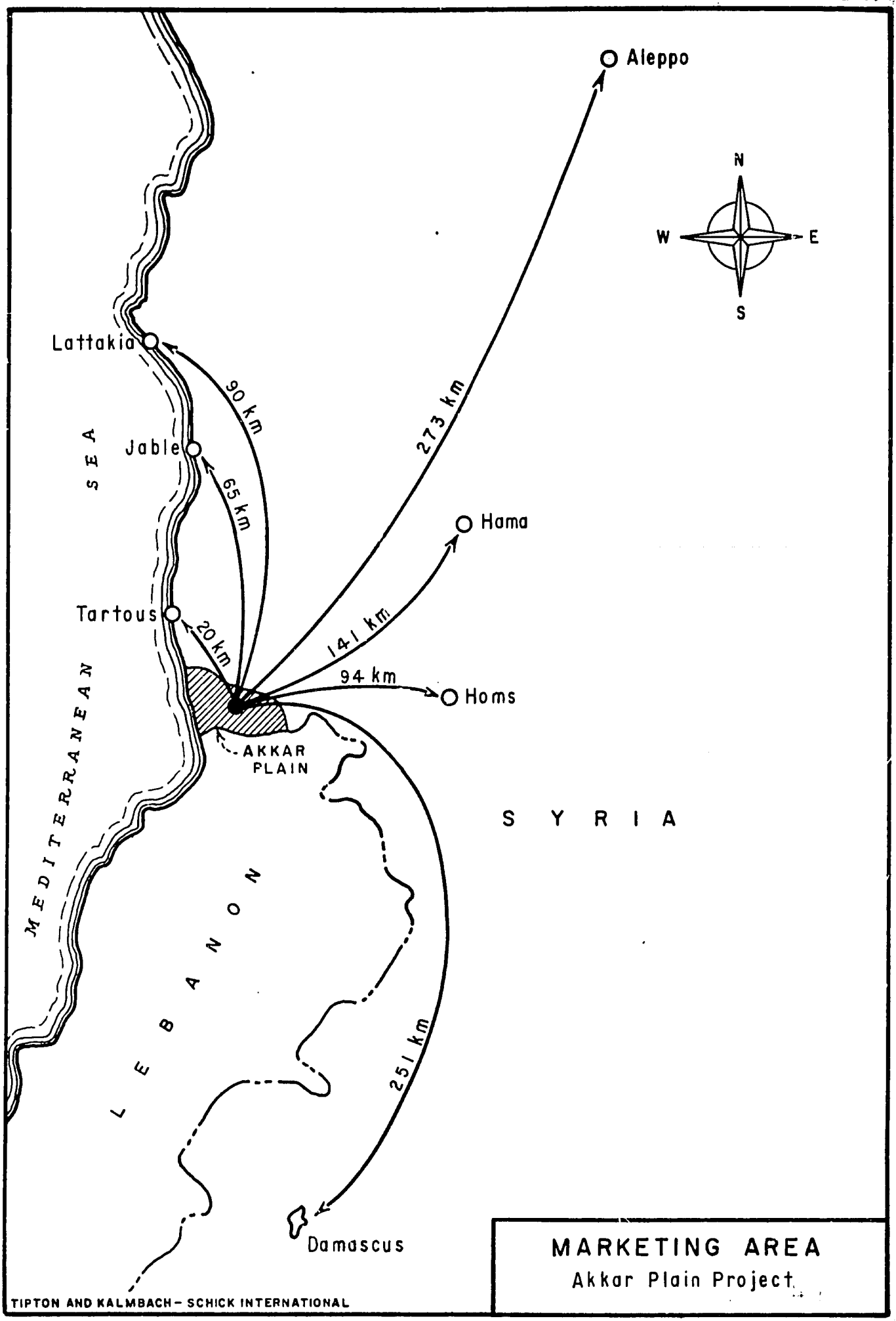
Project Storage and Marketing Facilities

Storage and marketing facilities constructed or planned for Tartous by the government will be of secondary importance to the project since it is anticipated that a large portion of the crops produced on the project will be marketed in Homs, Hama and Damascus which is in the opposite direction, Figure AIV-11. Therefore, it is necessary that storage and marketing facilities be provided on the project.

Small Grain Storage

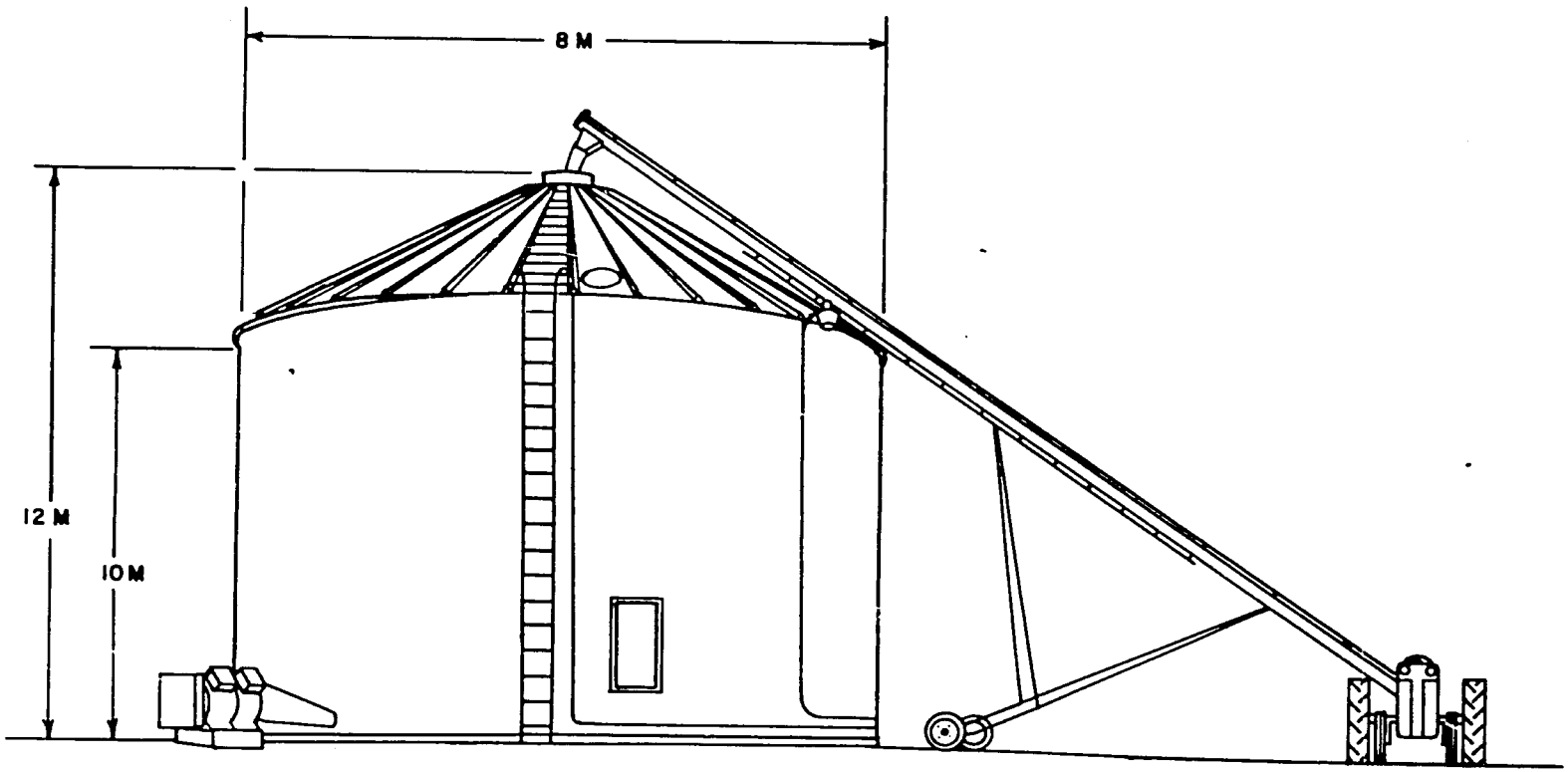
Although the major portion of the small grain presently produced on the project is stored on the farm, these facilities will be inadequate for the increased production under the project. Also, these facilities are substandard which results in heavy losses from rodents and spoilage from lack of proper ventilation during the damp winter season. It is anticipated that approximately 8,500 metric tons of additional storage will be required. Since SARG establishes market prices for grains and buys the farmer's crop, except what is required for his own use, the government will market the grain as harvested or provide additional storage. If storage is provided on the project, it is recommended that storage facilities be located at Arzooneh, Karto, Zahed, and Hamidyeh. Farmers should reduce spoilage and loss from rodents by providing good facilities for storage of grain retained for their own use. A typical storage bin is shown on Figure AIV-12. This facility has provisions for drying and ventilating the grain and can utilize several sources of power for operation of the elevator and drying and ventilating equipment. The storage bins are available in a size to meet the farmer's needs. The estimated cost of providing 24 grain storage units to store 8,500 M.T. of project grains is 1,795,100 SP or $460,284, Table AIV-7.

FIGURE AIV-11



MARKETING AREA
Akkar Plain Project

TIPTON AND KALMBACH – SCHICK INTERNATIONAL



CAPACITY 354 M.T.

FIGURE AIV-12

GRAIN STORAGE BIN
AKKAR PLAIN PROJECT

TIPTON AND KALMBACH — SCHICK INTERNATIONAL

Table AIV-7. Grain Storage - Estimated Cost

Description	Unit	No. Units	Unit Cost U.S. $	Unit Cost S.P.	Cost S.P.	Cost U.S. $
Steel Storage Bin 380 tons	ea.	24	10,100	39,390	945,360	242,400
Elevator 10 m	ea.	24	400	1,560	37,440	9,600
Ventilator - Drier	ea.	24	500	1,950	46,800	12,000
Concrete foundation	25 cu. yd.	24	3,750	14,625	351,000	90,000
Grading	100	24	100	390	9,360	2,400
Freight	ea.	24	1,000	3,900	93,600	24,000
				Total	1,483,560	380,400
		Contingencies 10%			148,356	38,040
					1,631,916	418,440
		Overhead and Engineering 10%			163,192	41,844
				Total	1,795,108	460,284
		Local Cost			436,035	111,803
		Foreign Cost			1,359,072	348,480

Table AIV-8. Grain Storage - Estimated Cost - Locally Supplied and Foreign Cost

Item	Locally Supplied S.P.	Foreign Cost U.S. $
Storage Bins	-	242,400
Elevators		9,600
Ventilator-Drier		12,000
Freight		24,000
Concrete Foundation	351,000	
Grading	9,360	
Total	360,360	288,000
Contingencies 10%	36,036	28,800
	396,396	316,800
Engineering and Overhead 10%	39,639	31,680
	436,035	348,480

Farmer Cooperatives

The larger project villages have farmer cooperative organizations. Farmers in the small villages usually have membership in the nearest cooperative. Leaders of the cooperatives are appointed by the government. The cooperatives provide a vital service to the farmers which includes:

a. Receive and distribute fertilizer, seed and insecticides from the government

b. Arrange with the Agricultural Bank for credit to the farmers for the items under "a", plus the purchase of farm machinery and pumping facilities etc.

The cooperative also serves as a meeting place for the farmers and a retail outlet for limited food, clothing and small tools.

It will be necessary to expand cooperative facilities under full project development. It is assumed, at this time, that since the cooperative is organized by the government and profits received are returned to the government, that the government will provide for necessary expansion of the cooperative program.

Health Facilities

There is one government owned and one private hospital in Tartous which is located approximately 30 km from the center of the project. These hospitals are staffed and equipped to handle general surgery, disease and emergencies. However, the main problem is the low ratio of one doctor to 4,000 persons. Because of this and the lack of transportation, project residents do not receive adequate medical attention. A new 500-bed hospital

is planned for Tartous but has not yet been funded. Dental care is also a problem because of the low ratio of dentists to the population and the lack of transportation.

Health centers have been established at Hamidyeh and Safsafeh, which are staffed with one doctor and two nurses, one of which is a midwife. They are equipped to handle fractures, lacerations, vaccinations, and minor health care.

Each of the large villages has a midwife and most of the babies are born at home. One of the important health needs at the villages is proper postnatal care for both mother and child.

Doctors and/or nurses visit the schools periodically for inoculations of the children, but there is a lack of transportation for timely medical help to reach the villages in case of epidemics or other emergencies. There are no particular health problems because of poisonous snakes, animals, and insects. Cholera and tuberculosis are common in the area, but the most common health problems in the villages result from untreated culinary water and lack of personal sanitation. Most of the residences do not even have pit-type latrines. Full project development would aggravate this condition. Installation of piped culinary water to the residences would permit the use of flush-type toilets and septic tanks which would be an important step in improving the general health and sanitary conditions.

It is recommended that a new health care center be established at Karto which would be staffed with two doctors, two dentists, and two or more nurses. The center should have the capability to handle dentistry, minor surgery,

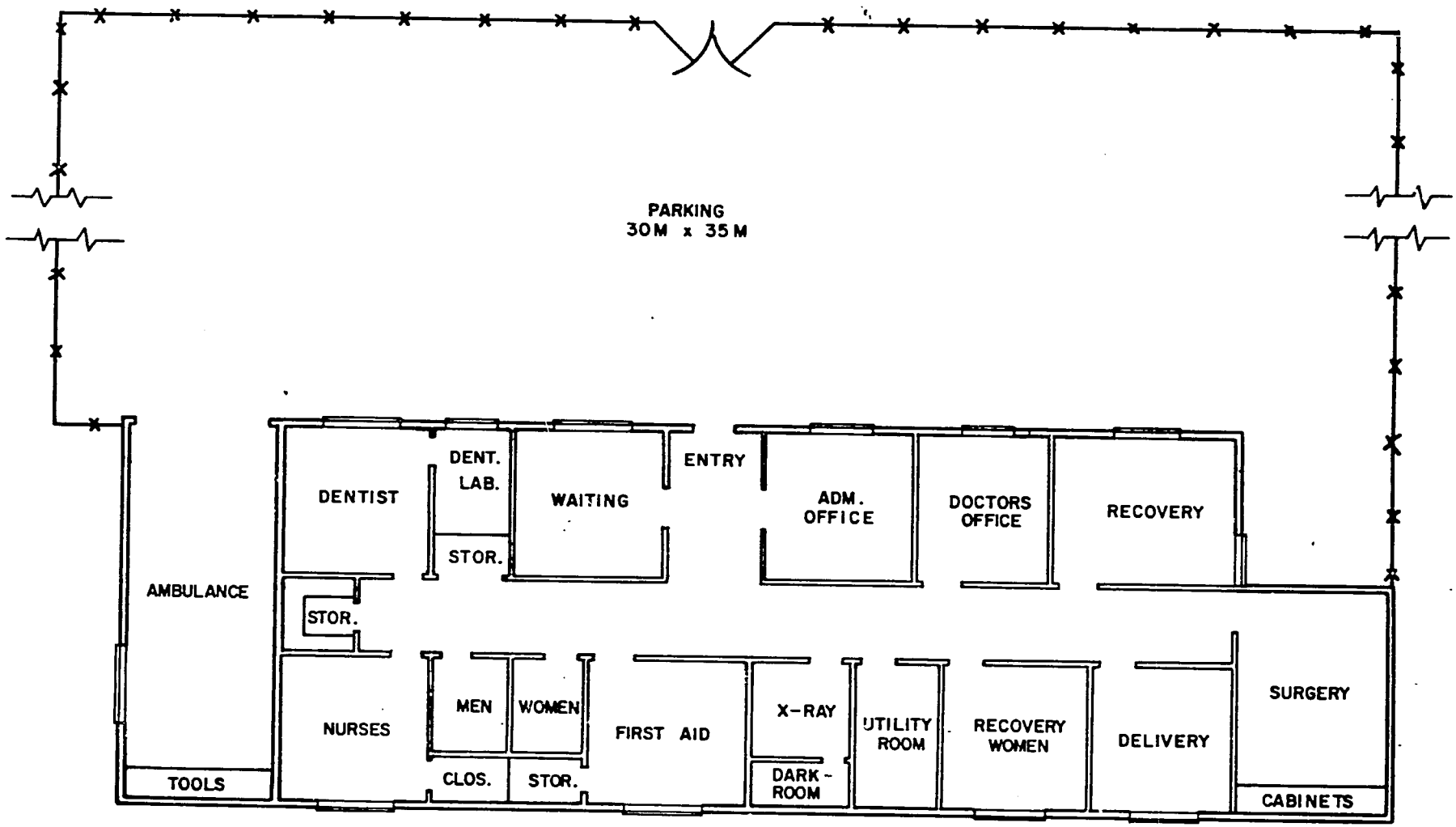
including oral surgery, special maternity cases, emergencies and general health care, Figure AIV-13. These facilities would be provided and maintained by the project but staffed by the government. The estimated cost for the health care facilities is 2,288,500 SP ($587,000) less land, which is itemized, Table AIV-9. Estimated local and foreign costs are itemized, Table AIV-10.

Karto was selected for the location of the health facility because it is centrally located, has a good secondary school, has a new water system, has telephone service and the Electricity Department at Tartous plans to construct a 20 KVA transmission line to Karto during 1979-80.

Animal Slaughtering and Processing

The principal meat product used in the area is beef which is imported from Australia and Argentina. Other meat products are sheep, goats and poultry. Pork is consumed only in minor amounts of ham and bacon which is imported. The principal animal processing facilities serving the project area are located at Homs, 97 kms to the northeast. There are small slaughter houses at Tartous but they have low output and are lacking in inspection and health standards. Farmers slaughter their own meat which consists of cattle, sheep, goats, and poultry.

Class V land under the project which is not suitable for irrigation because of drainage and heavy soil will be planted to vetch and pasture grasses and utilized for grazing. Therefore, it is recommended that an animal slaughtering and processing plant be constructed at Zahed to process animals grazed on the project and to serve the surrounding area. The plant could



FLOOR PLAN

400 M^2

FIGURE AIV-13

HEALTH CARE CENTER

AKKAR PLAIN PROJECT

TIPTON AND KALMBACH — SCHICK INTERNATIONAL

Table AIV-9. Cost Estimate Health Care Center

	Unit	No. Units	Unit Cost SP	Cost SP	Cost U.S. Dollars
Building	m^2	310	3,500	1,085,000	278,205
Equipment	L.S.			390,000	100,000
Grading	m^2	1,100	L.S.	4,000	1,026
Paving	m^2	1,050	16	16,800	4,308
Fencing	m^2	130	30	3,900	1,000
Ambulance	ea.	1	177,000	117,000	30,000
Field Vehicles	ea.	2	29,250	58,500	15,000
Office Equipment and Supplies	L.S.			58,500	15,000
	TOTAL			1,733,700	444,538
	Contingencies 10%			173,370	44,454
				1,907,070	488,992
	Architect and Overhead 20%			381,414	97,798
				2,288,484	586,790
	Local Cost			1,464,800	375,600
	Foreign Cost			823,680	211,200

1/ Does not include land.

Table AIV-10. Health Care Facilities - Local and Foreign Cost

Item		U S $	
Foreign Cost			
Hospital and Dental Equipment		100,000	
Ambulance		30,000	
Vehicles (2)		15,000	
Office Equipment and Supplies		15,000	
		160,000	
	Contingencies 10%	16,000	
		176,000	
	Overhead and Architect 20%	35,200	
		$ 211,200	
		823,680	S P
	Local Cost =	2,288,500	
	Less	823,680	
		1,464,820	S P

feature custom slaughtering for individual farmers with only a few head. The plant, Figure AIV-14, would handle 100 cattle per day or equivalent in other animals and associated by-products. The estimated cost of the facilities is 892,300 SP ($228,800), Table AIV-11, with foreign costs itemized, Table AIV-12.

Dairy Industry

Consumption of fresh milk is low in the project area and Syria in general. This is attributed to the lack of refrigeration and dairy cows. However, consumption of cheese, yogurt and other milk products are becoming popular. These products are imported from other areas of Syria and foreign countries.

There are only three small dairies in the vicinity of Tartous with a total of less than 40 cows. Milk production per cow is low and sanitation is substandard.

Class V land on the Akkar Plain is not suitable for irrigation because of the heavy soil and lack of drainage. These soils are suitable for raising hay, grain and pasture to support a dairy industry.

It is recommended that a dairy for approximately 300 cows be constructed near Zahed to utilize production from the Class V land and to improve the general diet of people in the area. A typical dairy barn and corrals of the recommended capacity is shown, Figure AIV-15. The estimated cost of the dairy is 795,000 SP ($203,000), Table AIV-13. Foreign costs are itemized on Table AIV-14.

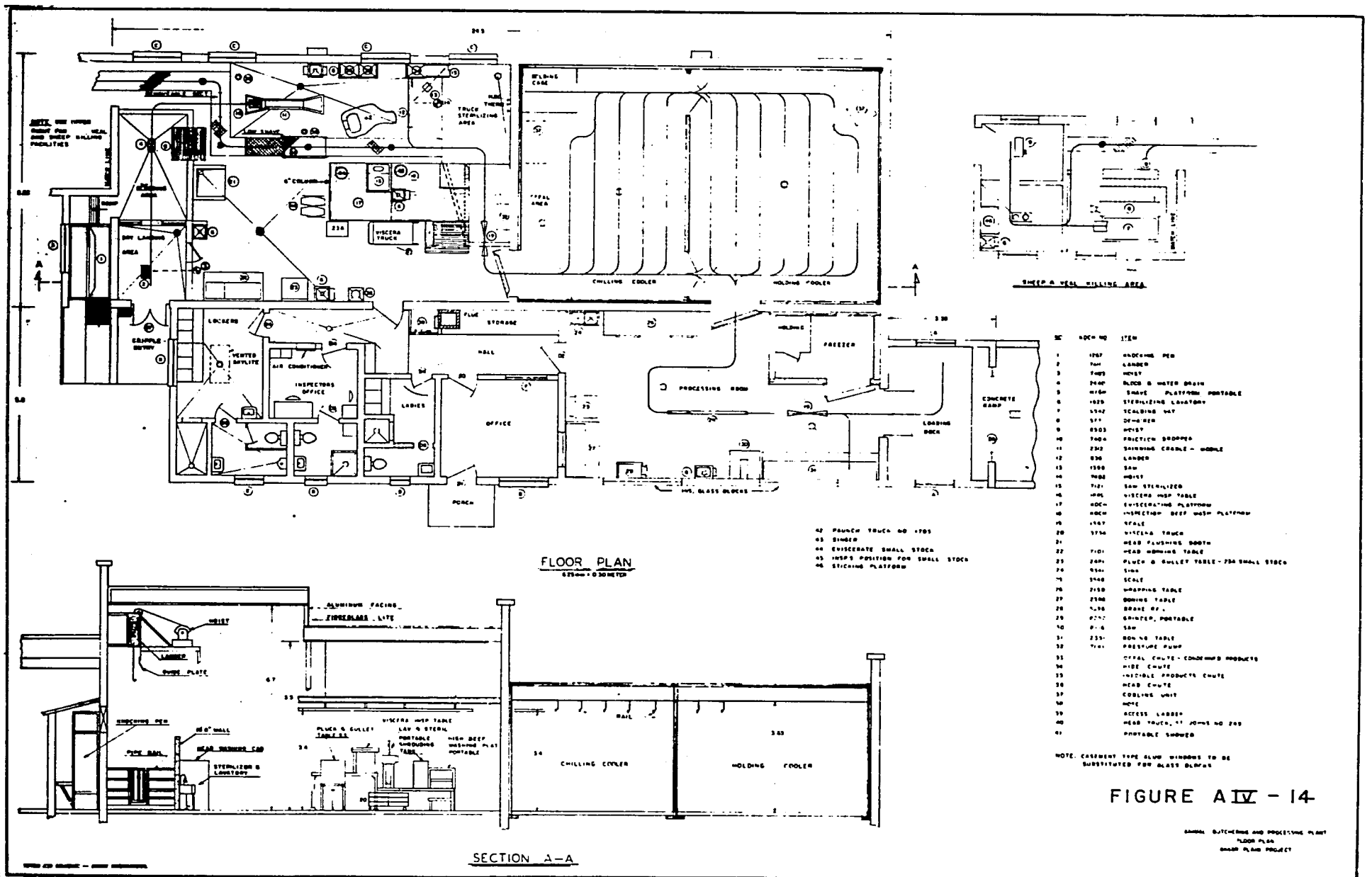


FIGURE A IV - 14

Table AIV-11. Estimated Cost - Animal Slaughtering and Processing Plant

Description	Unit	Number of Units	Unit Cost & U.S.	Unit Cost S.P.	Cost $ U.S.	Cost SP
Structure	m^2	370	360	1404	133,200 1/	519,480 1/
Plant Equipment	L.S.		-	-	45,000	175,500
Plant Supplies	L.S.		-	-	2,000	7,800
Office Equipment	L.S.		-	-	2,225	8,677
Paving, Asphalt	m^2	1,200	4.10	15.99	4,920	19,188
Fencing Chain Link	L.M.	600	7.69	29.99	4,614	17,994
Grading	m^2	2,000	1.00	3.9	2,000	7,800
Freight, Plant Equipment	est.		-	-	5,000	19,500
					198,959	775,940
			Overhead, Architect 15%		29,844	116,391
					$228,803	SP 892,331
			Local Cost		176,803	689,531
			Foreign Cost		52,000	202,800

1/ Does not include land, includes 10% contingencies.

Table AIV-12. Animal Slaughtering and Processing Facilities

Cost Estimate - Foreign Purchase

Structure 280.4 m^2 @ 10.25 SP

Equipment as per list lump sum $45,000 SP 175,500
Based on actual construction cost 1965.

Paving for parking and loading area 935 m^2

Fencing for security 183 m

Land not included in estimate - may be procurred by the government

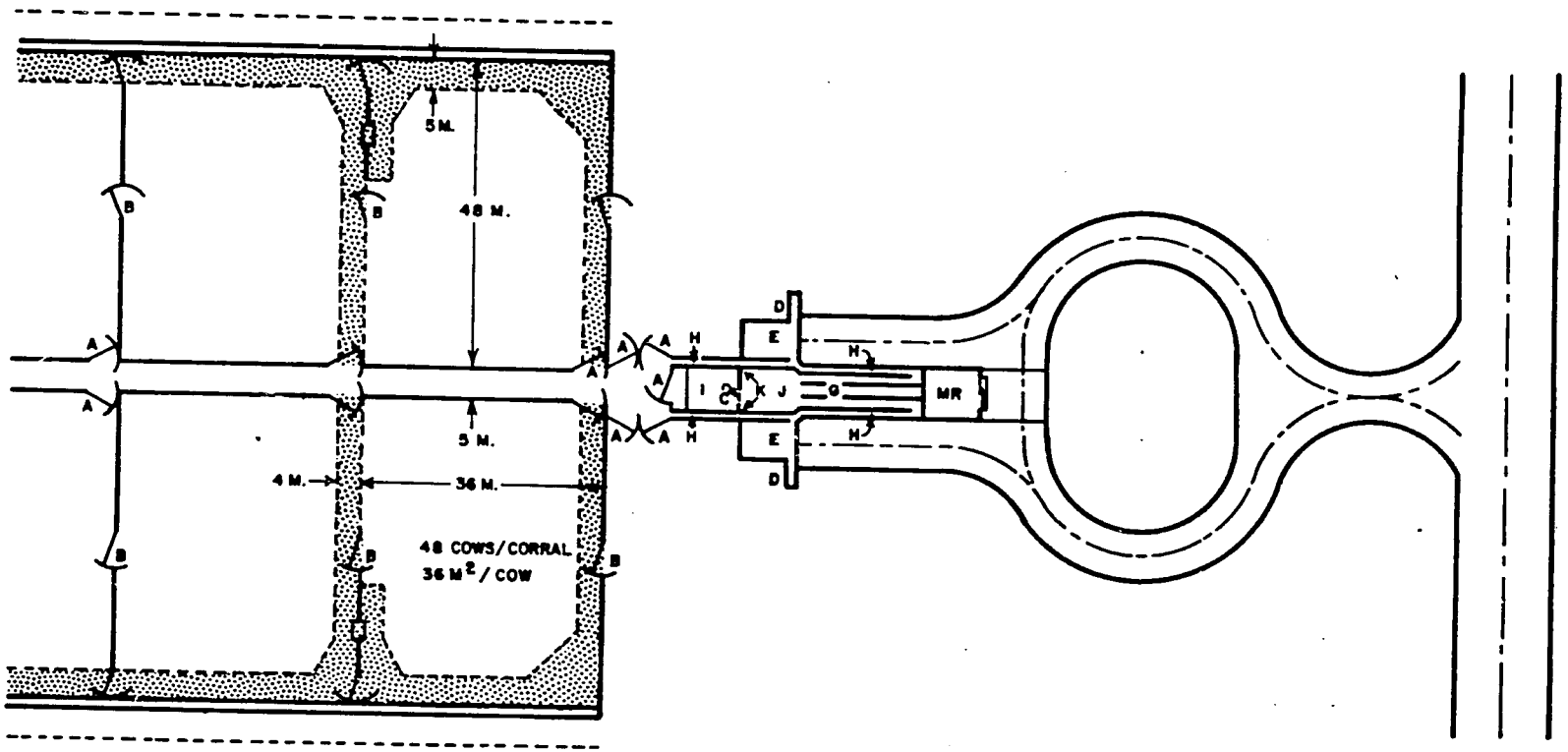
Freight to Syria and associated charges estimated.
Plant supplies, shrouds, wrapping paper, etc. $2,000

Office Equipment

2 desks	@	$ 200	S P 780
2 chairs	@	100	390
6 chairs	@	50	195
2 file cabinets	@	125	487.5
2 tables	@	75	292.5
1 typewriter	@	750	2925.0
2 calculators	@	75	292.5
misc.	@	250	975.0
bookcase	@	100	390.0
office supplies	@	500	1950.0
		$ 2,225	S P 8677.50

Foreign Purchase

Plant Equipment	$ 45,000	S P 175,500
Plant Supplies	2,000	7,800
Freight	5,000	19,500
	$ 52,000	S P 202,800
TOTAL	$213,959	834,439
	- 52,000	202,800
	$161,959	S P 631,639



PLAN

INITIAL CAPACITY 300 COWS

A – 5 M. GATE
B – 5 M. GATES
C – 4 M. SLIDING GATE
D – LOADING CHUTES
E – DIVERSION PEN
G – (2–10) HERRINGBONE
H – EXIT LANES
I – WASHING PEN
J – HOLDING PEN
MR – MILKROOM
K – MAN ESCAPES

FIGURE AIV-15

DAIRY

AKKAR PLAIN PROJECT

TIPTON AND KALMBACH — SCHICK INTERNATIONAL

Table AIV-13. Cost Estimate Dairy, 300 Cows

Description	Unit	No. of Units	Unit Cost $ U.S.	Unit Cost S.P.	Cost $ U.S.	Cost SP
Milking Plant and Equipment	L.S.	-	75,000	292,500	75,000 1/	292,500 1/
Corrals	L.S.	-	20,000	78,000	20,000	78,000
Hay and Hospital Barns	L.S.	-	18,000	70,200	18,000	70,200
Cow Shelters	L.S.	-	5,000	19,500	5,000	19,500
Grading	L.S.	-	2,000	7,800	2,000	7,800
Manure System	L.S.	-	15,000	58,500	15,000	58,500
Paving, Asphalt	m^2	1,500	4.10	15.99	6,150	23,985
Residence	L.S.	-	20,000	78,000	20,000	7,800
					165,150	628,485
			Contingencies 10%		16,115	62,845
					177,265	691,330
			Overhead and Architect 15%		26,590	103,699
					203,854	795,029
			Local Cost		187,518	731,322
			Foreign Cost		16,335	63,706

1/ Does not include dairy stock, land and delivery trucks, includes freight.

Table AIV-14. Dairy Cost Estimate - Foreign Cost

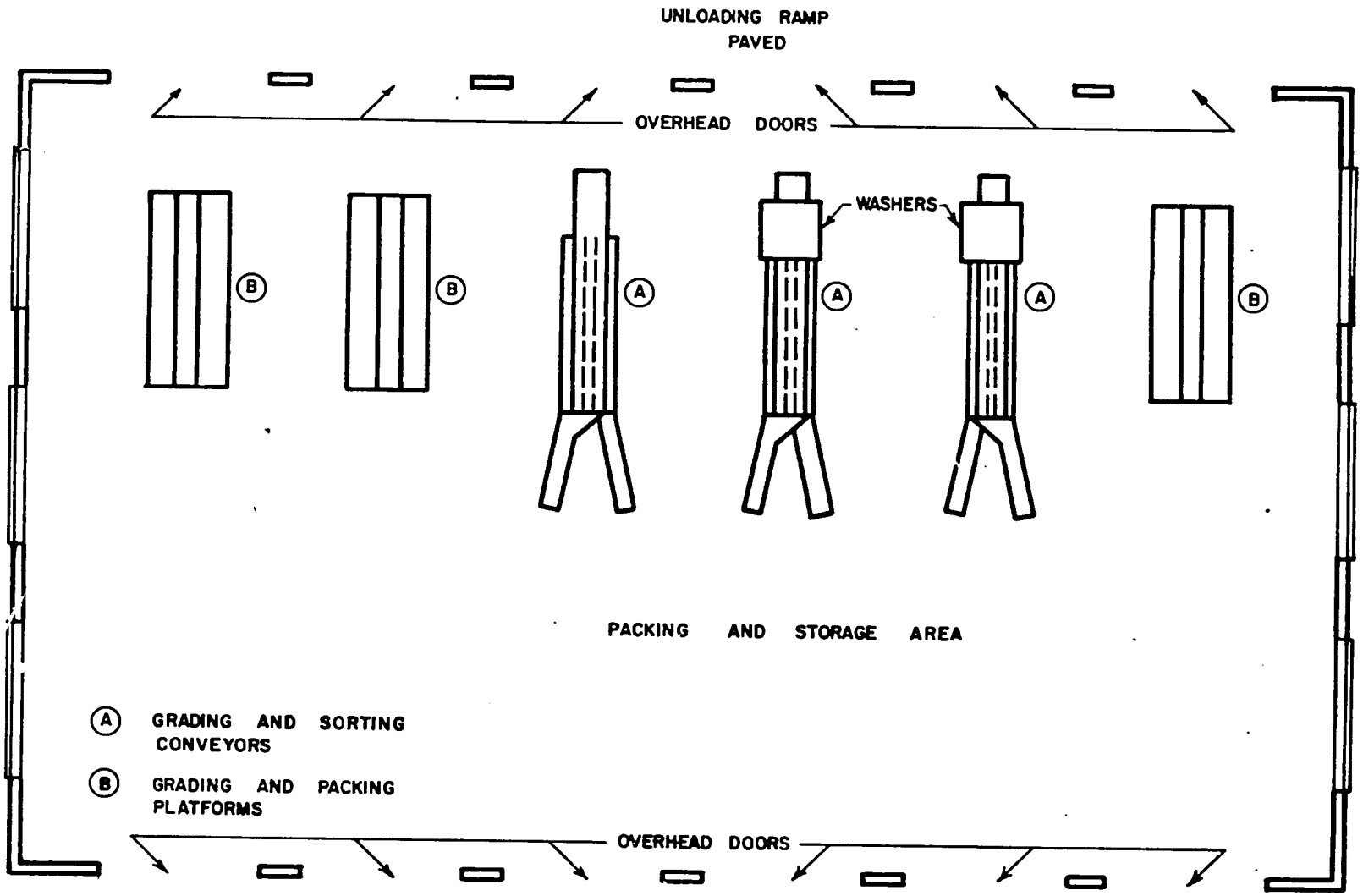
Description		Cost US $
Equipment		10,000
Manure, Pumps, etc.		2,500
Freight		1,000
	Total	$ 13,500
	Contingencies 10%	1,350
		$ 14,850
	Overhead 10%	1,485
	Total	$ 16,335
		63,706 S P
		795,029 S P
		63,706 S P
		731,323 S P

Agricultural Products - Grading and Packing Facilities

At the present time grading and packing of fruits and vegetables in the project area is by the farmer and buyer. As a result, grading varies widely and lack of adequate methods and facilities results in above-average spoilage before reaching the market. Farmers would receive a better price for their products if grading and packing facilities were provided on the project which were staffed with experienced graders and correct handling and packing methods were employed. Good grading and packing facilities would no doubt attract more buyers from the large cities. It is recommended that grading and packing facilities be located at Arizooneh and Zahed which would provide good access to farmers throughout the project. A recommended plan for a grading and packing facility is shown, Figure AIV-16. Cost of the facilities would be 928,000 SP ($238,000), Table AIV-15.

Vegetable and Fruit Cannery

Production of vegetables and fruit (citrus) under full project development will exceed the local demand which will require grading, processing and packaging for marketing in the major population centers of Alleppo, Hama, Homs and Damascus and for export to neighboring Arab and other countries. Although a large quantity of fruits and vegetables can be marketed fresh, it is necessary to can and process certain amounts of the vegetables and fruits to fully utilize the agricultural potential of the project. The nearest processing facilities are located at Homs, Jable and Latakia which are from 82 to 110 km from the project. These distances create a major restraint for



FLOOR PLAN

1 cm = 3 Meters

273 M^2

FIGURE A IV - 16

AGRICULTURAL PRODUCTS

GRADING AND PACKING FACILITIES

AKKAR PLAIN PROJECT

TIPTON AND KALMBACH — SCHICK INTERNATIONAL

Table AIV-15. Estimated Cost Agricultural Products - Grading and Packing Facility

Description	Unit	Number of Units	Unit Cost $ U.S.	Unit Cost SP	Cost $ US	Cost SP
Structure	m^2	273	280	1,092	76,440 1/	298,116 1/
Plant Equipment	L.S.	-	7,500	29,250	7,500	29,250
Supplies	L.S	-	3,000	11,700	3,000	11,700
Grading	L.S.	-	1,000	3,900	1,000	3,900
Paving, Asphalt	m^2	1,500	4.10	15.99	6,150	23,985
					94,090	366,951
			Contingencies 10%		9,409	36,695
					103,499	403,646
			Overhead and Architect 15%		15,525	60,547
			Local Supplied		119,024	464,193

Two Required.

1/ Does not include land.

processing project grown fruits and vegetables. Therefore, it is recommended that a vegetable and fruit cannery be located at Karto which is near the center of the project. The proposed cannery is sized and equipped to adequately handle the types and quantities of vegetables and fruits produced on the project. The design mimimizes the capital investment and optimizes utilization of labor, which is generally surplus in the region. It is considered that the following products can be produced and marketed:

Green beans

Maize

Carrots

Table beets

Whole tomatoes

Tomato juice and paste

Apricot halves, pears

Potatoes

Apricot nectar

Vegetable soup

Tomato soup

Chili con carne

Jams

Beef and mutton, fresh and stew

Chicken, turkey

Sauerkraut

Peanut butter

Frozen Foods

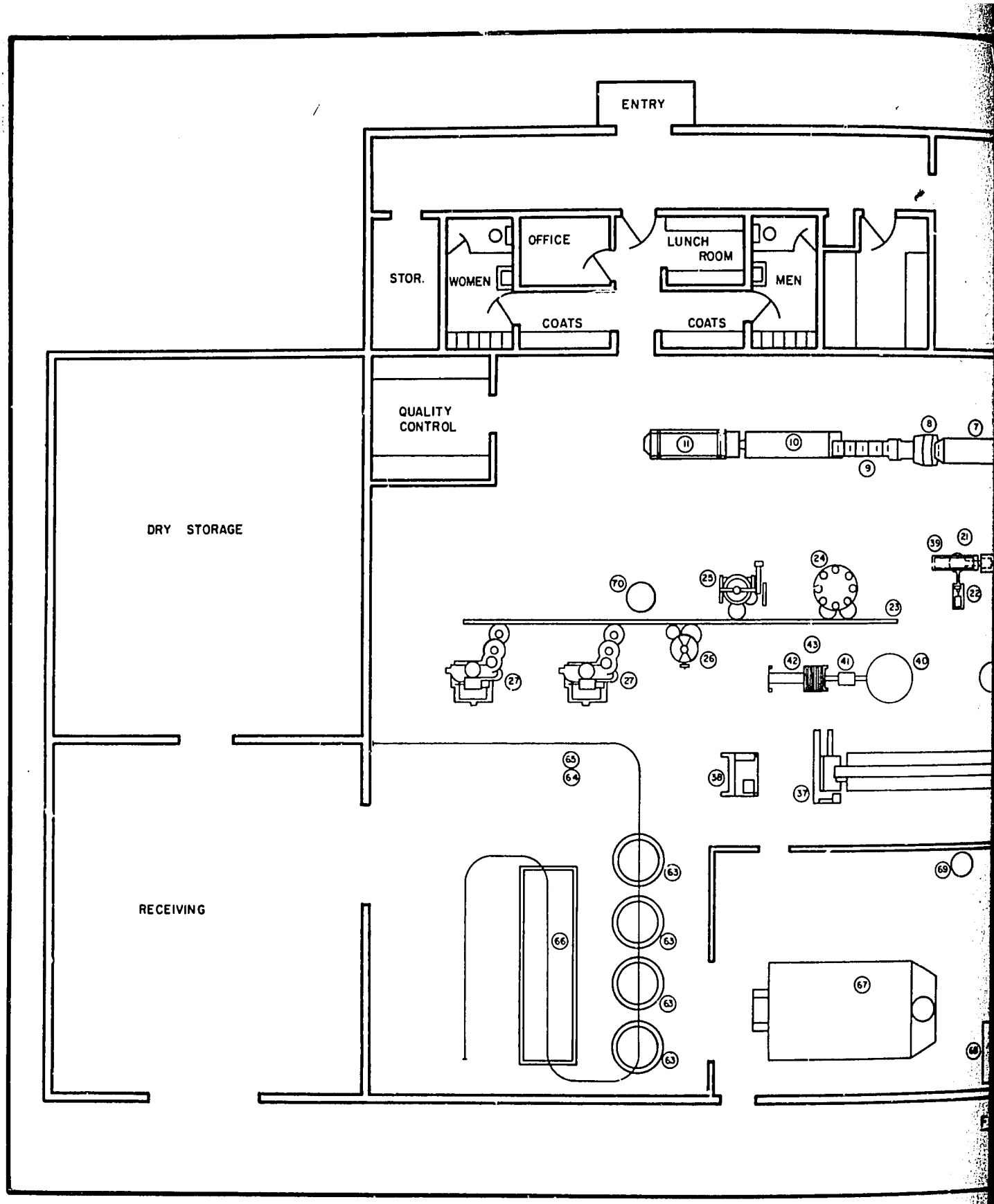
Broccoli

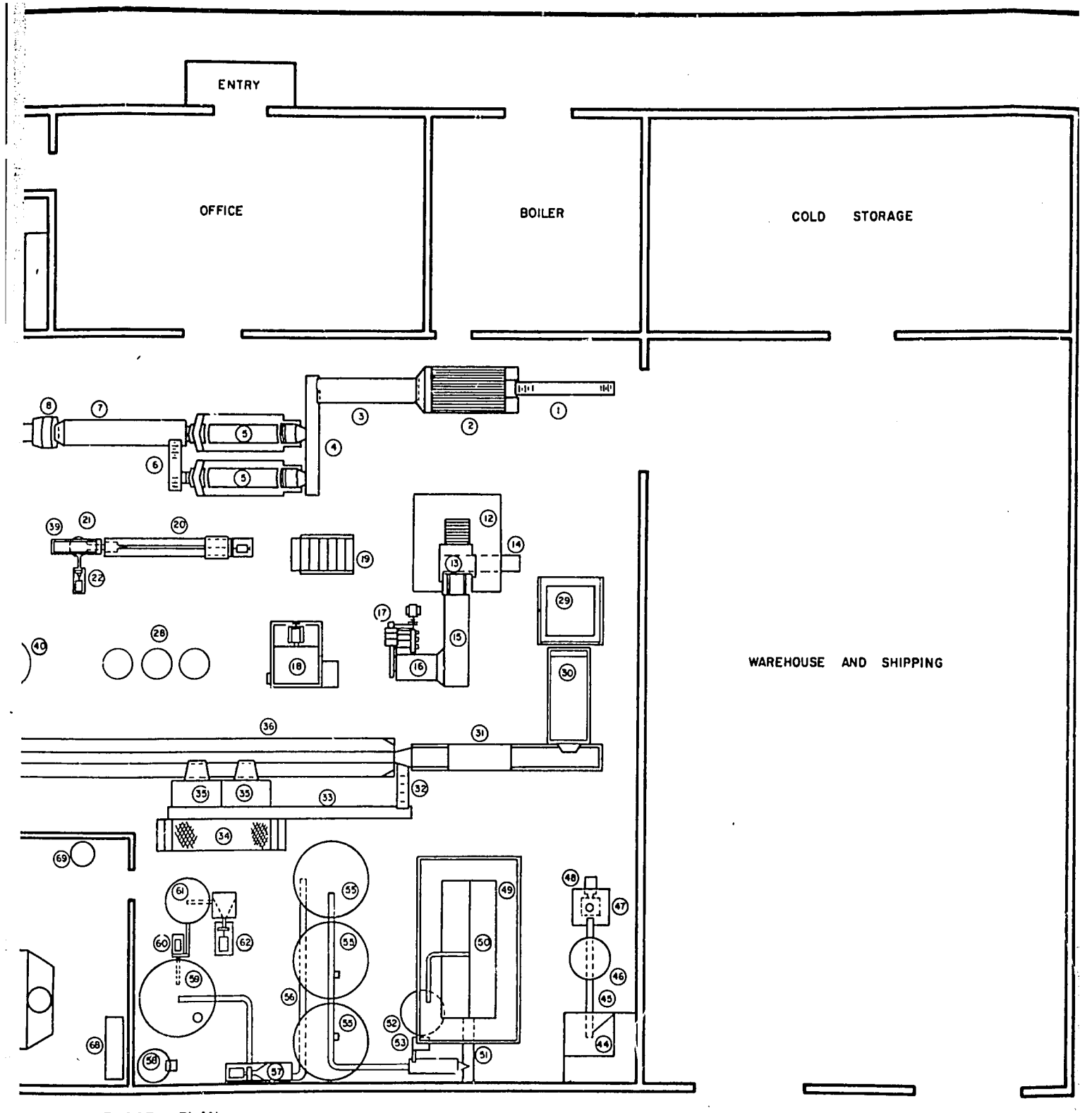
Spinach

Chard

Eggplant

The cannery could also accommodate canning sessions by cooperatives or organized village groups for family use. This would be an economical method of supplementing and improving the family diet during the winter season A suggested plant design with accompanying equipment schedule is shown on Figure AIV-17. The estimated cost of the cannery is 3,812,100 SP ($977,500) exclusive of land, Table AIV-16. Tables AIV-17 and AIV-18 are estimated equipment and foreign costs. Equally as important as plant design for the success of the cannery program will be giving high priority to the training of supervisors.


ENTRY
OFFICE
LUNCH ROOM
STOR.
WOMEN
MEN
COATS
COATS
QUALITY CONTROL
DRY STORAGE
RECEIVING



FLOOR PLAN
800 M^2

EQUIPMENT LIST

ITEM	DESCRIPTION
1	ELEVATOR
2	ROBBINS ROTARY WASHER # 2
3	INSPECTION TABLE
4	CROSS CONVEYOR
5	BEAN SNIPPER 2 EA.
6	ELEVATOR CONVEYOR
7	INCLINED INSPECTION BELT
8	BEAN CUTTER
9	ELEVATOR CONVEYOR
10	ROBBINS JR. BLANCHER
11	ROBBINS JR. ROTARY WASHER
12	PLATFORM
13	BUTTING-HUSKER
14	WASTE CONVEYOR
15	TRIM BELT
16	COB HOPPER
17	CORN CUTTER
18	ABRASIVE PEELER
19	CORN DE-SILKER
20	SCREW PRE-HEATER
21	SURGE TANK
22	FOOD PUMP
23	CAN BELT CONVEYOR
24	HAND PACK FILLER
25	FMC M-S FILLER
26	SYRUPER
27	CANCO SEAMER
28	STEAM KETTLE 3 EA.
29	BOX DUMPER
30	REEL WASHER
31	SCALDER
32	ELEVATOR CONVEYOR
33	FEED BELT CONVEYOR
34	PLATFORM WITH STEPS
35	WORK TABLE
36	WORK TABLE WITH CENTER
37	CHOPPER-PUMP
38	URACHEL, R.A. DICER
39	PULPER-FINISHER
40	SURGE TANK
41	PUMP
42	PASTEURIZER
43	PIPING SYSTEM TO AND FROM PASTEURIZER
44	RICE HULL HOPPER
45	MIXING SCREW
46	BIN
47	SURGE TANK
48	PUMP POSITIVE DISPLACEMENT
49	PLATFORM FOR WILMEN PRESS
50	WILMEN PRESS
51	SCREW, POMACE DISCHARGE
52	SURG TANK, PRESSED JUICE
53	PUMP JUICE
54	ROTARY SCREEN
55	DEPECTINIZING TANKS, 3 EA.
56	PIPING SYSTEM
57	PUMP, CENTRIFUGAL, JUICE
58	SLURRY MAKE-UP TANK WITH AGITATOR AND PUMP
59	TANK, HOLDING JUICE
60	PUMP, JUICE
61	PLATE FILTER
62	PUMP, JUICE
63	RETORTS, 4 EA.
64	OVERHEAD RAIL FOR HOIST
65	HOIST, OVERHEAD
66	COOLING TANK
67	BOILER
68	AIR COMPRESSOR
69	HOT WATER HEATER
70	TANK, TOPPING WATER, CEILING HUNG
71	CLEANING UNIT, HIGH PRESSURE

FIGURE A IV-17

CANNERY
AKKAR PLAIN PROJECT

Table AIV-16. Estimated Cost, Cannery

Description	Unit	No. of Units	Unit Cost $ U.S.	Unit Cost S.P.	Cost $ U.S.	Cost S.P.
Structure	m^2	700	400	1,560	280,000	1,092,000
Cannery Equipment		L.S.	-	-	414,308	1,615,801
Boiler and Piping		L.S.	10,000	39,000	10,000	39,000
Asphalt Paving	m^2	1,500	4.10	15.99	6,150	23,985
Grading	m^2	2,200	1.00	3.9	2,200	8,580
Fencing (chain link)	m	500	7.69	30	3,845	14,996
Office Equipment		L.S.	6,000	23,400	6,000	23,400
Cannery Supplies		L.S.	10,000	39,000	10,000	39,000
Office Supplies		L.S.	2,000	7,800		
Freight		L.S.	5,000	19,500	5,000	19,500
		Subtotal			740,503	2,887,962
		Contingencies 10%			74,050	288,796
					814,553	3,176,758
		Overhead and Architect 20%			162,910	635,352
		TOTAL			977,463	3,812,110
		Local Cost			476,600	1,858,800
		Foreign Cost			500,900	1,953,510

Table AIV-17. Estimated Cost of Equipment - Akkar Plain Cannery

ITEM	DESCRIPTION	ESTIMATED COST $ U.S.	S.P.
1	Elevator 1'x8'	2,173	8,475
2	Robins Rotary Washer #2	2,106	8,213
3	Inspection Table 2'x8'	2,808	10,951
4	Cross Conveyor 1'x10'	2,053	8,007
5	Bean Snipper, CRCO Model BST 2 ea. @ $3,450	6,900	26,910
6	Elevator Conveyor 1'x4'	1,974	7,699
7	Inclined Inspection Belt 2'x10'	2,808	10,951
8	Bean Cutter, Urschel Model #30	3,850	15,015
9	Elevator Conveyor 1'x8'	2,173	8,475
10	Robins Jr. Blancher	7,454	29,071
11	Robins Jr. Rotary Washer	2,106	8,213
12	Platform 7'x7' @ 20 sq. ft.	980	3,822
13	Butting-Husker, FMC	10,285	40,112
14	Waste Conveyor 1 1/2'x7'	2,166	8,447
15	Trim Belt 2'x8'	2,339	9,122
16	Cob Hopper	100	390
17	Maize Cutter	8,452	32,963
18	Abrasive Peeler	1,305	5,090
19	Maize Silker	3,995	15,580
20	Screw Pre-heater 35"x10'	8,568	33,415
21	Surge Tank, 25 gal.	674	2,629
22	Food Pump	1,165	4,543
23	Can Belt Conveyor 6"x26'	3,860	15,054
24	Hand Pack Filler	7,630	29,757
25	Simplex Filler, Single Twin	10,435	40,696
26	Syruper, FMC Mdl #60, 6 pocket	12,000	46,800
27	Canco Seamer, Steam Flo Units 2 ea. @ $11,500	23,000	89,700
28	Steam Kettle 30 gal. 3 ea. @ $1,375	4,125	16,087
29	Box Dumper	2,308	9,001
30	Reel Washer, Robins	2,209	8,615
31	Scalder, Robins #1	2,534	9,883
32	Elevator Conveyor 1'x4'	2,053	8,007
33	Feed Belt Conveyor 1'x20'	2,343	9,138
34	Platform 2 1/2' x 12', including steps @ $20	600	2,340
35	Apple Peelers - 4 cup - Pease 2 ea. @ $2,500	5,000	19,500
36	Work Table 3'x36' w/center conveyor 1'x36'	7,245	28,256

Table AIV-17 Cont. Estimated Cost of Equipment - Akkar Plain Cannery

ITEM	DESCRIPTION	ESTIMATED COST $ U.S.	S.P.
37	Chopper-Pump, Langsenkamp	6,560	25,584
38	Urschel, RA Dicer	8,500	33,150
39	Pulper-Finisher, Langsenkamp	4,415	17,218
40	Surge Tank	730	2,847
41	Pump	1,165	4,544
42	Pasteurizer	4,500	17,550
43	Piping System to & from Pasteurizer	1,000	3,900
44	Rice Hull Hopper w/Auger Feed	709	2,765
45	Mixing Screw, Stainless	1,233	4,809
46	Chopped Apple Bin	1,640	6,396
47	Surge Tank	1,640	6,396
48	Pump, Positive Displacement	2,500	9,750
49	Platform for Willmes Press	2,400	9,360
50	Willmes Press	26,000	101,400
51	Screw, Pomace Discharge	636	2,480
52	Surge Tank, Pressed Juice	1,640	6,396
53	Pump, Juice	475	1,852
54	Rotary Screen	1,966	7,667
55	Depectinizing Tanks, 3 ea. @ $4,000	12,000	46,800
56	Piping System	3,000	11,700
57	Pump, Centrifuge, Juice	475	1,853
58	Slurry Make-up Tank w/Agitator and Pump	3,990	15,561
59	Tank, Holding Juice (Optional)	1,361	5,308
60	Pump, Juice, Positive Displacement	2,500	9,750
61	Plate Filter	7,000	27,300
62	Pump, Juice	475	1,853
63	Retorts, 42" dia. 4 ea. @ $4,619	18,476	72,056
64	Overhead Rail for Hoist 100' @ $20	2,000	7,800
65	Hoist, Overhead	1,185	4,621
66	Cooling Tank	1,100	4,290
67	Boiler, 75 H.P.	15,952	62,213
68	Air Compressor	1,350	5,265
69	Hot Water Heater	200	780
70	Tank, Topping Water, Ceiling Hung	500	1,950
71	Cleaning Unit, High Pressure	595	2,321
		301,644	1,176,412
	SHIPPING COST	75,000	292,500
		376,644	1,468,912
	CONTINGENCIES 10%	37,664	146,891
	TOTAL	414,308	1,615,803

Table AIV-18. Cannery - Local and Foreign Cost

Description		Foreign Cost
Cannery Equipment		(SP) 414,308
Boiler and Piping		10,000
Freight		5,000
Cannery Supplies		10,000
Office Equipment		6,000
	Subtotal	455,308
	Contingencies 10%	45,531
		500,839
	Local Supplied	3,812,100
		1,953,272
		1,858,828
	Rounded	1,858,800
	Foreign Cost	$ 500,834
	Rounded	$ 500,900

Table AIV-19. Akkar Plain Cannery Production and Labor Requirement

Product	Cans per worker per hour	Crew	Size cans per hour
Jams	81	16	1303 (303)
Vegetable Soup	140	12	1688 (2 1/2)
Tomato Soup	120	14	1688 (2 1/2)
Chili Con Carne with Beans	72	12	869 (2 1/2)
Beef, Mutton, etc.	51	17	869 (2 1/2)
Apricot Nectar	86	14	1202 (2 1/2)
Apricots	118	33	3902 (2 1/2)
Tomato Juice	217	9	1952 (2 1/2)
Tomatoes	75	26	1952 (2 1/2)
Carrots	69	15	1040 (303)
Maize -whole kernel	114	14	1600 (303)
Green Beans	213	18	3840 (303)
Potatoes	40	8	323 (2 1/2)
Frozen Foods			
Broccoli	250 boxes	15	4000 (1/2 kilo.)
Spinach	250 boxes	15	4000 (1/2 kilo.)
Chard	250 boxes	15	4000 (1/2 kilo.)

PRODUCTION PROCESSES AND MANNING

Green Beans

Green beans are grown throughout the area and country. Commercially, beans are first put through a cluster breaker, which separates the beans from the vine, then washed (usually a flood washer), sent to the snippers, to an inspection belt and into the cutter. To this point commercial operations will have size graded the beans several times. After cutting, the beans are blanched, cooled, then filled mechanically or by hand. Hot water and salt are added before the can is sent through an exhaust box, seamed, and finally retorted. The cluster-breaker and the washer prior to the snipper are expensive pieces of equipment, and are considered unnecessary in any of the four plant sizes. There could be exceptions in any area where large volumes are grown commercially. In most operations, the cluster breaking and washing are expected to be hand operations followed by a mechanical snipper.

The limiting feature in canneries equipped with snippers will be the snipper capacity, which is in the range of 530 kilos/hr. In plants not equipped with snippers the capacity will be limited to retort capacity. The retort cook-cool cycle time is 30 minutes.

In some smaller canning operations, the snipper and cutter could be useful and should be considered optional pieces of equipment. In areas where bean volumes are small, the individual will snip and cut the beans by hand. Beans will be blanched in boiling water in a stream kettle or a double sink, then cooled and hand filled. After filling, the cans follows the same

steps as in a large operation - hot water fill, salt, exhaust, and close.

In the large and medium-sized canneries, the limiting factor will be the snipper capacity of 530 kilos/hr field run. The in-plant yield will be 80 percent of field weight. Thus, the snipper feed of 530 kilos/hr will approximate 425 kilos/hr in can fill weight.

In the smaller, hand prepared operations, the limiting factor will be the retort capacity. The common size will be the 303 can.

Maize - Whole Kernel

A large cannery set up in an area where maize is commercially grown can be expected to process large volumes of maize. In this case, an automatic husker, cutter, and desilker will be essential to get volume throughput. In other areas where less maize is grown and in the three smaller canning operations, it is unlikely these three items will be as essential. The one exception would be the desilker. Huskers and cutters are expensive pieces of equipment and difficult to clean. A considerable throughput volume would be required to justify their purchase. For this reason, they should be listed as optional equipment for canneries located in table maize growing areas.

In a large cannery the product flow is husking, blanching, on cob (optional) cutting and desilking, etc. The handling between units would be manual, using pans or baskets. After desilking, the maize is caught in pans and taken to tables where women fill measured amounts into the can. Sometimes whole kernel maize may be washed at this stage to remove the "milk". The can is then filled with hot water, salted and exhausted prior to closing.

The husker operation will be the limiting feature in this operation since is can average only about 1-1/2 to 2 tons per hour of unhusked maize.

Plant recovery from field weight is between 25 and 30 percent. This line speed will put 1,000 pounds per hour into the cans. With a 10-ounce fill weight, (303) production capacity is 1,600 cans per hour. The 1,600 cans per hour will require a retort of the same capacity since the cook-cool cycle is one hour. The Robins 42-inch diameter by 48-inch deep retort has a capacity for 1,280 (303) cans so two units are required to process this volume.

Small size canneries may operate with or without a husker or cutter, depending on location. Kernels may be cut off the cob with a hand knife or by machine, put through the desilking operation, then filled into cans for exhausting and seaming, the same as at the large canneries. Additional women can be used to prepare and fill cans with maize until the retort and/or Rooney seamer capacity is reached.

Carrots

Like most root vegetables, carrots are grown all over the country. Because they can be stored for long periods, fresh product is available in most areas much of the year. The vegetable is canned sliced, diced, or whole. The in-plant recovery is about 65 percent of field weight. Retort cook-cool cycle is 35 minutes for the 303 size.

The procedure for preparation in all size canneries will be much the same since it is unlikely any plant will be processing sufficient volumes

to require an automated line. Carrots will probably come to the plant in jute sacks and may or may not have been prewashed. If they have not been field topped, the tops and tips must be removed at the plant. The product may be peeled in a variety of ways: a hot water scald, in an abrasive peeler or by hand. After peeling, they must be sliced, diced to proper size, blanched, then filled into the can. Once filled, the can is topped off with hot water, salted and exhausted before closing and cooking. The line capacity in the mini cannery will depend on the number of workers up to retort capacity and, in the larger cannery sizes, on the capacity of the abrasive peeling operation. Since line capacity can be increased to the limits, the production-manning chart is based on retort or peeler capacity.

Tomatoes

Since tomatoes are commonly grown in most areas of the country, tomato packs will probably be made in all four sizes. Where private operation is established in a commercial tomato growing area, it is probable that large packs of whole tomatoes will be made. However, even commercial plants are labor-intensive and the equipment required to prepare large volumes for canning will center around the scalding equipment and the areas needed for women to prepare and pack the tomato. Once the can is filled little additional labor is required and plant capacity is limited in each plant only by preparation space available and retort capacity. It is unlikely that any of the canneries would need mechanical equipment for sizing, peeling, filling, etc. whole tomatoes in the volumes foreseen. Sizing of the tomatoes

will not be important.

In the large and medium size plants, tomatoes can be continuously scalded in a steam chamber. Once scalded, the tomato skin is easily removed, the tomato hand-cored, and filled into the can. In the smaller plants the scalding will take place in small batches in a steam kettle. After scalding and subsequent cooling, the tomatoes will be taken to tables for peeling and coring. The most common can size packed is the 2-1/2.

Tomato Juice

Preparation of tomato juice normally goes hand in hand with whole tomato packs and probably will be commonly run by each size canning operation. Commercially the preparation is simple. The fruit is first washed, then inspected, trimmed, chopped, and cooked in an agitated cooker for up to 30 minutes before the pulping finishing operation. After finishing, spices are added, then the juice is pumped through a pasteurizer to a filler. Usually the can is given a light cook before cooling and packaging. A satisfactory product can be made using a small pulper finisher without a long cook.

In the three smaller canneries, the fruit will be prepared, then heated thoroughly in steam kettles before pulping. The juice can be pumped to the overhead brine tanks, then gravity fed into the can or hand-filled and salted. In the large cannery the line will operate continuously. If the product is filled hot, an exhaust box is not necessary and the can is then closed and cooked.

The yield is about 80 percent and the typical can size is the 2-1/2

size. Retort cycle time is 60 minutes. Limiting equipment will be the retorts.

Apricots

The preparation of apricots for processing is simple and quick. Preparation includes washing, inspection, splitting (pit removal). If fruit is to be packed in halves, they will be hand-split or they may be packed directly into the can as whole fruit. After filling the can, the fruit is covered with a light syrup, exhausted, closed and cooked. The only variation between these steps and the commerical operation is that commercially splitting and filling will be done mechanically. Line capacity in all sizes will be limited by the seamers or cookers.

Yield is 80 percent of field weight. The common size will be the 2-1/2 and the retort cook-cool cycle will be 30 minutes.

Jams

While the preparation of jams will be similar in all sizes of canneries, the formula and kind of fruit used will dictate the process time. Jams will usually be made during harvest season but can be made equally well from frozen fruit and berries in the off-season. Assuming the product will be made in-season with all equipment available as required, the plant capacity will depend on the steam-jacketed kettle capacity, or in the case of a small cannery, the closer. Raw fruit with sugar syrup is simmered until it thickens and the hot product filled into cans (usually 2 1/2 size). Jam recipes often include the use of pectins, citric acid, etc., which will affect this preparation time. Cook temperatures are critical in the precook

since the product scorches easily so precook time will depend on cook volume, product type and recipe. For this report it is assumed the steam kettle recycle time will be 45 minutes. It is also assumed that the product will be filled hot and quickly closed. Whether the filled can is given a short sterilizing cook in the retort is optional. Often it is enough to fill at about 200°F, close and invert the can. The product temperature will complete the sterilization of the can, thus retort capacity is no factor but retorts may be used to cool sterilized cans.

Beef

Canned beef requires preparation before it can be canned. If brought to the cannery as fresh meat in quarters, halves or full carcasses, it must be deboned and cut into cannable sized chunks (usually about 1" cubes). These chunks must be pre-cooked in steam kettles for up to one hour before the meat and broth are filled into the can.

Line speed will be limited to one hour steam kettle cook cycle. The can size will be the 2-1/2 can. Retort cycle time will be two hours.

Apricot Nectar

Nectars are made from many fruits by the easy process of heating fruit into a slurry, then putting the pulp through a finisher to remove the skins and seeds. Preparation usually includes washing, inspection and removal of off-grade fruit. A simple syrup may or may not be added as the packer chooses. The finished puree is filled hot into cans, closed and cooked.

Yield is about 70 percent of field weight. The capacity of the line will be limited by the 30 minute steam kettle cook cycle in all cannery sizes.

Common can size will be the 2-1/2 size and the retort cook-cool cycle time is 30 minutes.

Chili Con Carne With Beans

This is a remanufactured product and so can be made at any time of the year. Because this is true, large full-year inventories of finished goods are not necessary as are those made from fresh products in season.

The process begins with an overnight soak of beans. When fully soaked, the beans are batch cooked with the spice formula and meat as called for by the recipe. When cooked, the product is filled into #2-1/2 cans, closed and cooked. The retort cook-cool cycle time is 120 minutes. Limitation in line capacity will be preparation cook time at the steam kettle except for the mini cannery which will be limited by the retort capacity. Since product formulation controls this time to a large extent, the cook time is assumed to be one hour.

Tomato Soup

Production methods of preparing tomato soup will be the same in all sizes of canneries. Soup can be made from fresh juice or canned paste. Stock in its single strength form is brought to a simmer in a steam-jacketed kettle. Some formulas will use a thickener added with the spices. The soup is brought back to a simmer, then filled into cans (2-1/2 size). Soup may be hand filled or pumped to a mechanical filler.

Line capacity will depend on the steam kettle recycle time which is assumed to be 30 minutes or , in the case of the small cannery, on the Rooney seamer. The cook-cool cycle time is assumed to be 60 minutes.

Vegetable Soup

The method of preparing vegetable soups for canning by each size cannery will be similar. Procedures for preparation will vary with the type of soup prepared and the stock used in the preparation. Whether the soup requires a beef or poultry stock or a cream base will affect cooking and preparation time. These times will also vary from soups prepared from fresh vegetables only or those prepared from dehydrated and dried vegetables mixed. Further, if the final soup contains meat, then the cook cycle will vary as well. An additional factor affecting soup's production time will be the formula itself. Some soups will require a simmer time, others will not. For this reason, this discussion assumed the soups dealt with here are fresh vegetable soups prepared from mixes of vegetables, such as potatoes, celery, onions, etc., and some dehydrated vegetables. The latter may include lentils, dried peas, etc.

With this assumption, a milk stock is prepared and brought to a simmer with fresh vegetables which have been prepared by peeling, cutting, chopping, or dicing, as required. The dehydrated or dried vegetables may or may not require a presoak. Soup will be prepared in a steam-jacketed kettle and brought to a simmer, at which time spices will be added.

With a purely vegetable soup, simmer time is usually long enough to properly heat the product for filling but not necessarily finish cooking the vegetables, which will be finally cooked in the retort. After the simmer, the soup is filled hot into the cans. The time required to bring the stock first to a simmer and then return to a simmer after the vegetables are added,

is assumed to be one-half hour. This is the cycle time for the steam-jacketed kettles and the capacity of the line will depend upon the steam-jacketed kettle capacity recycled on the one-half hour cycle time or, in the case of the small and mini canneries, on the Rooney seamer speed. The usual can size is 2 1/2 can, the retort cook-cool cycle time is 30 minutes, although this will vary by soup type.

Domestic Water

Lack of potable culinary water supply is a prime factor in the health of village residents. At the present time a tube well and elevated storage tank located at Deir Hajar serves the village of Deir Hajar, Waseia, Jamaseh, Hamidyeh, Arab Shati and Rihaniyeh. The Department of Public Works is presently constructing a domestic water system at Karto. The system consists of two tube wells at Karto with elevated storage tanks at Karto and Tell Snoon which will serve the villages of Karto, Tell Adass, Khirbet, Akrad, Hasneh, Mechirfeh, Zarbleet, Madhala, Tell Snoon, Arzooneh, Azizyeh and Ransiyeh. The system is scheduled for completion during 1978, Figure AIV-18. These systems supply water to a standpipe and faucet in each village. Property owners are responsible for piping the water to their own residence. In general, the water is carried from the central hydrant to the residences. The cost of extending the water system to each residence is probably the deterring factor. The water is tested periodically and is not chlorinated unless tests indicate the necessity. The Department of Public Works plans to start work during 1978 on construction of tube wells and elevated storage

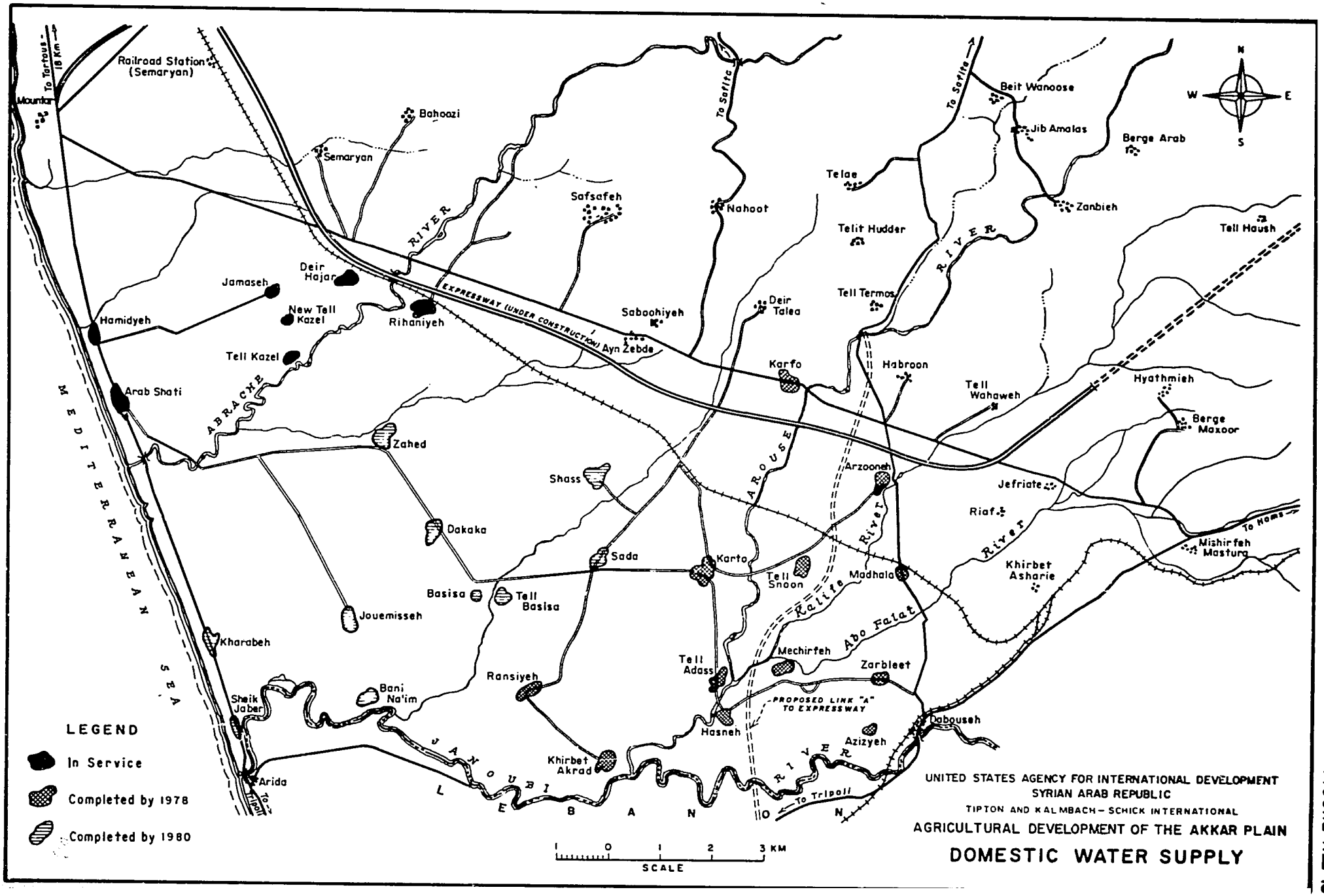


FIGURE AIX-18

tanks between Zahed and Dakaka to supply culinary water to Zahed, Shass, Soda, Basisa, Bani Na'im, Dakaka, New Tell Kazel and Jouemisseh. This system which is scheduled for completion during 1980 will also supply water to a central location in each village.

Other villages under the project obtain domestic water from shallow wells with hand pumps, irrigation wells, springs and streams. The water is hand carried from these sources. Although construction of the water systems described above is a great step forward, they are not adequate to provide a minimum of 300 gallons per day per family which will be required for full future development under the project. Water systems to serve other villages under the project should be planned to provide this standard.

Telephone Service

At the present time only four project villages have telephone service, which are Safsafeh, Hamidyeh, Arab Shati and Karto, Figure AIV-19. Hamidyeh and Arab Shati are served by a 10-line circuit from Tartous, and Karto is served by a branch line from Safsafeh. Only one telephone is located in Arab Shati and Karto. There are no plans, at the present time, for extension of telephone service to other project villages.

It is essential that telephone service be extended to Zahed, the other proposed village center, since telephone service is essential for obtaining current market quotations, supplying markets, communication between project and Government Extension Service Offices, emergency service etc. It is recommended that telephone service be extended to all project villages and the service extended to main infrastructure facilities in the village centers

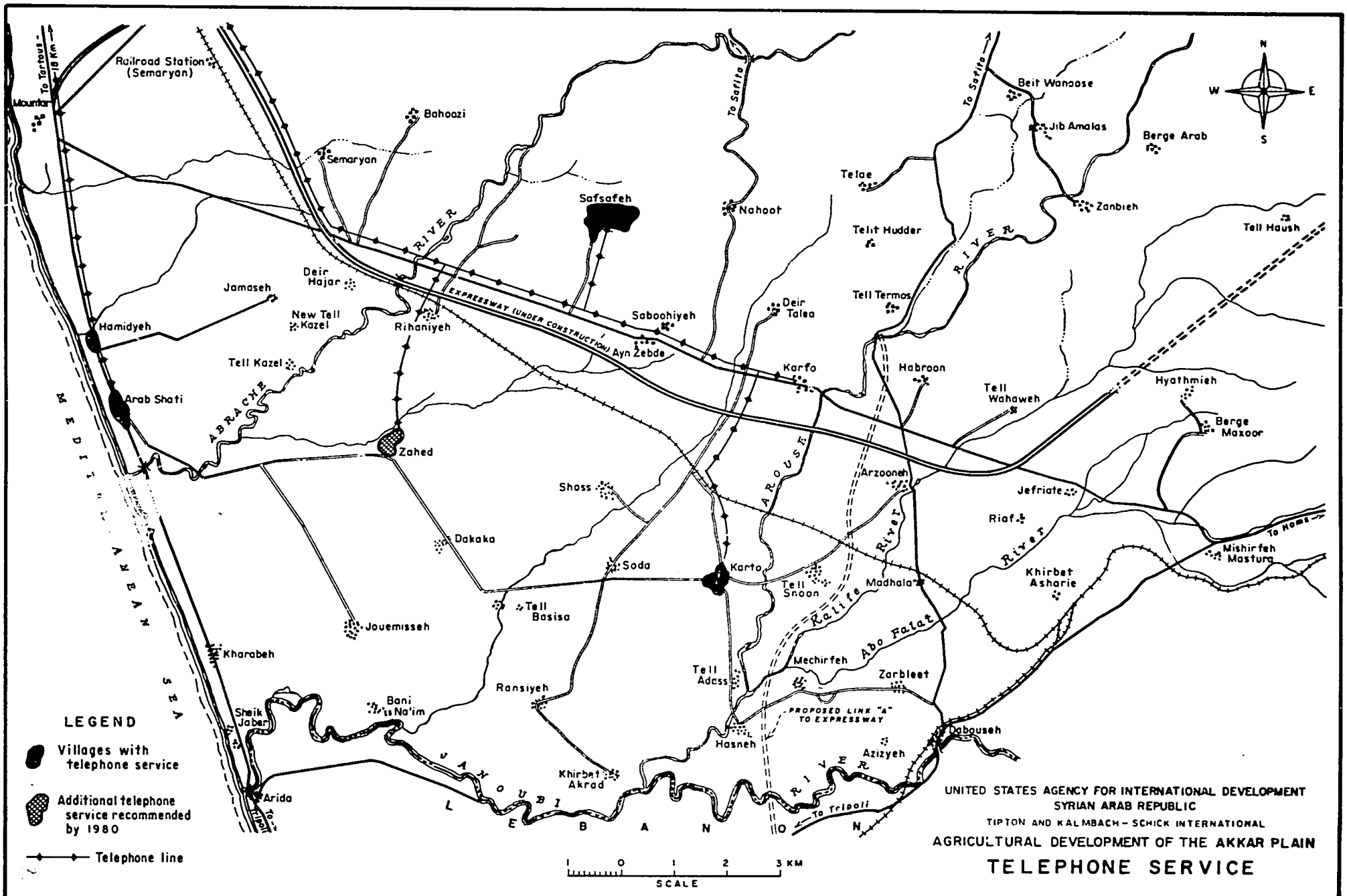


FIGURE AIV-19

of Karto and Zahed.

Rural Electrification

The availability of electric power for project villages is also a prime factor in growth and development. Electric power is desirable for lighting, operation of appliances and machinery, welders, pumps, etc.

Tartous is presently served by a 66 KVA transmission line from Homs; a second 230 KVA transmission line from Homs is under construction. These transmission lines traverse the north west side of the project. An inter-tie line, which traverses the project north and south near the center, will connect the 230 KVA line to transmission facilities in Lebanon. A secondary transmission line (20 KVA) serves the villages of Hamidyeh and Arab Shati. The government plans to extend electric service to Kharabeh, Deir Hajar and Karto by 1980, Figure AIV-20. It is recommended that electric service also be extended to Zahed by 1980 as Zahed and Karto are proposed village centers.

It is planned to extend electric service to all villages under or associated with the project by 1990. It is considered that ample electric power will be available for infrastructure recommended for the Akkar Plain Project.

Since the government will construct the transmission facilities, costs have not been included in the project cost.

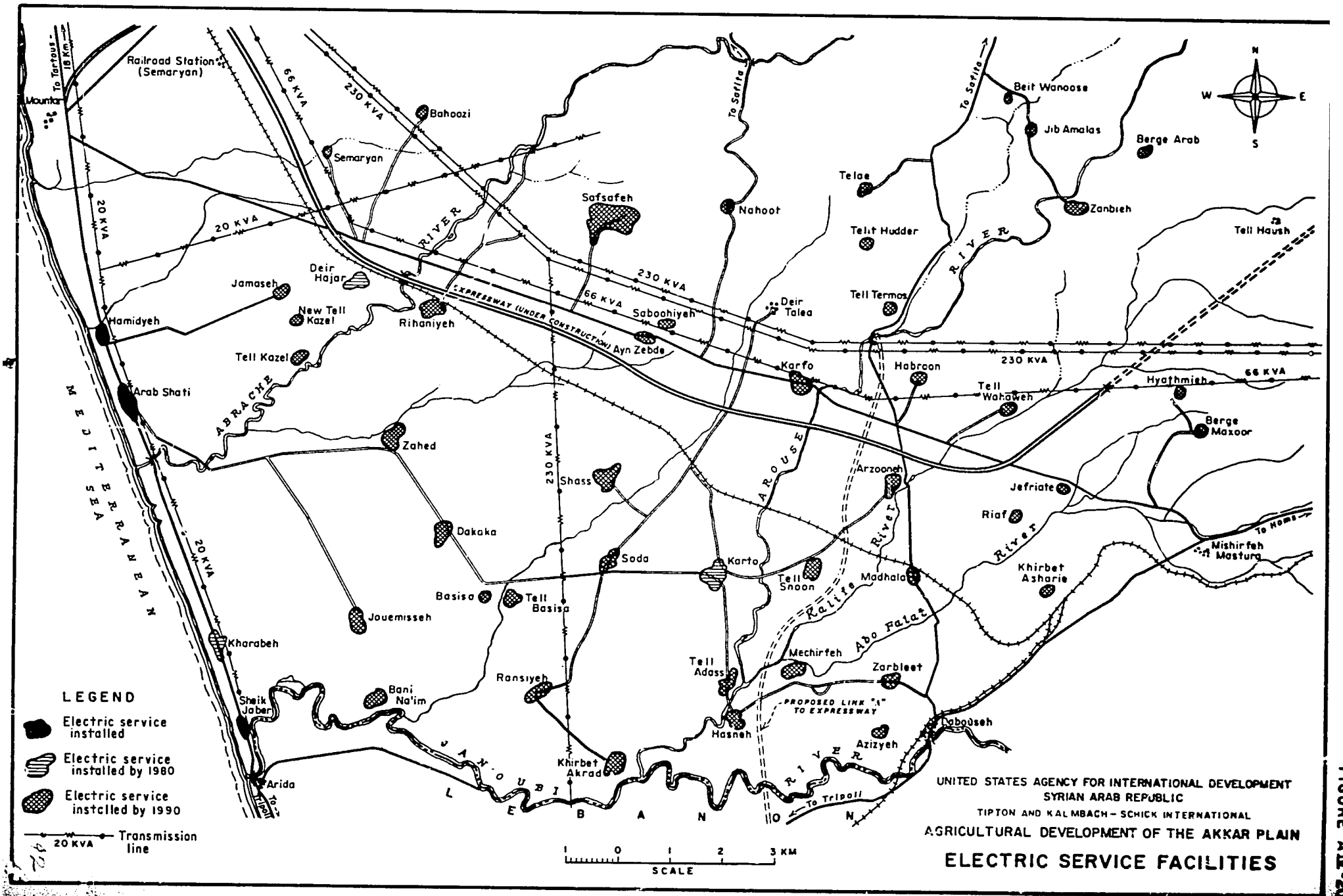


FIGURE AIX-20

Table AIV-20. Infrastructure Cost Summary.

Feature	Local Cost (SP)	Foreign Cost USA (SP)	Total Costs1/ (SP)	(US$)
Educational Facilities	7,293,000	-	7,293,000	1,870,000
Farm-to-Market Roads, Plan "B"	13,159,000	-	13,159,000	3,374,100
Agricultural Service Center	767,000	455,900	1,223,000	313,600
Health Care Center	1,464,800	823,700	2,288,500	586,800
Animal Slaughtering and Processing Plant	689,500	202,800	892,300	228,800
Dairy	731,300	63,700	795,000	203,850
Grading and Packing Facilities (2)	928,400	-	928,400	238,000
Vegetable and Fruit Cannery	1,858,800	1,953,500	3,812,300	977,500
Grain Storage	436,000	1,359,100	1,795,100	460,300
TOTAL	27,327,800	4,858,700	32,186,600	8,252,900

1/ Includes contingencies, overhead, and engineering but does not include land for sites.

AKKAR PLAIN AGRICULTURAL DEVELOPMENT PROJECT

APPENDIX AV

GROUNDWATER

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APPENDIX AV

GROUNDWATER

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APPENDIX AV

GROUNDWATER

Although it was believed at the beginning of the Akkar Plain study that a detailed geohydrology study of the area had been completed, it was found that only a reconnaissance-level investigation as part of an overall study of Syria had been completed. This data was not sufficiently detailed to be of benefit in evaluating the future potential of the groundwater resource for irrigation.

During the early phases of the Akkar Plain study, field observations on existing wells in the area were made. The results of tests performed on selected wells are presented in Table AV-1. The well letter designation in the table refers to the location of the well as shown in the corresponding map quadrant on Figure AV-1.

Subsurface information was obtained through conversations with drillers and well owners. Since the information recorded was usually a translation of a layman's recollection of what was encountered during drilling, little reliance can be placed on the details of the logs. Although recognizing that the data are suspect, it is concluded that the subsurface geology is complex. While additional studies are required to define the groundwater resource in more detail, it is believed that additional groundwater supplies are available in the Project Area and that these supplies can form an integral part of the future irrigation supply of the area.

Table AV-1

Water Well Data
May-June 1978

Well No.	Depth m	Nonpumping level depth m	Nonpumping level alt. masl	Pumping level m	Disch. l/s	Spec. Cap. l/s/m	T m^2/d	Ec mmhos	t °C	Reported Lithology	Remarks
A- 1	110	14.9	41	30.5	10.8	0.7	100			0-40 Soil and limestone 40-45 Blue clay 45-110 Limestone	
A- 2	117									Limestone Blue clay Limestone	Dry
A- 3	48	25.1	20	28.4	11.5	3.5	300	425		0-35 Limestone 35-57 (?) 37-48 Limestone	Water found in 35-37m horizon.
A- 4	100			70	10.0		low	1000		0-95 Calcareous marl/sandstone 95-100 Limestone	Flowing.
A- 5	99	25.1	19							0-99 Limestone	
A- 6	95									0-18 Calcareous sandstone 18-45 Grey/blue sand/clay 45-47 Limestone (?) 47-95 Grey/blue sand/clay	
A- 7	54				14.0			610		Basalt Weathered limestone Limestone	
A- 8	78	25.2	19		10.0					0-16 Blue clay (?) 16-20 Basalt 20-78 Limestone	
A- 9	90	32.2	15	40±	11.7	1.4±	167	590		1-15 Red/brown material 15-46 Basalt 46-51 Soft white material 51-90 Hard white material	
A-10	142				3.5					0-40 Limestone and topsoil 40-118 Clay, limestone 118-142 Weathered basalt (?)	
A-11	110	21.0	23		11.0		105	610	22	0-13 Limestone 18-38 Basalt 38-70 Blue clay 70-85 Med. hard white/yellow 85-110 Cretaceous limestone	Owner said water found at 85 and 110m. When drilling 0-85m water level was 2m, 85-109= 15m, 109-110m=25m.
A-12	126	7.3	17	13.7	20	3.1	411			0-12 Soil, chert, red matl. 12-69 Blue clay 69-125 Basalt 125-126 Limestone	Previously had artesian flow.
A-13	88					low				0-30 Soil/red material 30-50 Blue clay 50-54 Basalt 54-80 Blue clay 80-88 Limestone	This log given by the same man as gave the log for well A-12. No explanation for poor correlation. Well yielded small artesian flow which could not be increased by pumping.
A-14	63	1.2	24	12.4	11.0	1.0	2485	500	21	0-10 Soft white material 10-60 Weathered basalt (?) 60-63 Red sandy material	Owner said water from 60-63m. However, TD of A-15 is 50m and it has the same characteristics; aquifer must be in 0-50 horizon.
A-15	50	1.5	24	11.4	10.0	1.0					
A-16								525		See Log of well A-20	Artesian flow approx. 5 lit/sec.
A-17	30	5.6	0.5	11.6	4.8	0.8	8.4	4800		0-20 Calcareous sandstone 20-30 Blue clay	Bottom of the well has caved.
A-18	80			9.3	6.0	0.5				See Log of well A-20	
A-19	75									See Log of well A-20	
A-20	90									0-65 Calcareous marl/limestone 65-80 Basalt 80-90 White sandstone	Artesian flow approx. 1.5 lit/sec.
A-21	100	29	16	36.1	12.75	1.8		625			
A-22		11.5	34	32.7	9.1	0.43		1050			
B- 1					5.0						
B- 2	53	10	44	19.4	6.7	0.7		575	21.5	0-19 Limestone 19-29 Blue clay 29-53 Basalt	
B- 3	77	31.9	32	55	3.0	<0.1		525		0-10 Limestone (?) 10-36 (?) 36-45 Blue clay 45-55 (?) 55-77 Hard basalt	ECe dropped from 70 to 525 after 10 min. pumping.
B- 4	100				4			550	21.5	0-45 Alternations limestone and weathered basalt 45-51 Basalt 51-100 Limestone	
B- 5					4.6			590	21		
B- 6	75									0-75 Limestone	Dry
B- 7	65				5					0-65 Basalt	
B- 8	68				5.4			350	22	0-31 Basalt 31-68 Limestone 68 Basalt too hard to drill	
B- 9	83									0-43 Brown/black weathered basalt 48-58 Hard basalt 58-62 Orange/blue sandy marl 62-72 Soft buff limestone 72-83 Hard white limestone	
B-10	48	19.5	49	22.6	6.0	1.9		510		0-20 Basalt 20-48 Limestone	
B-11	35	14.0	54	19.2	5.7	1.1		480	21.5	0-35 Basalt	
B-12	50	8±	56	10.3	6.0	2.6		500	21.5	0-6 Brown material 6-20 White material 20-50 Reddish soft material	

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Table AV-1

Water Well Data
May-June 1978
(Continued)

Well No.	Depth m	Nonpumping level depth m	Nonpumping level alt. masl	Pumping level m	Disch. l/s	Spec. Cap. l/s/m	T m^2/d	Ec mmhos	t °C	Reported Lithology	Remarks
B-13	77				2±					0-77 Basalt	
B-14	105	18.6	54	29.9	6.5	0.6	356	430	22	0-25 Basalt 25-105 Limestone	
B-15	85				8.6			500	23		Pump at 57m breaking suction. Formation caving, blue clay being discharged in pumped water.
B-16	70	14.0	70	34.4	3.5	0.2	4.2	460	22	0-10 Weathered basalt 10-35? Limestone 35?-70 Weathered basalt	Farmer says water delivered from "blue clay" formation at 35-70m.
B-17	53	3.5	51	23.9	2.0	.1				0-53 Basalt (?)	
B-18	37	5.7	51	15.8	7.7	.8		480	22	0-37 Basalt	
B-19	60				11.4			460		0-6 Soil 6-8 Hard basalt 8-60 Limestone and blue clay	
B-20					7.7						
B-21					5.0						
B-22	50	5.6	48	6.0	6.3	14.6		550	21	0-40 Weathered basalt 40-50 Limestone	
B-23	36	5.7	50	6.7	8.5	8.3		460	21	0-36 Weathered basalt	
B-24	63	10.1	39	13.4	14.0	4.3	692	500		0-30 Basalt 30-60 Limestone 60-63 Red (basalt)	
B-25		3.3	50								
B-26	55									0-20 Limestone 20-38 Blue clay 38-55 Weathered limestone (?)	
B-27	39	4.2	38	5.7	16.0±	10±	278				
B-28					5.4			460	22		
B-29	40	10.1	39	> 28	0.5	0.1		610		0-40 Basalt	
B-30					8.2						
B-31	50	8.0	50	11.5	4.6	1.3		490			
B-32	100	45.0	50	51.4	13.8	2.2		350	22		
B-33	65	11.7	50								
C- 1	63	22.5	50	25.4	14.0	4.8	138	490	21.5	0-63 Basalt (?)	
E- 1	40	8.0±	38	11.3	11			470	22		
E- 2	103									0-43 Limestone 43-57 Hard basalt 57-63 Red (basalt) (?) 63-103 Red marl and basalt	Dry.
E- 3	24	7.4	43	15.1	10.6	1.4	559	400	23	0-24 Basalt	
E- 4	35				4.0	low		560	21.5		Pump breaking suction.
E- 5		7±	28	20.9	12.0	0.8		520	22.5		
E- 6	35	5.3	37		4.9			420	22.5	0-35 Basalt	
E- 7		12.9	35	16.6	9.9	2.7		420	23		
E- 8	35	8.2	29	31	3.5	.2		620			
E- 9		13.5	31	15.0	12	8.0		480	21		
E-10	38	10.8	30	16.9	6.5	1.1	289	650	22.5	0-38 Basalt	
E-11	42	8.4	27	13.4	3.5	0.7		750	23	0-42 Basalt - probably weathered	
E-12	40	6.1	21	6.7	4.3	7.3	1133			0-40 Hard basalt	
E-13					1	low				Basalt (?)	
E-14					3.3	low		650	22	Basalt (?)	
E-15				24.8	2	low		725		Basalt (?)	
E-16	27				2	low				Basalt (?)	
E-17	33	6.0	44	12.4	1.4	0.22	4.1	570	20.5	0-6 Weathered basalt 6-11 Hard basalt 11-23 Weathered limestone 23-24 Hard limestone 24-33 Blue clay	
E-18	40									0-40 Basalt	Dry.
E-19	78									0-15 Basalt 15-40 Limestone 40-78 Brown marl	Not yet fitted with pump.
E-20	56	4.2	43							0-20 Weathered basalt 20-33 Hard basalt 33-34 Limestone (?) 34-56 Red (basalt)	Artesian flow in winter.
E-21	37	7.8	20	10.9	11.1	3.5	351	580	22	0-37 Basalt	
E-22	105				<1	low					This well is only 300m from the excellent well E-12.
E-23	30									0-30 Limestone	
E-24	25									0-15 Basalt 15-25 Limestone	Dry.
E-25	117									0-2 Soil 2-35 Basalt 35-98 Hard basalt 98-117 Limestone	During drilling caving occurred in the limestone. Water was obtained only in the 12-35m horizon.
E-26	45				5					0-35 Basalt 35-45 Basalt	
E-27	40				15	high				Basalt	Farmer says water from 28m depth.
E-28	30				5						
E-29	22	1.4	35	5.6	15.2	3.6		540	21	0-22 Basalt	
E-30	55	13.1	18	15.2	5.4	2.7		590		0-20 Red 20-32 Blue clay 32-55 Basalt	
E-31		12.9	17	24.3	4.2	0.4		540			
E-32		9±	21	13.4	11	2.3		575	21		
E-33		12±	14	20.4	10	1.2		600	22	Limestone overlying basalt	

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Table AV-1

Water Well Data
May-June 1978
(Continued)

Well No.	Depth m	Nonpumping level depth m	Nonpumping level alt. masl	Pumping level m	Disch. l/s	Spec. Cap. l/s/m	T m^2/d	Ec mmhos	t °C	Reported Lithology	Remarks
E-34					3.7			670	21		
E-35		2.3	25								Artesian flow of approx. 1 lit/sec noted on 14 June.
E-36	35	2±	23	11.1	9.4	1				0-15 Red material 15-35 Blue clay	
E-37	36	3.7	20							0-16 Weathered basalt 16-36 Basalt	
E-38		26.0	5	32.4	7.5	1.2	39	590			
E-39	50	22.9	43	24.8	3.5	1.8		475	22	0-50 Basalt	
E-40	75	22.5	21	29.6	12.8	1.8	270			0-20 Red material 20-26 Soft white material 26-30 Blue clay 30-57 Med. hard red material 57-65 Med. hard black material 65-73 Hard basalt 73-75 Black/red basalt	Water found in 73-75m horizon.
E-41	50				6						
E-42	52	10.6	15	22.9	5.1	0.4	26	475		0-50 Limestone	
E-43	35	5.6	20	7.0	5.5	3.9	640	590		0-52 Limestone 0-35 Weathered basalt	
E-44	35									0-? Limestone ?-35 Basalt	
E-45		14±	3	29.7	2.9	0.2		640		? Probably limestone	
E-46	31	8.9	7	9.1	11.2	53	very high			0-3 Soil 3-13 Weathered limestone 13-31 White limestone	The driller apparently intercepted a cavern at 29m. Rate of drawdown was not measurable and recovery was almost instantaneous.
E-47	85									0-85 Limestone	
E-48	64	5±	19	39.5	10	0.3		520	22.5	85 Basalt - too hard to drill 0-12 Weathered basalt 12-64 Basalt	
E-49	23	7.9	31	19.0	11.8	1.3		500			
E-50	31	4.3	43	6.5	6.5	2.95		525			
E-51	35	3.6	14								
F-1					2±	low					
F-2	130	9±	18	34.9	10.3	0.3				0-15 Limestone 15-55 Blue clay 55-58 Hard basalt 58-80 Blue clay 80-82 Hard basalt 82-100 Blue clay 100-130 Hard red material	
F-3	85	8.0	19	29.6	4.8	0.2	7.2			0-18 Limestone 18-40? Blue clay 40?-42 Basalt 42-85 Blue clay	
F-4					6						
F-5		3±	18	29	8.1	0.3					
F-6		4.6±	4.5	13.3	2.7	0.3		610			
F-7	82			>35	4.8	low		675			
F-8	9					high				White/red sandstone (?)	Farmer says well yields "strong 3 ins" for 'no' drawdown.
F-9	12+	3.0	1.5	17.5	5.2	0.4	19	5000		0-12? Black sticky material 12?-	This E.C. was thoroughly checked.
F-10	75	9.0	-4	24.6	2.9	0.2	4.7	710		0-75 Limestone (?)	
F-11	35				5.0			710		See F-10	
F-12	40	5.3	-1	6.4	7.1	6.2	360	1700		0-20 Calc. sandstone 20-40 Limestone	Water was 'found' at the top of the limestone.

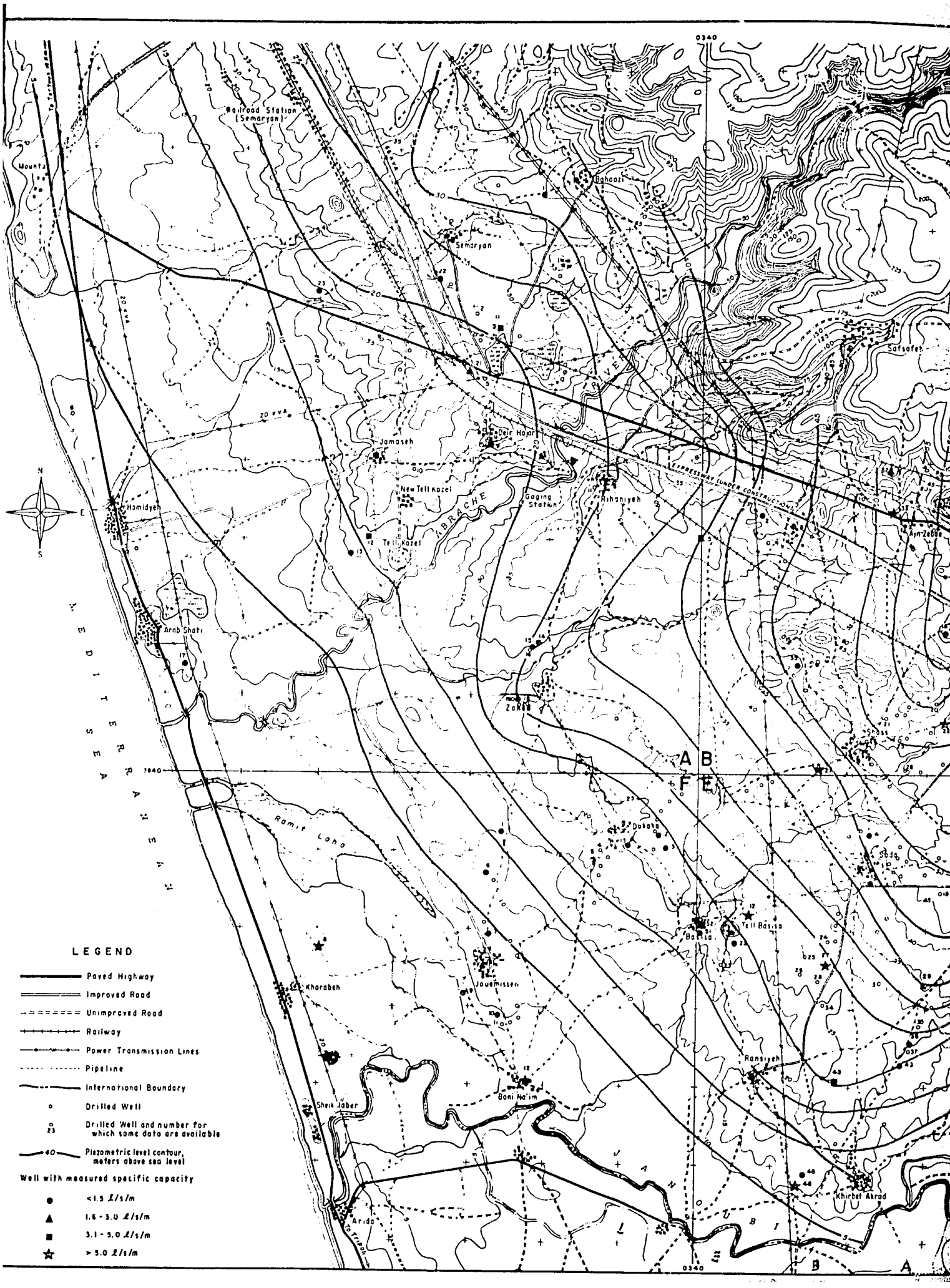
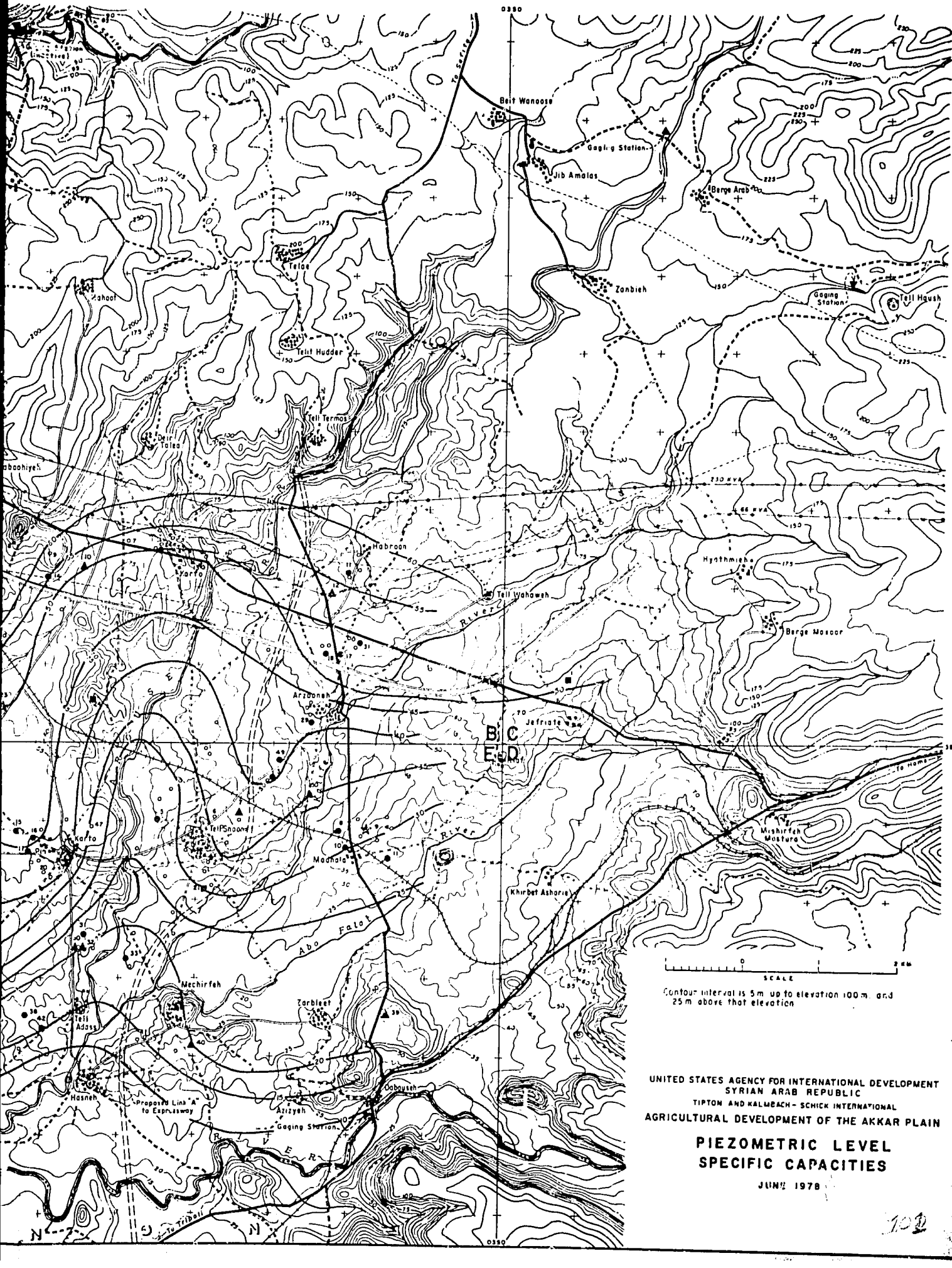

Railroad Station (Semaryan)
Mounts
Bahaozi
Semaryan
Safsafet
Deir Hajar
Jamaseh
New Tell Kazel
Tell Kazel
Gaging Station
Hihaniyeh
Hamidyeh
Arab Shati
Zakaa
Ayn Zabde
Dabaha
Tell Basita
Basita
Jouemissen
Kharabeh
Ramit Laha
Ransiyeh
Boni Na'im
Sheik Jaber
Arida
Khirbet Akrad
MEDITERRANEAN SEA
JANIB
LIBRACHE
EXPRESSWAY (UNDER CONSTRUCTION)
20 KVA
0340
1040
A
B
E
F
N
S
LEGEND
Paved Highway
Improved Road
Unimproved Road
Railway
Power Transmission Lines
Pipeline
International Boundary
Drilled Well
Drilled Well and number for which some data are available
Piezometric level contour, meters above sea level
Well with measured specific capacity
<1.5 ℓ/s/m
1.6 - 3.0 ℓ/s/m
3.1 - 5.0 ℓ/s/m
> 5.0 ℓ/s/m

FIGURE AV



UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
SYRIAN ARAB REPUBLIC
TIPTON AND KALMBACH - SCHICK INTERNATIONAL
AGRICULTURAL DEVELOPMENT OF THE AKKAR PLAIN

PIEZOMETRIC LEVEL
SPECIFIC CAPACITIES

JUNE 1978

AKKAR PLAIN AGRICULTURAL DEVELOPMENT PROJECT

APPENDIX AVI

IRRIGATION SYSTEM

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APPENDIX AVI

IRRIGATION SYSTEM

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APPENDIX AVI

IRRIGATION SYSTEM

A complete description of the irrigation distribution system, including the proposed canals and storage reservoir alternatives, is in relevant portions of the Report. The purpose of this Appendix is to present hydraulic data and unit costs used in the study.

CANAL DESIGN

The canals of the Akkar Plain Project will range in capacity up to 6 cubic meters per second. Most of the main canals will traverse irregular and rolling terrain and the depth of canal excavation will vary in order to reduce their sinuosity and length. Secondary canals will convey water from the main canals to the farm ditches and generally run with the land slope. All canals will be lined with concrete with side slopes of 1.5:1. Design parameters adopted for the canals are summarized below:

	Main Canals	Secondary Canals
Mannings "n"	0.014	0.014
Velocity at design discharge	1.0 meter per second minimum	3.0 meters per second maximum, or critical velocity, whichever is less
Width-depth ratio	1.0-1.5	1.0
Freeboard	0.50 meters	0.25 meters
Service road width	5 meters north bank 3 meters south bank	3 meters one bank only

The dimensions of the canals were determined from Manning's equation:

$$Q = \frac{AR^{2/3} S^{1/2}}{n}$$

in which:

Q = Discharge in cubic meters per second

A = Area of waterway in square meters

R = Hydraulic radius in meters

S = Slope

n = Roughness coefficient (0.014)

The main conveyance canals of the irrigation systems are laid out on the minimum feasible slopes because of considerations of command. The secondary canals, on the other hand, follow the natural slope of the terrain, which in most areas is greater than that required by hydraulic considerations. They are designed to operate at the maximum feasible slopes to reduce the number of chutes and other energy dissipating structures along these canals. Maximum slopes are predicated on limiting the velocity to 3.0 meters per second or the critical velocity, whichever is less, and when used may result in width-to-depth ratios greater than those sited above.

Tables AVI-1 and AVI-2 show the principal dimensions and hydraulic parameters of canals. Figure AVI-1 portrays the typical sections of the main and secondary canals. The concrete lining in all canals is unreinforced. Weakened plane joints on an approximately 5-meter grid are provided to control cracking.

COST ESTIMATES

Estimates were made of the quantities of the various kinds of work required to construct the canals, Rihaniyeh Dam, and the Abrache Diversion Dam required under the Yazdieh Dam alternative. Unit prices were developed from cost data for various projects in Syria as well as the cost of similar works in the United States and United States Bureau of Reclamation cost data. A summary of the unit prices is shown in Table AVI-3. Figures AVI-2 and AVI-3 show typical canal structures used to develop minor structure costs.

Table AVI-1
PRELIMINARY HYDRAULIC DESIGN
MAIN CANALS
(Rihaniyeh Dam Alternative)

WEST BANK

Offtake No.	Area Supplied (ha)	Length (km)	Discharge (m^3/sec.) @ 1.13 l/s/ha	Discharge (m^3/sec.) @ 1.36 l/s/ha	Flow Depth at 1.13 l/s/ha (m)	Velocity (m/sec.)	Bed Width (m)	Slopes
Head								
W-1	1838	0	2.08	2.50	-	-	-	-
W-2	1485	2.5	1.68	2.02	0.84	1.0	0.75	.00057
W-3	1379	0.5	1.56	1.89	0.80	1.0	0.75	.00061
W-4	1302	0.4	1.47	1.77	0.77	1.0	0.75	.00063
W-5	1214	1.3	1.37	1.65	0.74	1.0	0.75	.00065
W-6 (Begin Siphon)	1032	0.6	1.17	1.40	0.67	1.0	0.75	.00073
W-7	587	1.2 (Siphon)	0.66	0.80	-	-	-	-
End Siphon	562	0.7 (Siphon)	0.64	0.76	-	-	-	-
W-8	562	0.5	0.64	0.76	0.51	1.0	0.50	.00107
W-9	226	0.8	0.26	0.31	0.28	1.0	0.50	.00211
W-10	170	0.7	0.19	0.23	0.23	1.0	0.50	.00243
Total		9.2						

EAST BANK (40m Canal)

Head								
E-1	4162	2.2	4.70	5.66	1.34	1.0	1.5	.00029
E-2	3801	0.3	4.30	5.17	1.27	1.0	1.5	.00031
E-3	3735	0.6	4.22	5.08	1.25	1.0	1.5	.00031
E-4	3690	1.7	4.17	5.02	1.24	1.0	1.5	.00032
E-5	3196	0.4	3.61	4.35	1.25	1.0	1.0	.00035
Pump Offtake to 50m Canal	3034	0.3	3.43	4.13	1.22	1.0	1.0	.00035
E-6	2038	0.8	2.30	2.77	0.95	1.0	1.0	.00047
E-7	1729	0.7	1.95	2.35	0.92	1.0	0.75	.00051
E-8	1651	0.6	1.87	2.25	0.89	1.0	0.75	.00055
E-9	1573	1.0	1.78	2.14	0.87	1.0	0.75	.00055
E-10	1346	0.5	1.52	1.83	0.79	1.0	0.75	.00061
E-11	1083	1.0	1.22	1.47	0.69	1.0	0.75	.00070
E-12	1037	0.8	1.17	1.41	0.67	1.0	0.75	.00073
E-13	151	0.9	0.17	0.21	0.21	1.0	0.50	.00276
Arouse	-	0.8						
Total		12.6						

Pump Offtake								
Junction	996	0.8	1.13	1.35	0.65	1.0	0.75	.00077
1E	293	0.2	0.33	0.40	0.33	1.0	0.50	.00176
2E	237	0.8	0.27	0.32	0.29	1.0	0.50	.00198
3E	176	0.5	0.20	0.24	0.23	1.0	0.50	.00269
4E	151	1.4	0.17	0.21	0.21	1.0	0.50	.00276
End	106	2.0	0.12	0.14	0.16	1.0	0.50	.00382
Junction								
1W	703	1.1	0.79	0.[illegible]	0.58	1.0	0.50	.00094
2W	617	1.2	0.70	0.84	0.54	1.0	0.50	.00100
3W	536	1.3	0.61	0.73	0.49	1.0	0.50	.00116
4W	480	0.9	0.54	0.65	0.46	1.0	0.50	.00119
5W	217	1.1	0.25	0.30	0.27	1.0	0.50	.00225
Total		11.3						

Table AVI-2
PRELIMINARY HYDRAULIC DESIGN
SECONDARY CANALS
(Rihaniyeh Dam Alternative)

Secondary[a]	Irrigated[b] Area (ha)	Length (km)	Discharge @ 1.36 l/sec/ha (m^3/sec.)	Depth[c] of Flow (m)	Velocity (m/sec)	Bed Width (m)	Slope S
W-1	353	5.9	0.48	0.33	1.5	0.5	.00372
W-2	106	0.9	0.14	0.17	1.1	0.5	.00415
W-3	77	0.9	0.10	0.14	1.0	0.5	.00434
W-4	88	1.1	0.12	0.15	1.1	0.5	.00485
W-5	182	1.2	0.25	0.23	1.3	0.5	.00421
W-6	445	4.2	0.61	0.37	1.6	0.5	.00377
W-6a	50	0.7	0.07	0.11	1.0	0.5	.00507
W-7	25	-	0.03	Offtake to Farm Ditches			
W-8	336	2.7	0.46	0.32	1.5	0.5	.00387
W-8a	59	0.7	0.08	0.12	1.0	0.5	.00485
W-9	56	0.8	0.08	0.12	1.0	0.5	.00465
W-10	170	2.0	0.23	0.22	1.3	0.5	.00423
Subtotal	1838	21.0					
E-1	361	2.6	0.49	0.33	1.5	0.5	.00388
E-2	66	0.6	0.09	0.13	1.0	0.5	.00400
E-3	45	-	0.06	Offtake to Farm Ditches			
E-4	494	1.6	0.67	0.39	1.6	0.5	.00366
E-4a	66	0.9	0.67	0.39	1.6	0.5	.00366
E-4b	311	5.1	0.58	0.36	1.5	0.5	.00381
E-4c	117	1.2	0.16	0.18	1.2	0.5	.00438
E-5	162	1.9	0.22	0.22	1.2	0.5	.00387
E-6	309	3.2	0.42	0.31	1.4	0.5	.00367
E-7	78	0.9	0.11	0.15	1.0	0.5	.00407
E-8	78	1.2	0.11	0.15	1.0	0.5	.00407
E-9	227	2.2	0.31	0.26	1.3	0.5	.00402
E-9a	76	0.8	0.10	0.14	1.0	0.5	.00434
E-10	263	3.2	0.36	0.28	1.4	0.5	.00404
E-11	46	-	0.06	Offtake to Farm Ditches			
E-12	886	5.6	1.20	0.52	1.8	0.5	.00347
E-12a	100	1.0	0.14	0.17	1.1	0.5	.00415
E-12b	229	2.3	0.31	0.26	1.3	0.5	.00402
E-13	151	0.8	0.21	0.21	1.2	0.5	.00421
E-13a	59	0.6	0.08	0.12	1.0	0.5	.00485
Subtotal	3166	35.7					
P-1E	56	-	0.08	Offtake to Farm Ditches			
P-2E	61	0.9	0.08	0.12	1.0	0.5	.00485
P-2E-A	16	0.4	0.02	0.05	0.7	0.5	.00644
P-3E	25	-	0.03	Offtake to Farm Ditches			
P-4E	45	-	0.06	Offtake to Farm Ditches			
End	106	2.0	0.14	Offtake to Farm Ditches			
P-1W	86	-	0.12	Offtake to Farm Ditches			
P-2W	81	-	0.11	Offtake to Farm Ditches			
P-3W	56	0.7	0.08	0.12	1.0	0.5	.00485
P-4W	263	1.2	0.36	0.28	1.4	0.5	.00404
P-4W-A	63	0.9	0.09	0.13	1.0	0.5	.00460
P-5W	217	1.0	0.30	0.26	1.3	0.5	.00376
Subtotal	996	7.1					

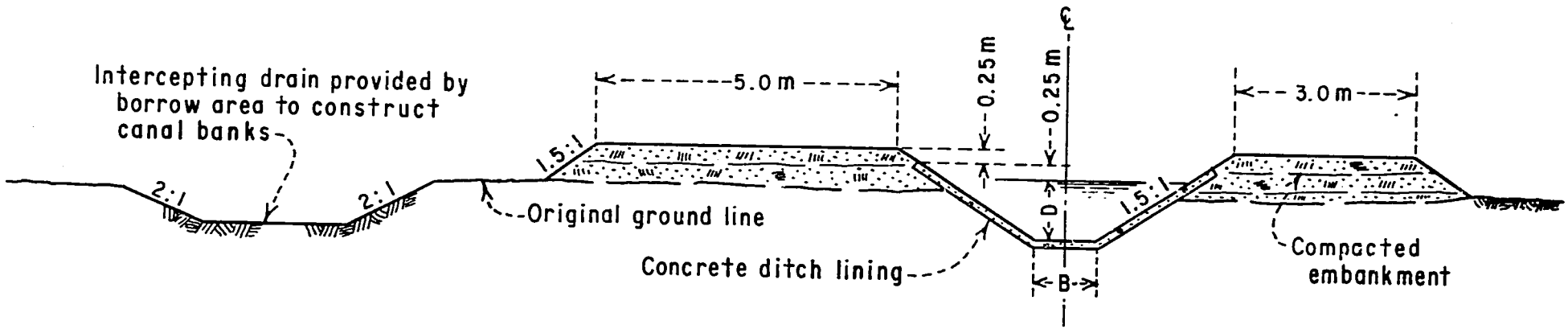
(a) W denotes secondary canal from West Bank Main Canal, E from East Bank 40m Main Canal, and P from East Bank 50m pumped canal.

(b) Numbers in parentheses refer to area below minor canal offtake used for sizing canal.

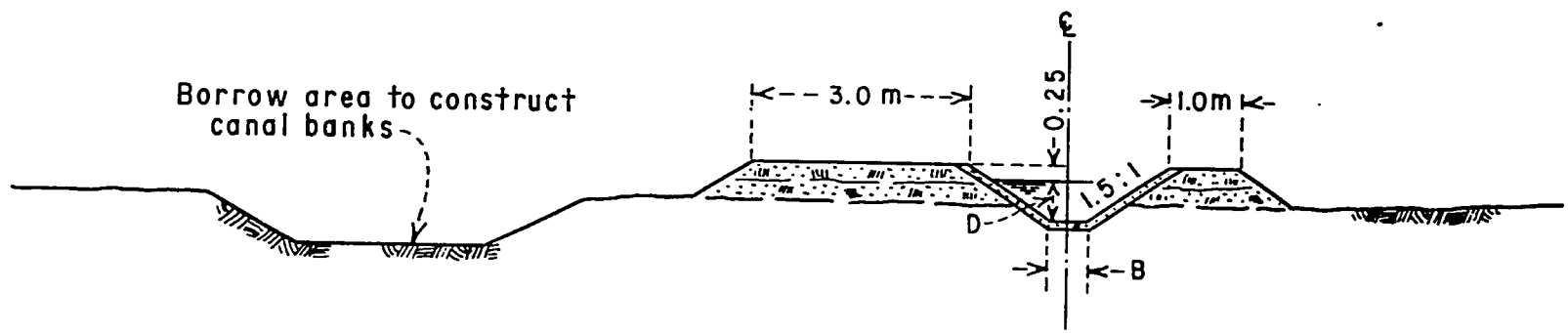
(c) Based upon critical flow condition. Slope may be flatter if field conditions require. Maintain minimum velocity of 1.0 m/sec.

Table AVI-3
UNIT PRICE SUMMARY

Clearing and stripping	WP1750/ha
Excavation for canal in earth and place in embankment	SP10.00/m^3
Excavation for borrow in earth and dumping, 1 km	SP10.00/m^3
Structural excavation, earth	SP20.00/m^3
Structural excavation, rock with blasting	SP55.00/m^3
Excavation for borrow in rock with blasting and machines and dumping, 1 km	SP15.60/m^3
Haul per 1 km over 1 km	SP1.50/m^3
Backfill, compacted for structures	SP15.00/m^3
Compacted embankment for canal and earth dam	SP13.00/m^3
Rock fill for dam, material from borrow	SP1.50/m^3
Canal trimming	SP2.00/m^2
Concrete canal lining, 8 cm thickness	SP575/m^3
Reinforced concrete in structures	SP650/m^3
Mass concrete for gravity dams	SP240/m^3
Dumped riprap	SP130/m
70 cm RCP 15 m pressure pipe	SP640/m
120 cm RCP 45 m pressure pipe	SP1150/m
180 cm RCP 45 m pressure pipe	SP2300/m
45 cm RCP	SP125/m
60 cm RCP	SP162/m
75 cm RCP	SP228/m
90 cm RCP	SP311/m
105 cm RCP	SP383/m
120 cm RCP	SP465/m
150 cm RCP	SP742/m
180 cm RCP	SP1000/m
Fabricated steel	SP8.60/kg



TYPICAL SECTION
MAIN CANAL



TYPICAL SECTION
SECONDARY CANALS

IRRIGATION SYSTEM
CANALS
TYPICAL SECTIONS
Akkar Plain Project

FIGURE AVII-1

TIPTON AND KALMBACH - SCHICK INTERNATIONAL

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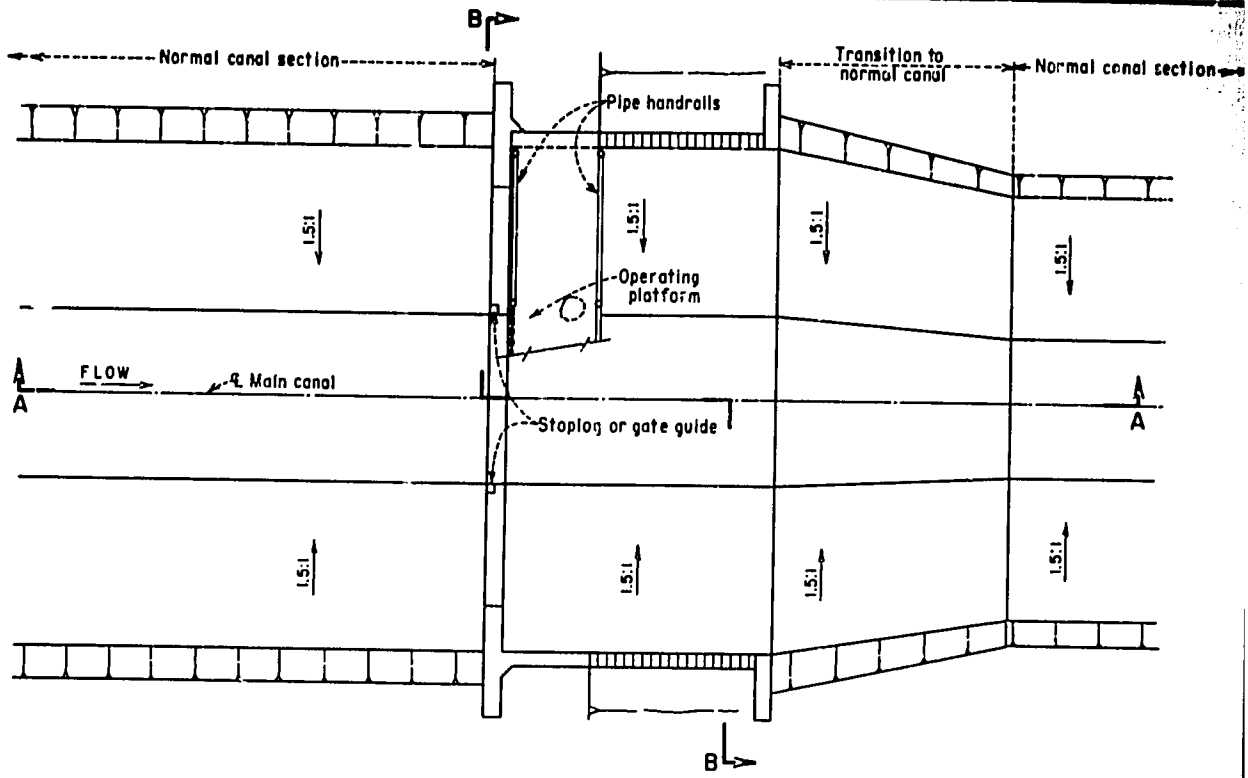
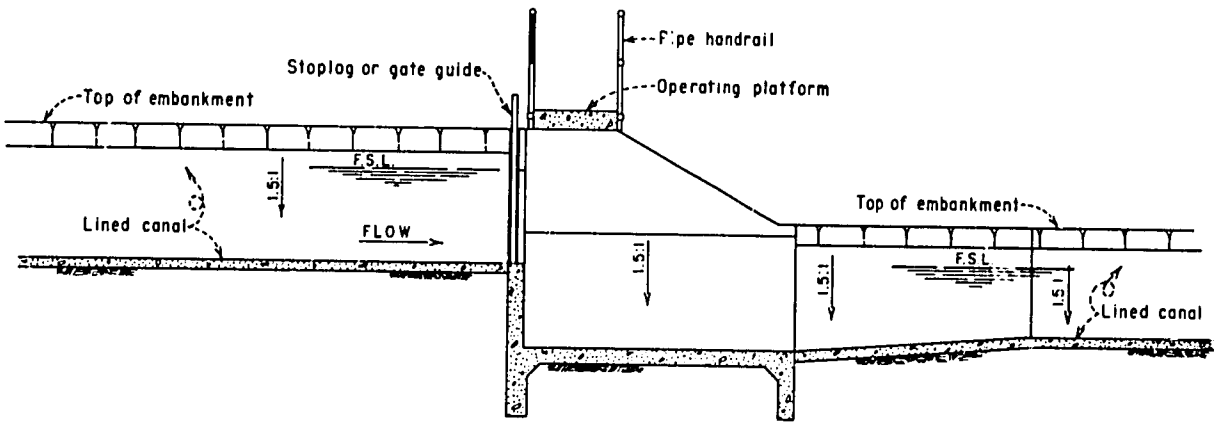
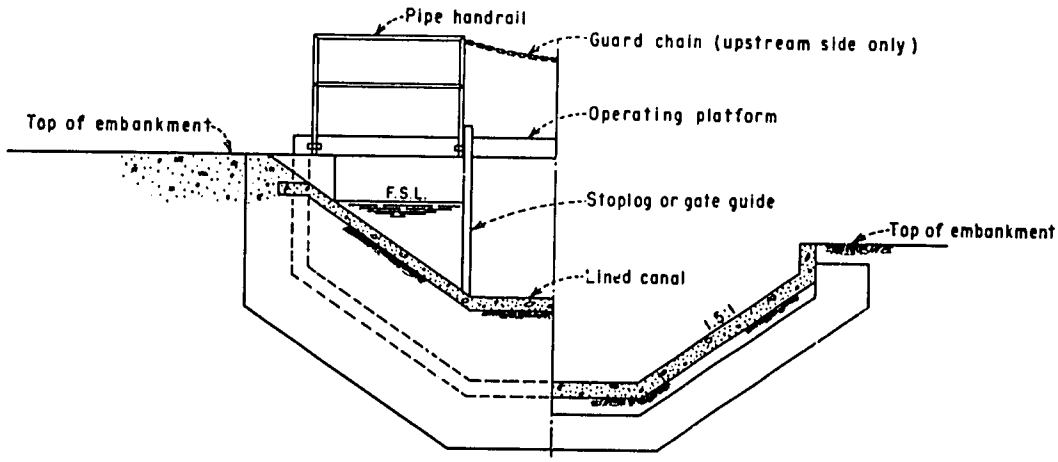


PLAN



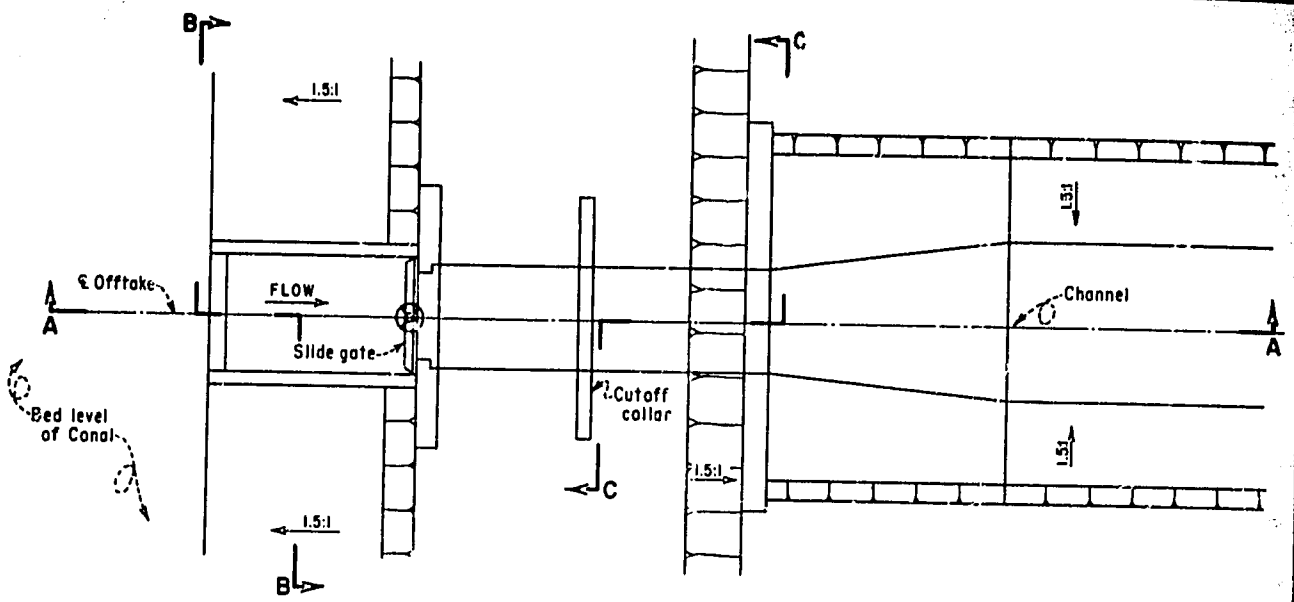
SECTION A-A



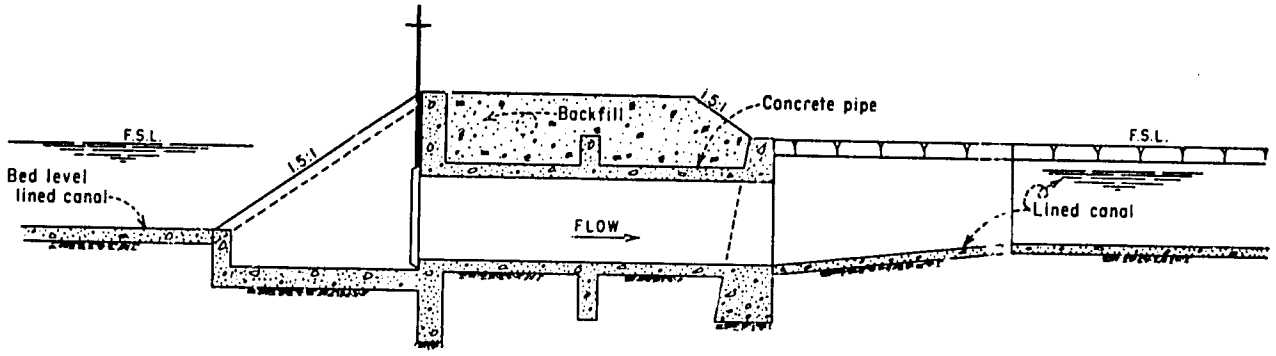
SECTION B-B

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
SYRIAN ARAB REPUBLIC
TIPTON AND KALMBACH - SCHICK INTERNATIONAL
AGRICULTURAL DEVELOPMENT OF THE AKKAR PLAIN

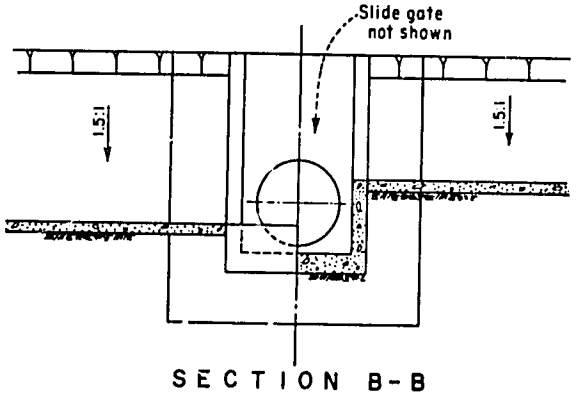
CHECK DROP STRUCTURE



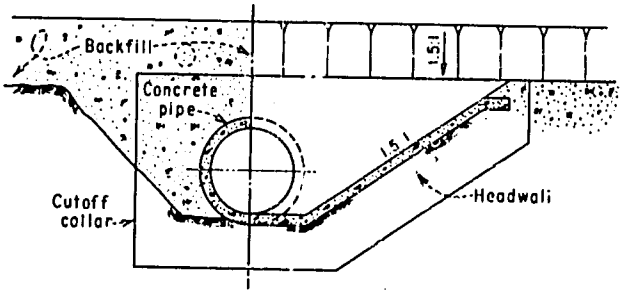
PLAN



SECTION A-A



SECTION B-B



SECTION C-C

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
SYRIAN ARAB REPUBLIC
TIPTON AND KALMBACH – SCHICK INTERNATIONAL
AGRICULTURAL DEVELOPMENT OF THE AKKAR PLAIN

OFFTAKE STRUCTURE

AKKAR PLAIN AGRICULTURAL DEVELOPMENT PROJECT

APPENDIX AVII

SOCIAL SOUNDNESS

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SOCIAL SOUNDNESS

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APPENDIX AVII

SOCIAL SOUNDNESS

SOCIOCULTURAL FEASIBILITY

The people in the Akkar Plain area vaguely recognize the potential benefits that can accrue through development of the land and water resources. The proposed irrigation, drainage and infrastructure schemes are difficult for the average person to understand; however, the planners and government leaders do envision substantial agricultural and agricultually-oriented benefits from development of the excess water now flowing into the Mediterranean Sea and from an effective drainage control program. The SARG officials also realize that economic and social benefits can only be obtained if various social changes are achieved. A knowledge of the social factors in the society will facilitate making effective decisions ensuring the acceptance, support and eventual success of the development.

The farmers in the area expressed the need for irrigation, drainage, and water control to reduce the risk of damage from floods and drought. Most of the farmers do have a knowledge of the irrigation practices presently being used in the area. However, farmers have little or no knowledge of the irrigation practices or changes that would be required under a sustained full irrigation operation. Present farm operators expressed a willingness to learn new practices necessary to effectively use irrigation water.

Some farmers who have well-drained soil and protection from wind, either natural or provided, can grow citrus, a relatively new crop to the area.

Several have already planted orchards and others are planning to do the same. The Government of Syria has encouraged production of citrus on the Akkar Plain and other coastal areas where possible, to eliminate the need for some citrus imports. (Those farmers planting citrus have demonstrated excellent management by interplanting other crops while the orchards mature).

The farmers, including the poor, are capable of double cropping more of their land than they presently do, and they have the desire to do so if an adequate supply of water and a drainage program can be provided. The present constraints of inadequate water for irrigation and water-logging of the soil by winter precipitation prevent more intensive cropping.

Pertinent characteristics relative to development of the human and natural resources of the Akkar Plain such as population, family structure, social customs, health and welfare, as well as informative educational programs that may be suggested to ensure success of the project, have been given consideration. How the various characteristics affect the planned development, or how they may be affected by the potential changes, is discussed in this report.

POPULATION AND DENSITY

The population of Syria (over six million) with its age variation, rural and urban geographic distribution, density, and income are the main determinants in the effective domestic demand for food and food products. A review of the general population characteristics for the entire country of Syria as well as for its administrative divisions and for the project area, will now be presented for comparison.

The population of Syria, according to the 1970 Census of Population was 6,304,685 people, living in 1,061,839 households on 185,180 square kilometers (km^2). This results in a density of 34 people per km^2. Population of Tartous Mohafaza was 302,065 people in 50,057 households on an area of 1,890 km^2, resulting in a density of 160 people per km^2. The population of Tartous Mantika was 101,296 in 7,365 households on an area of 571 km^2, resulting in a density of 177 people per km^2.

A further analysis of the 1970 census data for the Nawahi of Hamidyeh and Safsafeh within the Tartous Mantika, the two sub-districts in which the proposed Akkar Plain Project is located, indicates a population of 26,098 in 4,217 households, with a total of 85 villages and farms. A population of 12,207 people, 2,005 households, and 32 villages was reported in the 1970 census within the boundaries of the Akkar Plain Project for a density of 81 people per km^2.

There is a wide range in the population density of Syria. A fairly wide belt extending from the Turkish border along the Mediterranean shore and along the western borders has a population density of 160 to 180 persons per km^2. In an easterly extension of this belt, roughly between the cities of Aleppo and Homs, the population density is 70 to 80 persons per km^2. The population density for the rest of the country ranges from 10 to 20 persons per km^2. The higher density of population in the western portion of the country is a result of the temperate climate, arable land, and water resources. Population and density of the administrative division of Syria, including the Nawahi which encompasses the Project, is shown in Table AVII-1.

Table AVII-1. 1970 Population, Households, Area and Density for Syria by Mohafaza Mantika and Nahia for Tartous Mohafaza Only 1/

Mohafaza	Mantika	Nahia	Population	Households	Area (km^2)	Density Per km^2
Tartous	Tartous	Tartous City	29,842	5,458		
		Villages of Tartous Center	22,248	3,527		
		Total Center	52,090	8,985		
		Arwad	4,133	766		
		Al-Soda	18,975	3,397		
		Hamidyeh 2/	12,595	2,074	NA	
		Safsafeh 2/	13,503	2,143	NA	
	Tartous Mantika Total		101,296	17,365	571	177
	Safita		62,438	10,312	347	180
	Banias		77,496	12,834	585	133
	Sheikh Badr		26,100	4,116	199	131
	Dreikish		34,735	5,430	188	185
Tartous Mohafaza Total			302,065	50,057	1,890	160
Damascus City			836,668	147,143	118	7,090
Damascus			621,265	105,390	18,170	34
Homs			546,176	88,526	42,226	13
Hama			514,748	81,881	8,844	58
Latakia			389,552	67,985	2,436	160
Idleb			383,695	68,545	5,933	65
Aleppo			1,316,872	222,553	16,142	82
Al Rakka			243,736	42,368	22,000	10
Dier-ez-zor			292,780	44,443	33,060	9
Al-Hasakah			468,506	76,227	23,371	20
Sweida			139,650	25,366	5,550	25
Dar'a			232,481	38,658	3,730	62
Quneitra			16,490	2,697	1,710	10
TOTAL SYRIA			6,304,685	1,061,839	185,180	34

1/ Population Census in Syrian Arab Republic, vol. 1, (1970), and Population Census, vol. 7, (Tartous Government, 1970), pp. 31, 304-337

2/ Akkar Plain Project area is located in these 2 Nawahi.

The population of Syria has been growing rapidly. The government has estimated an annual growth rate of about 3 percent. The youthfulness of the population is one major factor in the growth rate. Over one-third (37 percent) of the population is under 10 years of age, 49 percent under 14 years of age, and 66 percent under 25 years of age. At this rate, the projected population of Syria for 1978 would be 7,986,500 people. The projected 1978 population distribution and population density by Mohafaza are shown in Figure AVII-1.

Urbanization of the larger cities has increased rapidly. This has probably resulted because of the migration pattern from rural to urban areas, higher fertility rates, and lower mortality rate of urban groups, and an influx of refugees to the larger cities. Also, there are few medium-sized settlements to which the large population of people from small villages can migrate.

In 1978 the population of the Akkar Plain Project area was estimated at 18,000. These data were estimated for the year 1978 based on the correlation of information from village leaders, 1970 census data, and the population projections established by the Central Bureau of Statistics for the Tartous Mohafaza, Table AVII-2.

The average size of families in the project area is estimated at 9.8 persons, as determined from random interviews in 21 villages with 157 farm operators. The average size of household as determined from the Farm Economic Survey is larger than the average size (6.5 persons) as determined from the census data, perhaps because of definition or because several households may

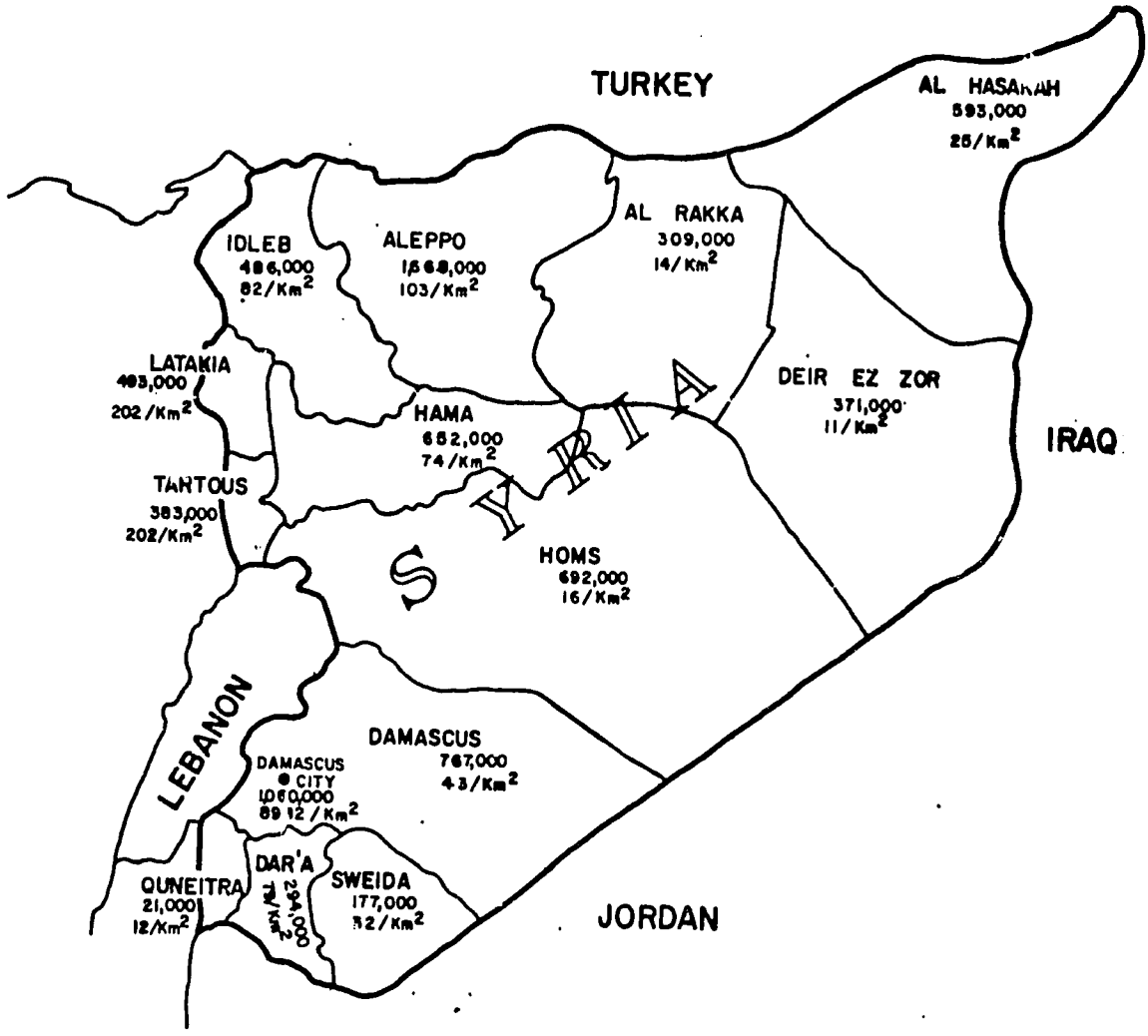

FIGURE A VII-1

ESTIMATED POPULATION DISTRIBUTION OF SYRIA
BY MOHAFAZA
1978

Table AVII-2. Projected 1978 Population, Size of Family, by Village on the Akkar Plain Project 1/

Village	Average Size of Family	Total Population
Hamidyeh	8.2	1,920
Basisa	9.5	464
Tell Adass	NA	428
Beni Na'im	8.6	854
Jamaseh	9.2	598
Hasneh	13.4	673
Dakaka	7.6	524
Tell Kazel	NA	224
Ransiyeh	8.5	429
Zahed	9.8	440
Semaryan	7.3	430
Soda	12.1	617
Shass	10.1	546
Sheik Jaber	11.7	571
Arab Sheti	9.8	1,729
Arzooneh	9.1	784
Bahoozi	11.7	831
Tell Snoon	5.5	831
Khirbet Akrad	9.3	735
Deir Hajar	13.0	312
Rihaniyeh	11.0	556
Mechirfeh	NA	408
Zarbleet	11.7	433
Farfo	NA	755
Karto	9.3	1,548
Madhala	NA 2/	360
AVERAGE	9.8	
TOTAL		18,000

1/ Source: Farm Survey.

2/ Not available in Farm Survey.

have been engaged in business other than farming. (The definition of farm family household included everyone living in the same house with the farm operator at the time of the interview, which often included grandfather and grandmother and possibly other relatives).

FARM SIZE

The average-sized farm operated on the project is 8.4 hectares, as determined from the farm operators interviewed. This number included all land operated by the farmer, whether owned or rented, but it did not include land owned but rented to others. Table AVII-3 shows the variations in average farm size between villages.

FAMILY AFFILIATIONS

Social groups in Syria center around the family. This is also true on the Akkar Plain where the family functions are closely tied to the farming operations. Family loyalty usually is the dominating obligation. An individual's standing in society depends upon his family background. Men dominate women in all of Syrian society including the family. There is little social contact between unrelated men and women. A division by sex was observed in most social environments. However, this seems to be diminishing as women receive more equality, both in employment and social activities.

The ideal marriage is within one's own lineage. Marriage between cousins is common. The wealthy marry within their own families to preserve the purity of their bloodlines. The poorest may marry within their families to avoid bride-wealth payments which must be made to a man from outside the family. These types of marriages preserve the cohesiveness of the different classes and ethnic groups. Thus, marriage is viewed as a practical bond between families and often has political and economic overtones even among the poorer people.

Village organizations strongly follow family lineages which results in

Table AVII-3. Average Farm Size, by Village, on the Akkar Plain Project 1/

Village	Average Size of Farm (Hectares)
Hamidyeh	4.9
Basisa	6.3
Beni Na'im	4.9
Jamaseh	8.3
Hasneh	7.4
Dakaka	15.5
Ransiyeh	2.9
Zahed	8.6
Semaryan	11.8
Soda	14.9
Shass	10.0
Sheik Jaber	9.0
Arab Shati	4.6
Arzooneh	12.8
Bahoozi	10.7
Tell Snoon	9.5
Khirbet Akrad	5.7
Deir Hajar	7.0
Rihaniyeh	8.0
Zarbleet	8.9
Karto	5.5
Average	8.4

1/ Source: Farm Survey.

very little change over time. Ideally, the Syrians prefer the three-generation household with the senior generation in charge. The father is the head of the household and the mother is supervisor of the women. Frequently, relatives outside the immediate family are found living in a household. The two-generation household is common at the present time since the eldest son has first right to bring his bride home to live with his parents, with younger subsequent sons and daughters moving away.

The relatively large size of the typical household in part results from the two- or three-generation family living together as well as a large number of children. Also, single adults rarely live alone, children live at home until marriage, and the widowed tend to live with their children and other relatives.

LANGUAGE

Arabic was established by King Faysal as the official language of Syria in 1920. Presently, Arabic is one of the most widely spoken languages in the world. It is the mother tongue of 50 million people. It is one of the Semitic languages and is related to Aramaic, Phoenician, Syrian, Hebrew, various Ethiopic languages, and ancient Babylonian and Assyrian. The Arabic language exists in three forms in the Arab countries: (1) The Classical Arabic of the Quran, (2) Modern Standard Arabic, and (3) Syrian Arabic. There are various dialects of Arabic throughout the Mid-East. Within the same geographical region, a city dweller may speak one dialect, a villager another, and a tribesman still a third. Arabic is the principal language used on the Akkar Plain, although there is a significant number of French speakers as well as a growing number of people learning English.

VILLAGE GOVERNMENT ORGANIZATION

Villages seem to be organized around families or lineages. (An

individual's primary social identity is as a member of a given lineage). The government normally appoints the village leader on the basis of his family background, as well as personal qualifications. He serves as a channel for communications between the village and high administrative officials and is highly respected for his abilities to maintain stability and make decisions.

Villages in the Project area are socially distinct but are dependent upon the nearest town or city for various services and products. The towns supply manufactured products, administrative and government services, education, medical care, entertainment, and other necessities. The villages supply agricultural products. Public and private transportation have alleviated the isolation of the villages which existed in the past. Akkar Plain villages depend primarily on the city of Tartous and, to a lesser extent, on cities such as Homs, Allepo and Latakia.

Villages are located somewhat in clusters in or near the center of the agricultural land. Practically every resident lives within the village boundary. Each farmer must walk an average distance of 1.3 kilometers to his farming operations.

The villagers have fewer status distinctions than may be found in the towns or cities. Most villagers are farmers, and those who are not frequently work as laborers or provide other services related to agriculture. A few non-agricultural specialists may be living in the village, such as a school teacher, a storekeeper of a small business, or a barber, who provide goods and services needed on a daily basis.

Government-Sponsored Organizations

The government has been emphasizing agricultural cooperatives in the last few years for the principal purpose of assisting farmers to increase productivity and economic stability in their agricultural operations.

Generally a cooperative is located in each village; however, in some areas 2 or 3 of the smaller villages are served by a single cooperative. The cooperatives assist members in obtaining credit, organizing farming operations, assuring necessary farm supplies, marketing crops and livestock, and assist in land improvement or the development of irrigation projects. Farm operators belonging to a cooperative may, under certain circumstances, obtain reductions in the price of some goods and services.

The cooperative may receive benefits in its dealings with the Agricultural Cooperative Bank, including priorities in the extension of credit, preferential interest rates, reductions in the price of agricultural inputs purchased through the Bank, and provisions for medium and long-term loans for production and development purposes. This longer-term credit could result in an advantage to project farm operators in development of irrigation on the Akkar Plain Project where farmers may be required to provide all or a part of the on-farm facilities such as headgates and gated pipe or its equivalent.

Agricultural cooperatives in Syria have increased from 471 in 1962 to 3,385 in 1976, with membership increasing from 38,148 to 256,036 members. The number of such cooperatives in the Tartous Mohafaza was 283 in 1976 with a membership of 25,772.1/

Cooperative facilities are available in all villages in the Project area and are capable of being expanded to provide any additional services that may be required for project development. The cooperative will not be weakened with project development.

1/ Syrian Arab Republic, 1977, pp 606-607, Statistical Abstract.

Allocation of Time

People are generally expected to respond favorably to the economic incentives of the project. However, there may be a few questions concerning other priorities that may have some minor effects upon full acceptance. Some people may want to avoid the possible risk that could result from a change in their life pattern, such as their social status or security. Others may question the non-matured value of new crops on their own land, such as citrus, or even the increase in physical labor that may be required with the project. Some of these questions are perhaps hypothetical and may concern situations beyond their experience. However, some general impressions have been gained from discussions with the farmers or village leaders and from other observations related to socioeconomic problems.

All farmers take risks, but they also enjoy the security of fully understanding their relatively simple technology and economy. They do recognize the greater opportunities for improvement that may come from more modern forms of agriculture. One farmer, when asked why he wanted to plant citrus, replied, "Someone who had raised citrus told me it was more profitable." Some prefer to wait to see the results from the first few farmers who experiment with the modern agricultural techniques. Their success would reduce the possible threat to social standing or security. About 97 percent of the farm operators reporting stated that one of the benefits of the project would be more effective utilization of their underemployed time.

Motivation of Individuals

Individuals differ in what they want from life. Some individuals have a

desire for possession or consumption of foods and services, others have an ambition to make a profit or gain more prestige. Even though they may be dissatisfied with their current conditions, they seem hesitant to make the unfamiliar changes in their lifestyle which would be required to attain that desire.

The personal motivation of the farmers is vital for the successful development of the project. Many alternatives for a better life, (such as cash, water, drainage, fertilizers, farm equipment, roads, schools, and health facilities) will be provided by the project. Information programs regarding project benefits could motivate farm operators to do what is necessary to bring about such a better life.

The farm operators were asked how they thought the gain in income would be distributed if the development were implemented. They believed very strongly that the farm families would receive most of the long-term-time benefits from the project. Only twelve percent of the farmers thought merchants would receive the greatest long-term-time benefits.

Education and Literacy

The educational system in Syria is presently patterned after the co-educational western models. Primary schools provide education for both boys and girls between the ages six to eleven. Intermediate schools have three grades for ages twelve through fourteen. Secondary schools have vocational training after 3 years of academic education. Universities are located at Damascus, Aleppo, and Latakia. Tuition is charged only to medical students who are aided by government scholarships.

The primary school system is intended to provide a basic general education for those who end their schooling at that level,as well as offering a preparatory education for those who continue to the next school level. General secondary education offers academic courses and prepares students for university entrance. In the last two years of secondary schools, the curriculum is divided into literary and scientific studies. Vocational training offers courses in industry, agriculture, commerce, and primary-school teacher training.

A major objective of the present school system is to make education more accessible to children of the middle and lower income families. Government-operated primary schools are tuition free. Attendance, in either a public or private school is compulsory until age eleven. Religious, private, and special schools are also operated at the intermediate and secondary school levels.

Many Syrian students are studying in foreign universities, either at their own expense, under private grants, or on government scholarships. The number of such students (17,042) enrolled in institutions of higher education at their own expense in various foreign universities is shown in Table AVII-4. An additional 401 students in foreign countries were holding government scholarships.

School facilities throughout Syria are limited and classrooms are crowded. Male students outnumber females in all levels of the school system. Of the total enrollment in primary and secondary schools and universities, about two-thirds, three-fourths, and four-fifths respectively are male students. The

Table AVII-4. Syrian Students Studying at Their Own Expense in Foreign Universities Under Supervision of the Ministry of Higher Education, by Subject at the End of Year 1976[1/]

Country of Study	SUBJECT						
	Medicine	Engine-ering	Science	Literature	Law & Commerce	Fine Arts	Total
Arab Countries	325	516	302	1,430	1,517	35	4,125
Western Countries: Germany (West) Italy, France, Belgium, Switzerland, Turkey Austria, England	4,616	2,487	582	398	364	66	8,513
Socialist Countries	1,608	1,030	329	70	61	22	3,120
United State and Canada	374	341	115	29	56	2	917
Others	197	119	30	9	12	-	367
TOTAL	7,120	4,493	1,358	1,936	2,010	125	17,042

1/ Statistical Abstract, Syrian Arab Republic, 1977, pp 501-502.

urban population has had more education than rural because of better transportation and educational facilities. This difference can be seen in the higher literacy rate in urban areas. In 1970, 46 percent of the total population of Syria was literate, 61 percent in the urban areas, and 34 percent in the rural areas.

The number and kinds of schools, number of teachers and pupils, and other data for the country of Syria in 1973 are presented in Table AVII-5. These data indicate a classroom average of 36, 20, and 12 students per teacher in the primary, intermediate, and secondary schools respectively.

The school system on the Akkar Plain is generally not up to acceptable standards. The building facilities are in need of expansion and the classrooms are overcrowded. Several school buildings are now being enlarged in an effort to meet the present demand for education, especially the intermediate and secondary schools. Students attending the Akkar Plain schools must walk long distances due to lack of private and public transportation. Many students living east of the Arouse River must also wade or, even in some instances, swim the river to attend the closest secondary school at Karto.

The facilities available in the project area include a primary school in every major village, intermediate schools at Arizooneh, Hamidyeh, Safsafeh, and secondary schools at Safsafeh and Karto. Secondary or trade schools for mechanics, lathe, foundry work, electrical trades, hardware, welding, and carpentry are located in Tartous. Schools for the building trades are located in Latakia. All of these are available to students from the project area. However, Tartous and Latakia are located at a considerable distance, 20 kms

Table AVII-5. Number and Kind of Schools, Classes, Teachers, and Students in Syria, 1973 1/

Item	School Level				
	Primary	Intermediate	Secondary (Technical and Professional)	Higher Education	Campaign Against Literacy
Grades	6	3	3		
Ages	6-11	12-14	15-17	-	-
Number of Schools or Universities	6,444	967	53	3	
Number of Classes	42,819	9,314	488		375
Number of Teachers	30,356	19,004	1,372		503
Number of Facilities				23	
Number of Students	1,102,652	388,473	15,922		9,723
Male				39,784	
Female				9,471	

1/ The New Syria, by Antoine Guine.

and 90 kmn respectively, from the project area.

Literacy is somewhat higher in the Tartous Mohafaza than in the rest of Syria. In 1970, 53 percent of the population in Tartous Mohafaza was literate, as compared to 46 percent in Syria as a whole. In the rural areas of Tartous, which encompass the project area, 50 percent of the population was literate as compared to 34 percent in Syria. The male population in that rural area of Tartous is 76 percent literate, which is a rate 3 times greater than for the female population. Table AVII-6 summarizes the percentage of the population in Syria and Tartous Mohafaza that is considered literate.

CAPITAL REQUIREMENTS AND FARM CREDIT

The farm operator has a total investment estimated at $24,000 on an 8 hectare farm. This amount includes investment for land, farm irrigation structures, miscellaneous tools, and operating capital. The largest segment of the farmer's total investment was for land. Based on the market value determined from the farm interviews, the average farm operator would have about $18,000 invested.

Working capital was approximately $3,400/yr. based on the farm operator's yearly out-of-pocket costs; of this amount $1,700 was considered as necessary operating capital. The credit requirement for the average farm operator would be his operating capital, because only 50% of his total capital needs would be required at any one time.

Farm credit is available through the government-owned Agricultural Cooperative Bank, which is funded directly by the Central Bank of Syria. Loans

Table AVII-6. Summary of the Population in Syria[1/] and Tartous Mohafaza[2/] that was Literate in 1970

Item	Syria (percent)	Tartous Mohafaza (percent)
Total Population		
Total	46	53
Male	65	77
Female	26	28
Rural Population		
Total	34	50
Male	57	76
Female	11	22
Urban Population		
Total	61	68
Male	76	82
Female	45	53

1/ Population Census in Syrian Arab Republic, 1970, Vol 2, (Table 82)

2/ Population Census in Syrian Arab Republic, 1970, Vol 1, (Table 7)

The average number of school years completed by the farm operators who reported such information on the farm survey schedules was 7.1 years.

are then made directly to individual farm operators or indirectly by way of the farm cooperative. The advantage the farm operator has by getting a loan through the farm cooperative is a 1 1/2 percent reduction in the interest rate.

The loan policy of the farm cooperative and the Agricultural Bank is the same. Three types of loans are given: (1) seasonal loans to purchase seed, fertilizer, supplies etc; (2) short term loans for pumps, machinery, small projects etc; and (3) long-term loans for orchard establishments. During the first 5 years only the interest is due each year; in the next 5 years the farm operator pays principle plus interest. Farm loans are easy to obtain, but in all cases the land is mortgaged. Loans from the cooperative are managed by a board from each cooperative, while loans directly from the Bank are managed by the Bank.

Data obtained from farm interviews indicate that additional credit, longer term loans for certain enterprises, and less "red tape" would help the farm operator financially. Of the farm operators interviewed, 77 percent said they could use more or longer term credit. If they did have credit, 90 percent would buy more equipment, 88 percent would buy more insecticides, 76 percent more fertilizer, 88 percent would improve their irrigation system, and 58 percent would buy more livestock.

Bank officials stated that their capacity to lend was directly related to the needs of the farm operators and that additional credit resources could be obtained to cover the increased demand of intensified farming activities associated with the proposed irrigation project.

The average farm operator now receives an estimated $190 in net farm income. This relatively low figure does not portray a true picture of the farm operator's financial status. The farm operator has organized and used his factors of production in such a way as to provide about $230 worth of farm products used in the home and nearly $200 per farmer in cash income from the sale of surplus farm products. Use of an additional $1,450 of interest on investment would make a total of $1,880 of disposable income or about $190 per capita.

Land Ownership

All land included in the Akkar Plain Irrigation Project is divided into four categories of ownership; private, reformed, cooperative, and government. According to information received from the village leaders and farm operator interviews, about two thirds (67 percent) of the cultivated land is privately owned, 30 percent is reformed land, 1 percent is owned by cooperatives, and 2 percent is government-owned and may be rented by the operator.

The Agrarian Reform Program initiated in 1958 placed the land of large-scale farm operators in the hands of small-scale farm operators. This redistribution program was a government sponsored effort to equalize income distribution and raise the standard of living of the rural population. The present farm operators are paying for the reform land at a nominal rate per year for 20 years.

The predominant mode of land ownership is vested in the individual. Only about 3 percent of the cultivated land is owned by the cooperative or by the government. The cooperative land is operated by farmers who are members of

the cooperative under a sharecrop or other such arrangement. The cooperative pays the members a salary, then shares the profits at year end.

Handling Labor

The Arabic family is traditionally a closely-knit unit and consequently works together on farming operations. About 85 percent of the farming operations are carried on by the family. All members of the family, including women and children, work long and hard during the critical harvesting and planting periods. This is especially true during the short period of time between the harvesting of one crop and the planting of another on land that is double-cropped.

The economic farm survey indicated that 10 percent of the farmers exchanged work with their neighbors and that additional hired farm labor is usually available for peak labor requirements. It was reported by 20 percent of the farm operators interviewed that both family labor and hired labor were factors limiting production, yet nearly 100 percent reported that sufficient family labor would be available to grow more crops if the project required it.

Land preparation and some grain harvesting done by custom-hire is essential to the operation of farms on the Akkar Plain. Sixty-seven percent of the farm operators hire their plowing done by machine at least twice during the growing season. Subsequent plowing and further land preparation is then done using animals. The high cost of machinery prohibits the small-scale operator from owning all the equipment he needs, but more operators own or can hire equipment to run their farms.

With high intensity farming on the Akkar Plain, as proposed by the Irrigation Project, mechanized farming and efficiency are prerequisites. To attain the level of mechanization and efficiency required, all facets of the economy will be involved. Education programs have to keep pace to instruct the farm operator, the business sector must supply the equipment and backup of parts and services, banking must be able to give credit, and the farm operator must be motivated to produce quantity as well as quality. If these sectors move together simultaneuously,the economy will prosper.

Knowledge of Irrigation

The farm operator's knowledge of irrigation is limited to his current irrigation practices. Most of the farm operators on the Akkar Plain have a limited source of irrigation water from either drilled wells or dug wells, or pumped as diverted from streams. The farmers irrigate by gravity from wells using small diesel operated pumps with plastic discharge pipes generally 3 or 4 inches in diameter and long enough to deliver water to irrigation furrows on their individual ownerships. These furrows are generally constructed by hand with a small irrigation hoe. The same method of furrow construction and furrow irrigation is generally practiced where water is pumped or diverted by gravity from a stream.

Since irrigation on the Akkar Plain is limited to small individual unmechanized operations, the landowners will need to be educated about sophisticated irrigation methods which will be required by full irrigation development. During the farm interviews,the land operators indicated a willingness to attend instructional meetings for that purpose.

Farm Management

The farm operator's knowledge of farm management is limited to his own experience and exposure to special demonstrations. He is doing well in following the practices with which he is acquainted. For instance, 94 percent of the farm operators said they used commercial fertilizers and that it increased yields by 47 percent. About 95 percent of the farm operators had recently used insecticides and 56 percent had changed their cropping pattern in an effort to obtain more income. Of those who double-cropped some of their land, 51 percent stated the results were good, 38 percent fair, and 6 percent poor. Practically all the farmers indicated they would double-crop more of their land if sufficient irrigation water were available when needed. Many also indicated they would like to raise citrus, mainly because someone had said it would be more profitable. This new crop would enhance the existing economy. Also, 87 percent of the farmers indicated they would be willing to attend training meetings or demonstrations to learn how they could benefit by changing part of their farm to citrus, trees, or more vegetable crops. Their present farm management practices could be rated rather poor relative to preparing the land and seeding the crops, especially small grains. The seed is broadcasted and plowed another time to cover the seed. This results in poor or uneven germination because of the varying depths of the seed and also encourages weed growth. More land preparation equipment is needed, such as harrows, etc., to pulverize the soil prior to planting.

The farm operators seem to be above average in their ability to organize

their time in operating the rather complicated system of cropping their land. They make every effort to obtain maximum production of the many varieties of available crops, including those that can be double-cropped where sufficient water may be available.

Matching Participators

It is anticipated that all groups of people living in the project area will participate in its development. Since it is being backed by the government in an effort to raise the agricultural production in Syria, some people may feel a certain degree of obligation to support the development, but no evidence of this was found in the investigations. Essentially every farmer interviewed stated that he believed he would benefit from development of the project.

Production Constraints and Elements in Development

The physical plan of development, as proposed for the Akkar Plain Irrigation Project, includes several features that would tend to overcome the major problems that farmers are encountering in their farming operations, namely, those of an inadequate supply of water and inadequate drainage of surplus storm water. A generally adequate water supply with predictable shortages will be provided by project facilities, as well as an adequate irrigation distribution and drainage system.

No irrigation organization exists at present on the Akkar Plain. Most of the land presently being irrigated is served from individual wells which supply water to individual land ownerships. There are, however, several small irrigation canals which supply irrigation water to lands, principally in the southeastern portion of the project area. No community drainage organization which involves a collective group of farmers has been

established in the area.

Since the project will provide project water that must be provided among individual water users, organization of farmers into local water users' associations would be desirable. Local leadership would be advantageous to both the government and the local water users because the farmers would more readily take an active interest in the project if they could regard the system as their own project. This would involve, at least, a "common irrigator" who should be elected by the farmers. He would receive requests for water and act as liaison representative between the farmer and representatives of the water users' association, particularly the water master. He also would be responsible for equitable division of the water, act as arbitrator in disputes, and organize local labor as required for operation and maintenance of the project. These recommendations are described more fully in another section of this report.

An effective and efficient farmer assistance program will be required to implement irrigation development within a reasonable period of time. Present agricultural research, applied technological training, demonstration, farm credit, and other programs need to be expanded to meet the needs of the Akkar Plain farmers in general. These types of programs must be improved before full agricultural potential can be developed.

Sound agricultural research programs are needed to determine the levels of fertilizer, herbicide, and insecticide application most suitable for the soil types. Other research programs are also needed, such as farm mechanization, efficient use of irrigation water, crop improvement and agronomy, horticulture, evaluation of new crops, such as citrus, and

and new varieites of crops of animal husbandry and breeding, especially dairy and farm management.

Research and Applied Technology

There is a Directorate of Research under the Ministry of Agriculture, but there is no research section under the Regional Directorate, Agriculture and Agrarian Reform, in Tartous. There is an Extension Section of this agency, however, in Tartous through which agricultural information and training is made available to farmers on the Akkar Plain. However, it was found that little of such information has been given to the farmers. With the project, the need for some form of an active and effective program will be much greater if full agricultural potential is to be achieved.

An in-depth Research and Applied Technology Program should be set up on the Akkar Plain to train technical workers in basic farm management practices and to impart knowledge of research activities. In turn, the technical workers should train farmers in the practical application of successful irrigated farming at the farm level.

As has been recommended in another section of this report, there is need to expand the technical staff at the village level. Village workers or farm leaders should be employed to work with the farmers, following an adequate training period. A trained agricultural instructor should be available to work with the village workers. A specialist position should also be created to serve the project area for the purpose of establishing applied research plots in farmers' fields or other demonstration farms to ensure that results of the agricultural research will be made available at the village or farm level. This specialist would conduct tours of the

plots and would visit the sites periodically for observation, questions, and discussions concerning reasearch experiments. Success or failure of double-cropping or growing citrus could be observed. Early success would be a positive influence on neighbors or relatives, but each failure would greatly depress the rate of acceptance. He would also work closely with the other technical personnel and with the training programs.

No obstacles are anticipated with regard to the social groups within the project area. Furthermore, 95 percent of the farm operators interviewed indicated their belief that the project is needed and that they would benefit from its development. However, there will be temporary obstacles which will create problems during construction and early operation of the project. Irrigation distribution and drainage systems will require some farm land for rights-of-way which will demand adjustments in some individual farm units and may have an effect on the individual farmer's attitude. Also, an entirely different system of irrigation will be imposed on the farmers, which will necessitate changes in their present methods.

Some temporary obstacles may be encountered with the mechanization anticipated with the project. Due to mechanization, there will be a reduction in the requirements for hand or animal labor as now being used for land preparation and tillage. Increased mechanization would come about even without the project, but the change would tend to be accelerated with it. With increased production in the form of double-cropping, new crops and increased yields, more labor will be required. It is assumed these additional labor requirements for harvesting and processing will become available from increased use of family labor, some of which could

now be classified as "leisure" or unused farm labor. All of these obstacles require some social adjustments in the overall attitude of the project population, but they can be overcome without any adverse effects on the project.

COMMUNICATION

The most effective and most regularly used mass communication medium in the project area is the radio. The farm operators stated that 87 percent of the important messages concerning their farming operations or living conditions were received by radio, 9 percent from training meetings, and 7 percent from newspapers. Of those reporting the source of messages, 20 percent came from the Ministry of Agriculture and 18 percent from cooperatives. About 70 percent of the messages were received weekly, 7 percent bi-weekly, and 28 percent monthly. Television is practically non-existent in the project area and relatively few sets are located in the nearby city of Tartous.

The Ministry of Information controls the radio and television networks, controls the domestic and foreign press, and prepares publications for distribution at home and abroad. Officially approved books, magazines, and pamphlets are also under the jurisdiction of the Ministry.

The communication media are functioning in the project area. About 77 percent of the farm operators reporting stated that they had heard of the Akkar Plain Project about 2-1/2 months previously and only 8 percent had not heard of it as of the date of the interviews. About 15 percent of the farmers learned about the project from the village leaders, 31 percent from the government, 22 percent from neighbors, 12 percent from the radio, and 10 percent from newspapers.

WILL PEOPLE RESPOND TO ECONOMIC INCENTIVES?

Several elements have a bearing upon the reasons why the farmers will or will not accept the irrigation project. These elements, most of which have been described in previous paragraphs, would lead one to the conclusion that the farm operators on the Akkar Plain, probably the poorest people in the area, will accept the project.

All farm operators whose lives would be affected by the development of the project are entitled to an early explanation of the proposed plan. Public meetings should be held to present basic information which would help alleviate fears arising from a change of lifestyle. Field trips to successful demonstration plots or farms would further enhance acceptance of the project, as would training programs.

Reports to farmers regarding construction progress are important, in order that the operator may schedule his farming operations. He should be informed well in advance when to expect water. These periodic reports are extremely important in influencing the farmer's thinking, attitude, and behavior in making preparations for irrigation.

Farmers' organizations, which would be responsible for operating and maintaining the project, should be set up early in the construction period. They would be useful for receiving and transmitting pertinent information and would facilitate early training of the officials in their duties. Acceptance of the project plan by the people in the project area will be facilitated if this type of planning is followed.

LEADERSHIP - AUTHORITY

Discussions with several village leaders and other general observations

confirmed that they, either individually or as a group, are probably the most influential, highly respected, and capable men who could be chosen to lead the people of the communities. The villagers look to them as their leaders for all aspects of their economic and social life. They are chosen or appointed by the Ministry of Interior and, therefore, ultimate authority over the leadership of the villagers rests with the government.

These leaders could be extremely influential if they would participate in all the extension and training programs that should be offered to the farmers. The leader would then be in a knowledgeable position to discuss pertinent items with the members of his village. It seems quite evident that the participation and support of leaders for such programs are vital for success.

PATTERN OF MOBILITY

The radius of mobility of the villagers is relatively small and therefore their knowledge of the outside world is very limited. Most of the population has not travelled beyond their own village. In the country as a whole, about 17,500 individuals were studying at foreign universities in 1976. However, no records were available to indicate how many were from the project area. For the majority of the Akkar Plain residents, the average distances from the home, as reported in the socioeconomic survey, are: 1.3 km to the farm; 33.7 km to the usual shopping center, 22.2 km to the most common place of entertainment, and 0.9 km to the most frequent vacation spot (the home).

PREVIOUS PROJECT DESIGN AND EXECUTION

Other projects on the Akkar Plain which were designed to improve farming practices or living conditions have recently been undertaken.

These projects or demonstrations are as follows:

Local Project or Demonstration	Percentage Participation (Based on Socioeconomic Survey)
Improvement of Schools	39
Road Building Project	31
Household Water Supply	17
Improvement of Sanitary Conditions	4
Construction of Health Center or Clinic	8
Irrigation Demonstration	5
Use of Fertilizers, Insecticides, New Crops	3
Marketing Crops or Livestock	6

About 45 percent of the farmers contributed money, 29 percent contributed labor, 5 percent contributed materials, 3 percent contributed time in conducting the project, and 1 percent contributed time during the planning phase of the project. Government representatives were chiefly responsible for about 77 percent of these projects, village leaders for about 14 percent, and others for 9 percent.

Based on the willing landowner participation and acceptance of responsibility in these previously successful projects, it is anticipated that similar help and beneficial effects will be realized by the proposed project.

RATE OF ACCEPTANCE

Many factors will affect the rate of acceptance of project irrigation water. The farmers have indicated they want project water, but they may not have been fully informed as to how it would change their way of life. They need to be informed of the potential benefits of an increase in net farm

income. Also, they should be made aware of the need to work more, to plan differently and to apply better farm management practices. Benefits such as improved living conditions and increased labor requirements should be pointed out. The sooner the positive effects of the project are realized by the operators, the sooner implementation can occur and full project benefits can be attained. It is estimated that approximately 10 or 15 years will be required for this to take place.

SOCIAL CONSEQUENCES AND BENEFITS INCIDENT TO DEVELOPMENT (SOCIAL IMPACT)

The proposed project would have significant social impacts on a large number of people and institutions - farmers, businessmen, professionals, labor force, transportation, trade, public sources, utilities, and households.

No major group would be worse off because of the project. Some adverse effects will occur, primarily because of rights-of-way that will be required for construction of the project and the corresponding adjustment in some individual farm units; problems created by changing the present irrigation methods to the project ones; need of farmers to work more, thus decreasing leisure time; and the need for more laborers. In addition, existing social structures on the farms and in the villages would be temporarily disrupted during construction and training periods, and the organization of local water user associations would require a type of community cooperation that has not been practiced in this area to date.

Substantially improved living conditions would result with development of the project. Social impacts would accrue as farming operations change from near subsistence to more profitable intensive double-cropping. More crops would be available for the family and for sale on the commercial market,

thereby increasing cash farm income and national benefits. Personal and real estate property values would increase. The individual's desire for more income, prestige and influence would be satisfied. More income would further result in better education, better community services, and better housing conditions, i.e. homes could be enlarged or improved, more and better food would be available, potable water could be made available for domestic purposes, and health and sanitation conditions as well as roads would be improved. Radios, televisions, motorcycles, and labor-saving forms of household equipment could be acquired.

Farm employment would be increased considerably as new farming opportunities become available and erratic production patterns are eliminated. Other institutional labor associated with transportation, utilities, businesses, markets, and households would grow proportionately with farm production. (Further analysis of this item is presented in other sections of this report).

No displacement of farm families will be necessary as a result of the project with the possible exception of the reservoir area. When the reservoir area is finally selected, a complete impact study should be made to determine the problems of resettlement of the families involved.

No changes in public policy are anticipated with implementation of the project.

SUMMARY

A summary of the negative and positive socioeconomic impacts associated with development of the Akkar Plain Irrigation Project is as follows:

Negative impacts include: 1) Displacement of people in the reservoir area, yet to be selected. 2) Land and land rights-of-way through many

individual ownerships must be given up to provide for the construction of a dam and reservoir, irrigation canals, surface and subsurface drains, and a flood protection dike. 3) Temporary inconvenience in the form of limited mobility during construction.

The positive impacts to result from the proposed project include: 1) A significant increase in the standard of living. This would be accomplished by a general increase in farm income from year to year. 2) A significant positive social impact affecting many individuals and institutions due to expanded participation and improved social relations. This will benefit the local area as well as the entire country.

An evaluation of the socioeconomic impacts shows that the positive impacts clearly outweigh the minor negative ones, and therefore, it is concluded that the project is socially sound.

AKKAR PLAIN AGRICULTURAL DEVELOPMENT PROJECT

APPENDIX AVIII

ECONOMICS

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APPENDIX AVIII

ECONOMICS

GENERAL ECONOMIC CHARACTERISTICS

Land Use

The lands in the project area are presently used for agriculture, with a total of 17,179 hectares under cultivation. Of this total, 3,550 hectares are irrigated and 13,629 hectares are non-irrigated land. Olive groves and hillside pasture occupy 2,328 hectares on primarily Class 6 land. A very small percentage of the region is used for grazing since most of the farmers utilize the roadsides, steep hillsides, and other areas not suited for agriculture for this purpose.

The lands presently under irrigation get their water from dug wells, tube wells, or by pumping from rivers, streams, and some existing drains. The area not under irrigation utilizes the moisture from winter rains to mature the crops. The present cropping pattern is very restricted by the climate, drainage conditions, and lack of summer water.

The main winter crops include wheat, barley, lentils, chick peas, and Spanish beans. These crops, with the exception of the grains, are planted in early spring and utilize the residual moisture from winter rains and from spring rains thay may come in April and May. The grains are planted from October to December and make use of the heavy winter rains.

The crops presently grown by irrigation are located close to dug wells, tube wells, streams, and rivers. The area under irrigation is currently limited by the availability of water and the small pumping capacity at each well. Vegetables are the main irrigated crop, with

tomatoes, cucumbers, squash, and eggplant being the most prominent and profitable. Other small vegetables that are grown include onions, both green and dry, green beans, and peppers. Groundnuts are generally used as a double-crop where possible and maize is grown mainly as a windbreak for vegetables; both of these crops are planted in late spring.

The non-irrigated land is used to grow grain sorghum or is left idle after the harvesting of the winter crop until planting in the spring. Vetch is also planted to utilize winter moisture, but only in selected areas.

The factors which hinder increased production from the Akkar Plain are heavy seasonal rain combined with a heavy, poorly-drained soil. The farm operator cannot work the soil in the early spring due to standing water which also lowers the yields of winter crops. Because the rain is seasonal and there is a definite dry season, every effort is made to utilize the residual soil moisture. The structure of the soil is such, and the present drainage being almost non-existent, that utilization of this moisture is marginal at best.

Without the project, the drilling of new wells each year would increase the amount of irrigated land but this growth would not be significant. Even with some increase in irrigation, the farm operator would still be faced with a serious drainage problem.

With the implementation of the project, 6,500 hectares will be irrigated with a 100% supply of water. This increase in irrigated land plus, more importantly, a supply of water as needed, will greatly increase the productivity of the Plain. The farm operator will be able to manage his farm more efficiently and use cultural practices and double-cropping to greatly increase his output.

Agriculture

The Syrian Government has recently placed great emphasis on improving levels of agricultural technology and production in general. It is an effort to make the country less dependent on imports and more self-sufficient. The country-wide plan to improve agriculture involves many projects of which the Akkar Plain is only one part.

Through recent government planning and control, much progress has been made in increasing agricultural production. Where initially the plan was to increase the amount of cultivated land, the subsequent plans of the late 1960's and 70's have been aimed at improving yields and farm technology. The active implementation of this governmental plan can be seen in the emphasis that has been placed on the utilization of better quality seeds, the correct application of commercial fertilizer, and improved irrigation.

But the fact remains that change does not take place overnight. The majority of Akkar Plain farmers have been unable to satisfy the desired ends: raising levels of production and individual standards of living.

The cultural practices used by the average farmer on the Akkar Plain have not kept up with technological advances. Even when tractors are available, most of the farmers can only afford to utilize them for some ground preparation, usually only shallow or deep plowing. All planting is done by hand with the exception of a few implements used for drilling groundnuts. Animals are used extensively for cultivating and also for some plowing. Except for some grain combining, all harvesting is done by hand. The current cultural practices do not indicate an unwillingness

to change but an inability to improve due to factors that the farmer alone cannot change.

There are many factors that adversely affect the farmer's productivity. All of the project area has some type of drainage problem. Heavy seasonal rains during the winter and ponding of water make work in early spring impossible and, furthermore, cause damage to crops planted in the fall. The lack of moisture in the summer makes the cultivation of any crop without irrigation very difficult. Those crops that are irrigated get water from tube or dug wells by low volume pumps designed to supply only a hectare or two. The land in the southern part of the project, near the Janoubi River, is flooded frequently.

The proposed Akkar Plain Irrigation Project will eliminate these impediments and provide the input necessary for the farmer to increase his production. Through the extensive drainage program, the channel improvement of the Janoubi River, supplying irrigation water, infrastructure planning, and improved instruction by the extension groups, the Akkar Plain can become more productive.

Manufacturing and Industry

The majority of manufacturing and industry was nationalized in 1965. Petroleum is the largest industry with oil fields in the northeastern region of the country and a large refining facility at Homs. The oil fields are connected to the Homs refinery by pipeline. From Homs oil is pumped to the port at Tartous by pipeline which crosses the northern edge of the project area.

The mining of phosphate is also a major industry. The phosphate is hauled by truck from the mines at Palmyra and exported from Tartous.

Rock salt, gypsum, and asphalt are also mined, but not as extensively.

Food processing ranks second in economic importance, surpassed only by petroleum. Olive and vegetable oil are processed by small local plants located close to the cultivation centers. Cottonseed is the main source of vegetable oil and its yield fluctuates with the production of cotton. Therefore, a decrease in the output of the factories occurs when there is a production lag in the agricultural sector.

The processing of sugar has a great potential but the publicly-owned refineries do not operate at full capacity because of low beet production. The processing of fruits and vegetables also offer a great potential, but factories generally operate at less than full capacity due to lack of agricultural production. Small scale grain mills are located in many parts of the country, with larger mills located close to the grain production centers at Hama, Idlib, Al Hasakah, and Latakia.

The private manufacturing sector includes handicrafts and small-scale industries such as baking, shoemaking, and tailoring.

The industries in the project area are small, local operations such as olive mills. There is also a plant near Hamidyeh which makes charcoal out of olive pits. As agricultural production increases on the Akkar Plain, processing facilities for canning, meat processing, and other industries will be needed.

Trade and Service Industries

The Syrian Government has had complete control of the export-import companies since nationalization of private firms in 1965. Virtually all products entering or leaving Syria are under governmental control. The majority of all products that leave the country pass

through the ports of Latakia or Tartous. The best method for exportation of Syrian products has been by ship because of its ideally situated ports and since hauling by truck is difficult with the existing road conditions.

Syria has been the crossroads for international trade since earliest recorded history and it is no different today. Syria is a great national link between the Arab countries. Not only does Syria do business with other world countries for her own imports, but many products come into Syrian ports bound for other Arab nations, such as Jordan and Saudi Arabia. Syria provides a vital trade link between Europe and the Middle East.

The port at Tartous is equipped to handle everything from livestock to fresh fruit, from automobiles to phosphate fertilizer. The newest of Syria's two main ports, Tartous, also has facilities for loading or off-loading petroleum products. Tartous is linked to the rest of the country by rail and trucklines, both private and government-owned.

Latakia, north of Tartous, provides another port facility even larger and more established than Tartous. Exports are mainly cotton, oilcake, and barley, while imports include iron and steel products, chemical products, wood, machinery, sugar, and cereals. The increased sea freight and congestion at Latakia forced the much needed enlargement and modernization of the Tartous port, which was completed in 1968. Since then, both ports have been very active.

Two oil pipelines cross the Syrian desert to the port of Tartous and the oil terminal at Baniyas. The Iraq Petroleum Company (IPC) brings crude oil from Iraq to Homs and then on to Baniyas or Tartous. The

Trans-Arabian Pipeline carries crude from Saudi Arabia to Lebanon. The Syrian Government gets royalties from both of these lines, but the price charged for transport has been a source of trouble between these governments in recent years. At times both lines have been shut off to negotiate contracts involving royalty payments.

Transportation

Syria has two main airports: one at Aleppo and the other at Damascus, the latter being the most important. Many foreign carriers operate out of Damascus International Airport, as well as the government-owned Syrian Arab Airline serving Europe and the Mid-East.

The highway system in Syria is constantly improving with a lot of traffic on the Aleppo, Homs, Damascus routes. The Syrian Government realizes that an efficient transportation system is essential to the economic growth and development of its country. The manufactured and agricultural products must reach the trade center of Damascus, Aleppo, Homs, and the seaports, which is why the roads connecting these areas are being improved.

The Government has placed a high tariff on all automobiles coming into Syria to discourage use until the highway system can catch up with increased demand. but the only real traffic problems are in the inner city areas of Damascus and Aleppo.

Passenger travel by railroad has increased in recent years, but the majority of the people travel by private taxi or bus on long trips, such as between Damascus and Aleppo. The modern, government-owned bus line operates quite efficiently between the major cities in Syria, and short distance travel is accomplished by private, small bus service.

Government Structure

The Syrian people have lived under many different governmental systems. Most recently, since 1946, Syria has been fully independent and has a socialist type of government. The legislative, executive, and judicial branches are separate; the President and the Arab Bath Party share most of the power. The legislative branch is called the Peoples Council and is made up of members of the Bath Party, Socialist Unionist Movement, Arab Socialist Union, Arab Socialists, and Communists, as well as members of popular organizations such as trade and labor unions, professional groups, representatives of industry, and Islamic clergy.

The president has a cabinet headed by a prime minister and staffed with deputy ministers covering all the areas of government. The Bath Party holds much of the power in governmental matters. The people show support for their president by periodic referendum votes.

The Akkar Plain Irrigation Project is presently under the supervision of the Ministry of Agriculture, one of the cabinet posts in the governmental structure. The project would be handled by the Akkar Plain Authority who would be directly responsible to the Minister of Agriculture. Management would be on a local level and would include supervision of the various project segments: irrigation, drainage, Agricultural Service Center, etc.

The Ministry of Public Works will be responsible for construction of the two major parts of the project, the dam and irrigation system; but when construction is completed, full responsibility for the overall management of the project will belong to the Akkar Plain Authority, directly under the Minister of Agriculture.

Types of Farming

The type of farming does not vary significantly on the Akkar Plain. The better irrigable land is used to produce a variety of vegetable truck crops. The average farmer has a small farm with little equipment. Plowing is usually done by custom-hire at least once a year and other necessary plowing is done by animals. Planting is done by hand except in the case of groundnuts which are sometimes planted by machine. Much labor goes into the cultivation of vegetable crops especially cole crops, eggplants and tomatoes. The seeds are planted in small hotbeds close to the farmhouse and allowed to germinate. These small, plastic-covered hotbeds produce seedlings that are then transplanted to the field. All weeding is done by hand, mostly by the women family members. As the tomatoes ripen they are picked by hand which usually takes several weeks.

The very distinct wet and dry seasons dictate the cropping pattern to be used as well as determining the soil conditions and available irrigation water. The cropping pattern will be discussed in more detail later in this chapter.

On land unsuitable for field crops, usually because of slope and lack of water, olives are grown. Olives are a very important crop to the economy of Syria. After initial planting and cultivation, the olive tree requires periodic pruning until it is brought into full production in 5 to 8 years. The crop is harvested by hand and used mostly for oil. The crop is crushed by typically small, locally-owned presses for a percentage of the production. The oil is then sold based on its quality. The olive grower may or may not plant a crop between his trees; most do not after the

trees are in full production. To supplement his income and support his family, most growers also raise a few vegetables and some grain.

Citrus growing is very limited on the Akkar Plain, although greater production is being encouraged by the government. Those areas that now grow citrus are well-drained and protected by windbreaks. The constant wind, either from the prevailing sea winds or due to air drainage from the mountains to the northeast, makes most areas of the Plain unsuitable for citrus. Citrus production requires careful management and cultural practices to be successful.

The dry land that is farmed utilizes the moisture that comes in the spring and the residual soil moisture that falls in the rainy season. Winter wheat crops are planted to try to make use this residual moisture; but the yields are poor due to the wheat standing in too much water. Sorghum is also planted and grows during the dry season.

Land Ownership and Tenancy

The land area in the Akkar Plain is classified into four main areas or categories of ownership; private, reformed, cooperative and government. Of the cultivated land, 67 percent is owned privately, 30 percent is reformed land being purchased by the farmers, 2 percent is government land rented to the farmer, and 1 percent is owned by the cooperatives.

The government-sponsored re-distribution program, Agrarian Reform, was initiated in 1958. This program placed land from large-scale farmers into the hands of the small-scale operator. This land is being paid for at a nominal rate over a 20 year period.

The individual owner is the most prevalent type of proprietor on the

Plain. The land owned by the cooperative is operated by the farmers on a share crop basis or the farmers can receive a salary plus a share of the profit at years end.

Farm Size

The average farm operator has 8.4 hectares including land rented for his own use or rented to others. Most of the farmers received some land as a result of the Agrarian Reform Program. The land was allocated to landless peasants and small-scale operators according to shares; the shares were based on family size.

Cropping Patterns and Yields

The present cropping patterns on the Akkar Plain were determined by on-farm interviews and observations made during the growing season. The present cropping pattern includes the following:

Non-Irrigated Crops, wheat, barley, lentils, chick peas, Spanish beans, cabbage, cauliflower, lettuce, vetch, onions (dry and green), potatoes, maize, and sorghum.

Irrigated Crops, onions (dry and green), potatoes, green beans, kidney beans, cucumbers, tomatoes, eggplants, and pumpkin.

The future-with-project cropping pattern was designed according to land capability class. Figure AVIII-1, shows the four land classes with the corresponding cropping patterns.

Current yields are based on the farm surveys and village leader reports. Table AVIII-1, summarizes the present conditions and compares the future-without and future-with-project yields. The future-without-project yields were calculated as a 10% increase from present yields due to better cultural practices

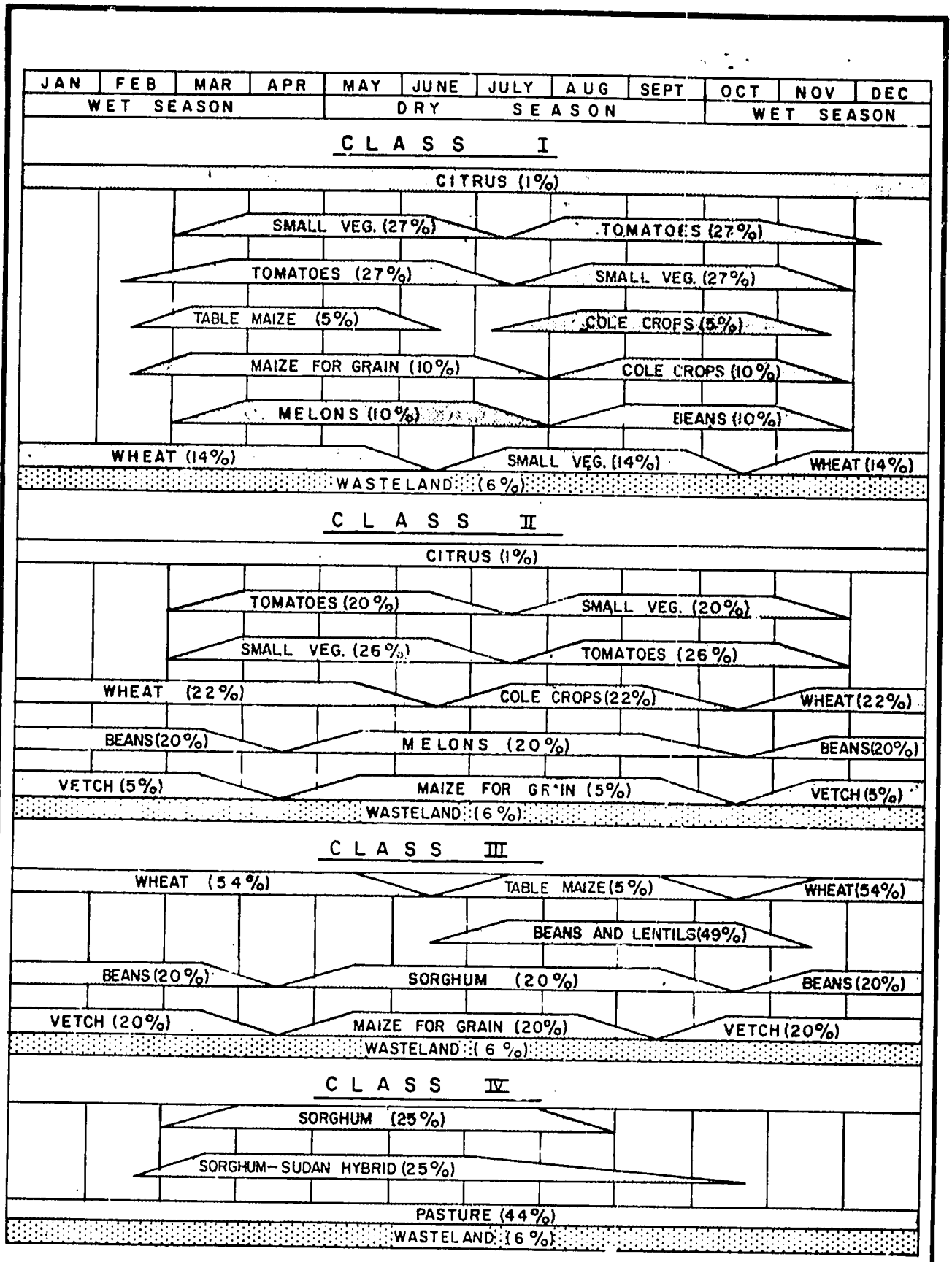


FIGURE AVIII-1 FUTURE CROPPING PATTERN AND LAND USE WITH IRRIGATION BY LAND CAPABILITY CLASS

Table AVIII-1. Crop Yields by Land Class, Present, Future Without Project and Future With Full Development

Crop	Units	Present all classes average	Future Without Project				Future With Project			
			Class 1	Class 2	Class 3	Class 5	Class 1	Class 2	Class 3	Class 5
Wheat	MT/HA	.92	1.1	1.1	1.00	-	5.94	5.94	5.39	-
Tomatoes	MT/HA	10.5	12.6	12.6	11.5	-	54.34	54.34	49.39	-
Sorghum	MT/HA	.76	-	-	.84	.80	-	-	2.86	2.75
Pasture	a.u.m.	2.5	-	-	-	2.6	-	-	-	22.00
Forage	MT/HA	.56	.68	.68	.62	.59	8.14	8.14	7.37	7.04
Citrus	MT/HA	-	-	-	-	-	22	22	-	-
Maize Field	MT/HA	1.5	1.8	1.8	1.6	-	6.6	6.6	6.05	-
Sweet		-	-	-	-	-	10.89	10.89	9.9	-
Dry Beans	MT/HA	1.0	1.2	1.2	1.1	-	2.75	2.75	2.53	-
Chick Peas	MT/HA	.8	1.0	1.0	.9	-	2.09	2.09	1.87	-
Potatoes	MT/HA	12.3	14.8	14.8	13.5	-	37.0	37.0	33.7	-
Cabbage	MT/HA	7.6	9.2	9.2	8.36	-	12.65	12.65	11.55	-
Melons	MT/HA	7.7	9.32	9.32	8.47	-	15.73	15.73	14.30	-
Cucumbers	MT/HA	10.1	12.22	12.22	11.11	-	14.52	14.52	13.2	-
Peanuts	MT/HA	1.6	1.76	-	-	-	-	-	-	-

and fertilization. The future yields projected over the fifty-year life of the project were based on current U.S. yields, by assuming that the future yields would be at least as high as present U.S. yields.

Farm Family and Labor Supply

The Arabic farm family work closely as a unit since the farm operator relies on family members for his labor supply. About 85 percent of all farming operations are carried on by the family. Men, women, and children work long and hard especially with double cropped land which involves the harvest of one crop and the planting of another. Even though one-fifth of those farm operators interviewed state that family and hired labor were limiting factors to their production, nearly all believed that sufficient labor would be available to handle increased yields with the development of the project.

Wage Rates

The farm survey and village leader interviews conducted showed that there was no real control over wages paid to farm labor. The laborer was paid according to the work that was done. The rate most commonly quoted, and the one used to calculate the value of hired labor, was 25 Syrian pounds per day. The length of work day varied from 5 to 10 hours but was generally an 8 hour day.

Livestock and Poultry

The livestock raised on the Akkar Plain is used as part of the farm operation. Only a few of the farmers have an exclusive livestock operation and most have at least a few animals on their farms. Based on farmers interviewed, the average farm enterprise would have 3 cows, some used for work; 8 chickens;

25 percent would have sheep; and 33 percent would have a burro. The farmers keep the cows for milk and draft power; the chicken for eggs and meat, usually consumed by the farm family; and the burros are used mainly for work and riding. Pasture is the limiting factor for sheep production since most farmers do not have sufficient grazing land. The sheep, at present, graze on roadsides and wastelands.

The installation of a government-owned dairy quarantine station at Karto will increase the interest in livestock production. About 550 animals per month are processed to areas in and out of Tartous Mohafaza.

Poultry farms lie in close proximity to the Akkar Plain, but none are found in the project area. The Syrian Government is also involved in the poultry industry with a farm close to Tartous. The problems with the poultry business seem to be: the increased cost of inputs, mainly feed, and the low price for eggs. The industry is still profitable, but many growers are now producing for meat rather than eggs.

Farm Production Input Prices

Chemical fertilizers as well as other commodities in Syria have price controls placed upon them by the government. Fertilizer is imported by the Agricultural Bank and then sold to the cooperatives or directly to the farmer. The cooperatives give a 5 percent price discount to their members for products bought through them. Due to lack of availability of either the correct fertilizer or the amount needed, some farmers prefer the black market price or buying from the Agricultural Bank directly.

The price of Urea, Triple Superphosphate, Sulfate Sulfur, Muriate of

Potash, and Micro-Nutrients, is calculated in the following tables. The world market price was used for all fertilizer prices and projections calculated for the future-with-project conditions. The current prices and rates of application were taken from interviews with Agricultural Bank personnel and on-farm interviews. The future-with-project projections for fertilizer application were made based on the soil analysis of each class of soil and amount needed to reach projected future yields. Table A-VIII-7 lists these rates of application and projects the rate and cost.

Local seed prices were used for describing present conditions and the price spread of U.S. seed and feed applied to the world market price for wheat, sorghum, pasture and forage uses. Other seed costs in the future are based on U.S. varieties and their respective costs. Table A-VIII-8 lists the rate and cost of seed per hectare.

The government controls the importation of agro-chemicals for insecticides and herbicides but they are sold through private industry. Most dealers are well-educated as to the use and results obtained from the use of various agro-chemicals and can therefore advise the farmer on how to treat his problems. Table AVIII-9 shows the cost and rates of application of the most commonly used chemicals.

Hired labor, based on the data collected in the farm interviews, showed an average wage rate of 25 Syrian pounds per day for an 8 hour day. Table VIII-10 shows the custom hire rates for various cultural practices. Projected rates are based on U.S. custom hire rates.

Farmland on the Akkar Plain is not taxed. The only taxes assessed are to those who are not self-employed and records are kept so that income can be

Table A-VIII-2. Price of UREA - Imported Imput, International Price Forecast for 1985 Expressed in 1978 Dollars

Item	Price U.S. Dollars / metric ton
Price of UREA, F.O.B. Europe, bagged expressed in 1974 U.S. dollars 1/	139.80
Inflation adjustment (1974 - 1978) 2/	40.12
Subtotal (price expressed in 1978 U.S. dollars)	179.92
Shipping costs:	
Handling on and off ship	+ 8.00
Shipping 3/	+ 27.00
Insurance 4/	+ .72
Transport, dock to market	+ 5.00
Merchants markup 5/	+ 44.13
Subtotal (price of UREA at market)	264.77
Transport, market to farm	+ 10.00
Price of UREA (46% nitrogen) at farm	274.77 (1071.60 SP)
Price of Nitrogen (N) per available kilogram = $ .60 U.S. 2.34 S P 6/	

1/ From "Table 1- Commodity Prices and Price Projections in 1974 Constant Dollars" received from IDA.
2/ Escalation of 28.7% based on data received from IDA.
3/ Includes freight plus storage charges.
4/ .33% of full value of shipment at port of embarkation including value of cost to merchant at market.
5/ 20% of cost to merchant at market.
6/ 1 U.S. dollar = 3.9 SP.

Table AVIII-3. Price of Triple Superphosphate (P_2O_5) - Imported Input International Price Forecast for 1985 Expressed in 1978 Dollars

Item	Price U.S. Dollars / metric ton
Price of triple superphosphate F.O.B. U.S.A.	
Gulfport, bulk, expressed in 1974 U.S. Dollars 1/	125.10
Inflation adjustment (1974 to 1978) 2/	35.90
Subtotal (price of triple - superphosphate expressed in 1978 dollars)	161.00
Shipping costs:	
Handling on and off ship	+ 8.00
Shipping 3/	+ 30.00
Insurance 4/	+ .67
Transport, dock to market	+ 5.00
Merchants markup 5/	40.93
Subtotal (price of triple superphosphate at market)	245.60
Transport, market to farm	10.00
Price of triple superphosphate (44% phosphate) at farm	255.60 (996.84 SP)
Price of phosphate (P) per available kilogram	
= $0.58 U.S.	
2.26 S P 6/	

1/ From "Table 1- Commodity Prices and Price Projections in 1974 Constant Dollars" received from IDA.
2/ Escalation of 28.7% based on data received from IDA.
3/ Includes freight plus storage charges.
4/ .33% of full value of shipment at port of embarkation including value of commodity, handling, shipping, etc.
5/ 20% of cost to merchant at market.
6/ 1 U.S. dollar = 3.9 SP.

Table A-VIII-4 Price of Sulfur, Imported Input 1978 Dollars U.S.

Item	Price U.S. Dollars / metric ton
Price of 70% sulfate U.S.	264.00
Shipping Costs: 1/	
Handling on and off ship	+ 8.00
Shipping	+ 25.00
Insurance	+ .33
Transport, dock to market	+ 5.00
Merchants markup 2/	60.47
Subtotal (price of sulfate at market)	362.80
Transport, market to farm	10.00
Price of sulfate	372.80 (1453.92 SP)
Price of sulfate per available kilogram	
=$ .53 U.S. 2.08 S P	

1/ Costs based on shipping of potash, assumed to be equivalent.

2/ 20% of cost to merchant at market.

Table A-VIII-5 Price of Muriate of Potash - Imported Input International Forecast for 1985 Expressed in 1978 U.S. Dollars

Item	Price U.S. Dollars / metric ton
Price of muriate of potash, F.O.B. 3/	
Vancouver, British Columbia, bulk	
Expressed in 1974 dollars 1/	50.80
Inflation adjustment (1974 to 1978) 2/	14.58
Shipping 3/	
1. Handling on and off ship	8.00
2. Shipping	25.00
3. Insurance	.33
Transport dock to merchant	5.00
Subtotal (price of muriate of potash expressed in 1978 U.S. dollars)	103.71
Merchants mark-up 4/	20.74
Subtotal (price of muriate of potash at market)	124.45
Transport, market to farm	10.00
Price of muriate of potash (60% potash at farm)	134.45
Price of potash (K) per available kilogram	(524.36 SP)
= .22 U.S.	
.57 S.P.	

1/ From "Table 1 -Commodity Prices and Price Projections in 1974 Dollars" received from IDA.
2/ Escalation of 28.7% based on IDA data.
3/ Shipping assumed to be equivalent to price for triple - super phosphate.
4/ 20% of cost to merchant at market.

Table A-VIII-6 Price of Micro-Nutrients - Imported Input, 1978 Dollars U.S.

Item	Price U.S. Dollars / metric ton
Price of Micro-Nutrient Compound U.S.	132.00
Shipping Costs: 1/	
Handling on and off ship	+ 8.00
Shipping	+ 25.00
Insurance	+ .33
Transport, dock to market	+ 5.00
Merchants markup 2/	34.07
Subtotal (price of Micro-Nutrient at market)	204.40
Transport, market to farm	+ 10.00
Price of Micro-Nutrient (at farm)	214.00 (834.60 SP)
Price of Micro-Nutrient per available kilogram 3/ = $ .59 U.S. 2.30 S P	

1/ Costs based on shipping of potash, assumed to be equivalent.

2/ 20% of cost to merchant at market.

3/ Based on a Zn, Fe compound.

Table A-VIII-7. Rate and Cost of Fertilizer

Crop	Type	Price per available kg (SP)	US $	Condition: Present Application (kg/ha)	Present Cost (SP)	Present Cost (US $)	Future w/o Dev. Requirement (kg/ha)	Future w/o Dev. Cost (SP)	Future w/o Dev. Cost (US $)	Future w/ Dev. Requirement (kg/ha)	Future w/ Dev. Cost (SP)	Future w/ Dev. Cost (US $)
Pasture	N	2.34	.60	-	-	-	-	-	-	168	393.12	100.80
	P	2.26	.58	-	-	-	-	-	-	56	126.67	32.48
	K	.86	.22	-	-	-	-	-	-	112	96.10	24.64
	S	2.07	.53	-	-	-	-	-	-	56	115.75	29.68
	Micro-Nut	2.30	.59	-	-	-	-	-	-	11	25.31	6.49
	TOTAL										726.38	186.25
Forage	N	2.34	.60	-	-	-	-	-	-	56	131.04	33.60
	P	2.26	.58	-	-	-	-	-	-	100	226.20	58.00
	K	.86	.22	-	-	-	-	-	-	84	72.07	18.48
	S	2.07	.53	-	-	-	-	-	-	56	115.75	29.68
	Micro-Nut	2.30	.59	-	-	-	-	-	-	11	25.31	6.49
	TOTAL										570.38	146.25
Citrus	N	2.34	.60	-	-	-	-	-	-	216	505.44	129.60
	P	2.26	.58	-	-	-	-	-	-	56	126.67	32.48
	K	.86	.22	-	-	-	-	-	-	112	65.52	16.80
	S	2.07	.53	-	-	-	-	-	-	56	115.75	29.68
	Micro-Nut	2.30	.59	-	-	-	-	-	-	11	25.31	6.49
	TOTAL										838.70	215.05

1/ 10% increase in application.
2/ Based on NPK (25-15-10) compound 7.6 kg/ha total application.
3/ Based on NPK (25-15-10) compound 23 kg/ha total application.

Table A-VIII-7. continued. Rate and Cost of Fertilizer

Crop	Type	Price per available kg (SP)	Price per available kg (US$)	Condition: Present: Application (kg/ha)	Present: Cost (SP)	Present: Cost (US $)	Future w/o Dev.: Requirement (kg/ha)	Future w/o Dev.: Cost (SP)	Future w/o Dev.: Cost (US)	Future w/ Dev.: Requirement (kg/ha)	Future w/ Dev.: Cost (SP)	Future w/ Dev.: Cost (US)
Wheat	N	2.34	.60	5.72 3/	13.38	3.43	6.29	14.70	3.77	168	393.12	100.80
	P	2.26	.58	3.43	7.76	1.99	3.77	8.54	2.19	56	126.67	32.48
	K	.86	.22	2.29	1.95	.50	2.52	2.15	.55	112	96.10	24.64
	S	2.07	.53	-	-	-	-	-	-	56	115.75	29.68
	Micro-Nut	2.30	.59	-	-	-	-	-	-	11	25.31	6.49
	TOTAL				22.46	5.76		24.73	6.34		756.95	194.09
Tomatoes	N	2.34	.60	19 2/	44.46	11.40	21	49.14	12.60	50	117.00	30.00
	P	2.26	.58	11.4	25.78	6.61	12.5	28.28	7.25	100	234.00	60.00
	K	.86	.22	7.6	6.51	1.67	8.4	7.22	1.85	100	85.80	22.00
	S	2.07	.53	-	-	-	-	-	-	56	115.75	29.68
	Micro-Nut	2.30	.59	-	-	-	-	-	-	11	25.31	6.49
	TOTAL				74.69	19.15		82.33	21.11		577.86	148.17
Sorghum	N	2.34	.60	-	-	-	-	-	-	213	498.42	127.80
	P	2.26	.58	-	-	-	-	-	-	84	190.01	48.72
	K	.86	.22	-	-	-	-	-	-	112	96.10	24.64
	S	2.07	.53	-	-	-	-	-	-	56	115.75	29.68
	Micro-Nut	2.30	.59	-	-	-	-	-	-	11	25.31	6.49
	TOTAL										925.59	237.33

1/ 10% increase in application.
2/ Based on NPK (25-15-10) compound 7.6 kg/ha total application.
3/ Based on NPK (25-15-10) compound 23 kg/ha total application.

Table A-VIII-8. Rate and Cost of Seed Per Hectare

Crop	Unit	Rate 1/ Per Hectare	Cost / Unit 2/					
			Present 3/		Future Without Project		Future With Project	
			SP	US $	SP	US $	SP	US $
Maize	Kg	15	-	-	-	-	-	2.20
Wheat	Kg	123	.93	.24	1.09	.28	1.09	.28
Tomatoes	Plants	11856	-	.05	.20	.05	.20	.05
Dry Beans	Kg	30	-	-	-	-	-	3.85
Sorghum	Kg	23	-	1.06	4.13	1.06	4.13	1.06
Pasture	Kg	18	-	3.96	15.44	3.96	15.44	3.96
Forage	Tree	18	-	3.96	15.44	3.96	15.44	3.96
Citrus		306	-	5.00	19.50	5.00	19.50	5.00

1/ Based on 110 lbs/ac wheat, 4800 plants/ac, tomatoes 20 lbs/ac, sorghum 16 lbs/ac, alfalfa used as equivalant for grass and pasture seed. Citrus 124 trees/ac, maize 12-15 lbs/ac.

2/ Cost based on percent spread between U.S. feed and seed cost applied to World market price. For wheat, sorghum, pasture and forage. Tomatoes and citrus estimated price/plant - based on U.S. variety. Beans 15 sp/kg (Tartous dealer)

3/ Actual seed cost Syria 1978

Table A-VIII-9. Rates of Application and Cost of Agro-Chemicals (Per Hectare)

Chemical	Unit	Unit Cost	Wheat (unit/ ha)	Wheat cost	Tomatoes (unit/ ha)	Tomatoes cost	Sorghum (unit/ ha)	Sorghum cost	Pasture (unit/ ha)	Pasture cost	Forage (unit/ ha)	Forage cost	Citrus (unit/ ha)	Citrus cost
Insecticides														
Malathion (50%)	(gal)	US $ 21.79 SP 84.98	-	-	1.5	32.69 127.49	-	-	-	-	1.62	35.36 137.90	1.5	32.69 127.49
Sevin (50%)	(kg)	US $ 3.34 SP 13.03	-	-	3.5	11.67 45.51	-	-	-	-	-	-	3.5	11.67 45.51
Gusathion (50%)	(gal)	US $ 13.59 SP 53.00	-	-	-	-	-	-	-	-	-	-	1.62	22.02 85.88
Herbicides														
2, 4-D (20%)	(gal)	US $ 12.56 SP 48.98	1.62	20.35 79.37	-	-	.6	7.54 29.41	-	-	-	-	-	-
Linuron	(kg)	US $ 10.00 SP 39.00	2.8	28.00 109.20	-	-	-	-	-	-	-	-	-	-
Treflan	(gal)	US $ 33.08 SP 129.01	-	-	.3	9.92 38.69	-	-	-	-	-	-	1.62	53.41 208.30

Table A-VIII-10. Custom Hire Rates/Crop Hectare

Crop	Custom Work (In U.S. Dollars)												
	Plow	Harrow[1]		Level		Plant		Weeding		Spraying		Harvest	
		US $	SP	US $	SP	US $	SP	US $	SP	US $	SP	US $	SP
Wheat													
Present	18	-	-	-	-	2/	2/	2/	2/	2/	2/	26	101.4
F/without	18	-	-	-	-	2/	2/	2/	2/	2/	2/	26	101.4
F/with	18	13	50.7	13	50.7	10 3/	39	2/	2/	6 3/	23.4 3/	26	101.4
Tomatoes													
Present	18	-	-	-	-	2/	2/	2/	2/	2/	2/	2/	2/
F/without	18	-	-	-	-	2/	2/	2/	2/	2/	2/	2/	2/
F/with	18	13	50.7	13	50.7	2/	2/	2/	2/	9 3/	35.1 3/	2/	2/
Sorghum													
Present	18	-	-	-	-	2/	2/	2/	2/	2/	2/	26	101.4
F/without	18	-	-	-	-	2/	2/	2/	2/	2/	2/	26	101.4
F/with	18	13	50.7	13	50.7	10 3/	39	2/	2/	6 3/	23.4 3/	26	101.4
Maize													
Present	18	-	-	-	-	2/	2/	2/	2/	2/	2/	26	101.4
F/without	18	-	-	-	-	2/	2/	2/	2/	2/	2/	26	101.4
F/with	18	13	50.7	13	50.7	13	50.7	2/	2/	6 3/	23.4 3/	26	101.4

1/ 50 PS/HA local cost for light tractor work.
2/ Work done by family labor.
3/ 1976 U.S. rates adjusted by International Inflation Index (14.2%)

determined. Property taxes are assessed in the cities to pay for police protection and other services.

The importation of farming equipment is government regulated and controlled. Most of the tractors used are brought in and assembled in Syrian factories. The equipment is expensive and this is why 67 percent of the farm operators custom hire their work. Replacement parts are available in Tartous but are costly.

The main implements purchased are moldboard and disk plows. Many additional ground preparation implements are still needed to prepare a more adequate seedbed. Much of the low yield problem could be solved by better preparation of the soil and being able to plant by machine.

Harvesting equipment for grain is available, but many prefer the binders rather than the newer combine.

Prices Received for Crops

The government regulates the prices received for farm products and publishes a weekly list summarizing these prices. The government price is adhered to in most markets although, a few pounds per kilo can be made by coming to the market early with good quality products.

The price projections for the future-with-project were either world market prices, where available, or U.S. market prices. Table A-VIII-11, summarizes these prices.

Table A-VIII-11. Summary of Farm Prices

		US $/MT	SP
Wheat	(No. 1 red spring f.o.b. Thunder Bay 1985 forecast in 1974 dollars) =	141.10	
	Inflation rate adjustment 1974 to 1978 28.7% =	40.50	
	10% discount for less than No. 1 quality =	-(41.10)	
	SUBTOTAL	140.50	
	Shipping and insurance, Thunder Bay to Tartous =	15.26	
	NET WHEAT PRICE	155.76	607.46
Sorghum	(U.S. No. 2 milo yellow f.o.b. Gulfports, 1985 forecast in 1974 dollars) =	83.80	
	Inflation rate adjustment 1974 to 1978 28.7% =	24.05	
	10% discount for less than No. 2 quality =	-(8.38)	
	SUBTOTAL	107.85	
	Shipping and insurance, Gulfports to Tartous =	15.26	
	NET SORGHUM PRICE	123.11	480.13
Tomatoes	(Average farm gate price taken from Akkar Plain farm surveys) = (.41 SP/kg)	105.13	410.01
Peanuts	(Average farm gate price from survey) = (1.56 SP/kg)	400.00	1560.00
Table Maize	177/MT (U.S. Veg Sit. 1978)	177.00	690.30
Forage	(Alta fescue @ $40./US ton) =	44.00	171.60
Maize	($95.1 Gulfports shipping and other adjustments in price the same as sorghum) =	125.41	489.10
Pasture	(1 a.u.m. = 840 lbs alfalfa hay @ .02/lb) =	16.80/ a.u.m.	65.52
Beans	(Average farm gate price from survey) .19/kg	194.87	759.99
Citrus	(EEC reference price for import of Group II varieties)	191.10	
	Inflation rate adjustment 1974 to 1978 28.7%	54.85	
	10% discount for less than No. 1 quality =	-(19.11)	
	SUBTOTAL	226.84	
	Shipping and handling costs	36.00	
	TOTAL	263.00	1025.70

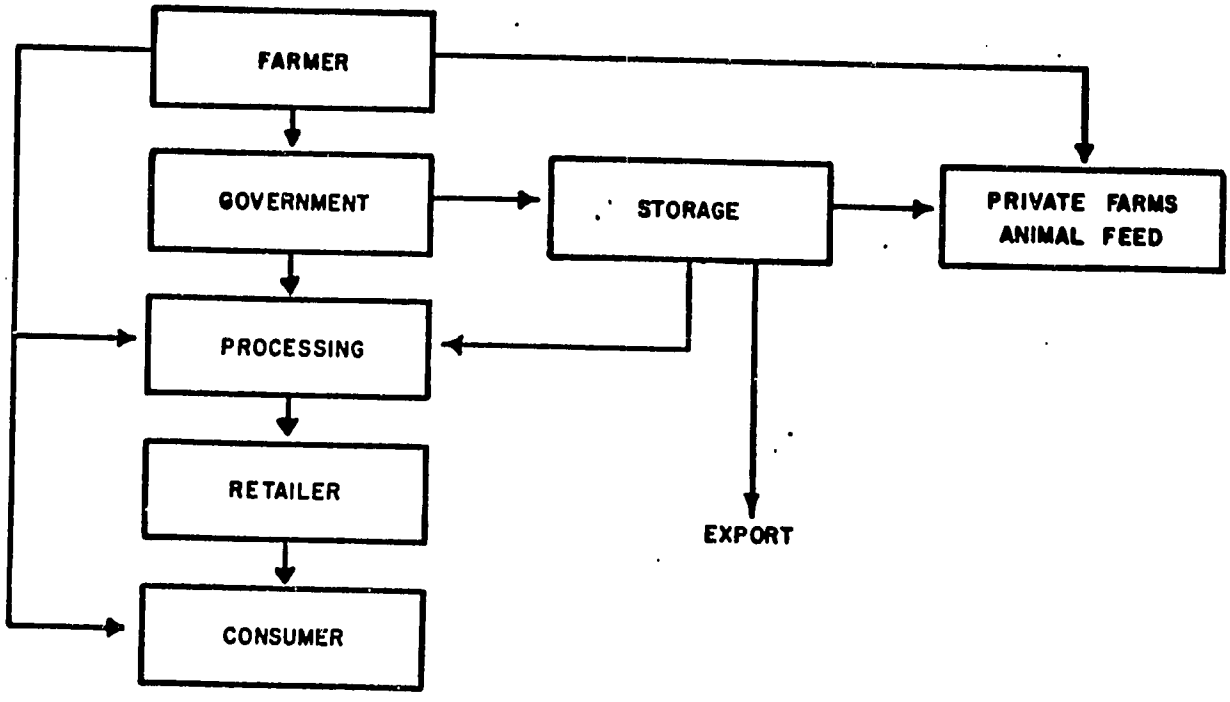
Market Channel for Major Crops

The channel for agricultural products produced on the Akkar Plain is farmer, wholesaler, retailer, consumer. In each major city there is an established wholesale marketing center for fresh produce. The farmer loses title to his crop by selling to the wholesaler. The wholesaler, rents a stall or area from the local Mohafaza government who owns the wholesale center, and sells to retailers thus making their profit on the exchange. The retail merchants come to the wholesaler to buy produce so the latter doesn't have transportation expenses related to buying or reselling. The retailer then passes on an increase to the consumer although the price is established by the government.

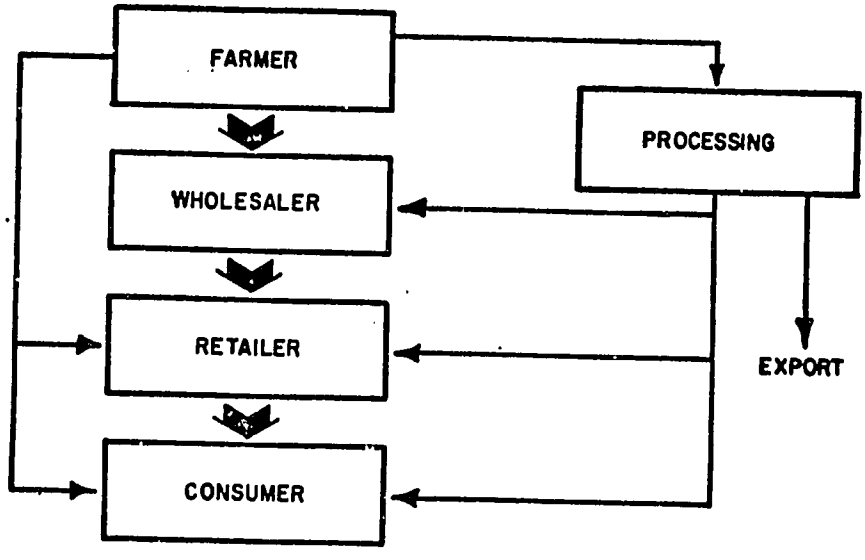
In some cases this market channel is altered. The farmer can sell directly to the consumer or to the retailer. Usually because of the ease in selling without hunting for a buyer the farmer goes to the wholesaler first. In some instances the wholesaler will buy directly from the farmer or a man with a truck may buy from the farmer and sell to the wholesaler or retailer. Those small farms adjacent to main roads often sell some of their products directly to the consumer on the road.

To get a better price many farmers take their produce to Homs to sell if they can get on the market early. It is a hit-and-miss method because the farmer gambles that the price will be higher; when it isn't, he has to pay the transportation cost. Many times the better price only covers transportation costs so the farmer needs to be sure he is coming on the market at a good time.

Citrus crops produced in the area are usually sold on the tree to a



CEREAL CROPS



VEGETABLE CROPS

FIGURE AVIII-2 FARM PRODUCE MARKETING CHANNELS

processor or directly to the consumer at small fruit stands. The grower may also sell to a wholesaler and run the product through the established market system. The pricing system has earlier been explained. Grading for fresh produce takes place at two locations: (1) the farmer picks out the culls of his crop and then the wholesaler buys what the farmer brings in, and (2) the wholesaler will sell according to quality to the merchant. Because of this system of grading and the associated small reward for high quality, much of the produce that reaches the market is of varied grades.

Farm to Market Roads and Transport

When fully developed, the Akkar Plain Project will provide agricultural products to major cities in Syria and neighboring Arab countries. Since a number of items produced will be perishable a good road system will be required to move products to market centers quickly and a minimum amount of damage. The existing roads on the Akkar Plain are inadequate for full project development. A network of graded and gravel-surfaced roads with an asphalt binder or tack coat serves the main villages. These roads have a surfaced width of approximately 4 meters which would classify them as a single lane. The subgrade is usually limestone rock which is adequate but lack of proper sealing and drainage of the road surface results in a large scale breakup during the rainy season. Damage to vehicles and transported products is high. The remainder of the villages are virtually isolated during the 3 to 4 month rainy season. Travel at this time is by foot, burro and tractor. Use of tractors on the ungraded and unsurfaced roads creates ruts making the roads impassible for other types of vehicles.

The roads proposed with the development of the project would be two-lane bituminous surface ones to connect the major villages in the project area.

These roads would also connect with the soon to be completed, Homs-Latakia expressway and the railroad at Semaryan. Graded and gravel-surfaced roads will be constructed to provide an all-weather road between all main villages in the project area.

ECONOMIC METHODOLOGY USED IN FARM BUDGET ANALYSIS

Individual farm budgets were calculated for the present, future-without project, and future-with project conditions. A composite budget for the four land capability classes was calculated for the present and future-without project conditions. A separate budget was estimated for each individual land class for the future-with project conditions.

The yields used in the budget analysis for present conditions were calculated from the farm surveys. An average yield was found for each crop. Future-without yields were estimated by taking the present yield times 10% for class III land, and 10% more for class I and II land and 5% less for class IV. It was assumed that in the future with better seed and minimum advances in technology, that the yield would at least increase to these levels.

The future-with yields were based on current U.S. yields adjusted to land class by the same method as described above. With full project implementation the farmers could do as well or better than current U.S. production.

The prices used to estimate the value of the crops produced were world market price for wheat, sorghum, maize and citrus. Table maize, forage, and pasture prices were based on current U.S. price. Tomatoes, groundnuts, and beans were based on the average farm gate price. Table AVIII-11, summarizes the prices used in the farm budgets.

The dispostion of farm crops was divided into four categories. The amount of each crop used for feed was calculated from the farm survey data. The amount kept for seed was based on the amount needed to sow a hectare of each crop times the number of hectares in the cropping pattern. The amount retained at home and used directly or indirectly for the farm family was estimated from the farm survey data and village leader inverview data.

The interest cost to the farmer was 6% of his total capital investment. This interest is the farmer opportunity cost, it is money foregone, it is not actually money he spends, but it is what he could make on his capital if he did not use if for the farm enterprise.

The depreciation and repair expense was calculated as straight-line depreciation on all farm machinery and farm irrigation structures. Repair was estimated at 5% of the gross value of the equipment.

Land preparation expense was based on current custom hire rates in Syria for present and future-without conditions using present cultural practices. The future-with project land preparation was designed to best prepare the seedbed for all crops in the cropping pattern according to the land capability class. The rate was a U.S. custom hire rate and the recommended practices were plow one time, power harrow two times, clod breaker two times, land plane one time, and lister one time. Planting of grain and field crops would also be by machine.

In the present and future-without situation, only vegetable seed would be purchased and other seed would be kept from previous years. It was found by farm interviews that most vegetable seeds were purchased locally at Tartous and good quality was available. In the future-with project condition, all seed

would be purchased in the normal amounts for seeding and valued at 1978 prices.

The expense for fertilizer and the fertilizer requirements were established by using the soil analysis and then supplying the amount of fertilizer needed to optimize yields. Table AVIII-7 shows the rate and cost of fertilizer for the major crops under all project conditions. Prices were based on world market fertilizer input prices.

The charge for both herbicides and insecticides was calculated from normal usage rates and current prices. The application of these agro-chemicals was to control common insects and problems that arise in general farm crops. Table AVIII-9 shows the rate of application and control for agro-chemicals used in the farm budget analysis.

The per hour rate used in the hired labor calculation was established by the village leader interviews. An average laborer would earn 20 Syrian pounds per 8 hour day.

The expense for harvesting was based on the custom hire rate in the U.S. for wheat, maize, and dry beans. Hay was also assumed to be swathed and baled at custom hire rates and priced in the field. Table AVIII-10 summarizes these rates for various operations.

No charge was made to the budget for marketing as the farm gate price was used on farm commodities, assuming no cost to the farmer to market his goods. Two percent of the subtotal was added as a miscellaneous expense.

The methodology used to estimate the investment made by the farmers is as follows: (1) land value for Class I and II was an average taken from the farm surveys of $2,300 U.S. per hectare. Class III land at $1,500 per hectare

and Class IV land at $400 per hectare; (2) no cost for a dwelling was made as the farmers live in the village and not on their farms; (3) farm irrigation structures at present and future-without were estimated at a typical farm with 1 diesel pump, 1 tube well, and a plastic pipe distribution system. The future-with project was a gate pipe system at $640 per hectare; (4) farm machinery on the present, future-without, and future-with Class III and V would be all custom hire. On Class I and II land, under future-with conditions, the farmer would be allowed a small utility pickup for use with the vegetable operation; (5) small necessary tools, such as shovels, hoes and other miscellaneous tools, were estimated and added to the farmer's investment; and (6) operating capital was calculated at 50 percent of expenses not including the interest cost.

Estimated real farm family income was divided into 3 main areas. The first considered was the family cash allowance, estimated by taking 1 percent of gross sales for management plus farm operator and farm family labor at 25 Syrian Pounds per day. The second area was an estimate of the value of farm products retained at home. The third area would normally be the value of the farm dwelling per year in terms of rental rates; however, most of the families do not live on the farm so the dwelling was separate from the farm enterprise.

The value of farm labor was determined from the farm surveys for the present conditions. Future-with project labor requirement and value was based on the amount of labor needed to operate the farm efficiently with projected changes in cropping patterns and yields. The amount of labor for the farm operator, his family, and the necessary hired labor was determined and charged at 25 Syrian Pounds per man-day.

Other assumptions and calculations used in the budgets were that generally tomatoes represented all vegetables except where otherwise specified. No land tax or fee was charged because that is the policy in Syria.

Total sales of farm commodities plus farm privileges minus total expenses is equal to net farm income. Net farm income minus family allowance is equal to total payment capacity.

Indirect benefits were based on U.S.B.R. standards which is a factor that is applied to total sales of each crop depending on the impact that crop has on the economy. A per hectare indirect benefit for each budget was calculated, Table AVIII-12.

Summary sheets, Table AVIII-13 through AVIII-20 show the results of each budget as calculated for the various conditions.

Table AVIII-12. Net Farm Income and Indirect Benefits

Farm Type	Condition	Land Capability Class	Net Farm Income/ (Benefit) Ha.		Indirect Benefits/ Ha.		Total Benefit per Hectare	
			SP	US $	SP	US $	SP	US $
General	Present	Composite	94	24	623.73	159.93	717.33	183.93
General	Future Without	Composite	199	51	702.23	180.06	901.13	231.06
Vegetable Crop	Future With	Class 1	9,769	2,505	8,510	2,182	18,279	4,687
Vegetable Crop	Future With	Class 2	8,755	2,245	7,765	1,991	16,520	4,236
General	Future With	Class 3	811	208	1,669	428	2,480	636
Forage	Future With	Class 4	316	81	250	64	565	145
Citrus	Future With	Class 1 & 2	8,818	2,261	4,528	1,161	13,346	3,422
General (drainage)	Future With	Composite	406	104	835	214	1,241	318

Table AVIII-13. Farm Enterprise Summary, Present Condition, Akkar Plain Project,

Farm Type: General, Farm Size: 8 hectares, And Soil Type: Composite.

Crop	%	Ha	Yield	Production			Disposition				Expense	
				Amount	Price	Value	Feed	Seed	Home	Sales	Item	Cost
First Crop			MT/HA	$/MT				$	$	$	Land Tax Or Fee	
Wheat	41	3.28	.92	3.02	155.76	470.40		62.30	144.86	263.24	Interest Cost	1,467.59
Sorghum	15	1.20	.76	.91	123.11	112.03		3.69	8.62	99.72	Depreciation/Repair	422.00
Peanuts	16	1.28	1.6	2.05	400.00	820.00		20.00	36.00	764.00	Land Preparation	241.77
Tomatoes	6	.48	10.5	5.04	105.13	529.86		1.58	13.67	514.61	Spraying	
Cucumbers	10	.80	10.5	8.40	105.13	883.09		1.05	14.72	867.32		
Melons	6	.48	10.5	5.04	105.13	529.86		.53	9.99	519.34		
Second Crop												
Tomatoes	6	.48	10.5	5.04	105.13	529.86		1.58		528.28	Seed And Plants	543.47
Cucumbers	10	.80	10.5	8.40	105.13	883.09		1.05		882.04	Fertilizer	87.16
Melons	6	.48	10.5	5.04	105.13	529.86		.53		529.33	Insecticides	153.49
											Hired Larbor	1,673.08
											Herbicides	203.56
											Harvesting	115.00
Cropped Area	116	9.28									Marketing	
Wasteland	6	.48									Sub – Total	4,907.12
Total	122	9.76				5288.05		92.31	227.86	4967.88	Miscellaneous Exp.	98.14
											Total Expenses	5,005.26

Capital Investment

Item	
Land	18400
Dwelling	
Farm Irrigation Structures	4240
Farm Machinery	
Hand Tools	100
Operating Capital	1719.77
Total	24459.77

Estimated Real Farm Family Income

1. Family Cash Allowance	2,312.41
2. Farm Products	227.86
3. Farm Dwelling	
Total	2,540.27

Farm Labor Man Days

Farm Operator	212
Farm Family	141
Hired Labor	261
Total	614

Financial Summary

Sales	4,967.88
Farm Privileges	227.86
Total	5,195.74
Farm Expenses	5,005.26
Net Farm Income	190.48
Family Allowance	2,540.27
Total Pay. Cap.	
Per Ha. Pay. Cap.	

Table AVIII-14. Farm Enterprise Summary, Future without Development Condition, Akkar Plain Project,

Farm Type: General, Farm Size: 8 hectares, And Soil Type: Composite.

Crop	%	Ha	Yield	Production			Disposition				Expense	
				Amount	Price	Value	Feed	Seed	Home	Sales	Item	Cost
First Crop			MT/HA	MT	$	$	$	$	$	$	Land Tax Or Fee	
Wheat	41	3.28	1.1	3.61	155.76	562.29	–	62.30	144.86	355.13	Interest Cost	1,475.91
Sorghum	15	1.20	.84	1.01	123.11	124.34	–	3.69	8.62	112.03	Depreciation/Repair	422.00
Peanuts	16	1.28	1.76	2.25	400.00	900.00	–	20.00	36.00	844.00	Land Preparation	241.77
Tomatoes	6	.48	12.6	6.05	105.13	636.04	–	1.58	13.67	620.79	Spraying	
Cucumbers	10	.80	12.22	9.78	105.13	1028.17	–	1.05	14.72	1012.40		
Melons	6	.48	9.32	4.47	105.13	469.93	–	.53	9.99	459.41		
Second Crop												
Tomatoes	6	.48	12.6	6.05	105.13	636.04	–	1.58	–	634.46	Seed And Plants	597.82
Cucumbers	10	.80	12.22	9.78	105.13	1028.17	–	1.05	–	1027.12	Fertilizer	95.88
Melons	6	.48	9.32	4.47	105.13	469.92	–	.53	–	469.40	Insecticides	168.84
											Hired Larbor	1,840.39
											Herbicides	223.92
											Harvesting	126.50
Cropped Area	116	9.28									Marketing	
Wasteland	6	.48									Sub – Total	5,193.03
Total	122	9.76				5854.91		92.31	227.86	5534.74	Miscellaneous Exp.	103.86
											Total Expenses	5,296.89

Capital Investment

Item	18400
Land	–
Dwelling	4240
Farm Irrigation Structures	–
Farm Machinery	100
Hand Tools	
Operating Capital	1858.56
Total	24598.56

Estimated Real Farm Family Income

1. Family Cash Allowance	2,318.08
2. Farm Products	227.86
3. Farm Dwelling	
Total	2,545.94

Farm Labor Man Days

Farm Operator	212
Farm Family	141
Hired Labor	261
Total	614

Financial Summary

Sales	5,477.20
Farm Privileges	227.86
Total	5,705.06
Farm Expenses	5,296.89
Net Farm Income	408.17
Family Allowance	2,545.94
Total Pay. Cap.	0
Per Ha. Pay. Cap.	0

Table AVIII-15. Farm Enterprise Summary, Future with Full Development Condition, Akkar Plain Project,

Farm Type: Vegetable Crop, Farm Size: 8 hectares, And Soil Type: Capability Class I.

Crop	%	Ha	Yield	Production			Disposition				Expense	
				Amount	Price	Value	Feed	Seed	Home	Sales	Item	Cost
First Crop			MT/HA	MT	$	$						
All vegetables	65	5.2	54.34	282.57	105.13	29706.37					Land Tax Or Fee	
Maize (table)	6	.48	10.89	5.23	177.00	925.21			84.10	29622.27	Interest Cost	3,020.04
Maize (grain)	9	.72	6.6	4.75	125.41	595.95			12.39	912.82	Depreciation/Repair	1,188.00
Wheat	14	1.12	5.94	6.65	155.76	1036.24			8.78	587.17	Land Preparation	1,474.24
									144.86	891.38	Spraying	287.48
Second Crop												
All vegetables	85	6.8	54.34	369.51	105.13	38846.80				38846.80	Seed And Plants	7,260.89
Beans	9	.72	2.75	1.98	194.87	385.84				385.84	Fertilizer	2,386.90
											Insecticides	564.25
											Hired Larbor	33,987.18
											Herbicides	189.31
											Harvesting	89.84
Cropped Area	188	15.04									Marketing	
Wasteland	6	.48									Sub – Total	50,448.13
Total	194	15.52				71496.41			250.13	71246.28	Miscellaneous Exp.	1,008.96
											Total Expenses	51,457.09

Capital Investment

Item	
Land	18400
Dwelling	
Farm Irrigation Structures	5120
Farm Machinery	3000
Hand Tools	100
Operating Capital	23714.05
Total	50334.05

Estimated Real Farm Family Income

1. Family Cash Allowance	3,295.69
2. Farm Products	250.18
3. Farm Dwelling	
Total	3,545.82

Farm Labor Man Days

Farm Operator	242
Farm Family	161
Hired Labor	5302
Total	5702

Financial Summary

Sales	71,246.28
Farm Privileges	250.13
Total	71,496.41
Farm Expenses	51,457.09
Net Farm Income	20,039.32
Family Allowance	3,545.82
Total Pay. Cap.	16,493.50
Per Ha. Pay. Cap.	2,061.69

Table AVIII-16. Farm Enterprise Summary, Future With Full Development Condition, Akkar Plain Project,

Farm Type: Vegetable Farm, Farm Size: 8 hectares, and Soil Type: Capability Class II

CROP	%	Hectares	Yield	Production Amount	Production Price	Production Value	Disposition Feed	Disposition Seed	Disposition Home	Disposition Sales	Expense Items	Expense Cost
First Crop			MT/HA	MT	U.S. $	U.S. $			U.S.$	U.S. $	Land Tax or Fee 3/	U.S. $
All Vegetables	45	3.60	54.34	195.62	105.13	20565.53			27.33	20538.20	Interest Cost 4/	2,876.10
Wheat	25	2.00	5.94	11.88	155.76	1850.43			144.86	1705.57	Depreciation/Repair	1,188.00
Beans	19	1.52	2.75	4.18	194.87	814.56			17.54	797.02	Plowing	1,474.24
Vetch	5	.40	8.14	3.26	44.00	143.26				143.26	Harrowing	
											Spraying	289.94
Second Crop												
All Vegetables	89	7.12	54.34	386.90	105.13	40674.88				40674.88		
Maize (grain)	5	.40	6.6	2.64	125.41	331.08				331.08	Seed and Plants	6,611.33
											Fertilizer	2,355.21
											Insecticides	507.39
											Hired Labor	30,064.10
											Herbicides 5/	109.39
											Harvesting	30.37
Cropped Area	188	15.04									Marketing 6/	
Wasteland	6	.48									Sub-Total	45,506.07
Total	194	15.52				64380.16			189.73	64190.43	Miscellaneous Exp. 7/	910.12
											Total Expenses	46,416.19

Investment Made by Farmer

Item	
Land	18400
Dwelling 1/	
Farm Irrigation Structures	5120
Farm Machinery	3000
Hand Tools	100
Operating Capital 2/	21314.99
Total	47934.99

Estimated Real Farm Family Income

1. Family Cash Allowance 8/	3,218.72
2. Farm Products	189.73
3. Farm Dwelling	
Total	3,408.45

Farm Work

Man Days by	
Farm Operator	241
Farm Family	161
Hired Labor	4690
Total	5092

Financial Summary

Sales	64,190.43
Farm Privileges	189.73
Total	64,380.16
Farm Expenses	46,416.19
Net Farm Income	17,963.97
Family Allowance	3,408.45
Total Pay. Cap.	
Per Ha. Pay. Cap.	

1/ Farm operator lives in village
2/ 50% of working capital, (50% of Expense subtotal less interest cost)
3/ No tax collected on property
4/ 6% of investment by farmer
5/ Custom hire
6/ Farm gate price used, no marketing cost
7/ 2% of Expense subtotal
8/ Farm operator plus farm family labor @ U.S. $ 6.41/day plus 1% of sales for management.

Table AVIII-17. Farm Enterprise Summary, Future With Full Development Condition, Akkar Plain Project,

Farm Type: General, Farm Size: 8 hectares, And Soil Type: Capability Class III

Crop	%	Ha	Yield	Production			Disposition				Expense	
				Amount	Price	Value	Feed	Seed	Home	Sales	Item	Cost
First Crop			MT/HA	MT	$	$			$	$	Land Tax Or Fee	
Wheat	56	4.48	5.39	24.15	155.76	3761.60			144.86	3616.74	Interest Cost	1,224.44
Beans	19	1.52	2.53	3.85	194.87	750.25			17.54	732.71	Depreciation/Repair	358.40
Vetch	19	1.52	7.37	11.20	44.00	492.80				492.80	Land Preparation	1,203.20
											Spraying	98.45
											Hired hauling	
											1% Sales	92.14
Second Crop												
Maize (table)	5	.40	9.90	3.96	177.00	700.92			12.39	688.53	Seed And Plants	900.66
Beans	51	4.08	2.53	10.32	194.87	2011.06				2011.06	Fertilizer	2737.98
Sorghum	19	1.52	2.86	4.35	123.11	535.53			8.62	526.91	Insecticides	248.41
Maize (grain)	19	1.52	6.05	9.20	125.41	1153.77			8.78	1144.99	Hired Larbor	
											Herbicides	351.77
											Harvesting	383.65
Cropped Area	188	15.04									Marketing	
Wasteland	6	.48									Sub – Total	7,599.10
Total	194	15.52				9405.93			192.19	9213.74	Miscellaneous Exp.	151.98
											Total Expenses	7,751.08

Capital Investment

Item	
Land	12000
Dwelling	
Farm Irrigation Structures	5120
Farm Machinery	
Hand Tools	100
Operating Capital	3187.33
Total	20407.33

Estimated Real Farm Family Income

1. Family Cash Allowance	1,918.99
2. Farm Products	192.19
3. Farm Dwelling	
Total	2,111.18

Farm Labor Man Days

Farm Operator	171
Farm Family	114
Hired Labor	
Total	285

Financial Summary

Sales	9,213.74
Farm Privileges	192.19
Total	9,405.93
Farm Expenses	7,751.08
Net Farm Income	1,654.85
Family Allowance	2,111.18
Total Pay. Cap.	
Per Ha. Pay. Cap.	

Table AVIII-18. Farm Enterprise Summary, Future With Full Development Condition, Akkar Plain Project,

Farm Type: Forage Crop, Farm Size: 8 hectares, And Soil Type: Capability Class IV.

Crop	%	Ha	Yield	Production			Disposition				Expense	
				Amount	Price	Value	Feed	Seed	Home	Sales	Item	Cost
First Crop			MT/HA	MT								
Sorghum	23	1.84	2.75	5.06	123.11	622.94					Land Tax Or Fee	
Sorghum - Sudan	23	1.84	7.04	12.95	44.00	569.80			8.62	614.32	Interest Cost	248.24
Pasture	48	3.84	22 aum	84.48	16.80	1419.26				569.80	Depreciation/Repair	
										1419.26	Land Preparation	455.21
											Spraying	22.63
Second Crop												
											Seed And Plants	219.82
											Fertilizer	710.50
											Insecticides	64.97
											Hired Larbor	
											Herbicides	13.87
											Harvesting	187.55
Cropped Area	94	7.52									Marketing	
Wasteland	6	.48									Sub - Total	1,922.79
Total	100	8.00				2612.00			8.62	2603.38	Miscellaneous Exp.	38.46
											Total Expenses	1,961.25

Capital Investment

Item	
Land	3200
Dwelling	
Farm Irrigation Structures	
Farm Machinery	
Hand Tools	100
Operating Capital	837.28
Total	4137.28

Estimated Real Farm Family Income

1. Family Cash Allowance	942.66
2. Farm Products	8.62
3. Farm Dwelling	
Total	951.28

Farm Labor Man Days

Farm Operator	86
Farm Family	57
Hired Labor	
Total	143

Financial Summary

Sales	2,603.38
Farm Privileges	8.62
Total	2,612.00
Farm Expenses	1,961.25
Net Farm Income	650.75
Family Allowance	951.28
Total Pay. Cap.	
Per Ha. Pay. Cap.	

Table AVIII-19. Farm Enterprise Summary, Future With Full Development (Drainage) Condition, Akkar Plain Project,

Farm Type: General, Farm Size: 8 hectares, and Soil Type: Composite.

CROP	%	Hectares	Yield	Production			Disposition				Expense	
				Amount	Price	Value	Feed	Seed	Home	Sales	Items	Cost
First Crop			MT/HA	MT								
Wheat	41	3.28	1.20	3.94	155.76	613.69		62.30	144.86	406.53	Land Tax or Fee	
Sorghum	15	1.20	.95	1.14	123.11	140.35		3.69	3.62	128.04	Interest Cost	1,467.59
Peanuts	16	1.28	1.76	2.25	400.00	900.00		20.00	36.00	844.00	Depreciation/Repair	422.00
Vegetables	6	.48	11.55	5.54	105.13	582.42		1.58	13.67	567.17	Plowing	241.77
Small Vegetables	10	.80	11.55	9.24	105.13	971.40		1.05	14.72	955.63	Harrowing	
Melons	6	.48	11.55	5.54	105.13	582.42		.53	9.99	571.90	Spraying	
Second Crop												
Vegetables	6	.48	11.55	5.54	105.13	582.42		1.58		580.84	Seed and Plants	541.14
Small Vegetables	10	.80	11.55	9.24	105.13	971.40		1.05		970.35	Fertilizer	87.16
Melons	6	.48	11.55	5.54	105.13	582.42		.53		581.89	Insecticides	153.49
											Hired Labor	1,673.08
											Herbicides	203.56
											Harvesting	115.00
Cropped Area	116	9.28									Marketing	
Wasteland	6	.48									Sub-Total	4,904.79
Total	122	9.76				5976.52		92.31	227.86	5606.35	Miscellaneous Exp.	98.10
											Total Expenses	5,002.89

Investment Made by Farmer

Item	
Land	18400
Dwelling	
Farm Irrigation Structures	4240
Farm Machinery	
Hand Tools	100
Operating Capital	1719.77
Total	24459.77

Estimated Real Farm Family Income

1. Family Cash Allowance	2,318.79
2. Farm Products	227.86
3. Farm Dwelling	
Total	2,546.65

Farm Work

Man Days by	
Farm Operator	212
Farm Family	141
Hired Labor	261
Total	614

Financial Summary

Sales	5,606.35
Farm Privileges	227.86
Total	5,834.21
Farm Expenses	5,002.89
Net Farm Income	831.32
Family Allowance	2,546.65
Total Pay. Cap.	
Per Ha. Pay. Cap.	

Table AVII-20. Farm Enterprise Summary, Future with Full Development Condition, Akkar Plain Project,

Farm Type: Citrus, Farm Size: 8 Hectares, and Soil Type: Capability Class I and II

CROP	%	Hectares	Yield	Production			Disposition				Expense	
				Amount	Price	Value	Feed	Seed	Home	Sales	Items	Cost
range	92	7.36	MT/HA 20	MT 147.2	$/MT 263	38714	-	-	-	38714	Land Tax or fee	
											Interest Cost	3060.00
											Depreciation/Repair	3633.00
											Cost to Establish 5 year old orchard	4009.00
											Fertilizer	195.00
											Insecticides	176.00
											Hired Labor	1122.00
											Herbicides	427.00
											Harvesting	4337.00
indbreak	8	.64									Marketing	774.00
											Sub-Total	17733.00
tal	100	8				38714				38714	Miscellaneous Exp.	355.00
											Total Expenses	18088.00

Investment Made by Farmer

em	
nd	18400
elling	-
rm Irrigation Structures	5120
rm Machinery	20000
nd Tools	150
erating Capital	7336
tal	51006

Estimated Real Farm Family Income

1. Family Cash Allowance	1958.00
2. Farm Products	-
3. Farm Dwelling	-
Total	1958.00

Farm Work

Man Days by	
Farm Operator	150
Farm Family	95
Hired Labor	175
Total	420

Financial Summary

Sales	38714.00
Farm Privileges	-
Total	38714.00
Farm Expenses	18088.00
Net Farm Income	20626.00
Family Allowance	1958.00
Total Pay. Cap.	18668.00
Per Ha. Pay. Cap.	2333.00
Indirect Benefits	9291.36
Indirect Benefits per Hectare	1161.42

ECONOMIC COROLLARY EFFECTS

Flood Control

The control provided by the Janoubi River Channel Improvement will have immediate beneficial effects on the local economy and well-being of the affected area. The maximum area flooded in a 1 percent flood would be 1,414 hectares; a 10 percent flood, 1,285 hectares; and a 66 percent flood would be 851 hectares. In the flood damage study completed, it was estimated that 60 percent of the area would be in wheat and of that area 66 percent would receive 40 percent damage and 34 percent would receive 10 percent damage. Sorghum would occupy 40 percent of the area and would receive damage in a like manner as wheat. Damage prevented would be a direct benefit to the construction of the channel improvement. The average annual benefits were totalled for a 1 percent, 10 percent, and 66 percent flood and, using the S.C.S. method, a net average annual benefit was calculated.

The future-without channel improvement was subtracted from the future-with channel improvement benefit and yielded the average annual benefit that was in the analysis. The EIRR for the channel improvement was 14.67 with a B/C ratio of 1.88 at 8 percent interest, Figure AVIII-3.

HEALTH AND SANITATION

During the construction period and upon completion of all phases of the project, the beneficial effects will become greatly apparent. Health care will be on a better patient to doctor ratio due to the improvements and construction of new facilities in the area.

With the added income, the diet of each family will improve and the possibility for better living conditions in general will become a reality. Inadequate sanitation on the Plain is responsible for much of the disease at the present time. Improved public water systems would reduce diseases among the people.

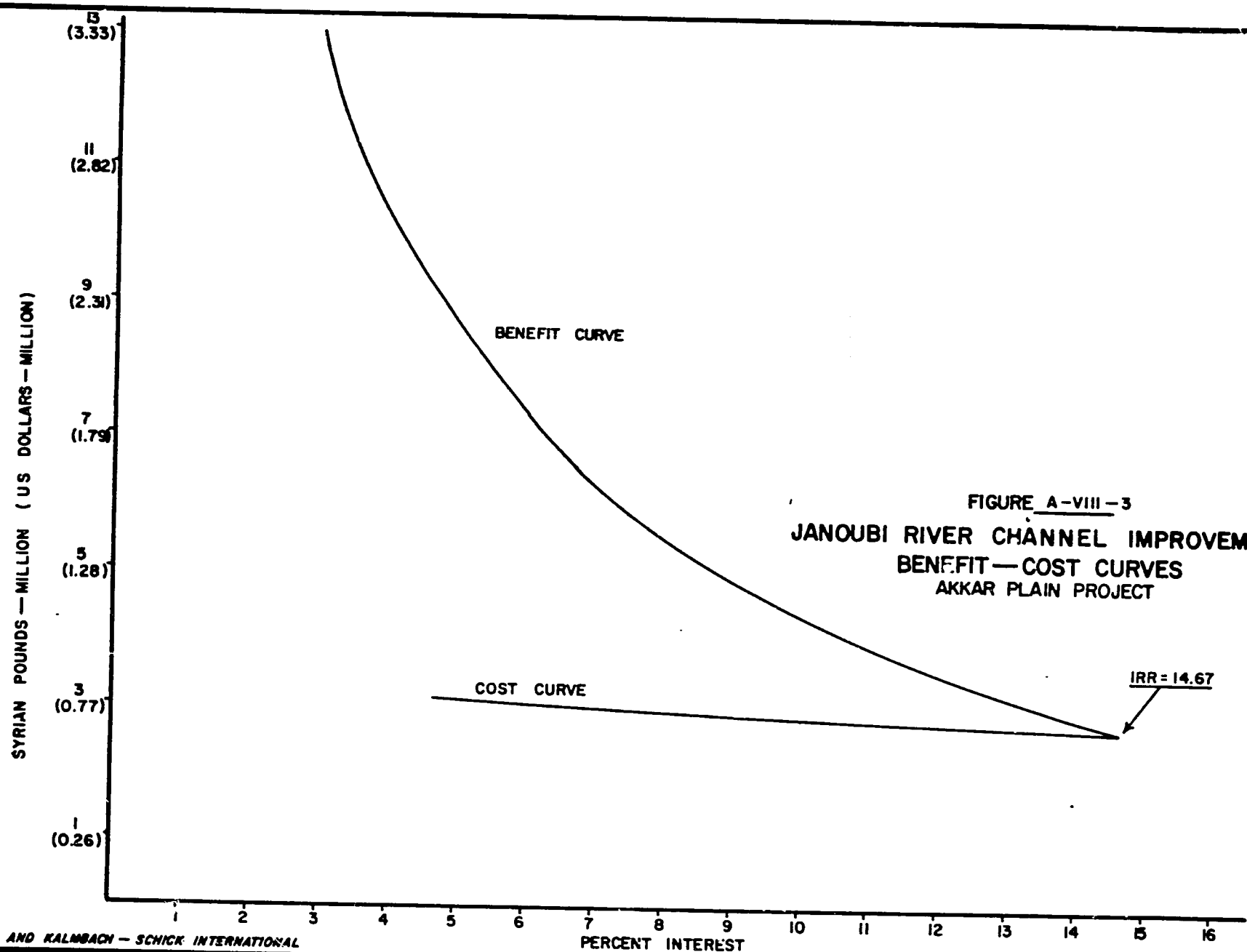


FIGURE A-VIII-3

JANOUBI RIVER CHANNEL IMPROVEMENT
BENEFIT — COST CURVES
AKKAR PLAIN PROJECT

TIPTON AND KALMBACH — SCHICK INTERNATIONAL

ECONOMIC FEASIBILITY AND FINANCIAL JUSTIFICATION

Farm benefits which amounted to the net farm income for each land class times the number of hectares of that land class in the area were considered the average annual benefit to agriculture. A benefit and cost stream was established for each phase. Tables AVIII-21 through AVIII-23 summarize these benefit and cost streams, Phase I and Phase II. Tables AVIII-24 through AVIII-26 are a detailed breakdown of Phase II benefits, while Tables AVIII-27 through AVIII-29 show the detailed costs. Note that each dam alternative is considered in the analysis.

The intangible benefits would accrue almost immediately. These would include the betterment of the community in general. The educational level would raise as schools would improve and with increased income the children would be sent to better schools outside the area.

The average farmer would be less preoccupied with the worries of raising his family and feel more secure. Security would allow the farmer more time to improve family relationships and the quality of life would, in general, be better.

Figure AVIII-4 shows the project schedule and the way that money would be spent and benefits would accrue. The cost schedule shows the allocation of money per year with lag time for Stage 2 of Phase II. Benefits would begin immediately after the first year of construction for Phase I and at the end of the third year for Phase II.

The project analyzed each part individually and in combination, each phase standing on its own or together with the total project. Each phase was analyzed using only direct benefits and with indirect benefits

Table AVIII-21. Total of Phase I and Phase II - Lower Dam - Rihaniyeh

Time Years	Benefit Stream (Million U.S. $)	Cost Stream (Million U.S. $)
Construction		
1	0	16.88
2	.23	16.88
3	.49	18.74
4	3.99	18.74
Project Life		
1	7.50	3.48
2	10.74	1.11
3	13.98	
14		1.11
15		2.04
16		1.11
29		1.11
30		6.01
31		1.11
50	13.98	1.11

Table AVIII-22. Total Phase I and II - Upper Dam - Yazdieh
Minimum Grout

Time Years	Benefit Stream (Million U.S. $)	Cost Stream (Million U.S. $)
Construction		
1	0	10.22
2	.23	10.22
3	.49	12.08
4	4.08	12.08
Project Life		
1	7.68	3.54
2	11.01	1.17
3	14.33	
14		1.17
15		2.10
16		1.17
29		1.17
30		6.07
31		1.17
50	14.33	1.17

Table AVIII-23. Total Phase I and II - Upper Dam - Yazdieh - Maximum Grout

Time Years	Benefit Stream (Ten Million U.S. $)	Cost Stream (Ten Million U.S. $)
Construction		
1	0	2.97
2	.02	2.97
3	.05	3.17
4	.28	3.17
Project Life		
1	.51	.37
2	.71	.13
3	.91	
↓	↓	↓
14		.13
15		.22
16		.13
↓		↓
29		.13
30		.62
31		.13
↓	↓	↓
50	.91	.13

Table AVIII-24 Phase II - Benefit Stream - Rihaniyeh - Lower Dam

Time Years	Stage 1	Stage 2	Total Phase II
Construction	(Millions U.S. $)	(Millions U.S. $)	(Millions U.S. $)
1			
2			
3			
4	1.80	1.45	3.24
Project Life			
1	3.59	2.89	6.48
2	5.39	4.34	9.72
3	7.18	5.78	12.96
↓	↓	↓	↓
50	7.18	5.78	12.96

Table AVIII-25. Phase II - Benefit Stream - Yazdieh - Upper Dam
Minimum Grout

Time Years	Stage 1	Stage 2	Total Phase II
Construction	(Millions U.S. $)	(Millions U.S. $)	(Millions U.S. $)
1			
2			
3			
4	1.88	1.45	3.33
Project Life			
1	3.77	2.89	6.66
2	5.65	4.34	9.99
3	7.53	5.78	13.31
↓	↓	↓	↓
50	7.53	5.78	13.31

Table AVIII-26. Phase II - Benefit Stream - Yazdieh - Upper Dam
Maximum Grout

Time Years	Stage 1 (Ten Million U.S. $)	Stage 2 (Million U.S. $)	Total Phase II (Ten Million U.S. $)
Construction			
1			
2			
3			
4	.19	1.45	.33
Project Life			
1	.38	2.89	.66
2	.57	4.34	.99
3	.75	5.78	1.33
↓	↓	↓	↓
50	.75	5.78	1.33

Table AVIII-27. Phase II -Cost Stream Rihaniyeh - Lower Dam

Time Years	Stage 1 (Millions U.S. $)	Stage 2 (Millions U.S. $)	Total Phase II (Millions U.S. $)
Construction			
1	15.64		15.64
2			15.64
3		3.09	18.73
4	15.64	3.09	18.73
Project Life			
1	.29	3.18	3.47
2		.81	1.10
14		.81	1.10
15		1.74	2.03
16		.81	1.10
29		.81	1.10
30		5.71	6.00
		.81	1.10
50	.29	.81	1.10

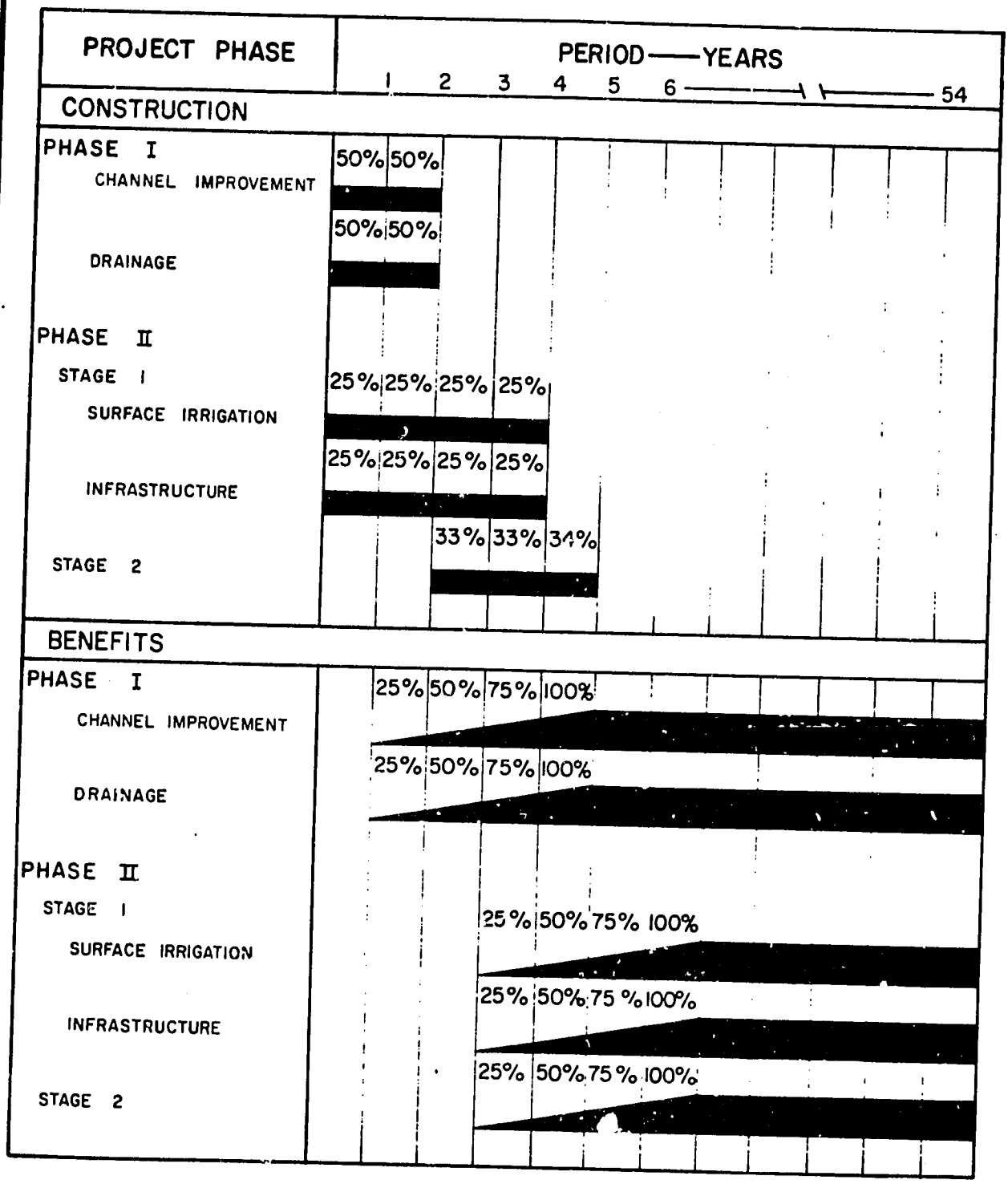
Table AVIII-28. Cost Stream Phase II - Yazdieh Dam - Mimimum Grout

Time Years	Stage 1 (Millions U.S. $)	Stage 2 (Millions U.S. $)	Total Phase II (Millions U.S. $)
Construction			
1	8.98		8.98
2			8.98
3		3.09	12.07
4	8.98	3.09	12.07
Project Life			
1	.35	3.18	3.53
2		.81	1.16
15		.81 1.74	1.16 2.09
29		.81	1.16
30		.81	1.16
31		5.71	6.06
50	.35	.81 .81	1.16 1.16

Table AVIII-29. Phase II - Upper Dam - Maximum Grout

Time Years	Stage 1 (Ten Million U.S. $)	Stage 2 (Million U.S. $)	Total Phase II (Ten Million U.S. $)
Construction			
1	2.85		2.85
2			2.85
3		3.09	3.16
4	2.85	3.09	3.16
Project Life			
1	.04	3.18	.36
2		.81	.12
14		.81	.12
15		1.74	.21
16		.81	.12
29		.81	.12
30		5.71	.61
31		.81	.12
50	.04	.81	.12

PROJECT SCHEDULE



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included. Table AVIII-30 is a summary of the EIRR and B/C ratios for the total project. The combined Phase I and II, using the lower dam at Rihaniyeh, has an EIRR or 13.8 and a B/C ratio of 1.7, Figure AVIII-5. The upper dam with minimum grout at Yazdieh has an EIRR of 20.5 and a B/C ratio of 2.5, Figure AVIII-6. The drainage system, which was part of Phase I, has an EIRR of 39.3 and a B/C ratio of 5.8 at 8 percent, Figure AVIII-7. The project, in part or as a whole, is economically viable.

The analysis of the project also included six sensitivity tests and the results are in Tables AVIII-31 through AVIII-33. Table AVIII-34 is of Phase I Totals of Channel Improvement and Drainage for Benefit Cost Streams.

Table 30. Economic Evaluation Summary, IRR and B/C.

Project Phase	Based on Net Direct Farm Benefits		Based on Direct Plus Indirect Farm Benefits	
	IRR	B/C @ 8%	IRR	B/C @ 8%
Phase I				
Flood Dike	14.7	1.9	28.3	3.9
Drainage	39.3	5.8	50	30.5
Combined Phase I	31.7	4.5	50	21.8
Phase II (Rihaniyeh)				
Stage 1	9.1	1.2	14.3	1.9
Stage 2	47.6	3.5	50	6.6
Combined Phase II	13.1	1.6	20.6	2.8
Combined Phase I & II	13.8	1.7	24.7	3.4
Phase II (Yazdieh Minimum Grout)				
Stage 1	15.1	2.0	21.2	3.1
Stage 2	47.6	1.2	50	6.6
Combined Phase II	19.8	2.4	28.4	4.0
Combined Phase I & II	20.5	2.5	33.8	4.7
Phase II (Yazdieh Maximum Grout)				
Stage 1	5.2	.7	9.3	1.2
Stage 2	47.6	3.5	50	6.6
Combined Phase II	4.5	.6	8.9	1.1
Combined Phase I & II	4.2	.7	12.0	1.5

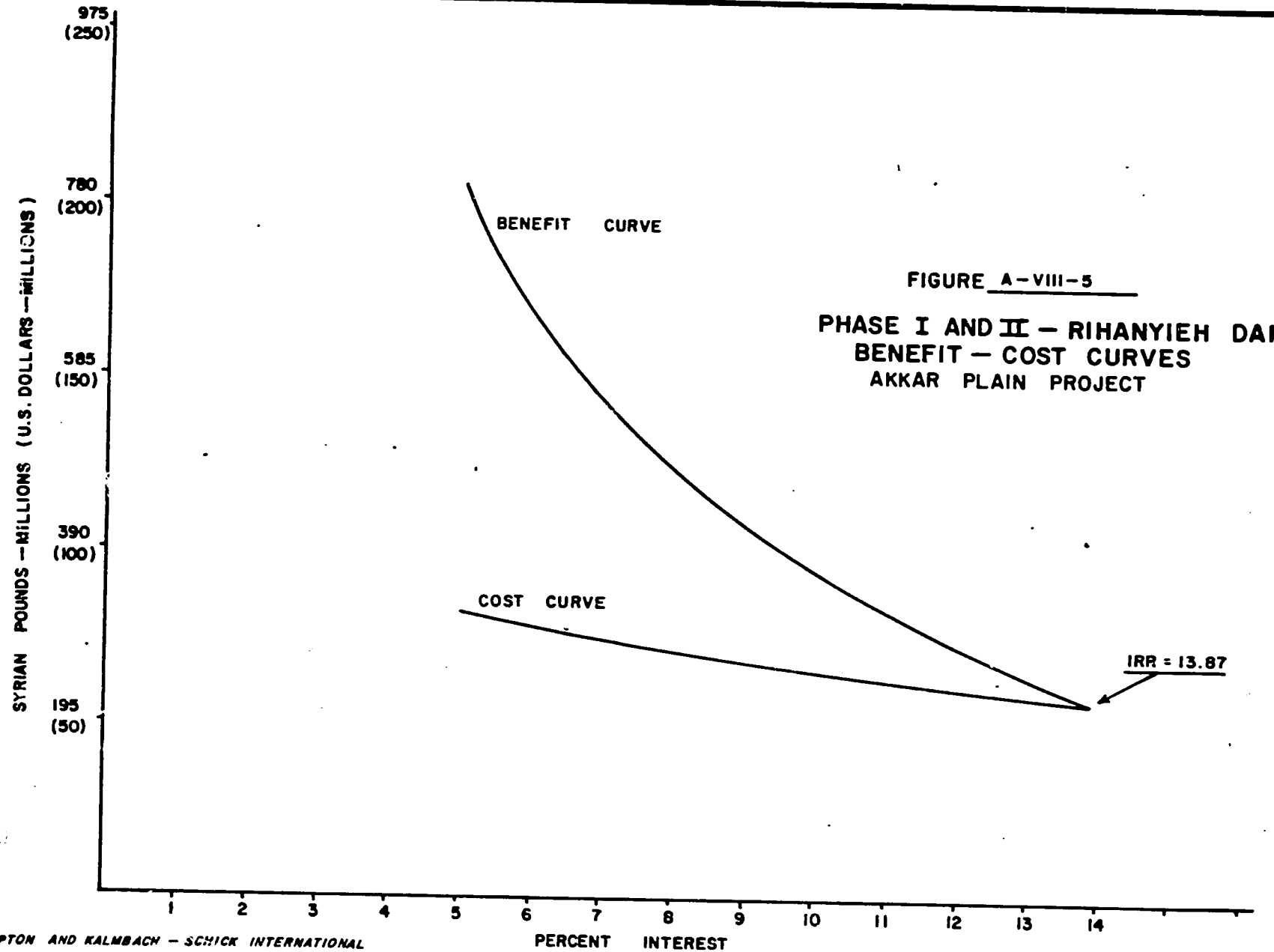

FIGURE A-VIII-5

PHASE I AND II — RIHANYIEH DAM
BENEFIT — COST CURVES
AKKAR PLAIN PROJECT

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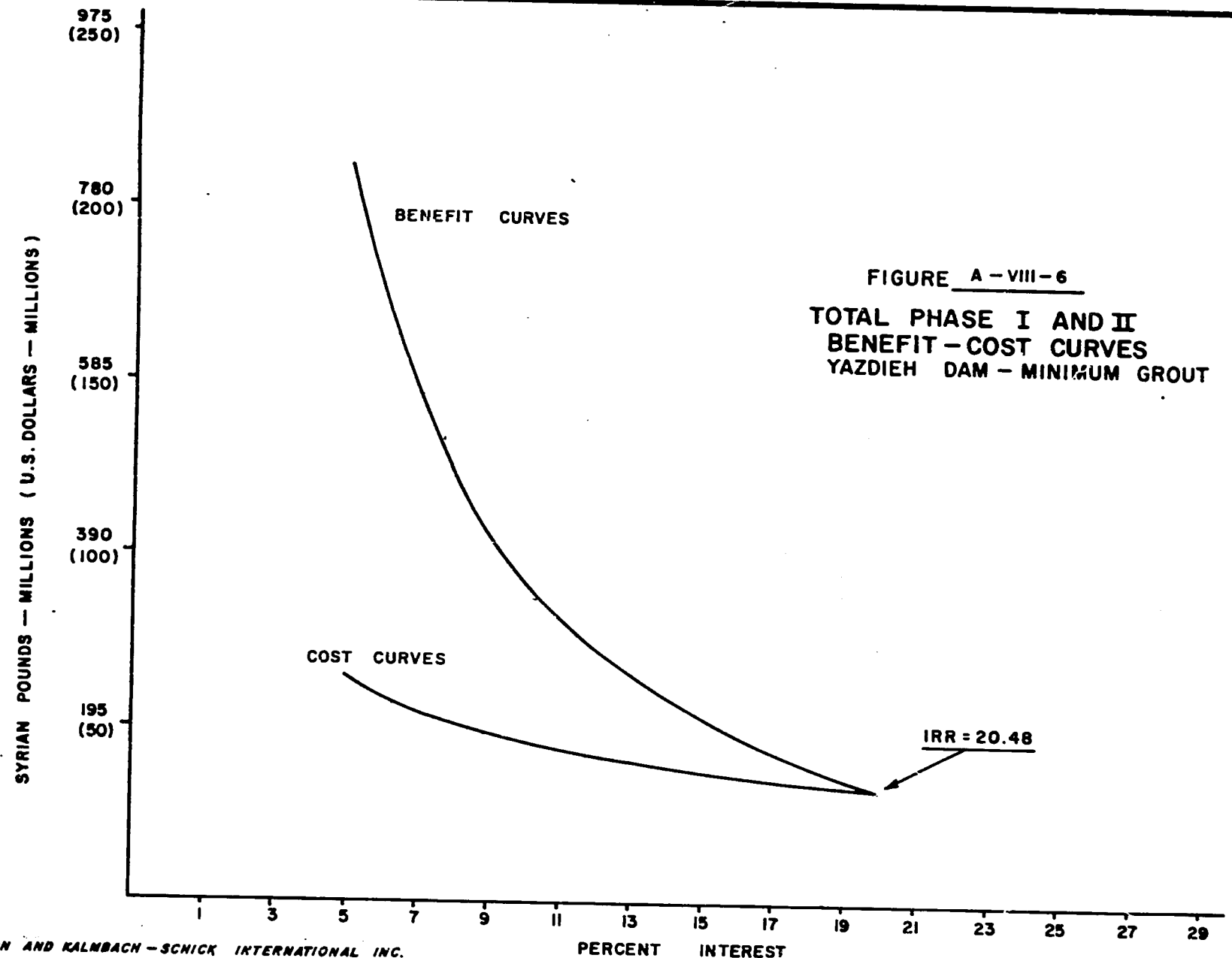

FIGURE A – VIII – 6

TOTAL PHASE I AND II
BENEFIT – COST CURVES
YAZDIEH DAM – MINIMUM GROUT

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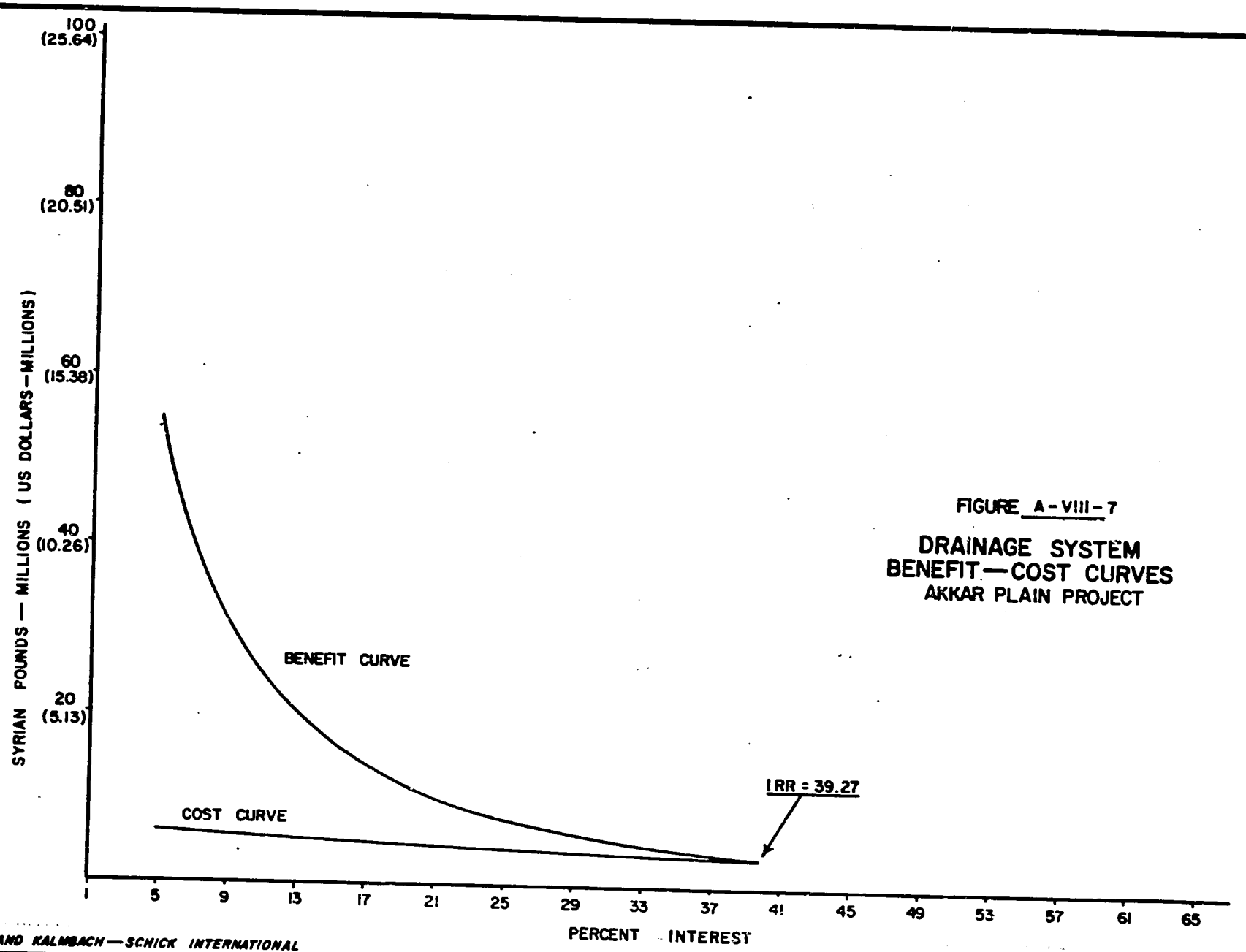

FIGURE A-VIII-7

DRAINAGE SYSTEM
BENEFIT—COST CURVES
AKKAR PLAIN PROJECT

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Table AVIII-31. Sensitivity Tests - Rihaniyeh Dam

Type of Test	B/C Ratio at 8%	IRR
Phase I		
Actual	4.5	31.7
Benefits x 1.00 costs x 1.10	4.1	29.3
Benefits x 1.00 costs x 1.20	3.7	27.2
Benefits x .90 costs x 1.00	4.1	29.0
Benefits x .80 costs x 1.00	3.6	26.2
Benefits x .90 costs x 1.10	3.7	26.7
Benefits x .80 costs x 1.20	3.0	22.4
Phase II		
Actual	1.6	13.1
Benefits x 1.00 costs x 1.10	1.5	12.0
Benefits x 1.00 costs x 1.20	1.4	11.0
Benefits x .90 costs x 1.00	1.5	11.9
Benefits x .80 costs x 1.00	1.3	10.6
Benefits x .90 costs x 1.10	1.3	10.8
Benefits x .80 costs x 1.20	1.1	8.8
Phase I & II		
Actual	1.7	13.87
Benefits x 1.00 costs x 1.10	1.6	12.69
Benefits x 1.00 costs x 1.20	1.4	11.68
Benefits x .90 costs x 1.00	1.5	12.57
Benefits x .80 costs x 1.00	1.4	11.23
Benefits x .90 costs x 1.10	1.4	11.48
Benefits x .80 costs x 1.20	1.2	9.33

Table AVIII-32. Sensitivity Tests - Yazdieh Dam - Mimimum Grout

Type of Test	B/C Ratio	IRR
Phase I		
Actual	4.5	31.7
Benefits x 1.00 costs x 1.10	4.1	29.3
Benefits x 1.00 costs x 1.20	3.7	27.2
Benefits x .90 costs x 1.00	4.1	29.0
Benefits x .80 costs x 1.00	3.6	26.2
Benefits x .90 costs x 1.10	3.7	26.7
Benefits x .80 costs x 1.20	3.0	22.4
Phase II		
Actual	2.4	19.7
Benefits x 1.00 costs x 1.10	2.2	18.2
Benefits x 1.00 costs x 1.20	2.0	16.8
Benefits x .90 costs x 1.00	2.2	18.0
Benefits x .80 costs x 1.00	1.9	16.2
Benefits x .90 costs x 1.10	2.0	16.5
Benefits x .80 costs x 1.20	1.6	13.6
Phase I & II		
Actual	2.5	20.5
Benefits x 1.00 costs x 1.10	2.3	18.8
Benefits x 1.00 costs x 1.20	2.1	17.4
Benefits x .90 costs x 1.00	2.3	18.7
Benefits x .80 costs x 1.00	2.0	16.8
Benefits x .90 costs x 1.10	2.1	17.2
Benefits x .80 costs x 1.20	1.7	14.2

Table AIII-33. Sensitivity Tests - Yazdieh Dam - Maximum Grout

Type of Test	B/C Ratio	IRR
Phase I		
Actual	4.5	31.7
Benefits x 1.00 costs x 1.10	4.1	29.3
Benefits x 1.00 costs x 1.20	3.7	27.2
Benefits x .90 costs x 1.00	4.1	29.0
Benefits x .80 costs x 1.00	3.6	26.2
Benefits x .90 costs x 1.10	3.7	26.7
Benefits x .80 costs x 1.20	3.0	22.4
Phase II		
Actual	.63	4.5
Benefits x 1.00 costs x 1.10	.57	3.9
Benefits x 1.00 costs x 1.20	.52	3.3
Benefits x .90 costs x 1.00	.56	3.8
Benefits x .80 costs x 1.00	.50	3.1
Benefits x .90 costs x 1.10	.51	3.2
Benefits x .80 costs x 1.20	.42	1.9
Phase I & II		
Actual	.67	4.2
Benefits x 1.00 costs x 1.10	.61	3.2
Benefits x 1.00 costs x 1.20	.56	2.3
Benefits x .90 costs x 1.00	.60	3.1
Benefits x .80 costs x 1.00	.53	1.8
Benefits x .90 costs x 1.10	.55	2.1
Benefits x .80 costs x 1.20	.45	.01

Table AVIII-34. Phase I Benefits and Cost Stream - Channel Improvement and Drainage

Time-Years	Benefit Stream (Hundred Thousand U.S. $)	Cost Stream (Hundred Thousand U.S. $)
Construction		
1	0	12.36
2	2.30	12.36
Project Life		
1	4.92	.06
2	7.54	↓
3	10.16	↓
↓	↓	↓
50	10.16	..06

Financial Analysis

Table Farm Enterprise Summary, F/W Full Development Condition, Akkar Plain Project,

Farm Type: Vegetable Farm, Farm Size: 8 hectares, and Soil Type: Capability Class II

Adjusted for use in financial analysis

CROP	%	Hectares	Yield	Production			Disposition				Expense	
				Amount	Price	Value	Feed	Seed	Home	Sales	Items	Cost
First Crop			MT/HA									
All Vegetables	45	3.60	54.34	195.62	105.13	20565.53			27733	20538.20	Land Tax or Fee	
Wheat	25	2.00	5.94	11.88	169.84	2017.70			157.95	1859.75	Interest Cost	2,876.10
Beans	19	1.52	2.75	4.18	327.96	1370.87			29.52	1341.35	Depreciation/Repair	1,188.00
Vetch	5	.40	8.14	3.26	44.00	143.44				143.44	Plowing	1,474.24
											Harrowing	
											Spraying	289.94
Second Crop												
All Vegetables	89	7.12	54.34	386.90	105.13	40674.80				40674.80		
Maize (grain)	5	.40	6.6	2.64	228.40	602.98				602.98	Seed and Plants	6,611.33
											Fertilizer	2,355.21
											Insecticides	507.39
											Hired Labor	30,064.10
											Herbicides	109.39
											Harvesting	30.37
Cropped Area	188	15.04									Marketing	
Wasteland	6	.48									Sub-Total	45,506.07
Total	194	15.52				66375.32			214.80	65160.52	Miscellaneous Exp.	910.12
											Total Expenses	46,416.19

Investment Made by Farmer	
Item	
Land	18400
Dwelling	
Farm Irrigation Structures	5120
Farm Machinery	3000
Hand Tools	100
Operating Capital	21314.99
Total	47934.99

Estimated Real Farm Family Income	
1. Family Cash Allowance	3,228.43
2. Farm Products	214.80
3. Farm Dwelling	
Total	3,443.23

Farm Work	
Man Days by	
Farm Operator	241
Farm Family	161
Hired Labor	4,690
Total	5,092

Financial Summary	
Sales	65,160.52
Farm Privileges	214.80
Total	65,375.32
Farm Expenses	46,416.19
Net rtn. to enterpr	18,959.13
Family Allowance	3,443.23
Total Pay. Cap.	15,515.90
Per Ha. Pay. Cap.	2,939.49

Financial Analysis

Table Farm Enterprise Summary, F/W Full Development Condition, Akkar Plain Project,

Farm Type: Vegetable Crop, Farm Size: 8 hectares, And Soil Type: Capability Class I.

Adjusted for use in financial analysis

Crop	%	Ha	Yield	Production			Disposition				Expense	
				Amount	Price	Value	Feed	Seed	Home	Sales	Item	Cost
First Crop			MT/HA	MT	$	$					Land Tax Or Fee	
All Vegetables	65	5.2	54.34	282.57	105.13	29706.58			84.10	29622.48	Interest Cost	3,020.04
Maize (table)	6	.48	10.89	5.23	228.40	1194.53			15.99	1178.54	Depreciation/Repair	1,188.00
Maize (grain)	9	.72	6.6	4.75	228.40	1084.90			15.99	1068.91	Land Preparation	1,474.24
Wheat	14	1.12	5.94	6.65	169.84	1129.44			157.95	971.49	Spraying	287.48
Second Crop												
All Vegetables	85	6.8	54.34	369.51	105.13	38846.59				38846.59	Seed And Plants	7,260.89
Beans	9	.72	2.75	1.98	327.96	649.36			295.16	354.20	Fertilizer	2,386.90
											Insecticides	564.25
											Hired Labor	33,987.18
											Herbicides	189.31
											Harvesting	89.84
											Marketing	
Cropped Area	188	15.04									Sub – Total	50,448.13
Wasteland	6	.48									Miscellaneous Exp.	1,008.96
Total	194	15.52				72611.40			569.19	72042.21	Total Expenses	51,457.10

Capital Investment

Item	
Land	18400
Dwelling	
Farm Irrigation Structures	5120
Farm Machinery	3000
Hand Tools	100
Operating Capital	23714.05
Total	50334.05

Estimated Real Farm Family Income

1. Family Cash Allowance	3,303.65
2. Farm Products	569.19
3. Farm Dwelling	
Total	3,872.84

Farm Labor Man Days

Farm Operator	242
Farm Family	161
Hired Labor	5302
Total	5705

Financial Summary

Sales	72,042.21
Farm Privileges	569.19
Total	72,611.40
Farm Expenses	51,457.10
Net rtn. to enterpr.	21,154.30
Family Allowance	3,872.84
Total Pay. Cap.	17,281.46
Per Ha. Pay. Cap.	2,160.18

Financial Analysis

Table Farm Enterprise Summary, F/W Full Development Condition, Akkar Plain Project,

Farm Type: General, Farm Size: 8 hectares, and Soil Type: Capability Class III

Adjusted for use in financial analysis

CROP	%	Hectares	Yield	Production			Disposition				Expense	
				Amount	Price	Value	Feed	Seed	Home	Sales	Items	Cost
First Crop			MT/HA	MT								
Wheat	56	4.48	5.39	24.15	169.84	4101.64					Land Tax or Fee	
Beans	19	1.52	2.53	3.85	327.96	1262.65			157.95	3943.69	Interest Cost	1,224.44
Vetch	19	1.52	7.37	11.20	44.00	492.80			29.52	1233.13	Depreciation/Repair	358.40
										492.80	Land Preparation	1,203.20
											Harrowing	
Second Crop											Spraying	98.45
Maize (table)	5	.40	9.90	3.96	228.40	904.46					Hired Hauling 1% Sales	130.05
Beans	51	4.08	2.53	10.32	327.96	3384.55			15.99	888.47		
Sorghum	19	1.52	2.86	4.35	228.40	993.54				3384.55		
Maize (grain)	19	1.52	6.05	9.20	228.40	2101.28			15.99	977.55	Seed and Plants	900.66
									15.99	2085.29	Fertilizer	2,737.98
											Insecticices	248.41
											Hired Labor	
											Herbicides	351.77
											Harvesting	383.65
Cropped Area	188	15.04									Marketing	
Wasteland	6	.48									Sub-Total	7,637.01
Total	194	15.52				13240.92			235.44	13005.48	Miscellaneous Exp.	152.74
											Total Expenses	7,789.75

Investment Made by Farmer

Item	
Land	12000
Dwelling	
Farm Irrigation Structures	5120
Farm Machinery	
Hand Tools	100
Operating Capital	3206.29
Total	20426.29

Estimated Real Farm Family Income

1. Family Cash Allowance	1,956.90
2. Farm Products	235.44
3. Farm Dwelling	
Total	2,192.34

Farm Work

Man Days by	
Farm Operator	171
Farm Family	114
Hired Labor	
Total	285

Financial Summary

Sales	13,005.48
Farm Privileges	235.44
Total	13,240.92
Farm Expenses	7,789.75
Net. rtn. to enterpr.	5,451.17
Family Allowance	2,192.34
Total Pav. Cap.	3,258.83
Per Ha. Pav. Cap.	407.35