

[NAR-4] Forestry-Improvement Program

Objective:

To select and preserve tree varieties well-suited to Oman, to develop afforestation methods and pilot projects using these varieties, and thereby contribute to overall environmental conservation.

Description:

Due to the economical and cultural impact of forest conservation and afforestation, and in terms of impressing upon the young generation the importance of conserving precious natural resources, research in this area should be addressed from an integrated governmental approach to include all concerned agencies in addition to MAF.

The following impact could be expected from afforestation:

- o Conservation of existing tree species in Oman (genetic resources)
- o Preservation of the natural environment and its beauty
- o Flood and soil erosion (wind or water erosion) control
- o Control of sand dune drift and desertification
- o Groundwater recharge
- o Climate improvement
- o Protection and nurturing of honey bee resources
- o Fodder supply
- o Creation of recreation sites

Although all the components involved in this project are not necessarily pure research work, careful research with particular attention to the selection and conservation of tree types suited to Oman, as well as pilot afforestation methods should be on the agenda. Careful attention would also have to be given to the degree that afforestation would compete with agriculture in terms of water consumption.

With regards to afforestation in Janubiya, efforts ought to be directed at the application of fog water interception for groundwater recharge on rangelands.

Necessary costs for this project are shown in Table 6.2.4. The personnel necessary for the above are also shown in Table 6.2.24.

Table 6.2.4 Cost Estimation of NAR-4 Project

1. COST OF AVERAGE ONE PILOT PROJECT

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
1. FENCING	3,000 m	5	15,000
2. LAND PREPARATION	35 ha	100	3,500
3. IRRIGATION	35 ha	460	16,100
4. OTHER EXPENSES	35 ha	100	3,500
5. OUT HOUSE CABIN	1 NOS.	1,900	1,900
TOTAL			40,000

2. COST PER YEAR  
 @ 40,000 × 5 (PLACES) = 200,000

3. COST FOR 5 YEARS  
 @ 200,000 × 5 (YEARS) = 1,000,000

[NAR-5] Establishment of Locust Survey and Central Unit

Objective:

To research, monitor and control periodic, large-scale outbreaks of desert locusts.

Description:

Desert locusts periodically occur, and the most recent outbreak was in May/June 1990. The damage was so serious that large government expenditures were necessary to respond to and control the situation.

Although Oman is an important path for locusts moving from Africa to India and back again, and although sometimes locust breeding grounds are found inside Oman, adequate research programs to investigate the mechanism behind the periodic large outbreaks as well as an effective monitoring and emergency control program has not been sufficiently established. Since desert locust outbreaks occurring in Oman spread to neighboring countries as well, it is essential in the early stages of breeding to contain it and to implement prompt and effective eradication procedures.

These would be performed under the project, with the establishment of a new unit at the Rumais Research Center.

Necessary costs for this project are shown in Table 6.2.5. Personnel and operation costs necessary for the above are also shown in Table 6.2.25.

Table 6.2.5 Cost Estimation of NAR-5 Project

LOCUST SURVEY AND CONTROL PROJECT

ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
1. EQUIPMENT			
(1) VEHICLES	3 NOS.	8,000	24,000
(2) SPRAYING EQUIPMENT			
HIGH VOLUME EQUIPMENT	1 SET	5,000	5,000
ULTRA LOW VOLUME EQUIPMENT	1 SET	20,000	20,000
(3) WIRELESS COMMUNICATION EQUIPMENT	3 NOS.	1,000	3,000
(4) COMPUTERS	1 SET	4,000	4,000
(5) OTHER EQUIPMENT	1 SET	4,000	4,000
SUBTOTAL			60,000
2. CONTINGENCY FOR LOCUST INVASIONS			
(1) COST PER ONE INVASION			
PESTICIDE	1 SET	150,000	150,000
AIR CRAFT RENTAL CHARGE	1 SET	300,000	300,000
OTHERS	1 SET	20,000	20,000
SUBTOTAL			470,000
(2) TOTAL COST IN 5 YEARS	2 TIMES	470,000	940,000
3. GRAND TOTAL 1.+2.(2)=			1,000,000

## [NAR-6] Soil Surveys

### Objective:

To implement soil surveys necessary for the horizontal expansion of agricultural production.

### Description:

In the 10-year Master Plan, the primary objective is the vertical expansion of crop production because of the limitations of short-term development of new water sources. However, in the mid- and long-term, considerable potential for the horizontal expansion of cropped areas is anticipated once effective levels of water use are achieved through facility construction and the extension of irrigation technology to farmers.

However, in implementing horizontal expansion, not only securement of a suitable water supply, but also soil surveys to ascertain maximum appropriateness of land for farming, must be done keeping in mind the finite resources in order to ensure that land with the most production potential is targeted for development. Therefore, soil surveys should be carried out in concert with the water resources surveys of MWR.

At present, with cooperation from FAO, a soil survey project for 10,000 ha of virgin land is in progress. Upon completion of the project, soil surveys will be carried out at sites ranked for priority in order to assess the potential for horizontal expansion.

In carrying these out under the Master Plan, priority will be given to the Nejd Region where a high potential for water-resources development exists. However, areas of particularly promising water and soil conditions would first be selected for stage-wise pilot farm projects to confirm first water source then subsequently to carry out a soil survey.

Under the project, soil surveys would also be implemented in the Sharqiya, Dakhliya and Dhahira Regions where some areas suitable for agriculture development are considered to exist.

Necessary cost estimates are allocated and shown in Table 6.2.6, but these costs should be re-examined according to the results of the above FAO project.

Table 6.2.6 Cost Estimation of NAR-6 Project

ITEMS	NUMBERS	TOTAL COST	
		UNIT PRICE (R.O.)	(R.O.)
1. SHARQIYA REGION	1 SET	160,000	160,000
2. DAKHLIYA REGION	1 SET	80,000	80,000
3. DHAHIRA REGION	1 SET	80,000	80,000
4. JANUBIYA REGION	1 SET	480,000	480,000
TOTAL			800,000

Table 6.2.7 Staff Requirements of NAR Projects

STAFF REQUIREMENT OF PROJECTS IN AGRICULTURE RESEARCH SECTOR

NAME OF THE PROJECT	NUMBER OF STAFF REQUIRED			
	TOTAL	RESEARCHER	ASSISTANT RESEARCHER	TECHNICIAN
1. AGRICULTURAL RESEARCH FACILITIES AT JEMMAH	45	8	17	20
2. AGRICULTURAL RESEARCH FACILITIES AT SALALAH	22	11	5	6
3. AGRICULTURAL RESEARCH FACILITIES AT SOHAR	18	6	10	2
4. AGRICULTURAL RESEARCH FACILITIES IN SHARQIYA	14	5	8	1
5. AGRICULTURAL MACHINERY RESEARCH UNIT	19	2	6	11
6. TOXICOLOGY LABORATORY	8	2	3	3
7. SEED AND TUBER PRODUCTION RESEARCH UNIT	7	1	3	3
8. CENTRAL SOIL, PLANT AND WATER ANALYSIS LABORATORY	18	2	6	10
9. LIBRARY AND DOCUMENTATION CENTER	2	1	1	
10. DISEASE AND PEST FORECASTING UNIT	5	2	2	1
11. SALT TOLERANT PLANTS AND HALOPHYTES RESEARCH UNIT	6	2	2	2
12. HONEY BEES RESEARCH UNIT	10	1	5	4
13. DATE PALM RESEARCH UNIT	28	6	10	12
14. FORESTRY IMPROVEMENT PROGRAM	6	1	5	
15. LOCUST SURVEY CENTRAL UNIT	11	1	2	8
TOTAL	219	51	85	83

Table 6.2.8 Staff Requirements of NAR Projects for 5 Years

NAME OF THE PROJECT	NUMBER OF STAFF				
	1991	1992	1993	1994	1995
1. AGRICULTURAL RESEARCH FACILITIES AT JEMMAH	45	>>>>	>>>>	>>>>	>>>>
2. AGRICULTURAL RESEARCH FACILITIES AT SALALAH	22	>>>>	>>>>	>>>>	>>>>
3. AGRICULTURAL RESEARCH FACILITIES AT SOHAR	18	>>>>	>>>>	>>>>	>>>>
4. AGRICULTURAL RESEARCH FACILITIES IN SHARQIYA	14	>>>>	>>>>	>>>>	>>>>
5. AGRICULTURAL MACHINERY RESEARCH UNIT	19	>>>>	>>>>	>>>>	>>>>
6. TOXICOLOGY LABORATORY	8	>>>>	>>>>	>>>>	>>>>
7. SEED AND TUBER PRODUCTION RESEARCH UNIT		7	>>>>	>>>>	>>>>
8. CENTRAL SOIL, PLANT AND WATER ANALYSIS LABORATORY	18	>>>>	>>>>	>>>>	>>>>
9. LIBRARY AND DOCUMENTATION CENTER		2	>>>>	>>>>	>>>>
10. DISEASE AND PEST FORECASTING UNIT			5	>>>>	>>>>
11. SALT TOLERANT PLANTS AND HALOPHYTES RESEARCH UNIT				6	>>>>
12. HONEY BEES RESEARCH UNIT	10	>>>>	>>>>	>>>>	>>>>
13. DATE PALM RESEARCH UNIT	28	>>>>	>>>>	>>>>	>>>>
14. FORESTRY IMPROVEMENT PROGRAM	6	>>>>	>>>>	>>>>	>>>>
15. LOCUST SURVEY CENTRAL UNIT	11	>>>>	>>>>	>>>>	>>>>
TOTAL	199	208	213	219	219

Table 6.2.9 Operation Cost of NAR Projects for First Year  
and Other Years

OPERATING BUDGET FOR THE AGRICULTURAL RESEARCH

NAME OF THE PROJECT	FIRST YEAR	ANNUAL
	OPERATING COST (R.O.)	OPERATING COST (R.O.)
1. AGRICULTURAL RESEARCH FACILITIES AT JEMMAH	488,970	388,970
2. AGRICULTURAL RESEARCH FACILITIES AT SALALAH	248,725	188,725
3. AGRICULTURAL RESEARCH FACILITIES AT SOHAR	429,141	304,141
4. AGRICULTURAL RESEARCH FACILITIES IN SHARQIYA	314,838	239,838
5. AGRICULTURAL MACHINERY RESEARCH UNIT	330,217	192,217
6. TOXICOLOGY LABORATORY	96,753	70,753
7. SEED AND TUBER PRODUCTION RESEARCH UNIT	109,299	69,299
8. CENTRAL SOIL, PLANT AND WATER ANALYSIS LABORATORY	211,846	150,846
9. LIBRARY AND DOCUMENTATION CENTER	58,954	32,954
10. DISEASE AND PEST FORECASTING UNIT	47,322	37,322
11. SALT TOLERANT PLANTS AND HALOPHYTES RESEARCH UNIT	64,798	49,798
12. HONEY BEES RESEARCH UNIT	170,810	117,810
13. DATE PALM RESEARCH UNIT	362,255	260,255
14. FORESTRY IMPROVEMENT PROGRAM	438,200	182,200
15. LOCUST SURVEY CENTRAL UNIT	159,415	104,415
TOTAL	3,531,543	2,389,543

Table 6.2.10 Operation Cost of NAR Projects for 5 Years

OPERATING BUDGET OF PROJECTS IN AGRICULTURE SECTOR FOR 5 YEARS

NAME OF THE PROJECT	ANNUAL OPERATING BUDGET				
	1991	1992	1993	1994	1995
1. AGRICULTURAL RESEARCH FACILITIES AT JEMMAH	488,970	388,970	388,970	388,970	388,970
2. AGRICULTURAL RESEARCH FACILITIES AT SALALAH	248,725	188,725	188,725	188,725	188,725
3. AGRICULTURAL RESEARCH FACILITIES AT SOHAR	429,141	304,141	304,141	304,141	304,141
4. AGRICULTURAL RESEARCH FACILITIES IN SHARQIYA	314,838	239,838	239,838	239,838	239,838
5. AGRICULTURAL MACHINERY RESEARCH UNIT	330,217	192,217	192,217	192,217	192,217
6. TOXICOLOGY LABORATORY	96,753	70,753	70,753	70,753	70,753
7. SEED AND TUBER PRODUCTION RESEARCH UNIT		109,299	69,299	69,299	69,299
8. CENTRAL SOIL, PLANT AND WATER ANALYSIS LABORATORY	211,846	150,846	150,846	150,846	150,846
9. LIBRARY AND DOCUMENTATION CENTER		58,954	32,954	32,954	32,954
10. DISEASE AND PEST FORECASTING UNIT			47,322	37,322	37,322
11. SALT TOLERANT PLANTS AND HALOPHYTES RESEARCH UNIT				64,798	49,798
12. HONEY BEES RESEARCH UNIT	170,810	117,810	117,810	117,810	117,810
13. DATE PALM RESEARCH UNIT	362,255	260,255	260,255	260,255	260,255
14. FORESTRY IMPROVEMENT PROGRAM	438,200	182,200	182,200	182,200	182,200
15. LOCUST SURVEY CENTRAL UNIT	159,415	104,415	104,415	104,415	104,415
TOTAL	3,251,170	2,368,423	2,349,745	2,404,543	2,389,543



Table 6.2.11 Operation Cost of Agricultural Research Facilities  
at Jimmah

AGRICULTURAL RESEARCH FACILITIES AT JEMMAH			
ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
(1) SENIOR CHEMICAL ANALYST	1 NOS.		
(2) CHEMICAL ANALYST	2 NOS.		
(3) ENTOMOLOGIST	1 NOS.		
(4) SOIL CHEMIST	1 NOS.		
(5) PATHOLOGIST	1 NOS.		
(6) AGRICULTURAL ENGINEER	6 NOS.		
(7) VEGETABLE RESEARCHER	1 NOS.		
(8) FRUIT RESEARCHER	1 NOS.		
(9) RESEARCH ASSISTANTS	11 NOS.		
(10) TECHNICIANS	20 NOS.		
(11) OTHER SUPPORTING STAFF	40 NOS.		
<b>SUBTOTAL</b>	<b>85 NOS.</b>		<b>314,970</b>
<b>2. MATERIALS</b>	<b>1 SET</b>	<b>39,000</b>	<b>39,000</b>
<b>3. SERVICES</b>	<b>1 SET</b>	<b>24,000</b>	<b>24,000</b>
<b>4. TRANSFERRED EXPENDITURE</b>	<b>1 SET</b>	<b>11,000</b>	<b>11,000</b>
<b>5. CAPITAL EXPENDITURE</b>	<b>1 SET</b>	<b>100,000</b>	<b>100,000</b>
<b>TOTAL</b>			<b>488,970</b>

Table 6.2.12 Operation Cost of Agricultural Research Facilities  
at Salalah

AGRICULTURAL RESEARCH STATION AT SALALAH			
ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
(1) COCONUT SPECIALIST	1 NOS.		
(2) POTATO SPECIALIST	1 NOS.		
(3) CLOVER SPECIALIST	1 NOS.		
(4) BANANA SPECIALIST	1 NOS.		
(5) PLANT NUTRITION SPECIALIST	1 NOS.		
(6) BIOLOGICAL CONTROL SPECIALIST	1 NOS.		
(7) WEED CONTROL SPECIALIST	1 NOS.		
(8) AGRICULTURAL SYSTEMS SPECIALIST	1 NOS.		
(9) AGRO-ECONOMY SPECIALIST	1 NOS.		
(10) PLANT WATER SPECIALIST	1 NOS.		
(11) MEDICAL & PERFUME PLANT SPECIALIST	1 NOS.		
(12) ASSISTANT RESEARCHER	5 NOS.		
(13) TECHNICIAN	6 NOS.		
(14) OTHER SUPPORTING STAFF	11 NOS.		
<b>SUBTOTAL</b>	<b>33 NOS.</b>		<b>153,725</b>
<b>2. MATERIALS</b>	<b>1 SET</b>	<b>20,000</b>	<b>20,000</b>
<b>3. SERVICES</b>	<b>1 SET</b>	<b>10,000</b>	<b>10,000</b>
<b>4. TRANSFERRED EXPENDITURE</b>	<b>1 SET</b>	<b>5,000</b>	<b>5,000</b>
<b>5. CAPITAL EXPENDITURE</b>	<b>1 SET</b>	<b>60,000</b>	<b>60,000</b>
<b>TOTAL</b>			<b>248,725</b>

Table 6.2.13 Operation Cost of Agricultural Research Facilities  
at Sohar

AGRICULTURAL RESEARCH FACILITIES AT SOHAR			
ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
(1) FIELD CROP SPECIALIST	1 NOS.		
(2) VEGETABLE SPECIALIST	1 NOS.		
(3) FRUIT SPECIALIST	1 NOS.		
(4) INSECT SPECIALIST	1 NOS.		
(5) PATHOLOGIST	1 NOS.		
(6) SOIL SPECIALIST	1 NOS.		
(7) HONEY BEE TECHNICIAN	2 NOS.		
(8) RESEARCH ASSISTANTS	10 NOS.		
(9) OTHER SUPPORTING STAFF	57 NOS.		
<b>SUBTOTAL</b>	<b>75 NOS.</b>		<b>260,641</b>
<b>2. MATERIALS</b>	<b>1 SET</b>	<b>22,500</b>	<b>22,500</b>
<b>3. SERVICES</b>	<b>1 SET</b>	<b>12,000</b>	<b>12,000</b>
<b>4. TRANSFERRED EXPENDITURE</b>	<b>1 SET</b>	<b>9,000</b>	<b>9,000</b>
<b>5. CAPITAL EXPENDITURE</b>	<b>1 SET</b>	<b>125,000</b>	<b>125,000</b>
<b>TOTAL</b>			<b>429,141</b>

Table 6.2.14 Operation Cost of Agricultural Research Facilities  
in Sharqiya

AGRICULTURAL RESEARCH FACILITIES IN SHARQIYA			
ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
(1) FIELD CROP SPECIALIST	1 NOS.		
(2) VEGETABLE SPECIALIST	1 NOS.		
(3) FRUIT SPECIALIST	1 NOS.		
(4) INSECT SPECIALIST	1 NOS.		
(5) PATHOLOGIST	1 NOS.		
(6) RESEARCH ASSISTANT	8 NOS.		
(7) HONEY BEE TECHNICIAN	1 NOS.		
(8) OTHER SUPPORTING STAFF	53 NOS.		
SUBTOTAL	67 NOS.		205,338
<b>2. MATERIALS</b>	1 SET	20,500	20,500
<b>3. SERVICES</b>	1 SET	9,000	9,000
<b>4. TRANSFERRED EXPENDITURE</b>	1 SET	5,000	5,000
<b>5. CAPITAL EXPENDITURE</b>	1 SET	75,000	75,000
<b>TOTAL</b>			<b>314,838</b>

Table 6.2.15 Operation Cost of Agricultural Machinery Research Unit

AGRICULTURAL MACHINERY RESEARCH UNIT			
ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
(1) AGRICULTURAL MECHANIZATION EXPERT	1 NOS.		
(2) AGRICULTURAL MECHANIZATION RESEARCHER	1 NOS.		
(3) AGRICULTURAL MECHANIZATION RESEARCH ASSISTANTS	2 NOS.		
(4) AGRICULTURAL MECHANIZATION ENGINEERS	4 NOS.		
(5) AGRICULTURAL MECHANIZATION TECHNICIANS	4 NOS.		
(6) DIESEL MECHANIC	2 NOS.		
(7) PETROL MECHANICS	1 NOS.		
(8) ASSISTANT MECHANICS	4 NOS.		
(9) OTHER SUPPORTING STAFF	17 NOS.		
SUBTOTAL	36 NOS.		155,217
<b>2. MATERIALS</b>	1 SET	22,000	22,000
<b>3. SERVICES</b>	1 SET	10,000	10,500
<b>4. TRANSFERRED EXPENDITURE</b>	1 SET	4,500	4,500
<b>5. CAPITAL EXPENDITURE</b>	1 SET	138,000	138,000
<b>TOTAL</b>			<b>330,217</b>

Table 6.2.16 Operation Cost of Toxicology Laboratory

TOXICOLOGY LABORATORY			
ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
BIOCHEMISTRY EXPERT	1 NOS.		
ASST. BIOCHEMISTRY EXPERT	1 NOS.		
BIOCHEMISTRY TECHNICIANS	3 NOS.		
LABORATORY ASSISTANT	3 NOS.		
OTHER SUPPORTING STAFF	4 NOS.		
SUBTOTAL	12 NOS.		61,753
<b>2. MATERIALS</b>	1 SET	4,000	4,000
<b>3. SERVICES &amp; TRANSFERRED EXPENDITURE</b>	1 SET	2,000	2,000
<b>4. SERVICES &amp; TRANSFERRED EXPENDITURE</b>	1 SET	3,000	3,000
<b>5. CAPITAL EXPENDITURE</b>	1 SET	26,000	26,000
<b>GRAND TOTAL</b>			<b>96,753</b>

Table 6.2.17 Operation Cost of Seed and Tuber Production Research Unit

SEED AND TUBER PRODUCTION RESEARCH UNIT			
ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
(1) BREEDING SPECIALIST	1 NOS.		
(2) ASSISTANT SPECIALIST	3 NOS.		
(3) TECHNICIAN	3 NOS.		
(4) OTHER SUPPORTING STAFF	6 NOS.		
<b>SUBTOTAL</b>	<b>13 NOS.</b>		<b>56,799</b>
<b>2. MATERIALS</b>	<b>1 SET</b>	<b>6,000</b>	<b>6,000</b>
<b>3. SERVICES</b>	<b>1 SET</b>	<b>3,000</b>	<b>3,000</b>
<b>4. TRANSFERRED EXPENDITURE</b>	<b>1 SET</b>	<b>3,500</b>	<b>3,500</b>
<b>5. CAPITAL EXPENDITURE</b>	<b>1 SET</b>	<b>40,000</b>	<b>40,000</b>
<b>TOTAL</b>			<b>109,299</b>

Table 6.2.18 Operation Cost of Central Soil, Plant and Water Analysis

Laboratory

CENTRAL SOIL, PLANT AND WATER ANALYSIS LABORATORY			
ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
(1) SOIL CHEMISTRY EXPERT	1 NOS.		
(2) SOIL CHEMIST	1 NOS.		
(3) CHEMICAL ANALYST	3 NOS.		
(4) SOIL ENGINEER	3 NOS.		
(5) LABORATORY TECHNICIAN	5 NOS.		
(6) ASST. LABORATORY TECHNICIAN	5 NOS.		
(7) OTHER SUPPORTING STAFF	6 NOS.		
<b>SUBTOTAL</b>	<b>24 NOS.</b>		<b>130,346</b>
<b>2. MATERIALS</b>	<b>1 SET</b>	<b>11000</b>	<b>11,000</b>
<b>3. SERVICES</b>	<b>1 SET</b>	<b>4000</b>	<b>4,000</b>
<b>4. TRANSFERRED EXPENDITURE</b>	<b>1 SET</b>	<b>55000</b>	<b>5,500</b>
<b>5. CAPITAL EXPENDITURE</b>	<b>1 SET</b>	<b>61000</b>	<b>61,000</b>
<b>TOTAL</b>			<b>211,846</b>

Table 6.2.19 Operation Cost of Library and Documentation Center

LIBRARY AND DOCUMENTATION CENTER			
ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
(1) LIBRARIAN	1 NOS.		
(2) ASSISTANT LIBRARIAN	1 NOS.		
(3) OTHER SUPPORTING STAFF	1 NOS.		
<b>SUBTOTAL</b>	<b>3 NOS.</b>		<b>15,954</b>
<b>2. MATERIALS</b>	<b>1 SET</b>	<b>10,000</b>	<b>10,000</b>
<b>3. SERVICES</b>	<b>1 SET</b>	<b>2,500</b>	<b>2,500</b>
<b>4. TRANSFERRED EXPENDITURE</b>	<b>1 SET</b>	<b>4,500</b>	<b>4,500</b>
<b>5. CAPITAL EXPENDITURE</b>	<b>1 SET</b>	<b>26,000</b>	<b>26,000</b>
<b>TOTAL</b>			<b>58,954</b>

Table 6.2.20 Operation Cost of Disease and Pest Forecasting Unit

DISEASE AND PEST FORECASTING UNIT			
ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
(1) ENTOMOLOGY SPECIALIST	1 NOS.		
(2) PLANT PATHOLOGY SPECIALIST	1 NOS.		
(3) RESEARCH ASSISTANT	2 NOS.		
(4) TECHNICIAN	1 NOS.		
<b>SUBTOTAL</b>	<b>5 NOS.</b>		<b>31,322</b>
<b>2. MATERIALS</b>	<b>1 SET</b>	<b>3,000</b>	<b>3,000</b>
<b>3. SERVICES</b>	<b>1 SET</b>	<b>2,000</b>	<b>2,000</b>
<b>4. TRANSFERRED EXPENDITURE</b>	<b>1 SET</b>	<b>1,000</b>	<b>1,000</b>
<b>5. CAPITAL EXPENDITURE</b>	<b>1 SET</b>	<b>10,000</b>	<b>10,000</b>
<b>TOTAL</b>			<b>47,322</b>

Table 6.2.21 Operation Cost of Salt-Tolerant Plants and Halophytes Research Unit

SALT-TOLERANT PLANTS AND HOLOPHYTES RESEARCH UNIT			
ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
(1) PLANT PYSIOLOGY SPECIALIST	1 NOS.		
(2) BREEDING SPECIALIST	1 NOS.		
(2) RESEARCH ASSISTANT	2 NOS.		
(3) TECHNICIAN	2 NOS.		
(4) OTHER SUPPORTING STAFF	4 NOS.		
<b>SUBTOTAL</b>	<b>10 NOS.</b>		<b>41,798</b>
<b>2. MATERIALS</b>	<b>1 SET</b>	<b>5,000</b>	<b>5,000</b>
<b>3. SERVICES</b>	<b>1 SET</b>	<b>2,000</b>	<b>2,000</b>
<b>4. TRANSFERRED EXPENDITURE</b>	<b>1 SET</b>	<b>1,000</b>	<b>1,000</b>
<b>5. CAPITAL EXPENDITURE</b>	<b>1 SET</b>	<b>15,000</b>	<b>15,000</b>
<b>TOTAL</b>			<b>64,798</b>

Table 6.2.22 Operation Cost of Honey-Bee Research Unit

HONEY-BEE RESEARCH UNIT			
ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
(1) HONEY BEE RESEARCHER	1 NOS.		
(2) HONEY BEE DISEASES RESEARCH ASSISTANT	1 NOS.		
(3) RESEARCH ASSISTANT	4 NOS.		
(4) HONEY BEE TECHNICIAN	4 NOS.		
(5) OTHER SUPPORTING STAFF	15 NOS.		
<b>SUBTOTAL</b>	<b>25 NOS.</b>		<b>98,810</b>
<b>2. MMATERIALS</b>	<b>1 SET</b>	<b>14,000</b>	<b>14,000</b>
<b>3. SERVICES</b>	<b>1 SET</b>	<b>2,000</b>	<b>2,000</b>
<b>4. TRANSFERRED EXPENDITURE</b>	<b>1 SET</b>	<b>3,000</b>	<b>3,000</b>
<b>5. CAPITAL EXPENDITURE</b>	<b>1 SET</b>	<b>53,000</b>	<b>53,000</b>
<b>TOTAL</b>			<b>170,810</b>

Table 6.2.23 Operation Cost of Date Palm Research Unit

DATE PALM RESEARCH UNIT			
ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
(1) SENIOR DATE RESEARCHER	1 NOS.		
(2) DATE - DISEASES RESEARCHER	1 NOS.		
(3) DATE - INSECTS RESEARCHER	1 NOS.		
(4) TISSUE CULTURE SPECIALIST	1 NOS.		
(5) DATE - INDUSTRY SPECIALIST	1 NOS.		
(6) RESEARCH ASSISTANTS	12 NOS.		
(7) OTHER SUPPORTING STAFF	23 NOS.		
<b>SUBTOTAL</b>	<b>40 NOS.</b>		<b>221,255</b>
<b>2. MATERIALS</b>	<b>1 SET</b>	<b>21,000</b>	<b>21,000</b>
<b>3. SERVICES</b>	<b>1 SET</b>	<b>13,500</b>	<b>13,500</b>
<b>4. TRANSFERRED EXPENDITURE</b>	<b>1 SET</b>	<b>4,500</b>	<b>4,500</b>
<b>5. CAPITAL EXPENDITURE</b>	<b>1 SET</b>	<b>102,000</b>	<b>102,000</b>
<b>TOTAL</b>			<b>362,255</b>

Table 6.2.24 Operation Cost of Forestry-Improvement Program

FORESTRY-IMPROVEMENT PROGRAM			
ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
(1) FOREST RESEARCHER	1 NOS.	10,000	10,000
(2) FOREST RANGER	5 NOS.	4,800	24,000
(3) FOREST GUARD OR LABOUR	58 NOS.	2,400	139,200
(4) DRIVERS	5 NOS.	1,800	9,000
<b>SUBTOTAL</b>	<b>69 NOS.</b>		<b>182,200</b>

Table 6.2.25 Operation Cost of Locust Survey Central Unit

LOCUST SURVEY CENTRAL UNIT			
ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
(1) LOCUST CONTROL SPECIALIST	1 NOS.		
(2) ENTOMOLOGIST	2 NOS.		
(3) TECHNICAL ASSISTANTS	8 NOS.		
(4) OTHER SUPPORTING STAFF	5 NOS.		
<b>SUBTOTAL</b>	<b>16 NOS.</b>		<b>69,415</b>
<b>2. MATERIALS</b>	<b>1 SET</b>	<b>21,000</b>	<b>21,000</b>
<b>3. SERVICES</b>	<b>1 SET</b>	<b>2,000</b>	<b>2,000</b>
<b>4. TRANSFERRED EXPENDITURE</b>	<b>1 SET</b>	<b>12,000</b>	<b>12,000</b>
<b>5. CAPITAL EXPENDITURE</b>	<b>1 SET</b>	<b>55,000</b>	<b>55,000</b>
<b>TOTAL</b>			<b>159,415</b>

[NAE-1] Improvement and Development of Extension Centers and Facilities

Objective:

To raise agricultural productivity and to improve farm management by establishing new extension sub-centers in remote areas and through extension by upgrading extension center facilities and providing necessary extension materials and equipment.

Description:

[NAE-1-1] Establishment of Extension Centers in Remote Areas

As a result of efforts to construct agricultural extension centers under the Third Five-year Development Plan, these facilities now exist at 43 locations and provide services to major farming areas.

However, the serious lack of extension staff, facilities and equipment has constrained extension activities in remote areas. As a result, levels of cropping technology, farm production and farm management in such areas are lower than the general average for farming in the Sultanate.

As a result, under the 10-year Master Plan, extension sub-centers (including one extension center) to support the current system and extend activities to remote areas will be established. Agricultural extension staff, spray teams and livestock extension officers will be permanently stationed at the sub-centers.

The sub-centers will store agricultural chemicals, fertilizers, seed and other equipment for the farmers, as well as serve as a depot for the tractor-hire service.

Locations of extension facilities to be established are indicated below and illustrated in Figure 6.2.1.

	Agriculture Extension Center	Sub-center
1. Sharqiya		1
2. Dakhliya	1	
3. Dhahira		3
4. Musandam		2
<hr/>		
Total	1 location	6 locations

Necessary costs estimated for the establishment of the above facilities are shown in Table 6.2.26.

In addition to the above, a pilot farm including research and extension components is to be established at Nejd in the Janubiya Region for large-scale development of agriculture. Technology developed under the project would be extended to local farmers. Components of the project are shown in section 6.6 of this volume.

As discussed in the development strategy of agricultural extension in volume 3, section 4.2.2.4, the number of extension staff vis-a-vis the farming population is seriously deficient compared to developed countries. Consequently, a nation-wide program to increase the number of extension staff and to train them for both existing and envisaged facilities is necessary.

The number of farming households in Oman according to the 1978/1979 census was 83,000. MAF estimates that the current number is in excess of 100,000. A desirable ratio of extension worker to farm household is considered to be 1 : 250 given the urgent requirements for farmer education and the need to raise their low levels of technology. In other words, 400 extension officers are required nation-wide.

Also, 20 extension supervisors to manage and monitor extension officers should be deployed.

In addition to guidance in traditional cropping methods, a portion of the extension staff will be actively engaged in disseminating irrigation techniques in order to ensure smooth execution of subsidy for New

Irrigation System Project. This would include guidance in the operation of irrigation facilities and the measuring of water requirements, as well as collation, analysis and reporting to MAF about water-use data obtained from farmers.

Thus far, only five subject matter specialists in vegetable, fruit and field crop cultivation have been deployed. This number will be increased to include specialists in date cropping, plant protection and socio-economic specialties. As in the case of extension officers, a portion of them will provide guidance in irrigation technology towards the effective implementation of Subsidy for New Irrigation System Project. The total number SMSs would be 49.

In implementing this project, attention will be paid to the following:

(1) In order to rectify as early as possible the gap between the existing level of farmer technology and that expected under the Master Plan, an adequate number of extension staff will be secured from the initial stage. These would be secured during this first 5-year period.

(2) At the outset, new extension personnel will be obtained largely from outside Oman, with steady Omanization of extension officers through a planned program of technology transfer from expatriate to local staff. Therefore, well-planned adoption of Omani extension personnel is anticipated.

(3) It would be feasible to gradually phase out the number of expatriate extension workers once farmer levels of training and technology have been raised to a point where stable farm self-management is attained.

(4) A combination of classroom programs and on-the-job training for extension officers will be established to include basic academic, specialized and extension technology aspects. Components of this training program are described in "NAE-3" project of this section.



(5) Extension officer candidates should be selected on the basis of examinations and interviews to determine their academic ability, knowledge and general motivation. In the future, it is recommended that some form of qualification system be introduced. The JICA team has tentatively proposed the following:

- (a) Subject matter specialist : Ph.D. or M.Sc. with several years' experience, or B.Sc. with many years of experience
- (b) Extension Supervisor : M.Sc. or B.Sc. with several years' experience in extension, or junior college or agricultural high school graduate with many years of experience
- (c) Extension Officer : B.Sc. or junior college or agricultural institute graduate with several years' experience in extension
- (d) Extension Support Staff : Junior college or agricultural high school graduate

Deployment of the above extension personnel is indicated in Table 6.2.27, and the recurrent cost for them is shown in Table 3.2.28. This deployment under the Master Plan is expected to remain at the same level until 2000.

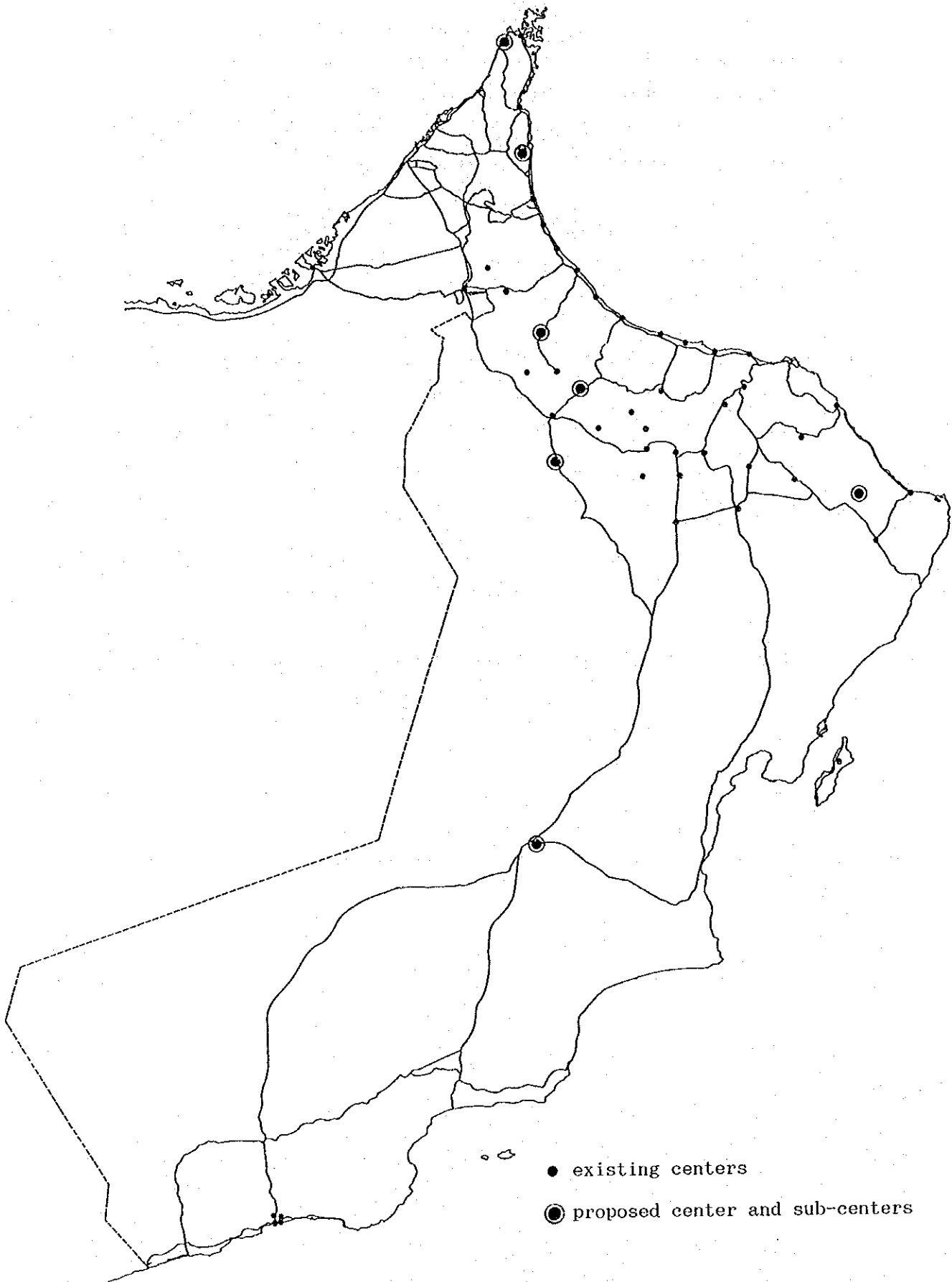


Figure 6.2.1 Location of Extension Centers and Sub-centers

Table 6.2.26 Cost Estimation of NAE-1-1 Project

1. EXTENSION CENTER

@ 100,000 (R.O./CENTER) (1 CENTER)

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
BUILDING	300 m <sup>2</sup>	200	60,000
WORKSHOP & STORAGE	150 m <sup>2</sup>	100	15,000
OTHER CONSTRUCTION	1 SET		15,000
FURNITURE	1 SET		6,000
OTHER OFFICE EQUIPMENT	1 SET		4,000
TOTAL			100,000

2. EXTENSION SUB-CENTERS

@ 50,000 (R.O./CENTER) × 6 CENTERS = R.O. 300,000

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
BUILDING	125 m <sup>2</sup>	200	25,000
WORKSHOP & STORAGE	100 m <sup>2</sup>	100	10,000
OTHER CONSTRUCTION	1 SET		10,000
FURNITURE	1 SET		3,000
OTHER OFFICE EQUIPMENT	1 SET		2,000
TOTAL			50,000

GRAND TOTAL 1+2= R.O. 400,000

Table 6.2.27 Extension Staff Increase Plan

EXTENSION STAFF INCREASE PLAN										SUBJECT MATTER SPECIALIST		
AGRICULTURAL REGION	EXTENSION STAFF									NUMBER IN 1989	NUMBER IN 1995	INCREASE 1989→95
	1989		NUMBER IN 1995			INCREASE 1989→1995						
NAME	OFFICER	OFFICER ASSISTANT	SUPERVISOR	OFFICER	OFFICER ASSISTANT	SUPERVISOR	OFFICER	OFFICER ASSISTANT				
1 SOUTH BATAVIA	1	18	2	19	59	2	18	49			6	6
2 NORTH BATAVIA	1	13	3	22	68	3	21	55	1		5	4
3 SHAROLA	1	14	2	12	37	2	11	23	2		6	4
4 OHAN INTERIOR	1	20	2	12	33	2	11	13	2		6	4
5 MUSTA	1	5	2	5	14	2	4	9			2	2
6 DAHIRAH	2	10	2	11	33	2	9	23			8	6
7 BURAIMI	1	3	1	3	9	1	2	6			5	5
8 MUSANDAM	1	4	1	5	12	1	4	8			6	6
9 SOUTH REGION	1	6	2	11	35	2	10	29			7	7
MINISTRY'S OFFICE	1		3			3	-1	0				0
TOTAL	11	85	20	100	300	20	89	215	5		49	44

Table 6.2.28 Operation cost of NAE-1-1 Project

Item	Character	Numbers	Unit Price (R.O.)	Total Cost (R.O.)
<b>1. Staff</b>				
Extension Supervisor	2.2	20 Nos.	6,912	138,240
Extension Officer	4.2	89 Nos.	3,372	300,108
Extension Officer Assistant	5.2	215 Nos.	2,808	603,720
Subject Matter Specialist	2.2	44 Nos.	6,912	304,128
Subtotal		368 Nos.		1,346,196
<b>2. Operation</b>				
Vehicle Operation		400 Nos.	600	240,000
Maintenance		0.01 %	650,000	6,500
Running		0.05 %	650,000	32,500
Subtotal				279,000
<b>Total</b>				<b>1,625,196</b>

[NAE-1-2] Improvement of Extension Center Facilities

The following equipment and materials will be needed to strengthen extension activities:

(1) Mobile A/V Unit

Opportunities for direct contact between extension officers and as many farmers as possible should be increased. At such times it will be important to deploy audio-visual material effectively and to maximize the benefits of the extension services.

Audio-visual materials will be taken in these mobile A/V units to places where farmer groups gather. There, previously agreed upon daily topics will be illustrated with materials on VTRs and other equipment. After, which the contents will be discussed with the farmers to ensure their understanding.

One in each agricultural region, nine units in total, will be provided.

(2) Computers

Since the latter part of the Third Five-year Development Plan, files have been created containing current information on management and cropping patterns for each of the 2,500 key farmers. Under the "Supporting Key Farmer Extension Program", the number of key farmers is to be expanded to 3,000 (see "NAE-4-1" project in this section).

For the training of these new key farmers, extension staff will require a rapid data-processing system. To provide this, data management with computer is to be introduced for prompt processing of information pertinent to farm management, crops, cropping seasons, cultivation areas, harvest seasons, and pest control.

Computers will also be utilized for the collation, analysis and report to MAF by extension officers regarding water use data obtained from farmers under Subsidy for New Irrigation System Project.

One computer will be provided for each extension center.

### (3) Simple Analytical Equipment for Soil and Water

All samples of soil and water are sent to the Rumais Agricultural Research Center and analyzed there. This takes a long time and makes it impossible to respond promptly to needs in the field. The work also takes up a disproportionate amount of the work time at the Agricultural Research Center. Simple analytical equipment provided to the extension centers would allow for analysis to be conducted there. This in turn would speed up the process of extending guidance to the farmer.

The necessary costs estimated for this project are shown in Table 6.2.29.

### [NAE-1-3] Development of Agricultural Technology Information Units (ATIU)

These Agricultural Technology Information Units (ATIU) will be established at the 30 extension centers which are located in key towns out of 44 (43 existing, 1 new) extension centers. These units will provide technical information to general and key farmers on agriculture and horticulture. Simple introductions to farming practices and farm inputs will be performed through a free access program for farmers and rural housewives alike, with facilities for viewing video tapes, diagrams, etc., and places for meetings. The units will provide significant information towards improving farm management, including crop market prices, etc.

In addition to improving farm income, a general enhancement of daily rural life is important for raising the standard of living in farming villages. Such aspects include improving health, sanitation, and nutrition.

These information units will undertake to provide the training, support and guidance for activities on promoting ways to address these aspects. However, to confront this wide range of issues, cooperation

between the ministries concerned will be necessary. The Agricultural Development Support Communication Center described in "NAE-2" in this section will be fully utilized in conjunction with activities under this project.

Necessary costs for this project are shown in Table 6.2.30.

Table 6.2.29 Cost Estimation of NAE-1-2 Project

1. MOBILE AUDIO/VISUAL UNIT			
@	20,000 (R.O./UNIT) ×	9 REGIONS = R.O.	180,000
2. VEHICLES			
	1/2 (NOS./STAFF) ×	400 STAFF = NOS.	200
@	6,000 (R.O./VEHICLE) ×	200 VEHICLES = R.O.	1,200,000
3. OTHER EQUIPMENT			
@	5,000 (R.O./CENTER) ×	44 CENTERS = R.O.	220,000
		NUMBERS	UNIT PRICE (R.O.)
			TOTAL COST (R.O.)
	COMPUTER SYSTEM	1 SET	1,500
	SIMPLE ANALYZER (SOIL & WATER)	1 SET	3,500
	TOTAL		5,000
4.	COMPUTOR SOFTWARE DEVELOPMENT		R.O. 20,000
	DEVELOPMENT BUDGET GRAND TOTAL		R.O. 1,620,000

Table 6.2.30 Cost Estimation of NAE-1-3 Project

@ 50,000 (R.O./CENTER) × 30 CENTERS = R.O. 1,500,000

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
BUILDING	400 m <sup>2</sup>	100	40,000
VISUAL DISPLAY	1 SET	6,000	6,000
FURNITURE AND OTHERS	1 SET	4,000	4,000
TOTAL			50,000

[NAE-2] Establishment of Development Support Communication Center (DSCC)

Objective:

Development and application of audio-visual materials to upgrade the level of farm knowledge and technology.

Description:

In keeping with the increase in farmer knowledge, the following step-by-step procedure will be aimed at.

(1) Information is disseminated to farmers by radio and other audio equipment.

(2) It is ensured that farmers understand the meaning of the information.

(3) Farmers are motivated to use the information to change traditional practices.

(4) Videos and other visual aids are used to impress upon farmers and convince them of the advantages of applying the new information.

(5) Under the guidance of extension staff, farmers are encouraged to try new technology.

(6) Through continued implementation, farmers master the new technology.

In order to support the above, the DSCC, as a part of MAF's overall extension activities, will develop videos, radio and TV programs, and printed materials. These efforts will be integrated with those of other agencies such as MSA towards overall improvement of the standard of living in rural areas. Materials developed under this project will be used as well by training centers, agricultural technology information units and mobile A/V units.

Developed materials will make up a program in line with that set out in "Audio-visual Farmers Training" in volume 3, section 4.2.2.4 development strategy of agricultural extension.

A subsequent review and analysis of the effect of media use, timeliness of topics, ease or difficulty of understanding, farmer reaction, and effectivity in extension will be essential in the improvement of future extension activities. Research experts will be permanently deployed for this purpose. The report on the foregoing items will be fed back to the DSCC research experts for study and analysis, and the application of findings will be used for the development of new materials.

Necessary costs for the establishment of this center are shown in Table 6.2.31. Necessary personnel and operating costs for the DSCC are shown in Table 6.2.32.

A committee centering around MAF but including representatives from all concerned agencies will monitor operation of the DSCC in light of its integrated role in the development of rural areas.

These agencies will be:

- (1) The Ministry of Agriculture and Fisheries
- (2) The Ministry of Social Affairs
- (3) The Ministry of Education and Youth Affairs
- (4) The Ministry of Health
- (5) Public Authority for Marketing Agricultural Produce
- (6) Oman Bank for Agriculture and Fisheries

Coordinators will be included in the necessary personnel of DSCC in Table 6.2.32 and will specifically work to ensure a smooth liaison between all the concerned agencies.



Table 6.2.31 Cost Estimation of NAE-2 Project

Items	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
1. BUILDING	1,500 m <sup>2</sup>	400	600,000
2. COMPUTER SET	1 SET	13,000	13,000
3. VIDEO STUDIO AND OTHERS			
①VIDEO STUDIO SYSTEMS	1 SET	50,000	50,000
②FIELD PRODUCTION SYSTEM	1 SET	45,000	45,000
③EDITING SYSTEM	1 SET	50,000	50,000
④DUPLICATING SYSTEM	1 SET	5,000	5,000
⑤VIDEO LIBRARY, LECTURE ROOM, etc.	1 SET	25,000	25,000
4. A/V MOBILE SYSTEM	1 SET	38,000	38,000
5. PRINTING EQUIPMENT	1 SET	180,000	180,000
6. AUDIO STUDIO & OTHERS			
①AUDIO STUDIO	1 SET	25,000	25,000
②OTHERS	1 SET	50,000	50,000
7. PHOTOGRAPHIC EQUIPMENT	1 SET	20,000	20,000
8. SCREENING & DISSEMINATION EQUIPMENT	1 SET	20,000	20,000
9. OFFICE EQUIPMENT & OTHERS	1 SET	15,000	15,000
10. VEHICLES	9 SET	6,000	54,000
TOTAL			1,190,000

Table 6.2.32 Operation Cost of NAE-2 Project

ITEM	YEAR	1991	1992	1993	1994	1995
1. STAFF						
DIRECTOR COMMUNICATION EXPERT (HEAD CREATIVE SERVICES) OR (HEAD ADMINISTRATION AND FINANCE)		25,000	25,000	25,000	25,000	25,000
SENIOR EDITOR (RESEARCHER) SENIOR GRAPHIC DESIGNER SMALL FORMAT MEDIA PRODUCER PHOTOGRAPHER SENIOR VIDEO PRODUCER SENIOR SOUNDMAN HEAD OUTREACH PROGRAMME			50,000	50,000	50,000	50,000
EDITOR (RESEARCHER) (2 PERSONS) ILLUSTRATOR GRAPHIC DESIGNER AUDIO/RADIO PRODUCER (2 PERSONS) VIDEO CAMERAMAN/EDITOR TRAINING SPECIALIST (3 PERSONS) INTEGRATED DEVELOPMENT COORDINATOR (2 PERSONS)				132,000	132,000	132,000
ACCOUNTS CLERK SENIOR SECRETARY SECRETARY PRINT SHOP OPERATOR (2 PERSONS) DARKROOM TECHNICIAN TAPE LIBRARIAN EQUIPMENT MAINTENANCE TECHNICIAN(2) OTHERS (11 PERSONS)						
2. OVERTIME		5,000	15,000	20,000	20,000	20,000
3. MATERIALS FOR PRODUCTION			30,000	60,000	60,000	60,000
4. MAINTENANCE			21,000	21,000	21,000	21,000
5. SPARE PARTS: VIDEO, AUDIO, VEHICLES, etc.			5,000	5,000	15,000	20,000
6. CONSUMPTION OF WATER & ELECTRICITY		3,000	7,000	7,000	7,000	7,000
7. FUEL, OIL, etc.		10,000	30,000	35,000	40,000	40,000
TOTAL		43,000	183,000	355,000	370,000	375,000
GRAND TOTAL FOR FIRST 5 YEARS						1,326,000

[NAE-3] Training of Research, Extension and Statistical Staff

Objective:

To establish facilities for training research, extension and statistical staff. To carry out the above-mentioned training.

Description:

The proper training of a sufficient number of extension workers is essential. This should begin with basic classroom training particularly in the case of those with only high school level educations. This should be supplemented by on-the-job training for all trainees to develop skills applicable to the field. These will include quick response to actual situations, and communication and leadership skills.

The following points will be focused upon:

- (1) Establishment of necessary facilities, equipment and materials for training

Centers for the training of extension staff will be established and training equipment and materials provided.

- (2) Establishment of training program

A training program will be established under the project. It will be carefully formulated with units forming a curriculum progressing smoothly from one level of difficulty to the next. Single units will be of sufficiently modest scope to be readily digestible by trainees. The training program would include (or try to include) university professors and agricultural research experts to reinforce specialized instruction.

- (3) Practical leadership skills

The effective extension of new technology to farmers is not possible without practical experience on the part of the

extension officer. On-the-job training in providing practical guidance to farmers will thus be an important part of the curriculum.

The research staff, at the agricultural research stations to be established at various points in the country under the Master Plan, will receive training in basic and analytical techniques developed at the Rumais Agricultural Research Center and attend lectures by expatriate research experts who will be invited from outside Oman in a range of specialities.

The agricultural statistical staff will receive training under the project in statistical surveys and analytical methods.

One-year study-abroad opportunities at foreign universities and research institutions will be extended to a select number of extension officers each year for exposure to the latest agricultural research and technology being pursued in developed countries.

#### <Training Center Description>

##### (1) Rumais Training Center

Training centers for extension officers are to be established at the Rumais Agricultural Research Center. Research experts will assume the roles of instructors, and training will be provided in such areas as cropping techniques, crop protection, farm management, and new developments in experimental research.

Facilities should include classrooms, a laboratory, a workshop, a library, meeting rooms and basic living facilities such as a dormitory, cafeteria, etc. Practical learning facilities will include an experimental farm and post-harvest facilities. Teaching aids to support training will include slides, photographs, charts, models, tape recorders, and VTR's and other audio-visual equipment.

These training centers are primarily to train extension officers but

they should also undertake the following activities:

(a) The centers should function as a forum for exchange between researchers and extension officers, thereby providing feedback to research institutions, universities, and other entities engaged in agricultural research.

(b) Audio-visual educational materials considered indispensable to providing effective extension and training services should be developed in cooperation with the Development Support Communication Center (see "NAE-2" in this section).

(c) Outside experts from PAMAP and elsewhere should be invited to assist in providing not only extension officers and research staff, but also any other interested parties with short-term training on agricultural production, gathering and selling crops, marketing and other specialized areas of concern.

(d) The research staff at the agricultural research stations should receive training in basic and analytical techniques as well as receive lectures given by expatriate research experts.

(e) Training on the methodology of agricultural statistical surveys ought to be provided.

## (2) Southern Region Training Center

In this training center, training will not only be provided for extension staff and researchers, but also for farmers who are to settle in the Nejd development area. Training for the latter will be carried out in cooperation with the pilot farm in the Nejd area (see section 6.6). This center will be at Salalah or in the Nejd area.

The necessary costs estimated for the establishment of these centers and the training programs are shown in Table 6.2.33. The staff to be deployed and the operation costs are shown in Table 6.2.34.

Table 6.2.33 Cost Estimation of NAE-3 Project

1. ESTABLISHMENT OF TRAINING CENTER (RUMAIS)

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
CENTER BUILDING (INCLUDING DORMITORY)	1,500 m <sup>2</sup>	150	225,000
WORKSHOP	1000 m <sup>2</sup>	50	50,000
COMPUTER SYSTEM	10 SET	1,500	15,000
SIMPLE ANALYZER (SOIL & WATER)	10 SET	3,500	35,000
OTHER EQUIPMENT	1 SET	9,000	9,000
VEHICLE	2 NOS.	6,000	12,000
MINI-BUS	3 NOS.	13,000	39,000
TOTAL			385,000

2. ESTABLISHMENT OF TRAINING CENTER (SOUTHERN REGION)

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
CENTER BUILDING (INCLUDING DORMITORY)	400 m <sup>2</sup>	150	60,000
MECHANICAL WORKSHOP	200 m <sup>2</sup>	50	10,000
FIELD WORKSHOP	200 m <sup>2</sup>	50	10,000
OTHER EQUIPMENT	1 SET	2,000	2,000
VEHICLE	3 NOS.	6,000	18,000
TOTAL			100,000

3. TRAINING OF RESEARCHERS IN THE TRAINING CENTER

50 (PERSONS / 5 YEARS) × 220 R.O. = 11,000

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
TRANSPORTATION EXPENSES	1 SET	40	40
ACCOMODATION CHARGE	10 DAYS	15	150
OTHERS	10 DAYS	3	30
TOTAL			220

4. TRAINING OF EXTENSION STAFF IN THE TRAINING CENTER & THE DSCC

1,000 (PERSONS / 5 YEARS) × 410 R.O. = 410,000

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
TRANSPORTATION EXPENSES	1 SET	50	50
ACCOMODATION CHARGE	20 DAYS	15	300
OTHERS	20 DAYS	3	60
TOTAL			410

5. TRAINING OF EXTENSION STAFF ABROAD

40 (PERSONS / 5 YEARS) × 12,350 R.O. = 494,000

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
TRANSPORTATION EXPENSES	1 SET	250	250
ACCOMODATION CHARGE	360 DAYS	30	10,800
OTHERS	1 DAYS	1,300	1,300
TOTAL			12,350

Table 6.2.33 Cost Estimation of NAE-3 Project (continued)

6. TRAINING OF AGRICULTURAL STATISTIC STAFF IN THE TRAINING CENTER  
 250 (PERSONS / 5 YEARS) X 410 R.O. = 102,500

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
TRANSPORTATION EXPENSES	1 SET	50	50
ACCOMODATION CHARGE	20 DAYS	15	300
OTHERS	20 DAYS	3	60
TOTAL			410

DEVELOPMENT BUDGET GRAND TOTAL 1+2+3+4+5+6= 1,502,500  
 ROUND 1,503,000

Table 6.2.34 Operation Cost of NAE-3 Project

TRAINING CENTER (RUMAIS)

ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
(1) SUPERVISOR FOR THE CENTRE	1 NOS.		
(2) TRAINING COORDINATOR	1 NOS.		
(3) TYPIST	1 NOS.		
(4) PUBLIC RELATIONS OFFICER	1 NOS.		
(5) OTHER SUPPORTING STAFF	7 NOS.		
SUBTOTAL	11 NOS.		30,784
2. MATERIALS	1 SET	15,500	15,500
3. SERVICES	1 SET	3,000	3,000
4. TRANSFERRED EXPENDITURE	1 SET	6,500	6,500
5. CAPITAL EXPENDITURE	1 SET	55,000	55,000
TOTAL			110,784

TRAINING CENTER (SOUTHERN REGION)

ITEMS	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
<b>1. STAFF</b>			
(1) SUPERVISOR FOR THE CENTRE	1 NOS.		
(2) TRAINING COORDINATOR	1 NOS.		
(3) TYPIST	1 NOS.		
(4) OTHER SUPPORTING STAFF	4 NOS.		
SUBTOTAL	7 NOS.		17,964
2. MATERIALS	1 SET	5,000	5,000
3. SERVICES	1 SET	2,000	2,000
4. TRANSFERRED EXPENDITURE	1 SET	1,000	1,000
5. CAPITAL EXPENDITURE	1 SET	15,000	15,000
TOTAL			40,964

[NAE-4] Intensive Extension Guidance Program

Objective:

To provide intensive extension to farmers with a view to increasing vertical agricultural productivity, and adjusting production to demand.

Description:

[NAE-4-1] Supporting Key Farmers Extension Program

An extension program has been in progress in Oman and is targeted at 2,500 key farmers. These farmers are expected to be the mainstay of Omani agriculture in the future. Key farmer fields function as demonstration fields for new varieties, new cultivation methods, etc. It is anticipated that by example, these new techniques will be disseminated to other farmers in the village. In this project, the on-going program will be continued and the number of key farmers will be expanded to 3,000.

The crops to be focused on in the program will be those where there is a large gap between the future demand forecast and current productivity, as well as crops for which there is consumer demand for a large improvement in quality such as garlic, potatoes, feed crops, oranges and other citrus fruit, grapes, etc.

Farm technology to be targeted in the program includes technology with proven effectiveness in raising productivity but which has as of yet, had little application in Oman, i.e. new irrigation, crop rotation, straight or foliar fertilizer application, dispersion of cropping season, cultivation methods for new crops, pruning of fruit trees, etc.

It is assumed that a 5-year period will be adequate for mastery of the above techniques and as such, a new group of key farmers will be targeted for the next 5-year period to maximize the number of farmers exposed to the program.

Each key farmer will set aside one feddan for demonstration of new crops and techniques. As incentive, a 100 % subsidy for fertilizer,

seedlings, and agricultural chemicals will be provided.

Through the "Farming Improvement Model" described in volume 5, chapter 4, and results of farm-management research at the agricultural research center and stations, guidance should be actively extended to the key farmers in an effort to improve management.

Data-processing by computer would be applied to collate and analyze information obtained from key farmers regarding crop type, cropping pattern, fertilizers, agricultural chemicals, soil and water quality, water requirements, etc.

Necessary costs estimated for this project are shown in Table 6.2.35.

Table 6.2.35 Cost Estimation of NAE-4-1 Project

1. BUDGET PER FARMER PER ANNUM			
	NUMBERS	UNIT PRICE (R.O./ha)	TOTAL COST (R.O./ha)
FERTILIZER	0.4 ha	200	80
SEED OR NURSERY TREE	0.4 ha	40	16
AGRICULTURAL CHEMICALS	0.4 ha	10	4
TOTAL			100
2. TOTAL BUDGET IN 5 YEARS			
100 (R.O./YEAR) × 5 (YEARS) × 3,000 (FARMERS) =			1,500,000



[NAE-4-2] Date Palm Rehabilitation and Improvement Program

Dates are a traditional product in Oman and have been cultivated since ancient times. Date cultivation accounts for about 60% of cropped area, and in terms of individual crops, accounts for the highest total production value.

However, labor, soil and water (caloric value and production value per unit volume of water) productivity is low. Produce quality is also poor.

The supply and demand forecasts by the JICA team indicates that date exports will increase by 7,200 tons from 1988-2000. However, produce for export must be of higher quality. To this end, inputs to increase quality and productivity of date cultivation will be 100% subsidized under the project. Farmers indicating a desire to raise higher quality dates will be eligible for the program, with final selection being made by the extension staff. The responsible extension officer would accordingly extend intensive guidance to the selected farmers.

Inputs to be subsidized would be pruning machines, pollination machines, superior seedlings and harvest containers. Costs to be incurred for these are shown in Table 6.2.36.

Table 6.2.36 Cost Estimation of NAE-4-2 Project

- (1) EXPECTED INCREASE OF DATES EXPORTED FROM 1988 TO 2000  
7,200 (TON)
- (2) AREA NEEDED FOR PRODUCTION  
 $7,200 \text{ (TON)} \div 6 \text{ (TON/ha)} = 1,200 \text{ (ha)}$
- (3) NUMBER OF DATE-PRODUCING FARMERS (0.4ha/FARMER)  
 $1,200 \text{ (ha)} \div 0.4 \text{ (ha/FARMER)} = 3,000 \text{ (FARMERS)}$
- (4) NUMBER OF PLASTIC CONTAINERS NEEDED FOR HARVESTING  
 $7,200 \text{ (TON)} \div 25 \text{ (kg/CONTAINER)} = 288,000 \text{ (CONTAINER)}$
- (5) NUMBER OF NURSERY TREES NEEDED FOR PRODUCTION  
 $1,200 \text{ (ha)} \times 280 \text{ (NOS./ha)} = 336,000 \text{ (TREES)}$
- (6) TOTAL BUDGET IN 10 YEARS

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
PRUNING MACHINE	3,000 NOS.	150	450,000
POLLINATION MACHINE	3,000 NOS.	30	90,000
PLASTIC CONTAINER	288,000 NOS.	10	2,880,000
NURSERY TREE	336,000 NOS.	25	8,400,000
TOTAL			11,820,000

- (7) TOTAL BUDGET IN FIRST 5 YEARS

$$(6) \times 1/2 = 5,910,000$$

[NAE-4-3] Provision of Inputs for Experimental Purposes

It is essential to strengthen the linkage between extension and research so that developed technology is relayed promptly into the field for practical application.

However, due to the following factors, technology developed on the experimental farm which appears promising may in some cases not yield the anticipated results in the field.

(1) There may be slight differences in soil and climatic conditions between the experimental farm and the targeted farm area.

(2) The gap between farmer and research farm staff in level of farming technology may not be given sufficient attention in formulating the experimental program, resulting in technologies that may work well on the experimental farm but are too ambitious given the actual know-how at the farmer level.

(3) Cultivation on the research farm is by nature small-scale, where conditions differ from the larger-scale farming in the field.

Constant cross-checking between findings on the experimental farm and applicability of these to the actual farms is necessary throughout the course of the experimental procedure in areas like the introduction of foreign varieties, new agricultural chemical and fertilizer technologies and farm mechanization.

Such kinds of technology will be experimentally adopted by farmers through linkage intensification between research and extension. Through this program, the transfer of new technology from research to extension will be accelerated.

Target farmers for extension of such technologies would start with those with already superior technical abilities. To provide farmers with incentive to experiment with new but not fully established technology, losses incurred in case of failure as a result of adopting experimental methods as well as inputs to implement the same would be subsidized 100%

by the government.

Necessary costs estimated for this project are shown in Table 6.2.37.

Table 6.2.37 Cost Estimation of NAE-4-3 Project

1. BUDGET PER ANNUM

200 (FARMERS /1 YEAR) × 500 (R.O.) = 100,000 (R.O.)

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
PROVISION OF INPUTS FOR EXPERIMENTAL PURPOSES			
INPUTS	0.4 ha	1,000	400
MATERIALS	0.4 ha	250	100
TOTAL			500

2. TOTAL BUDGET IN YEARS

5 (YEARS) × 100,000 (R.O./YEAR) = 500,000 (R.O.)

[NAA-1] Collection and Organization of Agricultural Statistics

Objective:

To collect and collate statistical data to be used in forming agricultural policy.

Description:

[NAA1-1] Agricultural Census

A periodic agricultural census is essential to the formulation of agricultural policy. For this reason and because of the following, an agricultural census is called for under the Master Plan:

(1) No census has been carried out since 1978/79. Evaluation of past policies and formulation of new ones cannot be performed without more up-to-date data.

(2) Updated census data will be necessary for realistic formulation of future nation-level development planning. In the case of the Five-year Development Plan by the government, it is important to carry out an agricultural census such that data is available two years prior to commencement of the national plan.

The Master Plan thus recommends that a census be undertaken in 1991/92, with findings to be collated and published in the first half of 1993. Such data would then be ready for incorporation in the Fifth Five-year Development Plan. A subsequent census would be called for in 1996/97 for collation and publication of data in the first half of 1998.

At present, there is a shortage of staff in the Department of Agricultural Statistics of the Directorate General of Agriculture. The use of extension officers as census survey personnel is not a suitable solution to the problem. Accordingly, it is recommended that the 1991/92 census be carried by a private consultant. The same is recommended for the 1996/97 census; however, it is anticipated that training of Omani statistical survey personnel will have progressed sufficiently by that

time to permit their participation as counterpart personnel for transfer of technology.

Larger scale and improved accuracy will be pursued in carrying out successive censuses. Ultimately, it is expected that the government will execute the fourth census, relying completely on its own resources.

[NAA-1-2] Annual Update of Important Agricultural Statistics

Updating of key agricultural statistics is crucial to the planning and implementation of a sound agricultural policy. In order to prevent surplus production of specific farm products, accurate and current data concerning production amounts, the status of farm management and consumption trends must be available.

The items below are emphasized for annual update in order to evaluate past farm-policy performance and to a basis for current policy formulation which maximizes investment efficiency.

- (1) Employment of farm household members
- (2) Cultivated land and plant area
- (3) Farm household economic survey
- (4) Production cost of major crops
- (5) Food balance sheets

A system to collate and analyze the above data would be established under the project, including computer-processing capacity. Appropriate software would also be developed. Increase in statistical staff should also be aimed to meet the manpower needs of such a system.

In order to transfer the necessary operating technology to Omani staff, a consultant should be engaged to initially run the system and provide on-the-job training for Omani counterparts. Following the provision of the necessary equipment, a consultant would be engaged for the above for the 3-year period 1992-1994.

Necessary costs estimated for these projects are shown in Table

6.2.38. Staff requirements are shown in Table 6.2.39, and recurrent costs are shown in Table 6.2.40.

Table 6.2.38 Cost Estimation of NAA-1 Project

1. AGRICULTURAL CENSUS

THE 2ND AGRICULTURAL CENSUS (1991/1992)

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
PLANNING AND SURVEY (1ST YEAR)	1 SET	300,000	300,000
SURVEY (2ND YEAR)	1 SET	350,000	350,000
PUBLISHING	1 SET	50,000	50,000
TOTAL			700,000

2. ANNUAL UPDATE OF IMPORTANT AGRICULTURAL STATISTICS

660,000

(1) ESTABLISHMENT OF COMPUTER SYSTEM

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
SYSTEM DESIGN AND INSTALLATION	1 SET	30,000	30,000
SOFTWARE DEVELOPMENT	1 SET	100,000	100,000
HARDWARE			
HEADQUARTERS	1 SET	13,000	13,000
EXTENSION CENTER OFFICES	19 SET	3,000	57,000
OTHER EQUIPMENTS	1 SET	5,000	5,000
TOTAL			205,000

(2) STATISTIC MANAGEMENT CONSULTANCY

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
EXPERT MANPOWER AND SUPPORTING STAFF	18 M/M	5,000	90,000
OTHER CHARGE	25 %	90,000	22,500
SUB-TOTAL			112,500
CONTINGENCIES	5 %	112,500	5,625
TOTAL			118,125
		ROUND	118,000

(3) ANNUAL DATA COLLECTION

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
VEHICLE			
REGIONAL OFFICES	9 NOS.	6,000	54,000
EXTENSION CENTER OFFICES	43 NOS.	6,000	258,000
OTHERS	1 SET	25,000	25,000
TOTAL			337,000

GRAND TOTAL

1,360,000

Table 6.2.39 Statistics Staff Increase Plan

AGRICULTURAL REGION		STATISTICS STAFF				INCREASE 89-95	
No	NAME	1989		1995		STATIS-TICIAN	ENUME-RATOR
		STATIS-TICIAN	ENUME-RATOR	STATIS-TICIAN	ENUME-RATOR		
1	SOUTH BATINAH	1	7	4	18	3	11
2	NORTH BATINAH	1	1	3	15	2	14
3	SHARQIA	1	8	3	15	2	7
4	OMAN INTERIOR	1	4	3	7	2	3
5	WUSTA	0	3	1	5	1	2
6	DAHIRAH	1	0	3	6	2	6
7	BURAIMI	1	0	1	3	0	3
8	MUSANDAM	0	0	1	2	1	2
9	SOUTH REGION	1	4	3	12	2	8
	MINISTRY'S OFFICE	1		3		2	
	TOTAL	8	27	25	83	17	56

Table 6.2.40 Operation Cost of NAA-1 Project

Item	Character	Numbers	Unit Price (R.O.)	Total Cost (R.O.)
1. Staff				
Statistician	4.2	17 Nos.	3,372	57,324
Enumerator	5.2	56 Nos.	2,808	157,248
Subtotal		73 Nos.		214,572
2. Operation				
Vehicle Operation		52 Nos.	600	31,200
Computer System Operation		20 Nos.	300	6,000
Subtotal				37,200
Total				251,772

## [NAA-2] Agricultural Exhibitions and Festivals

### Objective:

To heighten interest in agriculture and awareness within the rural community and other agriculture-related persons and officials through a program designed to express the earnestness with which the government is committed to agricultural development. This would include an agenda of exhibitions and festivals to introduce new farming practices, and award efforts in the area of extension and practical application.

### Description:

In both developed and developing countries, agricultural exhibitions, competitions, fairs and festivals have proven an effective means to heighten awareness in the farming and related community regarding new farming practices, new varieties, and other agricultural innovations.

Specifically, an international agriculture exhibition could be sponsored by the government under the project once every three years, considering the pace at which world agricultural technology is progressing. The event would provide a forum for the exhibition and exchange of information on agricultural advances. Participation by Omani government agencies such as MAF, PAMAP and OBAF, as well as private enterprises involved in the agricultural sectors would be anticipated. Participation, likewise, by foreign government agencies, international agricultural research agencies and manufacturers and suppliers of farm inputs, equipment and machinery would be expected.

His Majesty Sultan Qaboos designated 1988 and 1989 as "Agricultural Years", and has led the government in promoting agricultural awareness and development. In turn, MAF has designated the two months corresponding to the start (August) and end (February) of the farming season each year as Agriculture Months. Domestic agricultural festivals under the Master Plan would reinforce these efforts to heighten interest in farming. The efforts of extension centers in each region would be evaluated during August and February, and awards made to those offices with greatest success in attaining extension goals.



Necessary costs for these projects are shown in Tables 6.2.41 and 6.2.42.

Table 6.2.41 Cost Estimation of NAA-2-1 Project

1. TOTAL COST IN 5 YEARS @  $\frac{\text{(R.O.)}}{225,000} \times 2 \text{ (TIMES/5YEARS)} = 450,000$

2. COST OF EACH EXHIBITION

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
PLANNING, DESIGN OF EXHIBITION SITE, CONSTRUCTION MANAGEMENT	1 SET	13,000	13,000
CONSTRUCTION	1 SET	190,000	190,000
PROGRESS MANAGEMENT	1 SET	22,000	22,000
TOTAL			225,000

Table 6.2.42 Cost Estimation of NAA-2-2 Project

1. PRIZES FOR REGIONS PER YEAR	
@ 4,000 (R.O./SECTION) × 9 (SECTIONS) = 36,000 (R.O.)	
(LIST OF SECTIONS)	
PLANT SECTION	1 DATES 2 FRUITS 3 VEGETABLES 4 FIELD CROP 5 FEED CROP
LIVESTOCK SECTION	6 COW 7 SHEEP AND GOAT 8 POULTRY 9 HONEY BEE
2. FESTIVAL EXPENDITURE PER YEAR	
@ 14,000 (R.O./YEAR)	
3. TOTAL COST IN 5 YEARS	
(R.O.)	(R.O.)
( 36,000 + 14,000 ) ×	5 (YEARS) = 250,000 (R.O.)

[NAA-3] National Project for Plant Protection and Aerial Spraying

Objective:

To increase agricultural production through a thorough program of pest control.

Descriptions:

A thorough program of pest control is expected to greatly expand agricultural production in Oman. Such a program has not been implemented to date due to low technical level of farmers aggravated by shortages of funding and necessary inputs.

Specifically, in the case of date palms, mangoes, citrus, coconut and other fruit trees, aerial spraying is recommended in light of the difficulty in executing pest control from the ground, as well as efficiency because of their unit cultivation area being rather large.

Depending on the crop, aerial spraying would be performed 1-5 times, and this service would be open to all farmers wishing to avail themselves of it. For areas where aerial spraying would not be practical for special reasons of terrain, crop configuration, type of fruit tree, etc., a spray team would be deployed from the related extension center for pesticide application from the ground.

The subsidy rate for the above service would be 100% during the initial stage of of the project. This subsidy at the outset would be necessitated by initial deficit of farmer technical and economic capacity as well as the difficulty of determining the precise holdings of each beneficiary as a basis for calculating charge rates for spraying. However, once farmers attain a sufficient technical and economic level, they would be expected to bear the cost themselves for plant protection measures, principally pesticide costs.

Necessary costs estimated for this project are shown in Table 6.2.43.

Table 6.2.43 Cost Estimation of NAA-3 Project

ITEMS	ESTIMATION
(1)TOTAL AREA OF FRUIT TREES	33,000 ha
(2)TARGET AREA OF AREAL SPRAYING	$(1) \times 3/4 \approx 25,000$ ha
(3)COST PER UNIT AREA	20 RO/ha
(4)APPLICATION TIMES (AVERAGE)	2 times
(5)TOTAL COST PER YEAR	$(2) \times (3) \times (4) = 1,000,000$ RO
(6)TOTAL COST IN 5 YEARS	$(5) \times 5 = 5,000,000$ RO

[NAA-4] Agricultural Technology Transfer to Farmers Project

Objective:

To transfer modern agricultural technology to farmers through provision of necessary equipment and inputs.

Description:

(1) Inputs

Sufficient amounts of fertilizer, agricultural chemicals and seeds are the critical inputs in high productivity farming. Type selection and the timing of applications have a controlling impact on crop production. However, all three elements must be used in a single coordinated program in order to achieve improved productivity.

Current technical and economic levels are insufficient for farmers to effectively procure and utilize these inputs on their own. Consequently, the current subsidy program will be continued under the project until farmers acquire familiarity with required practices.

With the future establishment of planned agricultural production and improvement and expansion of the distribution system for farm products enabling a good stable price for produce, farmers will be able to comfortably bear the cost for all of the input. Thus subsidies are to be gradually phased out over 10-year period.

Farm mechanization decreases labor time, enabling timely completion of tasks within the appropriate season and thereby increasing both productivity and quality for farm produce. Reduced labor requirement decrease the demand for labor, enabling cutbacks in employed foreign labor, thereby contributing to Omanization. Reduced farm work also generally heightens the attractiveness of farming, which in turn will encourage rural youth to remain in rural areas and engage in agriculture.

Unfortunately, at present Omani farmers do not have the economic wherewithal to purchase farm machinery, or the technical skills to

practically apply mechanized farming. These issues would be addressed by combining subsidy program and extension activities to deliver technology.

In reverse proportion to the phased reduction of subsidies for fertilizer, agricultural chemicals and seeds, subsidies for farm machinery would be steadily expanded under the project in line with increased farmer willingness and ability to apply mechanized practices.

This subsidy program is expected to encourage farmers to adopt new technologies and produce crops responsive to demand.

Subsidy rates under the project are proposed as follows:

	Subsidy Rate		
	1991-92	1993-94	1995
(a) Fertilizer			
(i) Chemical Fertilizer	25%	20%	15%
(ii) Manure pit	50%	40%	30%
(b) Agro-chemicals	50%	40%	30%
(c) Seed			
(i) Vegetables	50%	40%	30%
(ii) Wheat - Barley	100%	80%	60%
(d) Farm Machinery	50%	50%	50%
(tractor, sprayer, harvester, etc.)			

## (2) Honey-Bee Project

Bee keeping has been traditionally carried out in Rustaq, Nizwa and Salalah. The old method of compression of the traditional date palm log hive is used to obtain honey, and productivity is low. However, domestically-produced honey is popular among consumers and commands a market price of R.O. 10/kg which is 3 to 4 times that of imported honey. Improved productivity through modernization of bee-keeping practices will provide a valuable source of income for farmers.

A honey bee project incorporated into the First - Third Five-year Development Plans, aims at modernizing and expanding bee keeping in the Sultanate. The project comprises the following:

(1) Extension of modern bee keeping particularly in Rustaq, Nizwa and Salalah

(2) Supply of and/or financing to promote necessary modern bee keeping equipment for farmers

However, results under the project have been poorer than expected due to the lack of trained personnel for extension. Moreover, concern about prevention of infectious disease among Omani bees emerged with the discovery of American foulbrood disease in the heretofore disease-free bee population in 1988.

In order to promote and expand modern bee keeping in the country as well as address the problem of disease, the proposed project for bee-keeping development will undertake the following. (Particular focus will be given to southern Jabal where bee-keeping resources are abundant, and very direct impact on increased income can be expected in view of the general lack of other effective sources of livelihood).

(1) Facilities and trained staff at the existing extension centers in Rustaq, Nizwa and Salalah will be expanded. Current total staff of 6 will be increased to 12 for more effective extension.

(2) Largely pictorial pamphlets on modern bee-keeping practices will be prepared for distribution, and videos made for mobile presentation to farmers.

(3) Training in modern bee-keeping practices will be performed at extension centers and agricultural sector training facilities.

(4) In order to prevent the spread of infectious disease among bees, a system for registration of bee keepers will be initiated and authorization required for long distance shift of bee-keeping

operations. Import restrictions will also be established.

(5) Subsidies and interest-free financing will be made available to bee keepers for the procurement of the necessary modern equipment (bee hives, presses, protective clothing, etc.)

Subsidy rate : 50%

Remainder : interest-free loan

(6) Marketing support will be provided in the areas of packaging, product identification (location of production, production date, etc.), advertising, etc.

(7) A queen bee breeding station will be established in southern Jabal for a production capacity of 5,000 colonies in a 5-year period. Proposed yearly expansion of colonies there is shown in Table 6.2.44.

Necessary costs estimated for this project are shown in Table 6.2.45.

Table 6.2.44 Jabal Honey-Bee Colonies Development Plan

Year	Minimum Number of Colonies From which Spilits Could be Obtained	Number of New Colonies Produced	Accumulative Total Number of New Colonies Produced
1	50	100	100
2	100	250	350
3	250	550	900
4	550	1,250	2,150
5	1,250	2,850	5,000

Table 6.2.45 Cost Estimation of NAA-4 Project

1. TOTAL BUDGET

ITEMS	ANNUAL BUDGET				
	1991	1992	1993	1994	1995
(1) FERTILIZER, etc.					
(a) CHEMICAL FERTILIZER	165,000	165,000	132,000	132,000	99,000
(b) MANURE PIT	20,000	20,000	18,000	16,000	12,000
(2) AGRICULTURAL CHEMICALS	100,000	100,000	80,000	80,000	60,000
(3) SEEDS					
(a) VEGETABLES	175,000	175,000	140,000	140,000	105,000
(b) WHEAT AND BARLEY	15,000	15,000	12,000	12,000	9,000
(4) AGRICULTURAL MACHINERY	448,000	455,000	533,000	521,000	608,000
(5) HONEY BEE PROJECT	77,000	70,000	87,000	99,000	107,000
TOTAL	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000

2. COST BREAKDOWN OF HONEY BEE PROJECT

ITEMS	ANNUAL BUDGET				
	1991	1992	1993	1994	1995
(1) REGISTER EQUIPMENT	10,000				
(2) METHOD IMPROVEMENT	15,000	15,000	15,000	15,000	15,000
(3) FARMER TRAINING			5,000	5,000	5,000
(4) MODERNIZED EQUIPMENT SUBSIDY	15,000	15,000	15,000	15,000	15,000
(5) JABAL COLONY DEVELOPMENT					
(a) STAFF	20,000	22,000	24,000	26,000	13,000
(b) TRANSPORTATION	2,000	3,000	3,000	3,000	3,000
(c) OPERATION	5,000	5,000	5,000	5,000	6,000
(d) CAPITAL	10,000	10,000	20,000	30,000	50,000
TOTAL	77,000	70,000	87,000	99,000	107,000



[NAQ-1] Development and Improvement of Plant Quarantine

Objective:

To protect domestic agriculture from plant diseases of foreign origin in view of future increased volume and variety of foreign agricultural products.

Description:

The volume and variety of imported agricultural products are expected to increase rapidly with population growth and diversification of eating habits. Types of farm products to be subject to plant quarantine as well as varieties of diseases to be addressed are expected to increase as well.

As a result, of new facilities, and expansion and improvement of existing plant quarantine facilities is called for.

Expansion and Improvement of Existing facilities

- (1) Seeb International Airport : quarantine field and greenhouse
- (2) Mina Qaboos : building expansion and installation of large-scale fumigation equipment
- (3) Salalah Airport : construction of new quarantine facilities

New Facilities

- (1) Al Gizzy (border with UAE)
- (2) Surfait (border with Yemen)

Necessary costs estimated for this project are shown in Table 6.2.46. Personnel development to man these facilities, including increased staff at the existing Wajaja, Hafeet and Raysut Port quarantine centers is shown in Table 6.2.47. Recurrent costs are shown in Table 6.2.48.

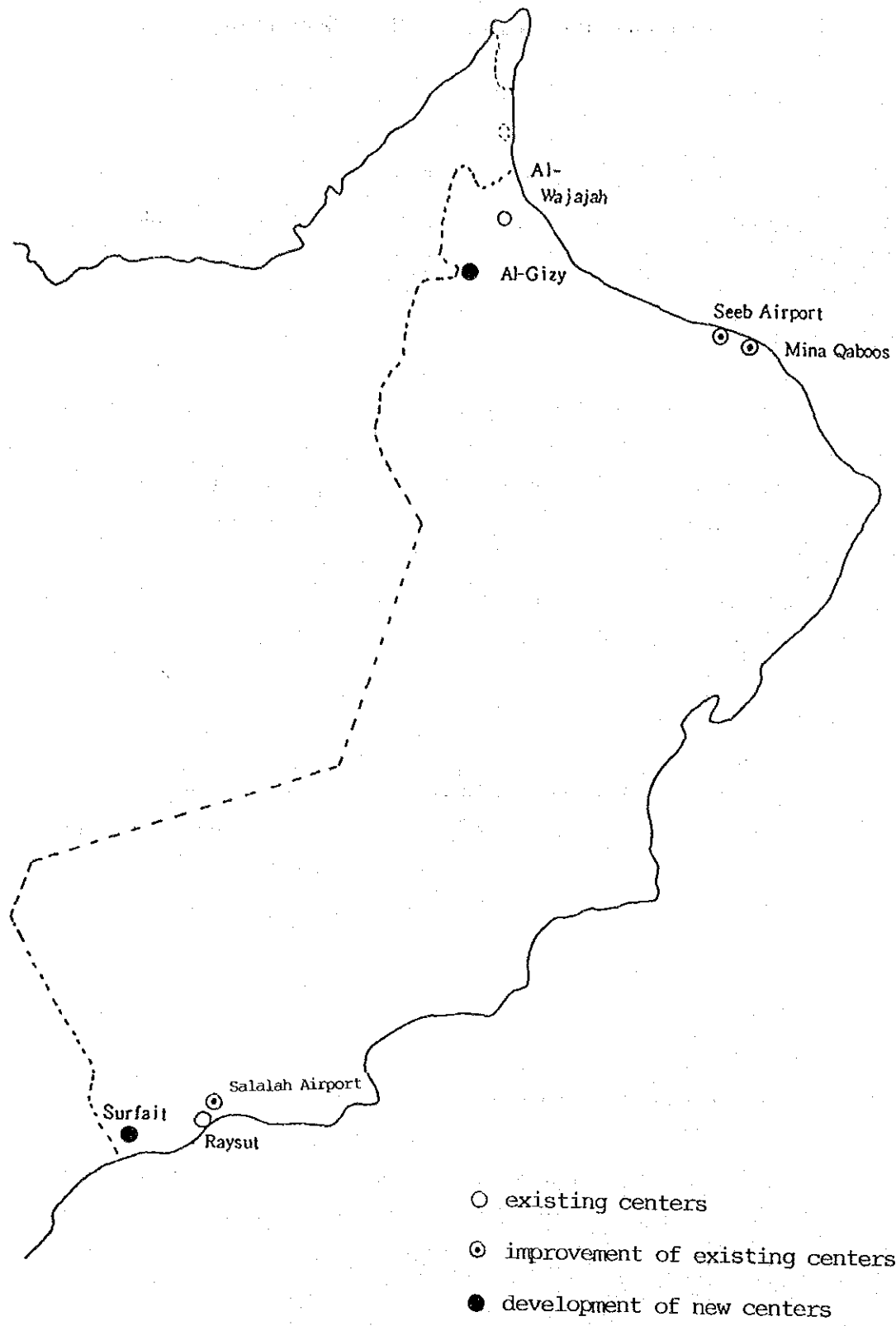


Figure 6.2.2 Location of Plant Quarantine Centers

Table 6.2.46 Cost Estimation of NAQ-1 Project

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
(1)SEEB INTERNATIONAL AIRPORT			100,000
ISOLATION FARM	4,000 m <sup>2</sup>	9	36,000
ISOLATION GREENHOUSES	1,000 m <sup>2</sup>	64	64,000
(2)MINA QABOOS			200,000
FLOOR ADDITION	1 SET	100,000	100,000
FUMIGATION EQUIPMENT	1 SET	100,000	100,000
(3)SALALAH AIRPORT			200,000
BUILDING AND OTHERS	1 SET	120,000	120,000
EQUIPMENT	1 SET	71,000	71,000
ISOLATION FARM	1000 m <sup>2</sup>	9	9,000
(4)AL-GIZZY (NEW)			200,000
BUILDING AND OTHERS	1 SET	120,000	120,000
EQUIPMENT	1 SET	44,000	44,000
ISOLATION FARM	4000 m <sup>2</sup>	9	36,000
(5)SURFAIT (NEW)			200,000
BUILDING AND OTHERS	1 SET	120,000	120,000
EQUIPMENT	1 SET	44,000	44,000
ISOLATION FARM	4000 m <sup>2</sup>	9	36,000
Total			900,000

Table 6.2.47 Staff Requirement of NAQ-1 Project

	EXISTING NUMBER	REQUIRED NUMBER	INCREASE NUMBER
(1)SEEB INTERNATIONAL AIRPORT	4	13	9
ENGINEER	3	7	4
ASSISTANT ENGINEER		1	1
TECHNICIAN	1	5	4
(2)MINA QABOOS	4	8	4
ENGINEER	1	4	3
ASSISTANT ENGINEER		1	1
TECHNICIAN	3	3	
(3)HAFEET	4	9	5
ENGINEER		2	2
TECHNICIAN	4	7	3
(4)SALALAH AIRPORT	1	6	5
ENGINEER	1	3	2
TECHNICIAN		3	3
(5)AL-GIZZY (NEW)		6	6
ENGINEER		3	3
TECHNICIAN		3	3
(6)SURFAIT (NEW)		5	5
ENGINEER		2	2
TECHNICIAN		3	3
(7)WAJAJA	4	12	8
ENGINEER	4	7	3
TECHNICIAN		5	5
(8)RAYSUT SEAPORT	1	4	3
ENGINEER	1	2	1
TECHNICIAN		2	2
Total	18	63	45
ENGINEER	10	30	20
ASSISTANT ENGINEER		2	2
TECHNICIAN	8	31	23

Table 6.2.48 Operation Cost of NAQ-1 Project

Item	Character	Numbers	Unit Price (R.O.)	Total Cost (R.O.)
<b>1. Staff</b>				
Engineer	2.2	20 Nos.	6,912	138,240
Assistant Engineer	4.2	2 Nos.	3,372	6,744
Technician	5.2	23 Nos.	2,808	64,584
Sub Total		45 Nos.		209,568
<b>2. Operation</b>				
Maintenance		0.01 %	1,100,000	11,000
Operation		0.05 %	1,100,000	55,000
Sub Total				66,000
<b>Total</b>				<b>275,568</b>

### 6.3 Livestock

The principal objectives within the livestock sector under the first 5-year Agricultural Development Plan are :

- To promote efficient, cost-effective animal husbandry in the Sultanate.
- Through the development thereof to provide the Omani population with a source of stable, good quality livestock products. Projects and programs formulated for the sector under the 5-year Agricultural Development Plan are described below.

#### [NLL-1] Rangeland Regeneration Projects in the Southern Region

##### Objectives:

This project aims at increasing livestock carrying capacity and conservation of southern Jabal rangeland where the vegetation is seriously reduced because of overgrazing.

##### Description:

Recently, the nutrient supply in the rangelands in southern Jabal has declined due to the rapid increase of the number of grazed livestock. As a result, a significant increase in purchased feed marks a major constraint on livestock management in southern Oman.

These conditions are gradually worsening. To improve them, it is necessary to conduct the following.

- (1) Identify the livestock carrying capacity of rangeland and prospect the development potential of rangeland.
- (2) Control grazed livestock to the appropriate number for the proper management and conservation of precious rangeland resources.

With respect to item (1), there are almost no data regarding livestock carrying capacity of the rangeland, or which indicate accurately the number of grazing livestock in southern Jabal.

In view of this condition, MAF has started a research study program named "Establishment of Rangeland Management Program" in cooperation with UNDP (FAO). This program's purpose is to provide institutional buildings for the Directorate General of Agriculture and Fisheries in the Southern Region through the formulation and implementation of a program on rangeland and forest management and conservation.

For this purpose, the above-mentioned fundamental data are being collected and development and management methods for rangeland are being researched.

With respect to item (2), unplanned, mixed livestock grazing (cattle, goats, camel) has been carried out to date in this area and no effective countermeasures to prevent overgrazing have been taken.

For the increase of livestock carrying capacity and conservation of rangeland, it is necessary to improve the present grazing method and control the grazing pressure in the future. In this Master Plan, integrated implementation of the following projects are proposed to address these problems.

#### [NLL-1-1] Establishment of Rangeland Management

Establishment of a rangeland management program which is now being conducted by MAF and UNDP should be continued and reinforced. The project for a rangeland vegetation map should be made up, and training of technicians to instruct farmers about how to implement grazing control should be done in cooperation with the Salalah Agricultural Research Station under this program.

Furthermore, as the next stage, small-scale rangeland management pilot projects which aim at extending appropriate rangeland management methods among livestock holders in southern Jabal should be established and managed in cooperation with the Salalah Agricultural Research Station.

#### [NLL-1-2] Grazing Control

In order to improve unplanned mixed grazing methods and control grazing pressure, grazing units which consist of 4-5 animal holders should be established and well-planned grazing should be allowed in a suitable area (about 500 ha rangeland as 1 unit), appropriate to number and animal species of the livestock.

This project will introduce new concepts of grazing and livestock management to local animal holders in Jabal which will incorporate a degree of grazing control, range improvement and improved management aimed at achieving sustained economic production of livestock and their products. The strategies will include pasture improvement, formation of grazing groups, provision of livestock-management facilities and training.

For instance, the following items may be implemented in order to organize grazing units and set up an appropriate grazing area.

- Explain the necessity for grazing control, and carry out extension to and training for farmers in control methods.
- Implement seeding and afforestation in order to conserve rangeland vegetation.
- Temporarily suspend (about 1 1/2 months) livestock grazing during the monsoon season to allow regeneration of pasture. This would also require construction of shed space for livestock during this period (to be financed 50% by government subsidy and the remainder by the farmers themselves or OBAF loan).

- Fertilize parts of rangeland which are seriously damaged.
- Set up grazing boundaries to control grazing.

It will be effective to construct fences in order to control grazing pressure. Through fences (boundary of grazing area), a rotation grazing system could be established on the basis of thorough dialogue between authorities and animal holders.

These programs would require some alteration of traditional grazing customs and concepts of animal holders, and therefore the execution of these programs may not be easy.

Nevertheless, improved management by animal holders who participate in, or follow the programs, and the demonstration of the positive results of such improvement to other farmers will be effective for bringing about a change in the grazing and economic consciousness of Jabal people.

#### Responsibility:

MAF has the responsibility for implementing these projects in co-operation with UNDP (especially for the project for the Establishment of Rangeland Management) and the later-mentioned project for the Company for Livestock Products.

#### Source of Finance:

With respect to the project for the Establishment of Rangeland Management, a portion of the project cost, around 25 %, would be expected to be subsidized by UNDP (FAO) according to the existing cost-sharing ratio. The remainder of the project cost would be subsidized by MAF. Another project, namely that for Grazing Control would be totally subsidized by MAF except for animal shed construction cost (either 50 % financed by OBAF, or completely self-financed).



Timing:

Timing is as follows:

NLL-1-1 Establishment of Rangeland Management----- For 2 years from  
1991  
NLL-1-2 Grazing Control----- For 5 years from  
1991

TIMING

Project	1991	1992	1993	1994	1995
Establishment of Rangeland Management	_____ 2years				
Grazing Control	_____				

Budget:

Budget is as follows:

BUDGET 2,352,000

Project	1991	1992	1993	1994	1995	Total
Establishment of Rangeland Management	176,000	176,000				352,000
Grazing Control	400,000	400,000	400,000	400,000	400,000	2,000,000

## [NLL-2] Animal Health and Disease Control Project

### Objectives:

This project aims at improving animal hygiene conditions and eliminating serious epidemics in order to reduce the mortality of livestock and increase the productivity of animal husbandry in Oman.

In addition, it aims at supplying sound livestock products to the Omani population.

### Description:

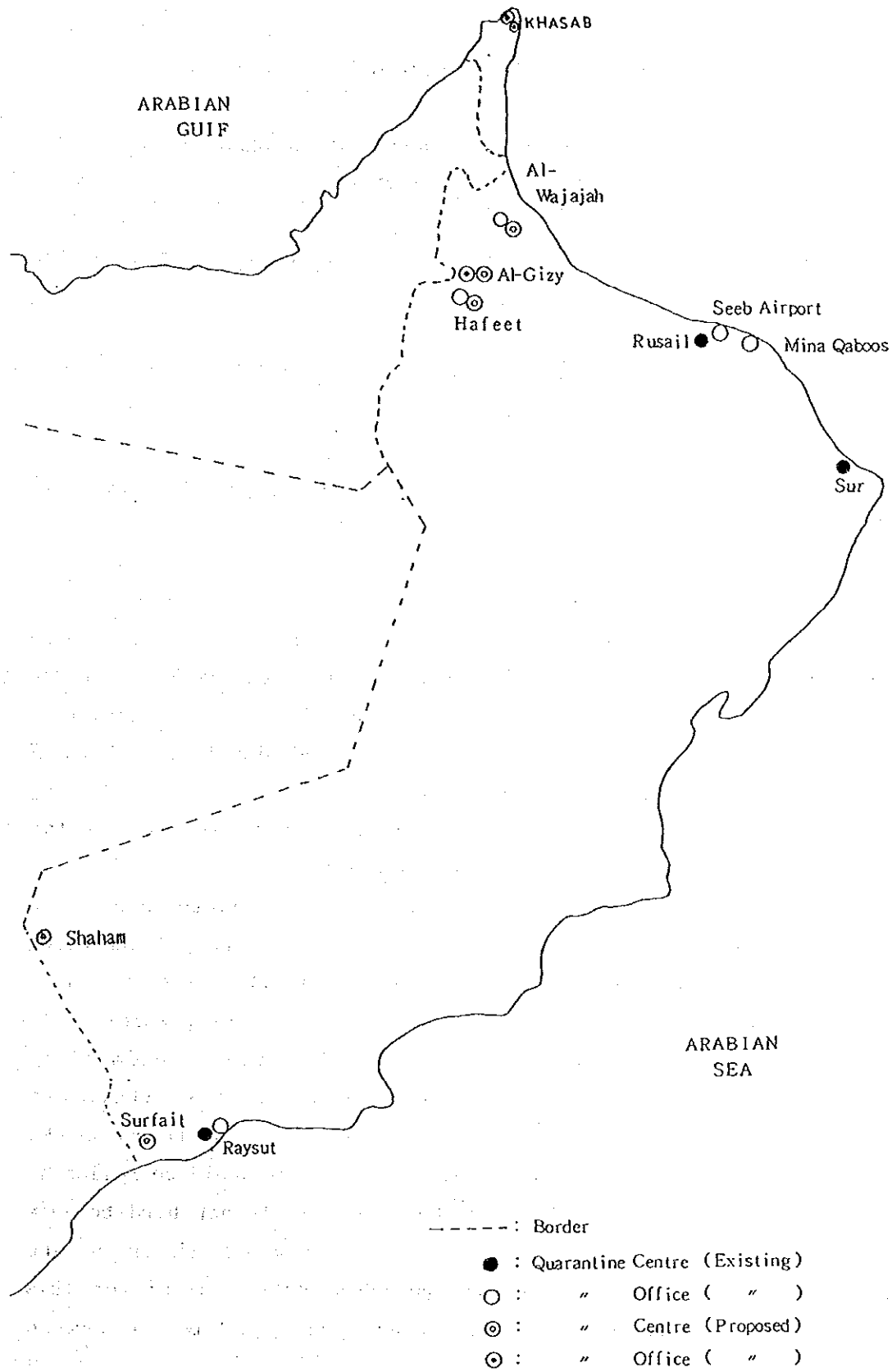
This project is composed of seven components.

#### [NLQ-1] Development of New Quarantine Project

The condition of animal hygiene in Oman has shown a tendency to improve gradually in recent years because of the implementation of vaccination programs and the establishment of quarantine facilities and increase in animal clinics, etc. Unfortunately, imported live animals from GCC countries, and especially from Turkey, which are increasing in number in proportion to the increase of meat demand in Oman, sometimes cause serious epidemics and extensive damage to animal husbandry in Oman. This project checks the entry of major diseases and helps to eliminate existing diseases in the country as undertaken by the vaccination program. For this purpose, appropriate quarantine facilities should be newly established at all border points on transportation routes between neighboring countries and Oman. Moreover, proper quarantine activities should be carried out at each quarantine station. Figure 6.3.1 and Table 6.3.1 show the location and scale of new quarantines, the refurbishment plan for existing quarantine facilities, and required staff at each quarantine station.

#### [NLL-2-1] Animal Clinic Improvement Project

Figure 6.3.1 Existing and Proposed Quarantine Stations



The responsibilities of the regional veterinary officer at the animal clinics are as follows:

- (1) to execute the disease control program in the region,
- (2) to provide daily treatment of sick animals brought to the clinic or seen during weekly visits to villages,
- (3) to conduct extension/education discussions on disease control for the farmers and livestock holders,
- (4) to give vaccinations, and encourage farmers and livestock holders to participate in such programs,
- (5) to conduct mass treatment against internal and external parasites by drenching, spraying and dipping.

In the Third Five-year Development Plan, 19 animal clinics and sub-clinics were additionally established in Oman. As a result, there are 53 animal clinics and sub-clinics now in the Sultanate. However, judging from the diagnosis area of each clinic and the overworked condition of clinic staff, it is necessary to additionally establish 7 animal clinics and 2 sub-clinics in the future. Moreover, upgrading 10 sub-clinics to clinic status and refurbishment of the Salalah Animal Hospital are necessary. At the same time, provision of adequately trained veterinary technicians in appropriate numbers is important. At present, there is a shortage of veterinary technicians in Oman. Therefore, the required number of staff for each clinic including new clinics should be supplemented as soon as possible. It is preferable that additional veterinary technicians be Omani in accordance with national Omanization policy. However, there are presently only a few Omani's who aspire to veterinary work. Therefore, qualified foreign veterinary technicians would be relied on to make up the shortage. The veterinary work is rather hard because veterinarians in Oman have to do a lot of field work in severe conditions. If there is no proper remuneration or reward for this hard work, Omanization of veterinary technicians cannot be expected to

progress. In order to encourage Omanis to become veterinarians, the necessity and the importance of veterinary work should be emphasized to students on a wide basis. Furthermore, the salary system of veterinarians should be revised. Table 6.3.2 shows required number of animal clinics and veterinary technicians etc., in each region of Oman. The increase of recurrent budget for expanding the veterinary staff is indicated later.

Moreover, veterinary technicians should be deployed more intensively in the Southern Region than in the northern Oman due to the general backwardness of animal health control and the necessity of implementing a later-mentioned project for brucellosis control program, etc. in the Southern Region.

#### [NLL-2-2] Laboratory Development

##### (1) CVIL Development

Most of the efforts in CVIL are spent on diagnosis of pathological samples collected from clinics and reports thereof to MAF. Consequently, CVIL performs little investigation and research for the prevention of livestock epidemics. Diagnostic facilities for poultry which are expected to increase in number in the future because a self-sufficiency rate of 100 % in chicken and table egg production is aimed at, remain undeveloped at this stage. In the future, to realize the elimination of serious animal epidemics, the following activities should be executed in CVIL, coupled with the improvement of facilities and increase the number of staff.

- (a) Study and research for vaccine development in order to produce vaccines effective against epidemics, especially for viral diseases and CCPP.
- (b) Execution of tests for various vaccines and drugs.
- (c) Diagnosis of pathologic samples from poultry and research for

Table 6.3.1 Quarantine Development Plan

Location	Existing			Required			Additional			Facilities Scale head/term
	Doctors	Assistants	Nurses	Doctors	Assistants	Nurses	Doctors	Assistants	Nurses	
M Port Gaboos (Office)	3	2	0	4	1	1	1	-1	1	1
M Seeb Airport (Office)	1	0	0	3	0	1	2	0	0	1
M Rusail Quarantine(Center)	1	3	0	1	1	1	0	-2	1	(5,000)
B Wajajah Border (Office-center)	3	0	0	4	0	1	1	0	1	1,000
Dh Hafeet Border (Office-center)	3	1	0	4	0	1	1	-1	1	2,000
S Sur Quarantine(Center)	0	0	0	1	0	2	1	3	2	10,000
Dh Al-Gizy Border(Office-center)	0	0	0	4	3	3	4	3	3	100
J Surfait Border (Office)	0	0	0	1	1	2	1	1	2	(5,000)
J Raysut Quarantine(Office-center)	1	1	2	2	4	4	1	3	2	100
J Shaham Border (Office)	0	0	0	1	1	2	1	1	2	100
Mu Kasab (Office- Center)	0	0	0	4	0	1	4	0	1	1,000
Total	12	7	2	29	14	19	17	7	17	

Table 6.3.2 Animal Clinic Development Plan

Region	Clinics and Sub-Clinics			Existing			Required			Additional		
	Existing	Required	Additional	Doctors	Assistants	Nurses	Doctors	Assistants	Nurses	Doctors	Assistants	Nurses
South	4	5	1	2	8	3	5	8	8	3	0	5
Batinah	3	2	-1									
North	1	3	2	2	4	3	3	6	6	1	2	3
Batinah	5	5	0									
Sharqiya	3	4	1	3	6	10	4	9	9	1	3	-1
Oman	5	5	0									
Interior	3	4	1	3	8	10	4	12	12	1	4	2
Wusta	2	2	0	2	1	2	2	3	3	0	2	1
Dahira	2	2	0	2	0	5	2	4	4	0	4	-1
Buraimi	2	2	0	2	0	0	2	4	4	0	4	-1
Buraimi	1	1	0	3	0	0	1	3	3	-2	3	3
Musandam	1	2	0									
Musandam	1	1	0	1	3	0	2	3	3	1	0	3
South Region	5	10	5	5	8	8	8	13	13	3	3	4
South Region	7	7	7improve	2	5	23	15	30	60	13	25	37
TOTAL	(2)	33	10	25	38	65	46	84	121	21	46	56
	23	29	-1									

NOTE: 1. Above numbers show clinics, below numbers show sub-clinics in each column  
2. #these numbers show veterinarians in Salalah Hospital

prevention of poultry diseases.

- (d) Production of biological materials to reduce diagnostic costs. Biological materials are being imported at present from foreign countries at high prices.

For implementation of these activities, the following items should be executed, in addition to making the best use of existing facilities.

- Establish new buildings in which there are suitable facilities.
- Increase staff at CVIL, especially technicians and specialists in virology, bacteriology and parasitology.

Furthermore, with the establishment of new facilities, existing facilities for virology should be converted to facilities for bacteriology in order to expand bacteriologic activities (especially for the study of CCPP).

Table 6.3.3 shows the facilities-development plan and staff-distribution plan for CVIL, etc.

## (2) Salalah Veterinary Laboratory

Up to now, the diagnosis of animal diseases in the Southern Region has been conducted at the Salalah Animal Hospital. However, some cases of disease were impossible to diagnose accurately there, and therefore the pathological samples were sent to CVIL for diagnosis. Due to the long distance between Salalah and Rumais (where CVIL is located), the time required for diagnosis was excessive and the execution of suitable measures against the diseases was apt to be delayed.

Economic losses due to such diseases have been rather large in the Southern Region because of this. To cope with the problem, the

Table 6.3.3 Veterinary Laboratory Development Plan

Civil Staff Plan

Section	Expert	Technician	Assistant	Attendant	Remarks	Facilities
Pathology	1	1	0	1	existing required additional	
	1	2	2	1		
	0	1	2	0		
Virology	1	1	1	0		Need New Facilities 400m <sup>2</sup> and Equipment
	3	2	2	5		
	2	1	1	5		
Parasitology	1	0	1	1		
	2	2	2	1		
	1	2	1	0		
Bacteriology	1	1	0	1		
	2	2	2	1		
	1	1	2	0		
CCPP Vaccine Development	0	0	0	0		Need new Equipment and Expansion of Facilities
	1	1	1	1		
	1	1	1	1		
Biochemistry	0	1	1	0		
	1	2	2	1		
	1	1	1	1		
Sterilization Washing	0	0	1	1	Need one more Engineer	need Technician
	0	1	2	1		
	0	1	1	0		
Laboratory Animal Unit	0	0	1	1		
	0	1	2	1		
	0	1	1	0		
Total	4	4	5	5		
	10	13	15	12		
	6	9	10	7		

Salalah Laboratory Staff Plan

Section	Expert	Technician	Assistant	Attendant	Remarks	Facilities
Parasitology	2	2	2	2		300m <sup>2</sup> Building and Equipment Infrastructure
Bacteriology	2	2	2	2		
Sterilization Washing		1 (Engineer)	2	1		
Administration				2	Clerk	
Total	4	5	6	7		



Salalah Veterinary Laboratory which has bacteriology and parasitology facilities should be established near the existing Salalah Animal Hospital. It will then be possible to make prompt diagnosis of the diseases and take the necessary countermeasures against them. As a result the economic losses caused by the disease should be reduced.

#### [NLL-2-3] CCPP Vaccine Development

The cause of CCPP (Contagious Caprine Pleuro-pneumonia) is probably of multi-Mycoplasma spp. origin. It has now been determined that Mycoplasma F38 exists in Oman. This species is very pathogenic and infectious and has been responsible for the CCPP epidemics in recent years.

The disease only occurs clinically in goats and can be acute or chronic and is manifested as pneumonia and pleurisy. It is transmitted by direct contact with an infected animal. The incubation period is three to five weeks.

In the acute form, death may occur before clinical symptoms appear, but more usually it is manifested as pneumonia with death in 3-5 days, with mortality rates from 60 to 100 percent.

Omani animal holders are very concerned about CCPP. However, there is no effective treatment at the moment. Treatment is only possible with Tylosin tartrate and to a lesser extent with Tetracyclines, although neither is very effective.

Development of an effective vaccine is urgently required. Recently a vaccine has been developed in Kenya for Mycoplasma F38 infection which has proven to be effective. However the vaccine is not yet available in commercial quantities and has a shelf life of only a few months.

Moreover, it is estimated that the vaccine would have different effectiveness according to the multi-Mycoplasma species.

As proposed in this CVIL Development Project, it is necessary for Omani livestock to develop vaccines effective against Omani epidemics.

This CCPP Vaccine Development program aims to develop a CCPP vaccine in Oman on the basis of the vaccine developed in Kenya. However, in the first stage, it is important to clarify the etiology of the disease and execute a test for the effectiveness of the Kenyan vaccine at CVIL.

The results would serve as the basis for the planned vaccine development. Subsequently a foreign expert would be engaged for actual initiation of the program for a while.

#### [NLL-2-4] National Vaccination

Since 1982, nation-wide vaccination programs have been carried out with positive results. It is important that such vaccination programs be continued to reduce animal epidemic diseases, since serious economic losses would be brought to animal husbandry if such diseases occurred. Furthermore, a lot of money would be necessary to eliminate the epidemic diseases. Vaccinations are carried out for almost the same diseases in the previous stages of the vaccination program, however CCPP should be added because of its serious impact on Omani animal husbandry. Also, in the next stage, complete nation-wide vaccinations for all livestock should be aimed at. This plan targets 100 % vaccination of all livestock in Oman by 1995.

Specifically in co-operation with extension services and veterinary services, the vaccination implementation team should make an effort to contact the animal holders in areas where the team has been unable to make contact so far.

Considering the fact that the vaccination rate for animal holders in the Southern Region has been low due to their nomadic nature, it is important that the current approach to vaccination be altered from

that of vaccination when periodic contact is made, to a program where the animal clinic is established as the base of operations with a full-time veterinarian on duty to perform vaccinations at any time. The crux to implementing such a program in the Southern Region will be the Omanization of veterinary personnel. It is important that a shift from relying on the outside consultant teams as in the past be implemented so that such vaccinations become the responsibility of the regional government entity itself. Table 6.3.4 shows the contents of the future vaccination plan.

#### [NLL-2-5] Supplies of Veterinary Drugs and Equipment

The present veterinary fee in animal clinics is only R.O. 0.1 per case for animal holders, and the remainder (balance) of the cost is covered by government subsidies.

The reduction of economic losses caused by animal diseases is one of the most important problems facing Oman livestock management, as is raising the feed self-supporting rate in order to ensure a proper margin.

The veterinary subsidy (including drug supply) should be continued until serious epidemic diseases are eliminated, and the establishment of a complete quarantine system, which will be accelerated by the above-mentioned Animal Health Improvement Project, are realized. However, gradual raising of the present veterinary fee (0.1 R.O./case) may be necessary in the future to give incentive to animal holders to improve animal hygiene conditions themselves.

Almost all of the animal clinics are under governmental operation, therefore daily veterinary activities are finished by 2.30 p.m. as a rule.

There is only one private animal clinic in Oman, located in Sohar, and there are many animal holders who visit it late at night in order to obtain treatment for their livestock. To upgrade the quality

Table 6.3.4 Contents of Planned Vaccination Program

	Current Situation	Future Plan
Sheep & Goats	PPR POX	PPR POX CCPP(additional) FMD (at least in exotic sheep & goats or temporary, emergency, ring vaccination)
Cattle	R/P	R/P
- <u>North Oman</u>	FMD (twice/year)	FMD (exotic cattle at least 2 initial doses 1 month apart and 3-4 doses per year)
- <u>South Oman</u>	R/P FMD (twice/year) B/Q Botulism BVD - 10,000 doses/year	R/P FMD (exotic cattle same as above) B/Q Botulism BVD - as now on all commercial diaries and at government request elsewhere.
	Brucella - 5,000 doses/year	Brucella (all commercial diaries)

of animal treatment in Oman in the future, establishment of private animal clinics will be effective. Therefore, a part of this subsidy should be spent to aid in establishing private clinics, for example in the purchase of drugs and materials etc.

[NLL-2-6] Brucellosis Control in the South

Brucellosis disease is a common epidemic both in animal and humans, and more than three hundred people are affected by this disease every year in the Southern Region, especially the Jabali. The problem is particularly serious because this disease's infection route is milk which is part of the main diet for the Jabali people.

It is necessary to eliminate brucellosis disease as quickly as possible in order to reduce the livestock economic losses brought on by the disease, as well as to maintain people's health in the Southern Region. Particularly, as described below, the Milk Collecting and Processing Project, it is indispensable for Jabali people to increase their agricultural income by selling fresh milk to general consumers in the future. For this purpose, the supply of sound milk is necessary and thus the elimination of brucellosis must be pursued. Therefore, the following items should be implemented under this program, with a view to the slaughter of brucellosis-infected animals.

- Periodical inspection of livestock
- Vaccination of livestock in infected areas
- Slaughter of infected animals and payment of compensation to the animal holders

The above programs and projects items in "NLL-2" should be implemented on an integrated basis to establish a proper animal health system aimed at the elimination of serious epidemic diseases.

Responsibility: MAF (including DG of Agriculture and Fisheries in Southern Region)

Timing:

Timing is as follows:

NLQ-1 Development of New Quarantines ----- For 5 years from 1991  
 NLL-2-1 Animal Clinic Improvements ----- For 5 years from 1991  
 NLL-2-2 Laboratory Development ----- For 5 years from 1991  
 NLL-2-3 CCPP Vaccine Development ----- For 3 years from 1993  
 NLL-2-4 National Vaccination ----- For 5 years from 1991  
 NLL-2-5 Supplies of Veterinary Equipment ---- For 5 years from 1991  
 NLL-2-6 Brucellosis Control in South ----- For 5 years from 1991

TIMING

Project	1991	1992	1993	1994	1995
Development of New Quarantines	_____				
Animal Clinics Improvements	_____				
Laboratory Development	----CUIL ----- Salalah Lab.				
CCPP Vaccine Development	Fundamental Research and Study in CUIL				
National Vaccination	_____				
Supplies of Veterinary Equipment	_____				
Brucellosis Control in South	_____				

Note: ---- means detail design period  
 means improvement period of facilities

Budget:

Budget is as follows:

BUDGET 16,425,000

Project	1991	1992	1993	1994	1995	Total
Development of New Quarantines	395,000	395,000	395,000	395,000	395,000	1,975,000
Animal Clinics Improvements	238,000	238,000	238,000	238,000	236,000	1,188,000
Laboratory Development	306,000	20,000	20,000	293,000	30,000	669,000
CCPP Vaccine Development			30,000	30,000	30,000	90,000
National Vaccination	1,369,000	1,595,000	1,831,000	1,971,000	2,116,000	8,882,000
Supplies of Veterinary Equipment	600,000	600,000	600,000	600,000	600,000	3,000,000
Brucellosis Control in South	129,000	123,000	123,000	123,000	123,000	621,000

(Proposal to increase recurrent budget)

\* Increased of Veterinarian Staff

As discussed in "Development of New Quarantine Project", "Animal Clinic Improvement Project", and "Laboratory Development Project", training and expansion of veterinary staff is essential to the successful operation of facilities to be established under the subject Animal Health and Disease Control Project. The budget increase for these three projects would be as follows:

Recurrent Budget:

Recurrent budget is as follows:

Project	1991	1992	1993	1994	1995	Total
Development of New Quarantines	60,000	120,000	180,000	240,000	298,000	898,000
Animal Clinics Improvements	100,000	200,000	300,000	400,000	484,000	1,484,000
Laboratory Development	73,000	114,000	155,000	235,000	269,000	846,000

## [NLE-1] Livestock Extension Development Project

### Objectives:

The extension of rational livestock-management practice among farmers is necessary to increase the productivity of Omani animal husbandry. The development of an extension system and the improvement of extension methods should be implemented in order to achieve this purpose.

### Description:

This project is composed of two components.

#### [NLE-1-1] Extension Methods Improvement Program

Obviously, the shortage of extension technicians and the shortage of veterinary technicians is a major constraint which retards modernization of Omani livestock management.

There are only 34 livestock extension technicians in existing extension centers (6 specialists and 28 assistants - in which 11 members who are now being recruited are included). These extension technicians are considerably short of covering the extension services for the 56,500\* animal holders in Oman.

\*(Source: Range and Livestock Survey, GRM; 1982)

This increase in the number of extension staff should be executed in the early stages. However, the shortage of manpower (especially of technicians) is a serious problem in all areas of Oman.

Therefore, the increase in the number of extension staff will not be easy. Moreover, even if the above-mentioned increase in the number of extension staff could be attained, execution of a complete, careful and direct extension service to all animal holders in Oman would still be rather difficult. Under these conditions, in order to enhance the extension-service effect, the following extension methods should be



developed and adopted.

(1) The demonstration of modern equipment

The demonstration of such modern equipment as glass cutters, portable scales, milking machines, etc. should be performed for the benefit of key farmers (animal holders). Furthermore, such equipment should be lent to key farmers as a step in encouraging their use among all farmers in general.

(2) Visually effective extension methods

(a) Print extension pamphlets which are mainly composed of pictures and distribute them to animal holders.

(b) Make extension video programs and show them to farmers.

(c) Telecast extension programs on television.

(3) Establish demonstration units in the Southern Region

Especially in the Southern Region where the shortage of extension staff is more serious, it is important to establish demonstration farms by giving intensive extension, instruction and facilities to selected farms for the purpose of demonstrating intensive management techniques to local animal holders.

For example, to establish demonstration farms for the following:

- Cross-bred cow holdings, and sheep or goat fattening holdings in the Salalah plain
- Poultry and milk marketing management in Jabal
- Beef cattle fattening, introduction of shed feeding to traditional Bedouin management methods in Nejd

[NLE-1-2] Training Center Development Project

An important future theme in extension service is the upgrading of the abilities of extension staff as well as the expansion of the number of staff. Most training programs have been conducted as on-service training in various institutions related to livestock. However, judging from the existing number of livestock technicians, both trainers and trainees, most of whom are technicians in some institutions, are apt to be busy just conducting routine work. The full effects of the training may not be achieved under these conditions. To obtain the desired training effect, concentrated training programs concerning specific subjects should be conducted, even for short periods of time, at selected facilities. Under this plan, new training centers would be established in Rumais and Salalah, where both the research center and veterinary laboratory are located, providing a lot of reference materials for training, and well-planned training curricula should be offered at the centers annually. Training centers would be constructed for a maximum of 20 trainees in one training course.

Responsibility: MAF

Timing:

Timing is as follows:

NLE-1-1 Extension Methods Improvement-----For 5 years from  
1991

NLE-1-2 Training Center Development-----1991: Rumais  
1994: Salalah

TIMING

Project	1991	1992	1993	1994	1995
Extension Method Improvement	-----				
Livestock Training Center Development	<u>Rumais</u>	<u>Routine Training</u>	<u>Salalah</u>	-----	

Budget:

Budget is as follows:

BUDGET	482,000						
Project	1991	1992	1993	1994	1995	Total	
Extension Method Improvement	30,000	30,000	30,000	30,000	30,000	150,000	
Livestock Training Center Development	166,000			166,000		332,000	

(Proposal to increase recurrent budget)

\* Expansion of Extension Staff

There are 43 agricultural extension centers in Oman, and only 34 livestock-extension technicians in these centers (6 specialists and 28 assistants -- in which 11 members who are now being recruited are included). This number of extension technicians is considerably short of being able to cover extension services for 56,500\* animal holders in Oman.

\*(Source: Range and Livestock Survey, GRM, 1982)

For extension of rational management methods among traditional livestock holders and to reform traditional management attitudes of animal holders, a careful and intensive extension service is indispensable in the future.

Under this program, active recruitment of graduates of schools, such as Nizwa Agricultural Institution, is planned and at least an additional 41 specialists and 60 extension officers would be hired, trained and deployed by the year 1995.

Combined with the increase of extension staff, vehicles should be purchased for smooth execution of extension services. Table 3.3.5 shows hiring and deployment plan for extension staff and vehicles.

Recurrent Budget:

Recurrent Budget is as follows:

Project	1991	1992	1993	1994	1995	Total
Extension Staff Development	95,000	190,000	275,000	380,000	475,000	1,415,000
Livestock Training Center Development	33,000	33,000	33,000	66,000	66,000	231,000

Table 6.3.5 Required Number of Extensioners and Vehicles

Number of Livestock Specialists and Vehicles (in Extension Center)

Region Center (Required C.)	Staff			Vehicles Required	Remark
	Existing	Required	Additional		
South Batinah 7	1 3	7 28	6 25	14	1 Extensioner by each 300 animal holders
North Batinah 6	1 3	6 24	5 21	12	
Sharqiya 6	1 5	6 24	5 19	12	
Oman Interior 8	1 9	6 24	5 15	12	
Wusta 3	1 3	2 6	1 3	3	
Dahira 4	1 4	6 24	5 20	12	
Buraimi 3	0 0	2 6	2 6	3	
Musandam 2	0 1	2 6	2 5	3	
South Region 5	0 0	10 46	10 46	23	
TOTAL 44	6 28	47 188	41 160	94	

NOTE : 1. Above numbers show specialists, below numbers show advisors.

[NLR-1] Livestock Research Development Project

Objectives:

The implementation of research programs which directly connect with increased productivity for animal husbandry are essential. The upgrading of the research implementation structure is necessary in order to effect smooth execution of various research programs.

Description:

This project is composed of two programs.

[NLR-1-1] Development of Livestock Research Centers

There are 3 animal research centers in Oman. Modernization of 2 of these, namely the Wadi Quriyat Center and the Salalah Center, has just about been completed. Furthermore, the modernization of Rumais Center is now in progress. There are many subjects which require study and research for development of livestock industry in Oman.

Taking into consideration regional conditions and the character of each research center, research subjects which should be studied urgently are as follows:

(1) Rumais Research Center

(a) Research on securing and developing feed resources.

(It is necessary to co-ordinate with the activities of the Agriculture Research Center)

(i) Execute cultivation tests for fodder crops, such as southern-type grasses and legumes, fodder trees and spineless cactus, etc.

(ii) Measure the nutritive value of various feed materials such as;

- the above (item (i)) fodder crops
- existing by-products, for example dates, dry fish, banana stems, coconut, etc.
- potential feed materials, for example poultry litter, petrochemical by-products, etc.

(b) Research on animal improvement

- (i) Measure productivity of exotic, domestic and cross-breeding types of each livestock.
- (ii) Develop animal selection and improvement.
- (iii) Develop and execute artificial insemination methods.

(c) Research on improvement of animal feeding and management

- (i) Measure the nutrient requirement of each livestock at various stages of raising.
- (ii) Develop effective feeding methods.
- (iii) Develop modern management methods for grazing, coitus, milking, fattening and health control etc.

(2) Wadi Quriyat

Breeding, selection and improvement of goats and sheep, and supply of superior breeding stocks to farmers.

(3) Salalah

(a) Research on securing and developing feed resources

- (i) Execute cultivation tests for various fodder crops, and measure

their nutritive value.

(ii) Measure the livestock carrying capacity of Jabal rangeland and execute a field cultivation test for fodder trees and other potential crops for conservation and development of the carrying capacity.

(b) Research on animal improvement

(i) Measure productivity of domestic and cross-breeding types for each livestock in the Southern Region.

(ii) Develop animal selection and improvement, and supply superior breeders to farmers.

(iii) Develop and execute artificial insemination methods.

(c) Research on improvement of animal feeding and management

(i) Develop management methods for Jabal rangeland.

(ii) Execute beef cattle fattening tests, and develop fattening techniques.

Particularly for those research items at the Salalah Center, priority should be given to regeneration and conservation of rangeland, which is a precious natural feed resource in Oman.

As mentioned above, the modernization of research centers is now in progress. However, present planned facilities are not sufficient to implement all the above research items. All of these are important to accelerate the modernization of Omani animal husbandry and increase the productivity of livestock. The results of this research should promptly be reflected in productive activities through extension services.

Therefore, each research center should be developed and improved

flexibly according to the progress of its research activities. Under this program, in addition to the budget for hiring staff for the Rumais Research Center which is now in the process of being modernized, the budget for developing facilities and equipment for each research center is planned to correspond with the level of development of research activities at each center. Figure 6.3.3 shows each centers' structure.

#### [NLR-1-2] Research Centers Management Consultancy

As described above, the modernization of research center facilities has either just been finished or will be completed in the near future, and research activities should be actively promoted at this stage. The above-mentioned research items for each center are rather novel subjects for Omani researchers and the execution of research in modernized facilities will also be rather unfamiliar for Omani researchers. Under these conditions, some consultancy services are necessary in order to support and stabilize the research activities and new management systems at each center during the initial stages. In this program, consultancy services which are to be conducted by experienced foreign researchers is planned for 5 years.

The important point in the implementation of this program is that the training of Omani researchers should be actively pursued with a view to them taking over in the future the research activities of foreign researchers. For this purpose, the training of Omani staff should be stressed as well as Omani execution of the day to day operations of the centers.

The required consultants under this program are as follows:

(1) Rumais Research Center

- (a) Agronomist in charge of research on securing and developing feed resources.



- (b) Artificial insemination expert (co-ordinator of research) in charge of development and execution of artificial insemination methods.
- (c) Dairy expert in charge of research on animal improvement and improvement of animal feeding.
- (d) Farm manager in charge of management of experimental farm.
- (e) Veterinarian in charge of health control of livestock at the experimental farm.
- (f) Training instructor.

(2) Wadi Quriyat

- (a) Animal breeding expert in charge of breeding, selection and improvement of goats and sheep.
- (b) Farm manager in charge of management of breeding farm.
- (c) Veterinarian in charge of health control of livestock at the breeding farm.

(3) Salalah

- (a) Agronomist in charge of research on securing and developing feed resources.
- (b) Ruminant expert in charge of research on animal improvement and improvement of animal feeding.
- (c) Livestock economist in charge of research on improvement of livestock management (especially regarding monitoring of Jabal rangeland management etc.).
- (d) Farm manager in charge of management of experimental farm.

(Note: These experts are not included in the on-going staff requirement application proposed by MAF)

Responsibility: MAF

Timing:

Timing is as follows:

NLR-1-1 Development of Livestock Research Centers---For 5 years from  
1991

NLR-1-2 Research Centers Management Consultancy-----For 5 years from  
1991

**TIMING**

Project	1991	1992	1993	1994	1995
Development of Livestock Research Centers					
Research Centers Management Consultancy					

Budget:

Budget is as follows:

**BUDGET**

4,050,000 R.O.

Project	1991	1992	1993	1994	1995	Total
Development of Livestock Research Centers	400,000	400,000	400,000	400,000	400,000	2,000,000
(Rumais)	150,000	150,000	150,000	150,000	150,000	750,000
(Wadi Quriyat)	100,000	100,000	100,000	100,000	100,000	500,000
(Salalah)	150,000	150,000	150,000	150,000	150,000	750,000
Research Centers Management Consultancy	437,000	392,000	392,000	392,000	437,000	2,050,000

[NLM-1] Livestock Marketing Improvement Project

Objectives:

This project aims at a smooth increase in the distribution amounts of domestic livestock products by means of addressing the following:

- The reduction of the price gap between domestic livestock products and imports.
- The enhancement of the quality of domestic livestock products.
- The development of the processing and marketing facilities for livestock products.

Description:

Addressing these issues is very important in order to increase supply and distribution amounts of domestic livestock products to Omani consumers in the future. Under this Master Plan, the following seven projects and programs should be implemented in an integrated manner, and in co-ordination with other projects such as the Rangeland Revegetation Project in the south and the later-mentioned Small Farm Development Support Project, etc.

[NLM-1-1] Company for Livestock Products

As described under Rangeland Revegetation Project in the south, the nutrient supply in the rangelands in southern Jabal, which is the main production area for Omani beef cattle, has been declining in recent years due to the rapid increase of the number of grazing livestock. As a result, a significant increase in purchased feed marks a major constraint in the livestock management in southern Oman.

These conditions are gradually becoming more and more serious.

To improve them, it is necessary to reduce the herds of grazing livestock to the appropriate size for the proper management and conservation of precious rangeland resources.

Up to now, some projects have been executed in order to address this problem, however, satisfactory results have unfortunately not been achieved. Expansion of the distribution outlets for overgrazing livestock is one effective means of resolving this problem.

However, this difficulty is not only concerned with marketing (distribution) but also other sectors such as production, processing, selling, and consumption. The countermeasures for this problem should be balanced and integrated, and based on thorough discussion and dialogue among the concerned parties in the above-mentioned various fields. The approach, for example, would be:

- (1) Production ----- To reduce production costs and to enhance the quality of livestock products so as to make them attractive to the consumer
- (2) Processing ----- To add value to livestock products by processing them so as to make them attractive to the consumer.
- (3) Selling (Price adjustment) ----- To fine-tune the market by protection through adjusting import duties for imported products or by subsidizing the distribution process so as to minimize the price difference between local products and imported ones, and thereby make local products more competitive and attractive to the consumer.
- (4) Consumption ----- To promote consumption of local livestock products by advertising, etc.

In addition to the above, it is necessary to change traditional attitudes in the Jabal regarding animal husbandry, as they still maintain many head of cattle in spite of the negative profit from cattle-raising. As described above, the balanced integration of the

various sectors involved must be achieved for an equitable solution to the issue.

For this purpose, a public corporation, the Company for Livestock Products and Marketing, should be established which has the function of integrating marketing activities for livestock products in the south. Under this plan, a semi-autonomous, government-funded body would be established and this entity would aim at addressing various marketing problems in the Southern Region, such as overstocking of cattle in Jabal, through the implementation of the following items.

- (1) To integrate and balance the interests among the producer, processor, trader, retailer, consumer and government sectors regarding livestock.
- (2) To form and implement a plan for market adjustment.
- (3) To form a plan for establishment of marketing facilities which serve the interests of the public, such as the projects for Beef Cattle Fattening Farm and Milk Collecting and Processing Plant, etc., and provide government management for them or instruct the private sector in their management.
- (4) To promote consumption of local products.
- (5) To implement surveys and studies to promote marketing.
- (6) To finance a loan to the private sectors related to above items (1) - (5).

The establishment, structure, functions, authority, activities and management of the above entity should be carefully planned on the basis of the feasibility study now being conducted by the Omani government. However, the principal management policies of this entity are that:

- It be initially established by finance from the government and

private sectors (The finance sharing ratio between government and private sector is assumed to be 50 : 50 at this stage).

- It be managed jointly by the government and private sectors with subsidy assistance at the initial stage.
- It achieve financial independence at a later stage on the basis of the revenue from the following projects for Public Beef Cattle Fattening Farm, etc.

#### [NLM-1-2] Cattle Fattening

An appropriate reduction in the number of livestock to meet the capacity of the rangeland in the Jabal area is vital in order to develop the livestock in the entire Southern Region. The economic evaluation of cattle breeding in the Jabal area suggests a negative profit for livestock management when the proportion of the purchased feed exceeds 28 percent (nutritionally) of the entire feed requirement for livestock (see Table 6.3.26). Therefore, the following are urgently required:

- A precise estimate of the present number of livestock and the carrying capacity of the rangeland.
- A reduction in the number of livestock to meet the carrying capacity.
- Feeding of livestock with an appropriate combination of self-supplied and purchased feeds.

Since 1984, cattle, which are the major livestock in the Jabal area, have been purchased from time to time through a government subsidy program, in order to reduce the number of cattle. However, these reductions have not been successful. This has been due to the following reasons:

(1) Farmers have increased the number of cattle which might be sold at a good price by selling only old cattle, because the purchase price set by the government was considerably higher than the free market price.

(2) The increase in the number of livestock exceeded the number purchased by the government. Moreover, there was low demand for the animals in the market, except for those purchased by the government.

The reason for the lower demand is believed to be that merchants did not want to purchase cattle because they were less attractive, both in price and quality. The same reason explains the limited number of livestock purchased by the government; in other words, less demand in the market finally limited the government purchasing. In order to promote a reduction in the number of cattle in the future, it will be necessary to expand demand by upgrading the marketability of local cattle.

Furthermore, if such reductions are successfully achieved, the Jabal area will still be the area where the majority of cattle are raised in Oman. Therefore, upgrading the transportation and marketing of cattle in the Jabal area is vital to ensure a stable share of the domestic market. It is, therefore proposed in this Master Plan to:

- Establish a public cattle fattening farm which would supply high quality and low-priced beef cattle to consumers.

- Purchase calves from the livestock holders in the Jabal area, and fatten them effectively on the above stock farm, or redistribute them to farmers for fattening.

- Sell them at low prices after upgrading the meat quality.

(This farm probably exhibits a price control function to some extent, similar to the on-going cattle de-stocking subsidy -- NLL-2-5, and also a function as a cleaning center for cattle marketing.)

It is further proposed that fattening on the stock farm be started with a fairly small number of calves in the initial stages, namely in the form of a pilot farm, and after that gradually increase the number year by year according to the Jabali farmer sales trends. The reduction of cattle is to be done in combination with a government subsidy as described later (NLL-2-5). It is proposed that the initial investment and running costs be financed jointly by the government and private sectors. The finance would be done through the above-mentioned quasi-government entity. However, the management of this farm where the number of cattle reaches the targeted scale should be planned so as to operate using a self-supporting accounting system to be implemented by the entity discussed above.

In addition to the impact discussed above, the establishment and management of this public farm will be expected to give incentive to farmers to initiate small-scale cattle fattening. The method of establishing and operating this farm would be planned by the above-mentioned entity. The initial investment and running cost sharing ratio between government and private sectors is assumed to be 50 : 50 at this stage. The location of the farm would be in Nejd where agricultural development potential is large because of an existing large amount of fossil water.

#### [NLM-1-3] Cut Meat Processing

In order to expand distribution outlets for cattle in the Southern Region, it is necessary to process produce to render it attractive to the consumer. Given the considerable distance of over 1,000 km from the Southern Region to the major consumption area in and around the capital, it is essential that produce enter the distribution system in a form whereby freshness and sanitation can be preserved, and in which it can be transported at low cost.

Although it is generally considered appropriate for the private sector to bear the cost of construction and operation of processing facilities, the survey conducted by the Australian consultant GRM, "An



Assessment of the Viability of Manufacturing Processed Meat, 1988", concludes that the viability for such in the private sector at present is low.

A feasibility study is warranted to identify specifics regarding the viability of establishing cut-meat-processing facilities in the Southern Region, particularly in light of the proposed Beef Cattle Fattening Project discussed above. Nevertheless, it is apparent that a certain minimal level of capacity for meat cutting and chilled transport will be necessary for major distribution of beef northward.

Under this project, the above-described Company for Livestock Products will oversee the construction and initial stage-management of slaughter and butcher facilities, with the same to be transferred to the private sector in the future. The capacity of envisioned facilities would be 1,500 tons/year, equivalent to 2/3 of the future fattened beef production in the Southern Region (in this plan's estimation).

The initial investment and running cost sharing ratio between government and private sectors is assumed to be 50 : 50 at this stage.

#### [NLM-1-4] Milk Collecting and Processing Facilities

100 % self-sufficiency in fresh milk is proposed by the year 2000, and the outskirts of Salalah and the capital area are regarded as the main potential areas of future increased milk production under this Master Plan. The broad supply of fresh milk to the general consumer requires milk collecting and processing facilities. Primarily, the establishment and management of these facilities would be considered the responsibility of the private sector, however, in Oman only large-scale commercial dairies and the Oman National Dairy Company have actual experience in the management of such facilities. Moreover, the private sector is not likely to participate in milk marketing where raw milk is collected from small dairy farms because of following reasons:

- (1) No guarantee of a stable supply of raw milk.
- (2) Concerns about quality and hygienic condition of raw milk.
- (3) Expected smaller marketing margin due to additional milk collecting and testing costs.  
(It is necessary to collect milk from each farm and test it separately)

Under these conditions, the government (MAF) should take part in or conduct the development of milk-marketing facilities to some extent. Under this plan, therefore, the establishment of milk-marketing facilities by government initiative is proposed in southern and northern Oman, respectively.

(Southern Region)

In the Southern Region, there are relative concentrations of dairy cattle raising in Salalah and Jabal. Therefore, from the view point of the collection of raw milk, the conditions for establishing milk-marketing facilities are satisfied in these areas. The effects of the establishment and management of milk marketing facilities in the Southern Region are as follows:

- (1) Increased income for dairy cattle holders is possible through selling surplus milk to the milk-marketing facilities.
- (2) Coupled with item (1), cattle holders would realize the importance of cows (breeders), and a regular income from the sale of surplus milk may encourage farmers to cull out unproductive cows and male calves, leading to a measure of de-stocking and eventually increased feed availability for the remaining stock (especially in the Jabal area).
- (3) In order to increase milk yields from breeding cows, it is necessary to wean or cull nursing calves as quickly as possible.

This would contribute to de-stocking of overgrazing cattle in Jabal.

- (4) Contaminated milk is not accepted by milk marketing facilities; therefore, farmers would aim at supplying hygienic raw milk. This will bring about the improvement of animal health, and as a result have a positive impact on the hygiene of people in the south because of the reduction of brucellosis disease, etc.

A feasibility study on the establishment of these facilities was conducted by GRM in 1984 and their viability (to be operated mostly by the private sector) was recognized as IRR 13 %. The cost estimations of the study were revised in 1988 so that estimated investment cost in 1988 was twice that in 1984. On the basis of these figures the viability of the facilities (to be operated by the private sector) would be assumed to have declined drastically because of the unchanged price of milk during the intervening 4 years. However, as described above, the establishment of the facilities would have a great impact on the improvement of animal husbandry in the south, and therefore the government should take part in the establishment of such facilities.

It is proposed that the initial investment and running cost be partially subsidized by the government through the Company for Livestock Products, which would then instruct the private sector in the management of the facilities. Upon achievement of stable operation, management of the facilities would be transferred to the private sector (commercial dairy farms, such as Dhofar Cattle Company) using a self-supporting accounting system.

The establishment and management plan of the facilities should be carefully examined again before initiating this project.

The initial investment and cost/sharing ratio between government and private sectors is assumed to be 50 : 50 at this stage.

Moreover, steady progress of the Brucellosis Control Program and other animal health and disease control projects, as well as the

Artificial Insemination Service Project, which will accelerate dairy cow improvement are very important for stabilized milk-marketing-facilities management. Therefore, implementation of these projects should be coordinated with this Milk Collecting and Processing Project.

(Northern Oman)

In northern Oman, the Oman National Dairy Products Company is collecting milk from dairy farms located in the outskirts of the capital area, and processing and selling it to retailers on a trial basis. This pilot project has proven to be profitable due to the existing milk-processing capacity of Oman National Dairy's facilities. Under this Master Plan, 100 % self-sufficiency in fresh milk is aimed at, and accordingly, an increase of milk production is planned. In this case, new milk-processing facilities will be required in parallel with facilities for the increase of milk production. Feasibility studies for the establishment of new milk processing facilities which collect raw milk on a broad basis from smaller dairy farms have not been conducted except in the Southern Region. Based on the Livestock Marketing Survey, a feasibility study regarding the establishment of new milk-marketing facilities is recommended. This study would clarify the role of government and private sectors regarding the establishment of those. Under the present conditions, it appears that private sector capital will not gravitate naturally at this point into milk collection and processing.

Accordingly, the government is expected to play some role in collecting milk in the future. It is proposed in this Master Plan that the government and private sectors jointly establish five collection centers, strategically located throughout the project area (outskirts of the capital area). Dairy farmers would deliver raw warm milk to these collection centers, where it would be measured, tested and chilled before being transported to the processing plant for pasteurization and packaging. The private sector would be in charge of transporting the milk from collection centers to the processing plant, and afterwards. The milk storage capacity of each collection

center would be from 2 to 3 tons/day according to the supply demand prospect of fresh milk in the year 2000. The establishment and management plan for the collection centers should be carefully prepared. The initial investment cost sharing ratio between the government and private sectors is assumed to be 50 : 50 at this stage. A conceptual diagram of this plan is as shown in Figure 6.3.2.

#### [NLM-1-5] Hides and Skins Development

The hides and skins of cattle, sheep, goats and camels were traditionally an essential raw materials in the manufacture of many domestic and personal articles. However, they have ceased to play such an important role since cheap imported plastic and metal alternatives have become available. These products, nevertheless, remain a potentially valuable resource which could be exported or utilized in the manufacture of leather products in Oman. The current situation, where an estimated 95 percent of salable hides and skins are thrown away along with unused offal, represents a significant loss to the economy. Moreover, generally the hides and skins of animals in tropical areas are thin and high quality, so Omani livestock hides and skins are expected to have potentially high value. A feasibility study for hide and skin collection and processing facilities was conducted in 1984 by GRM, and revealed the viability of creating such facilities (In the case of them being operated mainly by the private sector in co-operation with MAF, IRR was 45%). To earn foreign exchange by exporting hide and skins materials is expected to be significant for the country's economy.

To date, the private sector has not participated in the marketing of hide and skins because most animals are slaughtered by families in their own homes for family consumption, and therefore hides and skins production is widely dispersed, making it impossible to collect high quality and uniform hide and skin raw materials easily.

Because of these conditions, the government should take some initiative to establish and manage hide and skin collection and

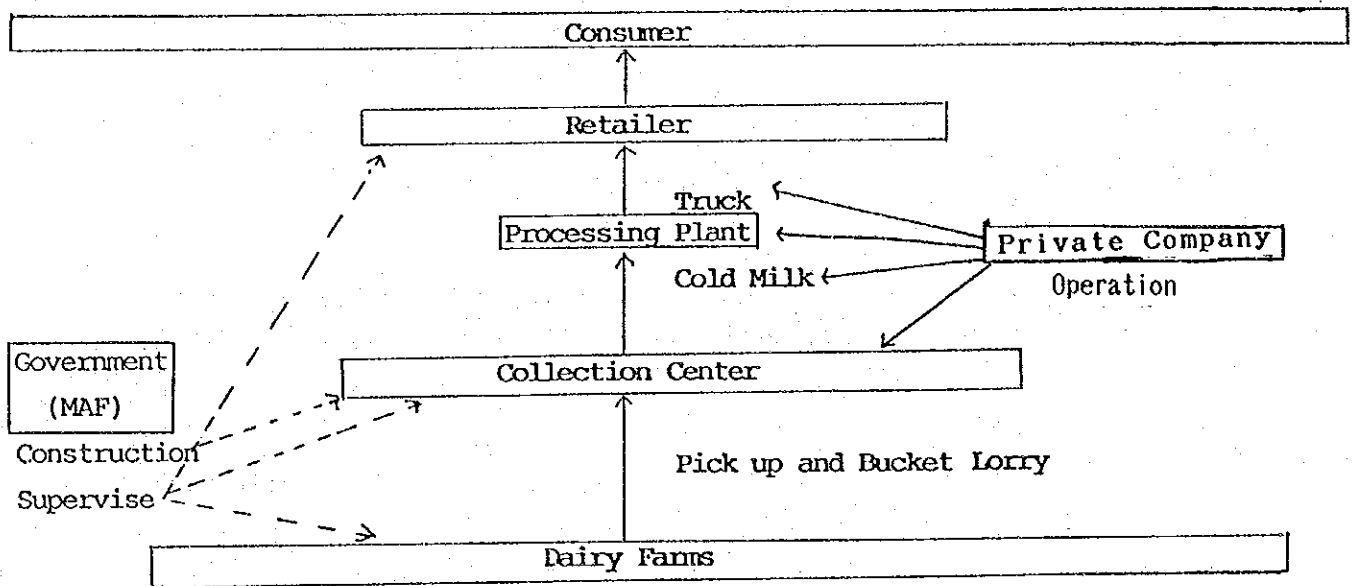


Figure 6.3.2 Proposed Milk Collecting and Processing System in Northern Oman

processing facilities in co-ordination with the progress of abattoirs (centralization of raw material production). It is proposed under this Master Plan that initial investment and operation cost be partially subsidized by the government through the Marketing Company. After achieving stable operation, the management of the facilities be taken over by the private sector. The following are considered to be the impact of establishing the facilities:

- (1) The facilities will accord value to a product which is presently regarded as waste, and will build up a trade in it which will be of economic benefit both to the individuals concerned and to the country.
- (2) The increase of farmer income will be possible through selling presently unused hides and skins to the said facilities.
- (3) In parallel with the progress of item (2), external parathytologic disease control is essential for producing high quality hides and skins. Therefore, the improvement of animal health would be promoted in this aspect.
- (4) By upgrading hides and skins, the facilities will ensure that a supply of good quality raw material is locally available for the leathercraft industry, which already exists on a small scale. Moreover, this will provide an incentive to initiate other leathercraft industries.

Nevertheless, the details of establishment and a management plan for the facilities should be examined again in a future study before project implementation. The initial investment and operation cost sharing ratio between government and private sector is assumed to be 50 : 50 at this stage.

#### [NLM-1-6] Cattle De-stocking Subsidy

The cattle de-stocking subsidy which is being executed under the

control of PAMAP should be continued until the purchase of beef cattle from Jabal by the above-mentioned feed lot farm achieves a stable level. In implementing this cattle de-stocking subsidy, the establishment of purchase price from Jabal and selling price to traders are the central issues. Therefore, basic policies in this regard are as follows:

- (1) The government purchase price from Jabal should be set so as not to stimulate excessively the desire of animal holders to increase their cattle herds, and also so as not to disturb the desire of animal holders to sell calves.
- (2) The government selling price to traders should be set so as to be sufficiently competitive at the retail level. In setting the selling price, it is necessary to estimate the competitive ability of Dhofari cattle beef on the basis of accurate estimation of the beef quality and its value on the consumer market.

In setting the selling price, it is necessary to ascertain the competitiveness of Jabal beef on the domestic market. This could be achieved by evaluating the quantitative value of Jabal beef in general on the consumer market, as well as the specific market value for the various possible preparations such as warm, chilled, frozen, etc.

In this regard, a more detailed feasibility study is necessary. Based on the existing PAMAP plan, the following prices are proposed under this plan.

- Purchase price: R.O. 1.0 /live weight kg
- Selling price: R.O. 0.7 /live weight kg  
(slightly lower than the existing PAMAP price)

A budget for purchasing 10,000 head of cattle per year (this figure is the average for the past 6 years) is proposed under this plan.



For effective cattle de-stocking in southern Jabal, it is necessary to implement this project in an integrated manner. The projects which are mentioned above, i.e. Rangeland Revegetation Projects, Company for Livestock Products, Cattle Fattening Farm Project and other related subjects should be implemented and integrated with this Cattle De-stocking Subsidy Project.

The cattle de-stocking subsidy would be implemented under the jurisdiction of PAMAP. However, after the establishment of the Company for Livestock Products, the said public corporation would control the subsidy scheme (until 1995).

#### [NLM-1-7] Marketing Promotion

In order to develop the livestock industry in Oman, it is necessary to improve marketing facilities and distribution methods, including the establishment of abattoirs, milk-processing facilities, egg-packing facilities and the introduction of chilled transport. It is also important to enhance livestock-product quality and minimize production costs. Generally, the gate price of local livestock products is higher than the price of imports.

This fact reflects the large handicap on local products compared with imports at the retail level. Large-scale traders do not participate in the local livestock market because of its smaller distribution margin. This may be the main reason why the market for local livestock remains rather small in scale, and retards development of marketing facilities.

Under these conditions, the government (MAF) should improve the marketing facilities and distribution methods to some extent in order to promote marketing.

The principal governmental policies for marketing promotion are proposed as follows:

(ITEM)

(RESPONSIBILITY)

(1) Red Meat

Development of abattoirs .... Capital, regional and Dhofar Municipalities are responsible for the establishment of abattoirs as in the past, and the establishment plan for abattoirs corresponds well with the future forecast for red meat supply.

(2) Milk

Development of Milk ..... As described in the above Collecting and Processing facilities section, MAF and the private sector would jointly play a role in this development.

(3) Table egg

Egg collection..... The private sector should assume responsibility for the establishment of egg-packing facilities since domestic eggs are competitive with imports in price and freshness. However, daily collection of eggs from small layer farms would be the work of PAMAP, coupled with the collection of vegetables, fruits and other crops (in some areas the same vehicle can be used).

(4) Poultry Meat

Meat-processing ..... These can be promoted by relying facilities mainly on the private sector. However, the collection of the birds would be the joint work of

MAF and private sector.

(5) Hides and Skins

Development of hide and skin collection and processing facilities ..... As described above, MAF and the private sector would play a role respectively in this development.

In addition to the items above, in parallel with the increase of domestic livestock-product supply, the promotion of their consumption will be necessary in the future. For this purpose, advertisements and product indications (production area, date, etc.) should be well-supported by the government initially.

Under this Marketing Promotion Project the following would be carried out:

- Purchase egg-collection trucks and assign them to PAMAP
- Purchase bird-collection trucks and assign them to the private sector
- Implement advertisements for domestic livestock products (especially poultry products, beef and mutton)
- Instruct farmers and concerned commercial companies in marketing methods

Responsibility:

MAF, DG of Agriculture and Fisheries in the Southern Region and the newly established company have the responsibility for the above-mentioned activities.

Timing:

Timing is as follows:

NLM-1-1 Company for Livestock Products-----For 7 years from 1991  
 NLM-1-2 Cattle Fattening-----For 5 years from 1994  
 NLM-1-3 Cut Meat Processing-----For 3 years from 1994  
 NLM-1-4 Milk Collecting and Processing-----For 6 years from 1991  
 NLM-1-5 Hides and Skins Development-----For 3 years from 1995  
 NLM-1-6 Cattle De-stocking Subsidy-----For 5 years from 1991  
 NLM-1-7 Marketing Promotion-----For 5 years from 1992

TIMING

Project	1991	1992	1993	1994	1995
Company for Livestock Products	Preparation				
Cattle Fattening	F/S and D/D		Pilot Project		
Cut Meat Processing	F/S and D/D				
Milk Collecting and Processing	Preparation				
Hides and Skins Development	F/S and D/D				
Cattle De-stocking Subsidy	Under PAMAP		Under COMPANY		
Marketing Promotion					

Budget:

Budget is as follows:

BUDGET 6,371,000

Project	1991	1992	1993	1994	1995	Total
Company for Livestock Products	50,000	866,000	200,000	200,000	200,000	1,516,000
Cattle Fattening				50,000	130,000	180,000
Cut Meat Processing				171,000	316,000	487,000
Milk Collecting and Processing	25,000	211,000	88,000	729,000	108,000	1,161,000
Hides and Skins Development					192,000	192,000
Cattle De-stocking Subsidy	500,000	500,000	500,000	500,000	500,000	2,500,000
Marketing Promotion		84,000	84,000	84,000	84,000	335,000

## [NLL-3] Livestock Input Company Project

### Objective:

A stable supply of concentrated feed and breeder birds will be essential for expanding animal husbandry and achieving the production targets under the project. Towards this end, it is recommended that a public corporation, hereinafter to be referred to as the Livestock Promotion Corporation, be established to provide such support, as well as to encourage and promote increased participation of private capital in this sub-sector.

### Description:

The proposed Livestock Promotion Corporation (named the Livestock Input Company) would be a joint public and private sector entity aimed at providing initial investment in production facilities and initial farm management, with management to shift totally to the private sector upon achieving a stable level of operation. Specifically, the public corporation would focus on two areas of activity: the supply of concentrated feed, and the supply of breeder birds. It is anticipated that the entity would provide incentive for increased private capital flow into these two areas.

The reasons for focusing government support on the stable supply of concentrated feed and breeder birds are as follows:

#### (1) Concentrated Feed

Under the 10-year Master Plan, achievement of 100 % self-sufficiency in chicken, table eggs and fresh milk, as well as around 50 % self-sufficiency in red meat are considered feasible. To attain this, a minimum increase of 4,000 ha of feed-crop cultivation and an additional supply of more than 220,000 tons of concentrated feed is necessary (see Table 6.3.6).

Table 6.3.6

Required Concentrate Feed in 2000

Required Amount(2000)-----		436,416 Ton/Year	
Existing Production Facilities		Planning (Existing)	Required Additional Production
Oman Flour Mill	60,000	30,000	Ton/Year
Dhofar Cattle Feed	60,000	60,000	Ton/Year
New Facilities-----		226,416 Ton/Year	

At present, the domestic supply of concentrated feed already shows signs of being insufficient, and the existing Oman Flour Mill Company and the Dhofar Cattle Feed Company already have plans to expand their concentrated feed-production facilities. However, the additional production capacity thus achieved will fall short of the requirements under the project, and construction of new facilities will be necessary.

From the standpoint of effective use of available resources, dates residue, date palm leaves, dried fish, etc. are considered as promising sources of raw material for concentrated feed production. In line with this, focus should be given to the construction of new facilities capable of converting the above raw material into the desired feed.

Generally, the construction and operation of such facilities would be the responsibility of the private sector, and the feasibility of such is the conclusion of the "Feasibility Study for Establishment of Animal Feed Mills", conducted by the Arab Company for Livestock Development in 1988. However, it is considered here that the need for some government participation in the construction of concentrated feed-production facilities and their initial management will be high for the following reasons:

- (a) Large investment is necessary for the construction of new facilities (over R.O. 4 million for production capacity of 20 t/h).
- (b) The development of new techniques suited to the raw materials available in Oman will be necessary.

Because of these, it is unlikely that the private sector will be able to act alone.

## (2) Breeder Birds

A target of 100 % self-sufficiency in chicken and table eggs is aimed at under the Master Plan. To achieve this, a large and stable supply of chicks will be necessary. However, as there are no bird-breeding stations at present in Oman, current supply relies on imported chicks. Also, there is no activity in the private sector at this point to construct new bird breeding facilities.

Expansion of poultry production, particularly among medium and small holders, it will be essential to establish a stable and inexpensive supply of healthy chicks well-suited to the Omani environment. The domestic production of chicks will be extremely important towards this end. A certain degree of domestic production will be necessary, in particular to achieve the chick-supply target under this project for broilers of 44,000,000 birds/year by the year 2000.

Although it generally would be considered appropriate for the private sector to assume responsibility for chick supply, and the feasibility of such is indicated in the "Feasibility Study for Establishment of Poultry Projects" by GRM in 1988, it is considered here that the need for some government participation in the construction of chick-production facilities and the initial management thereof will be high. The reasons for this are as follows:

(a) Initial investment in such facilities is high and profit margin lower than for chicken and table egg production.

(b) Close collaboration with research institutions will be necessary to develop the chicks best-suited to the Omani environment.

As such, it is not anticipated that private sector capital will readily flow into this activity in the early stages.

Details on method establishment, functions and structure of the proposed Livestock Promotion Corporation will require further study. However, on the basis of study to date, the breakdown of capital participation ratios in such a corporation are anticipated as follows. (Consideration has been given to the high IRR for the corporations principal activities: 20 % for feed mill and 15% for poultry breeder):

Government:	20%
Individual Investor:	50%
Private Company:	30%

Responsibility:

The newly established company has all the responsibility for its own activities. The agencies relevant to the company, including MAF, will support and facilitate its operation.

Timing:

Implementation period would be for 2 years from 1992

TIMING

Project	1991	1992	1993	1994	1995
New Feed Mill		F/S and B/D			
Poultry Breeder Farm		F/S and B/D			



Budget:

Budget is as follows:

BUDGET 1,359,000 R.O

Project	1991	1992	1993	1994	1995	Total
New Feed Mill			983,000			983,000
Poultry Breeder Farm		376,000				376,000

[NLL-4] Small Farm Development Support Project

Objectives:

The main purposes of the livestock sector under this Master Plan are to:

- Establish more efficient and economical livestock management in the country.
- Supply the nation with more and better quality livestock products through the development of the livestock industry.

Among others under the Master Plan, in accordance with the government policy, stress must be placed on establishing and developing intensive livestock management by the medium- and small-scale agriculture-based livestock farmers who occupy the majority of the rural area.

For this purpose, it is proposed in this project that the government give incentives to intensive management by subsidizing the initial investment, coupled with instructions in management methods.

Description:

This project is composed of three components:

[NLL-4-1] Small Holder Poultry Project

With respect to poultry, both meat and table eggs, 100 % self-sufficiency is aimed at under the Master Plan. To attain this goal, the development of small holder poultry farms should be actively pursued, coupled with the development of commercial large-scale poultry farms, because

----- Present retail price differences between domestic and imported poultry meat are relatively small,

and domestic table eggs have the advantage of freshness. There is not much price difference between domestic and imported table eggs. Therefore these products can compete with imports and their profitability will be relatively high. Moreover, poultry does not require a large land area. As a result, the production of poultry meat and table eggs will be a precious income source for rural small farmers.

-----  
The increase in rural farmer income will have a good effect on the permanent settlement of farmers in rural areas, and the increase of broiler and table egg production will promote the development of a processing industry and distribution system. This will increase the employment opportunities for local residents.

However, generally the Omani small farmers is not accustomed to raising poultry, therefore government support and instruction would be required in order to stabilize and expand intensive poultry management. Under this Master Plan, it is proposed that the on-going Small Holder Poultry Pilot Project, which is aiming at the establishment of 180 small holder poultry farms in Oman, be expanded. The government would subsidize the initial investment for the construction of small holder poultry farms and give support for and instruction on the initial operation of these farms.

This project will reduce the farmers' large personal investment at the initial stage and give them incentive to initiate small-scale intensive poultry management. This project comprises the following:

For the small farmers who were selected by MAF, this package provides on-site construction of sheds of an approved design (approximate cost R.O. 1,500). Additionally, in the first year of operation, MAF will provide the following support to the production costs of each farmer:

- (1) To broiler producers ..... 6 batches of 500, day-old chicks; the farmer to provide the necessary feed requirements.
- (2) To egg producers ..... 300 points of lay pullets; the farmer to provide the necessary feed requirements.
- (3) To both types of producer ... Free vaccinations and advice on management and marketing.  
(continued to the year 1995)
- (4) Training ..... Training of field staff who will provide instruction and support during the initial operation of these farms.

It is of particular importance that adequate field staff, responsible for the extension support of small-holder poultry farmers, be ensured because of the limited experience of Omani farmers in raising poultry. Moreover, because poultry is very susceptible to epidemic diseases, the formerly-mentioned CIVIL Development Project should be pursued as soon as possible and a poultry health and disease control system should be expanded in parallel with the increase of poultry farms.

Table 6.3.7 and Table 6.3.8 show the year-wise and region-wise number of farms to be supported under the project.

[NLL-4-2] Intensive Livestock Production

Aiming at the extension and demonstration of intensive livestock management, pilot facilities for goats and sheep, respectively, have been constructed at 301 and 100 farms in the country since 1987, and each farm has initiated intensive management. Under this project, MAF

Table 6.3.7 Projected Small Holder Poultry-Farm Development 1995-2000

(Broiler)	New Project										Continued On-Farm Devt.					
	1990	91	92	93	94	95	96	97	98	99	2000					
Pilot Proj.	90	320	320	320	320	320	320	320	320	320	320	-	-	-	-	
New Farms 1st Shed	-	36	128	128	128	128	128	128	128	128	128	-	-	-	-	
2nd Shed (40%)	-	-	22	77	77	77	77	77	77	77	77	-	-	-	-	
3rd Shed (40%)	-	-	-	13	46	46	46	46	46	46	46	-	-	-	-	
4th Shed (40%)	-	-	-	-	571	571	571	571	571	571	571	-	-	-	-	
Increase/year	90	356	470	538	571	571	571	571	571	571	571	46	46	46	46	
Cumulative Annual																
Output ('000 tons)	270	1338	2748	4362	6075	7788	8541	8810	9048	9048	9048	9048	9048	9048	9048	9048

Total Sheds Built by the Project -- 1690  
 Total Sheds expected to be built by farmers -- 1326

(Layer)

New Farms 1st Shed	90	195	195	195	195	195	195	195	195	195	195	-	-	-	-	
2nd Shed (40%)	-	36	78	78	78	78	78	78	78	78	78	-	-	-	-	
3rd Shed (60%)	-	-	22	47	47	47	47	47	47	47	47	-	-	-	-	
4th Shed (60%)	-	-	-	13	28	28	28	28	28	28	28	-	-	-	-	
Increase/year	90	231	285	333	348	348	348	348	348	348	348	75	75	75	75	
Total Number																
of Layers ('000)	27	96.3	184.8	284.7	389.1	493.5	539.4	561.9	570.3	570.3	570.3	570.3	570.3	570.3	570.3	570.3
Output of Eggs ('000,000)	4.05	14.44	27.72	42.70	58.36	74.02	80.91	84.28	85.54	85.54	85.54	85.54	85.54	85.54	85.54	85.54

Total Sheds Built by the Project -- 1065 (including Pilot Project)  
 Total Sheds expected to be built by farmers -- 836

**Assumption**

A proportion of Farmers may be expected to increase to a 4-shed capacity over a four period, anticipated in the following proportions:

- 40% of original farms will build a second shed
- 60% of these will expand to a third shed
- 60% of these will expand to a fourth shed

Table 6.3.8

New Poultry Farms and Their Location by Region

Region	Layers	Broilers
Interior	185	305
Sharqiyah	210	340
Dhahirah	120	175
Al Wasta	70	110
Musandum	20	25
Batinah	210	325
S. Region	160	320
Total	975	1600

provided sheds for livestock, grass seeds, and basic fertilizer as well as a portion of the breeding females and feed to selected farmers. Such livestock management is carried out by each farmer under intensive management methods set out by the government. As a result, some of the farmers who have initiated such management methods have reported higher livestock productivity than those who are using the conventional management method.

The major objective of this project at the current stage is the extension and demonstration of intensive livestock management. In the next stage, further expansion is required to extend intensive management methods to more numbers of small farmers.

In the initial stages of intensive livestock management, a considerable amount of investment is required, e.g. more than R.O. 4,000, to establish a farm for feeding 40 goats under the present Goats Project. This initial investment cost is too large for the average farmer to bear himself. It is, therefore, considered that if no measures are taken to support farmers, the expansion of the intensive management program may not be feasible.

Small holders seldom initiate new management practices requiring large personal investment even where it is recognized that profitability is good. It is therefore necessary for the expansion of intensive management to give some incentive to the farmers, such as the reduction of their initial investment.

Most of the small-scale agriculture-based livestock farmers have been raising livestock, and already possess the facilities for such. Unfortunately, however, most of these are insufficient for promoting intensive management. Therefore, the minimum requirement is that sheds be improved or rehabilitated to maintain sufficient space and hygienic conditions for animals. A suitable self-supply feed-resource base is also necessary.

In order to establish and expand intensive management among the small- and medium-scale agriculture-based livestock farmers under this

Master Plan, implementation of the following subsidy program is proposed to decrease the farmer's large personal investment at the initial stage.

(1) Purpose of subsidy:

To promote and encourage the adoption of more intensive and productive livestock-management systems.

A part of the initial investment is to be subsidized at the beginning of the intensive management program for goats, sheep and cattle.

(2) Potential recipients of subsidies:

- (a) Farmers wanting to participate in the intensive management program.
- (b) Farmers who have some experience and knowledge of livestock targeted under the subsidy program.
- (c) Those who have or are expected to have adequate area for feed cultivation to enable them to feed the applied-for number of livestock.

(3) Subsidy items (100 % subsidy)

- (a) Livestock shed ..... The area is to accommodate the number of livestock considered appropriate by MAF, but not exceeding the maximums of:

Dairy Cow.....	10 head
Beef Cattle.....	40 head
Goats and sheep .....	40 head

- (b) Grass seed ..... Necessary amount of seeds for the

feed crop field which will enable holders to feed livestock

(c) Irrigation facilities ... The necessary facilities for irrigation in the above fodder field (average 2 feddan)

(d) Machine and Equipment ... Grass-cutting machine and milking machine  
(50% subsidy)

(4) Subsidy application, review and delivery:

The farmer fills out the application form and submits it to the extension center, which examines the suitability for the delivery of the subsidy. Based on the examination report prepared by the extension center, MAF determines the delivery procedure.

Under this program, the following number of smallholders will be subsidized over 10 years.

about 900 cattle farmers

about 3,000 sheep and goat farmers

[NLL-4-3] Artificial Insemination Service Project for Dairy Cow

Under the Master Plan, a self-sufficiency rate of 100 % in fresh milk is aimed at by the year 2000. To attain this goal, it is proposed that more than 7,500 head of cross-bred dairy cows be raised at farms located in the outskirts of the capital area, such as Rumais and Nizwa, and near Salalah.

As for improvement through cross-breeding of exotic and local cows, artificial insemination methods will be effective for the following reasons:

(1) The effectiveness of artificial insemination service has been



confirmed and artificial insemination techniques have been spread widely throughout the world.

- (2) Various types of relatively cheap, high quality genetic material is available on the international market.
- (3) Generally, animal holders in Oman possess livestock in a small number, therefore it is more economical for them to utilize artificial insemination services than to support stud bulls individually.

Under this Artificial Insemination Service Project, the on-going Artificial Insemination Pilot Project being conducted by MAF for dairy farmers near Rumais, would be continued, supplemented and expanded. Sufficient number of cross-bred cows for self-sufficiency of milk would be produced by utilization of artificial insemination services in the outskirts of the capital area where there are marketing advantages, and near Salalah where there is an advantage in collecting milk because of the concentration of livestock holders. Furthermore, an appropriate system should be established to execute artificial insemination services for all cross-bred cows in these regions.

Responsibility: MAF

Timing:

Timing is as follows:

- NLL-4-1 Small Holder Poultry Production-----For 5 years from 1991
- NLL-4-2 Intensive Livestock Production-----For 5 years from 1991
- NLL-4-3 A. I. Services for Dairy Cow-----1991: Salalah  
1994: Nizwa

TIMING

Project	1991	1992	1993	1994	1995
Small Holder Poultry Production	_____				
Intensive Livestock Production	_____				
A. I. Service for Dairy Cow	Salalah	Routine Work		Nizwa	-----

Budget:

Budget is as follows:

BUDGET	15,285,000					
Project	1991	1992	1993	1994	1995	Total
Small Holder Poultry Production	1,761,000	1,754,000	1,772,000	1,774,000	1,794,000	8,855,000
Intensive Livestock Production	1,274,000	1,274,000	1,274,000	1,274,000	1,274,000	6,370,000
A.I. Service for Dairy Cow	30,000			30,000		60,000

Nature of Project:

NLL-4-1 Small Holder Poultry Production ----- Expansion of on-going project

(Proposal to increase recurrent budget)

The proposed increase for the recurrent budget to implement the above Artificial Insemination Service Project for Dairy Cows is as follows:

Recurrent Budget:

Recurrent budget is as follows:

RECURRENT BUDGET	336,000					
Project	1991	1992	1993	1994	1995	Total
A.I. Service for Dairy Cow	42,000	48,000	48,000	96,000	96,000	336,000