

[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 Programs

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 second 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 3.2.36.

Table 3.2.36 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
3. TOTAL BUDGET IN 10 YEARS			
1,500,000 (R.O./5 YEARS) ×			2 (PERIODS) = 3,000,000

[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 indicate 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 3.2.37.

Table 3.2.37 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

[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 3.2.38.

Table 3.2.38 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 10 YEARS
10 (YEARS) × 100,000 (R.O./YEAR) = 1,000,000 (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 so 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 rational 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.

Large 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 provide 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 3.2.39. Staff requirements are shown in Table 3.2.40, and recurrent costs

are shown in Table 3.2.41.

Table 3.2.39 Cost Estimation of NAA-1 Project

1. AGRICULTURAL CENSUS 1,900,000
 (1) 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) THE 3RD AGRICULTURAL CENSUS (1996/1997)

	NUMBERS	UNIT PRICE (R.O.)	TOTAL COST (R.O.)
PLANNING AND SURVEY (1ST YEAR)	1 SET	500,000	500,000
SURVEY (2ND YEAR)	1 SET	600,000	600,000
PUBLISHING	1 SET	100,000	100,000
TOTAL			1,200,000

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

2,560,000

[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.

Table 3.2.40 Statistics Staff Increase Plan

REGION	1989			1995			2000			INCREASE 89-95			INCREASE 95-00		
	STATIS- TICIAN	ENUME- RATOR	STATIS- TICIAN RATOR	STATIS- TICIAN	ENUME- RATOR	STATIS- TICIAN RATOR	STATIS- TICIAN	ENUME- RATOR	STATIS- TICIAN RATOR	STATIS- TICIAN	ENUME- RATOR	STATIS- TICIAN	ENUME- RATOR	STATIS- TICIAN	ENUME- RATOR
1. SOUTH SATINGAH	1	7	4	13	18	1	1	4	13	3	11	1	0	0	0
2. NORTH SATINGAH	1	1	3	15	15	1	1	3	15	2	14	1	0	0	0
3. SHARQIA	1	8	3	15	15	1	1	3	15	2	7	1	0	0	0
4. OMAN INTERIOR	1	4	3	7	7	1	1	3	7	2	3	1	0	0	0
5. MUSTA	0	3	1	5	5	1	1	1	5	1	2	1	0	0	0
6. DAHIRAH	1	0	2	3	3	1	1	3	3	2	0	1	0	0	0
7. BURAIMI	1	0	1	3	3	1	1	1	3	0	0	1	0	0	0
8. MUSANDAH	0	0	1	2	2	1	1	1	2	1	1	1	0	0	0
9. SOUTH REGION	1	4	3	12	12	1	1	3	12	2	8	1	0	0	0
MINISTRY'S OFFICE	1	4	3	25	25	4	4	3	25	2	2	4	0	0	0
TOTAL	8	27	25	83	83	13	13	22	83	17	56	13	4	4	2

Table 3.2.41 Operation Cost of NAA-1 Project

Item	Character	Numbers	Unit Price (R.O.)	Total Cost (R.O.)
1. Staff				
Statistic Specialist	2.2	13 Nos.	6,912	89,856
Statistician	4.2	14 Nos.	3,372	47,208
Enumerator	5.2	56 Nos.	2,808	157,248
Sub Total		83 Nos.		294,312
2. Operation				
Vehicle Operation		52 Nos.	600	31,200
Computer System Operation		20 Nos.	300	6,000
Sub Total				37,200
Total				331,512

Necessary costs for these projects are shown in Tables 3.2.42 and 3.2.43.

Table 3.2.42 Cost Estimation of NAA-2-1 Project

1. TOTAL COST IN 10 YEARS @ $\frac{\text{(R.O.)}}{225,000} \times 4 \text{ (TIMES/10YEARS)} = 900,000$
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 3.2.43 Cost Estimation of NAA-2-2 Project

1. PRIZES FOR REGIONS PER YEAR		@ 4,000 (R.O./SECTION) X 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 10 YEARS			
(R.O.)	(R.O.)		(R.O.)
(36,000	+ 14,000) X	10 (YEARS) = 500,000

[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, coconuts 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 3.2.44.

Table 3.2.44 Cost Estimation of NAA-3 Project

ITEMS	ESTIMATION
(1) TOTAL AREA OF FRUITS TREES	33,000 ha
(2) TARGET AREA OF AREAL SPRAY	(1) X 3/4 = 25,000 ha
(3) COST PER UNIT AREA	20 RO/ha
(4) APPLICATION TIMES (AVERAGE)	2 times
(5) TOTAL COST PER YEAR	(2) X (3) X (4) = 1,000,000 RO
(6) TOTAL COST IN 10 YEARS	(5) X 10 = 10,000,000 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 adequate 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 requirements 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 programs 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	1995-96	1997-98	1999-2000
(a) Fertilizer					
(i) Chemical Fertilizer	25%	20%	15%	10%	5%
(ii) Manure pit	50%	40%	30%	20%	10%
(b) Agro-chemicals	50%	40%	30%	20%	10%
(c) Seed					
(i) Vegetables	50%	40%	30%	20%	10%
(ii) Wheat - Barley	100%	80%	60%	40%	20%
(d) Farm Machinery	50%	50%	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:

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

(b) 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 project 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).

(a) 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.

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

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

(d) 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 shifts of bee-keeping

operations. Import restrictions will also be established.

(e) 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

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

(g) A queen bee breeding station will be established in the southern Jabal for a production capacity of 5,000 colonies in a 5-year period. Proposed yearly expansion of colonies in there is shown in Table 3.2.45.

Necessary costs estimated for this project are shown in Table 3.2.46.

Table 3.2.45 Jabal Honey Bee Colonies Development Plan

Year	Minimum Number of Colonies From which Splits 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 3.2.46 Cost Estimation of NAA-4 Project

ITEMS	ESTIMATION									
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1. TOTAL BUDGET										
(1) FERTILIZER, etc.										
(a) CHEMICAL FERTILIZER	165,000	165,000	132,000	132,000	99,000	99,000	66,000	66,000	33,000	33,000
(b) MANURE PIT	20,000	20,000	16,000	16,000	12,000	12,000	8,000	8,000	4,000	4,000
(2) AGRICULTURAL CHEMICALS	100,000	100,000	80,000	80,000	60,000	60,000	40,000	40,000	20,000	20,000
(3) SEEDS										
(a) VEGETABLES	175,000	175,000	140,000	140,000	105,000	105,000	70,000	70,000	35,000	35,000
(b) WHEAT AND BARLEY	15,000	15,000	12,000	12,000	9,000	9,000	6,000	6,000	3,000	3,000
(4) AGRICULTURAL MACHINERY	448,000	455,000	533,000	521,000	608,000	680,000	775,000	780,000	875,000	875,000
(5) HONEY BEE PROJECT	77,000	70,000	87,000	99,000	107,000	35,000	35,000	30,000	30,000	30,000
TOTAL	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
2. COST BREAKDOWN OF HONEY BEE PROJECT										
ITEMS										
(1) RESISTER EQUIPMENT	10,000									
(2) METHOD IMPROVEMENT	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
(3) FARMER TRAINING			5,000	5,000	5,000	5,000	5,000			
(4) MODERNIZED EQUIPMENT SUBSIDY	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
(5) JARAL 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	35,000	35,000	30,000	30,000	30,000

[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, new facilities, and expansion and improvement of existing plant quarantine facilities is called for.

Existing Facilities

- (1) Seeb International Airport : quarantine field and greenhouse
- (2) Mina Qaboos : building expansion and installation of large-scale fumigation equipment
- (3) Hafet : transfer of facilities to lot adjacent to customs
- (4) 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 3.2.47. Personnel development to man these facilities, including increased staff at the existing Wajaja and Raysut Port quarantine centers is shown in Table 3.2.48. Recurrent costs are shown in Table 3.2.49.

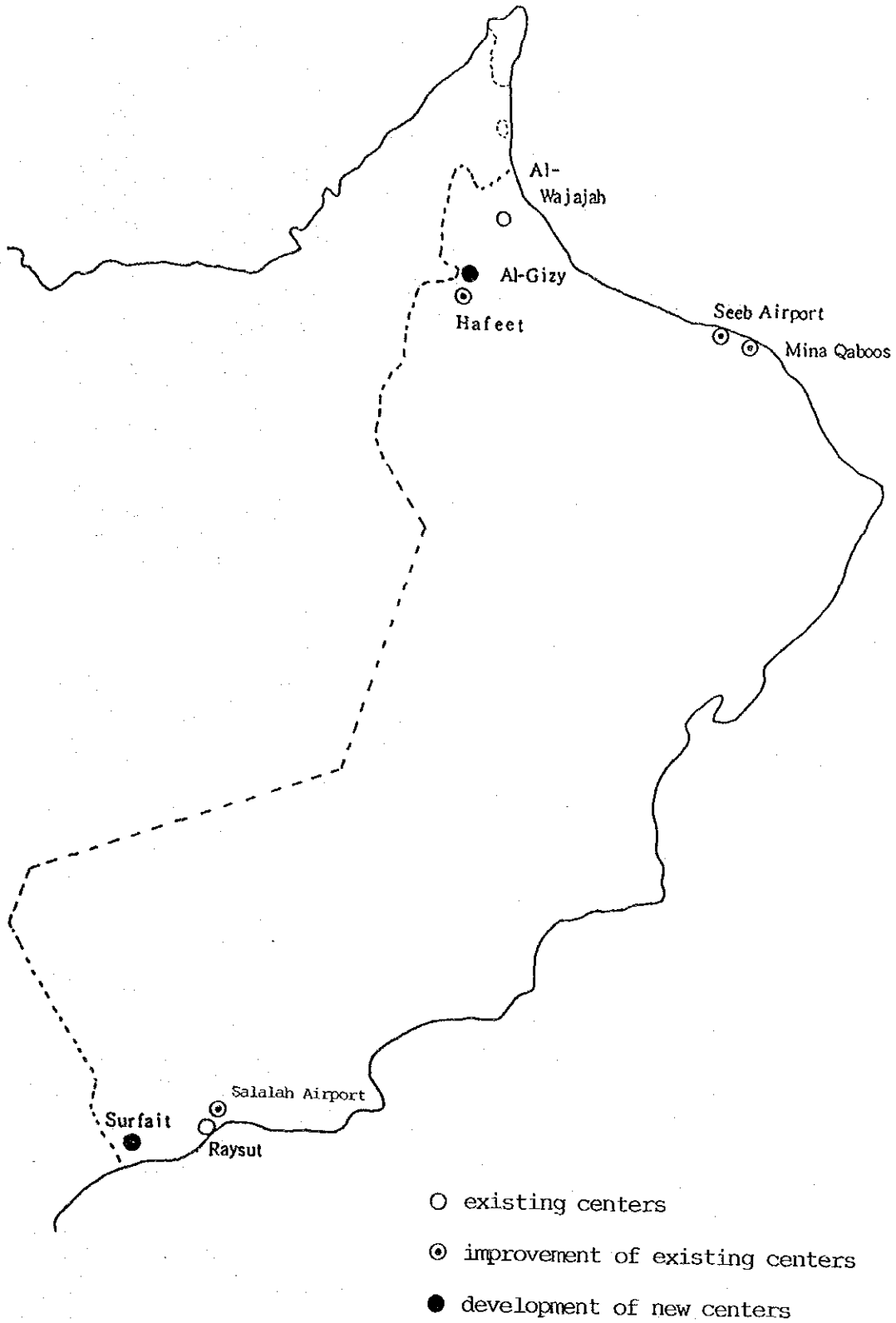


Figure 3.2.2 Location of Plant Quarantine Centers

Table 3.2.47 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 ²	9	36,000
ISOLATION GREENHOUSES	1,000 m ²	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)HAFEET			200,000
BUILDING AND OTHERS	1 SET	120,000	120,000
EQUIPMENT	1 SET	62,000	62,000
ISOLATION FARM	2000 m ²	9	18,000
(4)SALALAH AIRPORT			200,000
BUILDING AND OTHERS	1 SET	120,000	120,000
EQUIPMENT	1 SET	71,000	71,000
ISOLATION FARM	1000 m ²	9	9,000
(5)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 ²	9	36,000
(6)SURFAIT (NEW)			200,000
BUILDING AND OTHERS	1 SET	120,000	120,000
EQUIPMENT	1 SET	44,000	44,000
ISOLATION FARM	4000 m ²	9	36,000
Total			1,100,000

Table 3.2.48 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)	0	6	6
ENGINEER		3	3
TECHNICIAN		3	3
(6)SURFAIT (NEW)	0	5	5
ENGINEER		2	2
TECHNICIAN		3	3
(7)WAJAJA	4	12	8
ENGINEER	4	7	3
TECHNICIAN		5	5
(8)RAVSUT SEAPORT	1	4	3
ENGINEER	1	2	1
TECHNICIAN		2	2
Total	18	63	45
ENGINEER	10	30	20
ASSISTANT ENGINEER	0	2	2
TECHNICIAN	8	31	23

Table 3.2.49 Operation Cost of NAQ-1 Project

Item	Character	Numbers	Unit Price (R.O.)	Total Cost (R.O.)
1. Staff				
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
2. Operation				
Maintenance		0.01 %	1,100,000	11,000
Operation		0.05 %	1,100,000	55,000
Sub Total				66,000
Total				275,568

3.3 Livestock

The principal objectives within the livestock sector under the 10-year Master 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 10-year Agricultural Development Plan are described below.

[NLL-1] Rangeland Revegetation 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 to 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 co-operation 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 10-year 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 the grazing control should be done in cooperation with the Salalah Agricultural Research Center 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 Center.

[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 the number of grazing animals and 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 (such as electric fences), 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 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 10 years from 1991

Budget:

Budget is as follows:

.NLL-1-1 Establishment of Rangeland Management-----	R.O. 352,000
.NLL-1-2 Grazing Control-----	R.O. 3,200,000
Total	R.O. 3,552,000

[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:

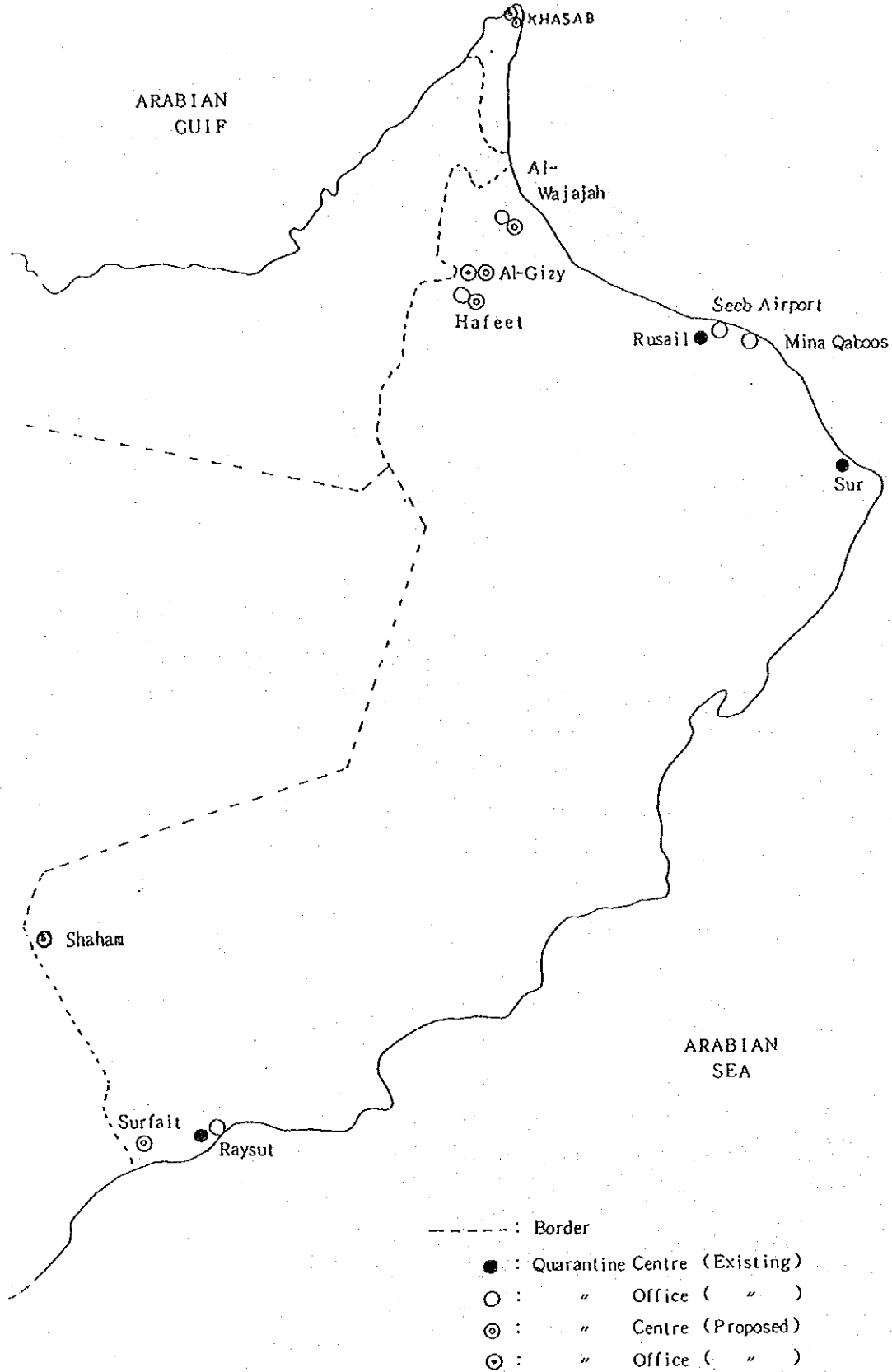
This project is composed of seven components.

[NLQ-1] Animal Quarantine Improvement 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 3.3.1 and Table 3.3.1 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 3.3.1 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 3.3.2 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 later-mentioned project for brucellosis control 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 extermination 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 prevention of poultry diseases.

Table 3.3.1 Quarantine Development Plan Note: This plan is on the basis of assumption that about 300 thousand annual livestock importation in number would be conducted

Location	Existing			Required			Additional			Facilities Scale head/term
	Doctors	Assistants	Nurses	Doctors	Assistants	Nurses	Doctors	Assistants	Nurses	
M Port Qaboos (Office)	3	2	0	4	1	1	1	-1	1	1
M Seeb Airport (Office)	1	0	0	3	0	1	2	0	1	(5,000)
M Rusail Quarantine(Center)	1	3	0	1	1	1	0	-2	1	1
B Wajajah Border (Office-center)	3	0	0	4	0	1	1	0	1	1,000
S Hafeet Border (Office-center)	3	1	0	4	0	1	1	-1	1	2,000
S Sur Quarantine(Center)	0	0	0	1	1	2	1	3	2	10,000
Dh Al Gazy 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
M 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 3.3.2 Animal Clinic Development Plan (20,000_25,000 heads animal/ 1 clinic covers)

Region	Clinics and Sub-Clinics			Existing			Required			Additional		
	Existing	Required	Additional	Doctors	Assistants	Nurses	Doctors	Assistants	Nurses	Doctors	Assistants	Nurses
South	4	5	1	1	2	8	3	5	8	3	0	5
Batinah	3	2	-1	2	2	3	3	3	3	1	2	3
North	1	3	2	2	4	4	3	3	6	1	2	3
Batinah	5	5	0	2	2	3	3	3	6	1	2	3
Sharqiya	3	4	1	1	3	6	10	4	9	1	3	-1
Oman	5	5	0	3	3	6	10	4	9	1	3	-1
Interior	3	4	1	3	8	8	10	4	12	1	4	2
Wusta	2	2	0	2	2	1	2	2	3	0	2	1
Dahira	2	2	0	2	2	0	5	2	4	0	4	-1
Buraimi	2	2	0	2	2	0	5	2	4	0	4	-1
Buraimi	1	1	0	3	3	0	0	1	3	-2	3	3
Musandam	1	2	0	1	1	3	0	2	3	1	0	3
Musandam	1	1	0	1	3	3	0	2	3	1	0	3
South Region	5	10	5	5	5	3	9	8	6	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
2. These numbers show veterinarians in Salalah Hospital

(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 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 3.3.3 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, a 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

Table 3.3.3 Veterinary Laboratory Development Plan
CVIL Staff Plan

Section	Expert	Technician	Assistant	Attendant	Remark	Facilities
Pathology	1	1	0	1	existing	
	1	2	2	1	required	
	0	1	2	0	additional	
Virology	1	1	1	0		Need New Facilities 100m ² 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	
	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	Remark	Facilities
Parasitology	2	2	2	2		300m ² Building and Equipment Infrastructure
Bacteriology	2	2	2	2		
Sterilization Washing		1 (Engineer)	2	1		
Administration				2	Clerk	
Total	4	5	6	7		

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 sp. 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 as 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 national 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 3.3.4 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 serious 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 (R.O. 0.1/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 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

Table 3.3.4 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 FMD (twice/year)	R/P FMD (exotic cattle at least 2 initial doses 1 month apart and 3-4 doses per year)
- <u>North Oman</u>		
- <u>South Oman</u>	R/P FMD (twice/year) B/Q Botulism BVD - 10,000 doses/ year Brucella - 5,000 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 (all commercial diaries)

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, and to maintain people's health in the Southern Region. Particularly, as described below, a 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 should 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 the Southern Region)

Timing:

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 10 years from 1991
NLL-2-3	CCPP Vaccine Development-----	For 3 years from 1993
NLL-2-4	National Vaccination-----	For 10 years from 1991
NLL-2-5	Supplies of Veterinary Equipment----	For 10 years from 1991
NLL-2-6	Brucellosis Control in South-----	For 10 years from 1991

Budget:

NLQ-1	Development of New Quarantines-----	R.O.	1,975,000
NLL-2-1	Animal Clinic Improvements-----	R.O.	1,188,000
NLL-2-2	Laboratory Development-----	R.O.	819,000
NLL-2-3	CCPP Vaccine Development-----	R.O.	90,000
NLL-2-4	National Vaccination-----	R.O.	20,115,000
NLL-2-5	Supplies of Veterinary Equipment----	R.O.	6,000,000
NLL-2-6	Brucellosis Control in South-----	R.O.	1,236,000
	Total	R.O.	31,423,000

(Proposal to increase recurrent budget)

*Increase 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: (For 10 years)

NLQ-1	Development of New Quarantines-----	R.O.	2,388,000
NLL-2-1	Animal Clinic Improvements-----	R.O.	3,904,000

NLL-2-2 Laboratory Development-----R.O. 2,191,000

[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 throughout 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 effects, 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 maximum of 20 trainees in one training course.

Responsibility: MAF

Timing:

NLE-1-1 Extension Methods Improvement-----	For 10 years from 1991
NLE-1-2 Training Center Development-----	1991: Rumais 1994: Salalah

Budget:

NLE-1-1 Extension Methods Improvement-----	R.O. 300,000
NLE-1-2 Training Center Development-----	R.O. 332,000
Total	R.O. 632,000

(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 the 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:

Training Center Development-----	R.O. 3,800,000
Expansion of Extension Staff-----	R.O. 561,000

Table 3.3.5 Required

Number of Livestock Specialists and Vehicles (per Extension Center)

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

NOTE : 1. Above numbers show specialists, below numbers show Extension officers.

[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 3.3.3 show 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 research items above-mentioned 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:

NLR-1-1 Development of Livestock Research Centers---For 10 years from
1991

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

Budget:

NLR-1-1 Development of Livestock Research Centers--- R.O. 4,500,000

NLR-1-2 Research Centers Management Consultancy----- R.O. 2,050,000

Total R.O. 6,550,000

[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 Small Farm Development Support Project, etc.

[NLM-1-1] Company for Livestock Products

As described under the 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:

Production ---- To reduce production costs and to enhance the quality of livestock products so as to make them attractive to the consumer

Processing ---- To add value to livestock products by processing them so as to make them attractive to the consumer

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

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 projects for Beef Cattle Fattening Farms 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 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 done 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 3.3.26). 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 exhibit 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 clearing 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 a 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 the government initiative is proposed in southern and northern Oman, respectively.

(1) 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 these in the Southern Region are as follows:

- (a) Increased income for dairy cattle holders is possible through selling surplus milk to the milk-marketing facilities.
- (b) Coupled with item (a), 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).
- (c) 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.

- (d) 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.

(2) 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 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 these. 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 3.3.2.

[NLM-1-5] Hides and Skins Development

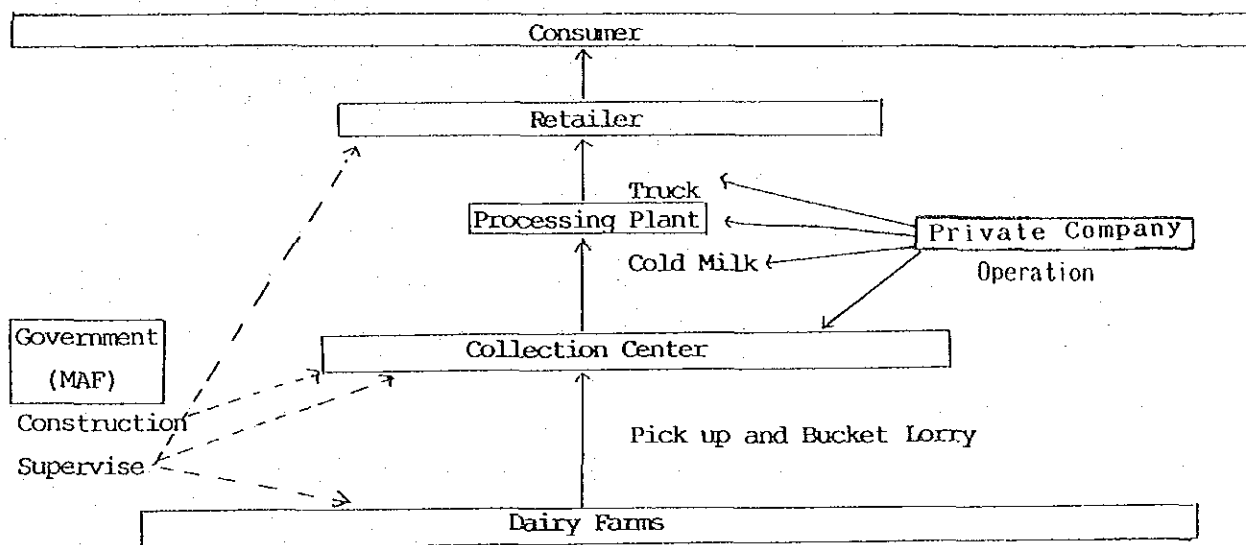
The hides and skins of cattle, sheep, goats and camels were traditionally an essential raw materials in the manufacture of many domestic and personal articles. However, they have ceased to play such an important role since cheap imported plastic and metal alternatives have become available. These products, 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 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 hide 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

Figure 3.3.2

Proposed Milk Collecting, Processing System in Northern Oman



initiative to establish and manage hide and skin collection and 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 subsidy, the establishment of the 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. the 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 the 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 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 mainly on the private sector. However, the collection of the facilities

birds would be the joint work of MAF and the private sector.

(5) Hide and Skin

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

In addition the items above, in parallel with the increase of domestic livestock-products 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:

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

Budget:

NLM-1-1 Company for Livestock Products-----	R.O.	1,716,000
NLM-1-2 Cattle Fattening-----	R.O.	979,000
NLM-1-3 Cut Meat Processing-----	R.O.	537,000
NLM-1-4 Milk Collecting and Processing-----	R.O.	1,192,000
NLM-1-5 Hides and Skins Development-----	R.O.	262,000
NLM-1-6 Cattle De-stocking Subsidy-----	R.O.	2,500,000
NLM-1-7 Marketing Promotion-----	R.O.	418,000
	Total	R.O. 7,604,000

[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 3.3.6).

Table 3.3.6

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 a promising source of raw material for concentrated feed production. In line with this, focus should be placed on the construction of new facilities capable of converting the raw materials 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 tons/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 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.

Budget:

Budget is estimated at R.O. 1,359,000.

[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, and
- 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 would give incentives to intensive management by subsidizing the initial investment, coupled with instruction 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 10-year 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 (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 CVIL 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 3.3.7 and Table 3.3.8 show the year-wise and region-wise number of farms to be supported under the project.

[NLL-4-2] Intensive Livestock Production

Table 3.3.7 Projected Small Holder Poultry Farm Development 1995-2000

	Pilot Proj.										
	1990	91	92	93	94	95	96	97	98	99	2000
New Farms 1st Shed	90	320	320	320	320	320	-	-	-	-	-
2nd Shed (40%)	-	36	128	128	128	128	128	-	-	-	-
3rd Shed (40%)	-	-	22	77	77	77	77	77	-	-	-
4th Shed (40%)	-	-	-	13	46	46	46	46	46	-	-
Increase/year	90	356	470	538	571	571	251	123	46	-	-
Cumulative Annual Output ('000 tons)	270	1338	2748	4362	6075	7788	8541	8910	9048	9048	9048

Total Sheds Built by the Project -- 1690
 Total Sheds expected to be built by farmers -- 1326
 (Layer) 103

	New Project										
	90	91	92	93	94	95	96	97	98	99	2000
New Farms 1st Shed	90	195	195	195	195	195	-	-	-	-	-
2nd Shed (40%)	-	36	78	78	78	78	78	-	-	-	-
3rd Shed (60%)	-	-	22	47	47	47	47	47	-	-	-
4th Shed (60%)	-	-	-	13	28	28	28	28	28	-	-
Increase/year	90	231	295	333	348	348	153	75	28	-	-
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
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

Table 3.3.8 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

Assumption
 A portion 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

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 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 methods.

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 stock considered appropriate by MAF but not exceeding the maximums of:

. Dairy Cow.....10 head

- . Beef Cattle.....40 head
- . Goats and sheep40 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 in 10 years.

- . about 900 cattle farmers
- . about 3,000 sheep and goat farmers

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

Under the 10-year 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 numbers of cross-bred cows for self-sufficiency of milk would be produced by the 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:

NLL-4-1 Small Holder Poultry Production-----For 5 years from 1991
NLL-4-2 Intensive Livestock Production-----For 10 years from 1991
NLL-4-3 A. I. Service for Dairy Cows-----1991: Salalah
1994: Nizwa

Budget:

NLL-4-1 Small Holder Poultry Production-----	R.O.	8,855,000
NLL-4-2 Intensive Livestock Production-----	R.O.	16,984,000
NLL-4-3 A. I. Service for Dairy Cows-----	R.O.	60,000
	Total	R.O. 25,899,000

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: (For 10 years)

A. I. Service Project for Dairy Cows----- R.O. 816,000

[NLL-5] Livestock Specialized Services Program
(Fundamental Data Collection, Reviews and Studies)

Objectives:

It is essential to precisely grasp present conditions and development potential to execute livestock development in the future.

At present, there are certain data indispensable for the analysis of the present situation remain vague, for example livestock population. Therefore, in this plan, the following data should be collected and collated for effective application to the execution of the above-mentioned projects.

Furthermore, there are some projects in this Master Plan which require reviews of the studies or further feasibility studies. These reviews and studies should be executed under this program as well.

Description:

[NAA-1-1] Livestock Census Program

The most recent livestock population survey, the "Range and Livestock Survey", was conducted by GRM in 1982. This survey was not based on a complete report from all animal holders in Oman, but rather it was partially based on various estimations. The livestock population announced by MAF in 1989 was estimated mainly on the basis of the data from the above-mentioned survey and additional information and estimates from the Southern Region Wali Office.

To understand the present situation for the livestock industry in the entire country, it is at least necessary to ascertain livestock population accurately. Through the investigation of all animal holders in Oman under this plan, the following items which are important fundamental data for livestock development, would be collected and collated:

- The number of animal holders.
(for each animal holders)
- The number of each type of animal.
- Kidding rate, mortality rate and culling rate.
- Head for marketing and head for home consumption.
- Cultivated area for feed crops.

(This census should be conducted periodically, in conjunction with the agricultural census)

[NLL-5-1] National Disease Survey

The reduction of economic losses caused by epidemic diseases is one of the most important subjects for Omani animal holders. Since the execution of the vaccination program in 1982, it is said that the number of occurrences of serious epidemic diseases has been decreasing gradually; however, there is no accurate data on the number of occurrences of animal diseases for the past several years. It is vital to know disease-occurrence conditions to take countermeasures. Under this plan, the on-going "National Disease Survey" conducted by CVIL on the basis of a report from each animal clinic should be reinforced, and the information from the clinics should be processed with computer, applying a fixed format. This data base will be effective in various fields, such as establishment of quarantine facilities, CVIL development, etc.

Moreover, a foreign expert should be periodically invited for a detailed survey and review and revision of the countermeasures against serious epidemic diseases.

[NLM-2] Livestock Products Marketing Survey

As the distribution of domestic livestock products increases in accordance with increased production in local areas, competition between domestic products and imported ones will be inevitable. To promote an increase in the distribution of domestic products, the following points are proposed:

- (1) Enhance productivity and quality of domestic livestock.
- (2) Reduce the price difference between domestic and imported products by means of price controls.

With respect to (1), such enhancement can be realized through implementation of the above-mentioned projects. With respect to (2), there are several ways to reduce the price difference, for instance, levy customs duties on imported products, subsidize domestic products, etc.

In the case of (2), government information in price-setting is a central issue, given its ultimate effect on the consumer.

Precise market surveys and studies are necessary to make an appropriate evaluation. Therefore, under this program, the following surveys are proposed:

- (1) Identify present consumption orientation regarding livestock products, and forecast trends.
- (2) Estimate the worth of livestock products on the basis of marketed form at the retail level (for instance frozen, warm, chilled, etc.) on the consumer market.
- (3) Identify marketing margins for domestic and imported livestock products.
- (4) Estimate the extent of possible further reduction in production costs for domestic livestock products.
- (5) Execute simulations for various price-control patterns.

[NLL-5-2] Consultancy Services (Reviews and Studies)

The reviews of the feasibility studies already conducted or further feasibility studies will be required in the near future. These are as follows:

- o Establishment of a livestock marketing organization in the south
- o Establishment of a public beef cattle fattening farm in Nejd
- o Establishment of milk collecting and processing facilities in the north and south
- o Collecting and processing facilities for poultry products in the north and south
- o Establishment of hide and skin collection and marketing facilities
- o Establishment of the Livestock Input Company
- o Viability of corral animal husbandry in the rangeland

Responsibility: MAF

Timing:

NAA-1-1 Livestock Census-----1991, 1996
NLL-5-1 National Disease Survey-----For 10 years from 1991
NLM-2 Marketing Survey-----1991
NLL-5-2 Consultancy Services-----For 10 years from 1991
(Reviews and Studies)

Budget:

NAA-1-1 Livestock Census----- R.O. 1,048,000
NLL-5-1 National Disease Survey----- R.O. 110,000
NLM-2 Marketing Survey----- R.O. 143,000
NLL-5-2 Consultancy Services----- R.O. 1,000,000
(Reviews and Studies)

Total R.O. 2,301,000

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Figure 3.3.3 Structure of Livestock Research Centers

Table 3.3.9 Cost Estimation of NLL-1-1:
Establishment of Rangeland Management

Item	Amount	Unit	Unit Price	Cost	Remark
Forest Management	1	Set	60,000	60,000	including Plantation
Rangeland Survey	1	Set	80,000	80,000	including Map Making
Management Unit	10	Unit	15,000	150,000	Fundamental Research
Demonstration Unit	4	Unit	30,000	120,000	Applied Method
Training	6	Set	10,000	60,000	Technician
Total				470,000	
	x0.75			352,500	Assumption FAO:25%

Source : JICA estimates

Table 3.3.10 Cost Estimation of NLL-1-2:
Grazing Control

Item	Set	Unit	Set Price	Cost	Remark
Seed, Forestry	5 year	10,000	50,000	50,000	Plantation Seed for 5 year
Grazing Group	10 year	10,000	100,000	100,000	Organizing Group 10 year
Rotation Grazing	10 year	10,000	100,000	100,000	Implementation of Rotation
Fertilization	10 year	20,000	200,000	200,000	For Upgrade Vegetation
Fencing	140 unit	300	42,000	42,000	Electricity line
Livestock shed	1 set	2,646,000	2,646,000	2,646,000	Cattle, Camel, Goat
Training	5 year	10,000	50,000	50,000	Farmers Training 200farmers/year for 5 year
Total				3,188,000	

Source : JICA estimate on basic of Regional Development Plan for the
Southern Region

Assumption

(Fencing)		
Relatively good condition pasture area		70000 ha
Assumed 1 grazing unit area		500 ha
Fence Set		140
(Shed only in Monsoon)		
Camel		27000
Cattle		90000
Goats		60000
Livestock Logging Rate in Shed	Camel	30 %
	Cattle	50
	Goats	30
Shed Area per Head	Camel	6
	Cattle	4
	Goats	2
Total Shed Area	Camel	48600
	Cattle	180000
	Goats	36000
Total		264600
Shed Cost /m ² (Subsidy Rate 50%)		10
Total cost		2,646,000

Table 3.3.11 Cost Estimation of NLQ-1:
Development of New Quarantines

Location	Existing			Required			Additional			Facilities Scale head/term	Unit Price RO/head	Cost RO	Required Vehicle NOS
	Doctors	Assistants	Nurses	Doctors	Assistants	Nurses	Doctors	Assistants	Nurses				
M Port Qaboos (Office)	3	2	0	4	1	1	1	-1	1	(5,000)	10,000	1	
M Seeb Airport (Office)	1	0	0	3	0	1	2	0	1				
M Rusail Quarantine(Center)	1	3	0	1	1	1	0	-2	1				
B Wajajah Border (Office-center)	3	0	0	4	0	1	1	0	1	1,000	200,000	1	
Dh Hafeet Border (Office-center)	3	1	0	4	0	1	1	-1	1	2,000	350,000	2	
S Sur Quarantine(Center)	0	0	0	1	3	2	1	3	2	10,000	1,000,000	5	
Dh Al Giza Border(Office-center)	0	0	0	4	3	3	4	3	3	100	30,000	1	
J Surfait Border (Office)	0	0	0	1	1	1	1	1	2	(5,000)	100,000	1	
J Raysut Quarantine(Office-center)	1	1	2	2	4	4	1	3	2	Road etc.	30,000	1	
U Shalam Border (Office)	0	0	0	1	1	2	1	1	2	100	30,000	1	
Mu Kasab (Office- Center)	0	0	0	4	0	1	4	0	1	1,000	200,000	1	
Total	12	7	2	29	14	19	17	7	17		1,920,000	11	

Investment

Item	Amount	Unit	Unit Price	Cost
Facilities	See Above			1,920,000
Vehicles	11 Cars		5,000	55,000
Total				1,975,000

The distribution plan of veterinarians in each animal clinic

Region	Clinics and Sub-Clinics			Existing			Required			Additional			Location
	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	(Upgrade) Al Hajar
Batinah North	1	3	2	2	4	3	3	6	6	1	2	3	Shinas
Batinah	5	5	0	2	4	3	3	6	6	1	2	3	Saham
Sharqiyah	3	4	1	3	6	10	4	9	9	1	3	-1	(Upgrade) Sur. Wadi Bani Khalid
Oman	3	4	1	3	8	10	4	12	12	1	4	2	(Upgrade) Adam
Interior	5	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	1	1	1	3	0	0	1	3	3	-2	3	3	Sinena
Musandam	2	2	0	0	0	0	2	3	3	1	0	3	
South Region	(2) 5	10	5 #	5 #	3 #	9 #	8 #	6 #	13	3 #	3 #	4	
	7	7	7 improve	2	5	23	15	30	60	13	25	37	
TOTAL	23	33	10	25	38	65	46	84	121	21	46	56	

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

Table 3.3.12 Cost Estimation of NLL-2-1:

Animal Clinics Improvement

Investment

Item	Amount	Unit	Unit P	Cost	Remark
Clinic Improvement	7 Set	40,000		280,000	South
New Clinic	7 Set	70,000		490,000	
New Sub-Clinic	2 Set	50,000		100,000	
Vehicle	19 Cars	6,500		123,500	
Clinic Upgrading	3 Set	30,000		90,000	North
Total				1,083,500	

Salalah Animal Hospital Improvement Cost

Item	Amount	Unit	Unit P	Cost	Remark
Refurbishment	200	m ²	110	22,000	
Office Building	100	m ²	150	15,000	
Residence	240	m ²	180	43,200	For Doctor
Pens for Animals	250	m ²	50	12,500	
Fence	1 Set		5,000	5,000	
Well-Pump	1 Set		7,000	7,000	
Total				104,700	

Source: JICA estimate on basis of MAF information

Table 3.3.13 Cost Estimation of NLL-2-2:

Laboratory Development

Civil development plan

(1) Virology Laboratory

Item	Character	Amount	Unit	Unit Price	Cost	Remark
Building	Hygienic	400	m ²	400	160,000	In Virology Lab. Air Conditioner etc
Equipment		1	Set	63,000	63,000	
Machine		1	Set	50,000	50,000	
Material		1	Set	20,000	20,000	
sub-total					293,000	

(2) Existing Laboratory

Building	Improvement	30	m ²	100	3,000	CCPP Development CCPP Development
Equipment		1	Set	5,000	5,000	
Machine		1	Set	5,000	5,000	
subtotal					13,000	

(1)+(2) 306,000

(3) Salalah Laboratory development plan

Item	Character	Amount	Unit	Unit Price	Cost	Remark
Building	Hygienic	300	m ²	400	120,000	Air Conditioner etc
Equipment		1	Set	53,000	53,000	
Machine		1	Set	50,000	50,000	
Material		1	Set	20,000	20,000	
Road, Fence		1	Set	50,000	50,000	
subtotal					293,000	

(1)+(2)+(3) 599,000

Table 3.3.14 Cost Estimation of NLL-2-3:

CCPP Vaccine Development

Item	Amount	Unit	Unit Price	Cost	Remark
Specialist	12 men		5,000	60,000	man/month
Machine	1 set		20,000	20,000	
Materials	1 set		10,000	10,000	
Total				90,000	

Source : JICA estimate

Table 3.3.15 Cost Estimation of NLL-2-4:

National Vaccination

(Condition)

1990--2000 Livestock Population Increase Rate	20 %
Vaccination Achievement Rate (Assumed)	
1990	60 %
1991	70
1992	80
1993	90
Year	1994
	95
	100
	100
	—
	2000
	100

60% Vaccination Cost for Present Number of Livestock
('000R.0) (Including CCPP Vaccine)
(Including Omani Training) 1150

(Cost)

1991	1,369
1992	1,595
1993	1,831
1994	1,971
1995	2,116
1996	2,158
1997	2,202
1998	2,246
1999	2,291
2000	2,336

Total

20,114

Table 3.3.15 Cost Estimation of NLL-2-4: (Alternative 1)

National Vaccination

(Condition)		
	1990-2000 Livestock Population Increase Rate	20 %
	Vaccination Achievement Rate (Assumed)	
	1990	60 %
	1991	65
	1992	70
	1993	75
Year	1994	80
	1995	85
	1996	90
	1997	95
	1998	100
	—	—
	2000	100
	60% Vaccination Cost for Present Number of Livestock ('000R.0) (Including CCPP Vaccine) (Including Omani Training)	1150
(Cost)		
	1991	1,271
	1992	1,396
	1993	1,525
	1994	1,660
	1995	1,799
	1996	1,943
	1997	2,092
	1998	2,246
	1999	2,291
	2000	2,336
	Total	18,557

Table 3.3.16 Cost Estimation of NLL-2-5:

Supplies of Veterinary Equipment
(Subsidy)

Present Subsidy-----300,000--450,000 R.O (It fluctuates year by year)

Ideal Subsidy -----600,000 R.O(In case of 62 Animal Clinics in Oman)

Assumed 2% increase of animal Population and 2% decrease of veterinary cares in number by every year in the future.

Because Budget will be 600,000 R.O/Year

Table 3.3.17 Cost Estimation of NLL-2-6:

Brucellosis Control in the South

Item	Amount	Unit	Unit Price	Cost	Remark
Vaccination	20000	Unit	1	20,000	Coordination with Vaccination Prog.
Transport	400	Times	4	1,600	
Testing	400	Times	5	2,000	
Slaughter	400	Times	4	1,600	
Compensation	200	Cattl	300	60,000	cattle
	200	Goats	75	15,000	goat
Subtotal				100,200	----①
Specialist	1	man	12,000	12,000	
Assistant	2	men	5,000	10,000	
Vehicle	1	Car	650	650	
Subtotal				22,650	----②
Vehicle	1	Car	6,500	6,500	Investment
(①+②)x10year				1,228,500	
Total				1,235,000	

Table 3.3.18 Recurrent Budget Regarding "Animal Health and Disease Control Project"

New Quarantines
Operation Cost

Item	Amount	Unit	Unit Price	Cost	Remark
Facilities	1920000	%	0.01	19,200	Maintenance
Vehicles		11 Cars	500	5,500	
Running (Staff)	1920000	%	0.05	96,000	
Doctor		17 Men	6912	117,504	
Assistant		7 Men	2808	19,656	
Nurse		17 Men	2376	40,392	Clerk
Total				298,252	

Source: JICA estimation on basis of MAF information

New Clinics

Animal Clinic Operating Cost

Item	Amount	Unit	Unit P	Cost	Remark
Maintenance	960,000	%	0.01	9,600	
Running	960,000	%	0.05	48,000	
Vehicles (Staff)		19 Cars	650	12,350	
Doctor		21 Men	6,912	145,152	
Assistant		46 Men	2,808	129,168	
Nurse		56 Men	2,376	133,056	
Total				477,326	

Table 3.3.18 Recurrent Budget Regarding "Animal Health and Disease Control Project"

Civil Development plan Operating Cost

Item	Character	Amount	Unit	Unit Price	Cost	Remark
Doctor	6.1	2	Men	9,744	19,488	
Doctor	2.2	4	Men	6,912	27,648	
Engineer	3.2	1	Men	5,700	5,700	
Technician	4.2	9	Men	3,372	30,348	
Assistant	5.2	10	Men	2,808	28,080	
Attendant	5.3	7	Men	1,776	12,432	
Building		163,000	R.0%	0.01	1,630	
Equipment		123,000	R.0%	0.05	6,150	
Electricity		12	Month	300	3,600	
Material		1	Set	10,000	10,000	
Training		1	Set	10,000	10,000	
Total					155,076	

Salalah Laboratory Development plan Operating Cost

Item	Character	Amount	Unit	Unit Price	Cost	Remark
Doctor	6.1	2	Men	9,744	19,488	
Doctor	2.2	2	Men	6,912	13,824	
Engineer	3.2	1	Men	5,700	5,700	
Technician	4.2	4	Men	3,372	13,488	
Assistant	5.2	6	Men	2,808	16,848	
Attendant	5.3	5	Men	1,776	8,880	
Clerk	2.5	2	Men	2,808	5,616	
Building		170,000	R.0%	0.01	1,700	
Equipment		103,000	R.0%	0.05	5,150	
Electricity		12	Month	300	3,600	
Material		1	Set	10,000	10,000	
Training		1	Set	10,000	10,000	
Total					114,294	

Table 3.3.19 Cost Estimation of NLE-1-1:
Extension Method Improvement

Item	Quantity	Unit	Unit Price	Cost	Remark
Extension Equipment					
Hoof Cutter	50	Set	10	500	
Dehorner	50	Set	12	600	
Scissors	50	Set	12	600	
Cutting Machine	50	Set	200	10,000	For Grass
Shearers	50	Set	15	750	
Scale	7	Set	500	3,500	Portable
Ear tag	50,000	Set	0.2	10,000	
Applicator	50	Set	5	250	For Ear-tags
Sprayer	50	Set	30	1,500	
Brush	500	Set	1	500	
Rake	500	Set	6	3,000	
Spade	500	Set	6	3,000	
Wheel Barrow	50	Set	20	1,000	
Burdizzo	21	Set	10	210	For castration
Weigher	21	Set	70	1,470	Suspended
Milking Machine	7	Set	1,950	13,650	
Sub-Total				50,530	
Video unit					
Film Making	10	Set	10,000	100,000	
Pamphlet making	10	Set	500	5,000	
Video Film	1,000	Set	5	5,000	
Pamphlet	300,000	Paper	0.2	60,000	
Video Machine Included in Agriculture Sector's Budget.					
Sub-Total				170,000	
Demonstration Unit					
Poultry	1	Unit	20,000	20,000	Jabal
Camel	1	Unit	20,000	20,000	Nejd
Bedouin Livestock	1	Unit	20,000	20,000	Nejd
Beef Cattle	1	Unit	20,000	20,000	Nejd
Sub-Total				80,000	Facilities, Feed, Drug, Fuel etc
Grand Total				300,530	

Table 3.3.20 Cost Estimation of NLE-1-2:
Training Center Development
Training center development plan(Rumais and Salalah)

Item	Character	Amount	Unit	Unit Price	Cost	Remark
(Investment)						
Center Building	Concrete	288	m ²	150	43,200	20 Students
Equipment		1	Set	15,000	15,000	
Vehicle		2	Cars	5,000	10,000	
Mini-Bus		2	Cars	13,000	26,000	
Dormitory	Concrete	400	m ²	180	72,000	Including Furniture
Subtotal					166,200	
(OP. Cost.)						RECURRENT BUDGET
Staff						
Coordinator	2.3	1	man	4,980	4,980	
Clerk	5.2	1	man	2,808	2,808	
Cook	7.2	1	man	1,932	1,932	
Labour	4.3	1	man	1,776	1,776	
Vehicle		2	Cars	500	1,000	30000km/y
Mini-Bus		2	Cars	1,300	2,600	30000km/y
Catering		3,000	Unit	2	6,000	
Allowance		3,000	Unit	3	9,000	
Others		1	Set	3,000	3,000	Electricity etc
Subtotal					33,096	
Total					199,296	

Source : JICA estimate on basis of MAF information

Table 3.3.21 Recurrent Budget Regarding "Livestock Extension Development
Extension Staff Development Recurrent Cost (RECURRENT BUDGET)

Item	Character	Quantity	Unit	Unit Price	Cost	Remark
(Staff)						
Specialist	2.2	41	men	6,912	283,392	
Extension off.	4.2	40	men	3,372	134,880	
Extension Ass.	5.2	120	men	2,808	336,960	
Subtotal					418,272	
(Vehicle)						
Veh. Operation		94	cars	600	56,400	
TOTAL					474,672	

Source : JICA estimate on basis of MAF information

Table 3.3.22 Cost Estimation of NLR-1-1:
Development of Livestock Research Centers

Item	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Rumais Development	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Quriyat Development	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Salalah Development	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Total	450,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000	450,000
Grand TOTAL	4,500,000									

Source: JICA estimation on basis of MAF information

Table 3.3.23 Cost Estimation of NLR-1-2:
Research Centers Management Consultancy

Item	1991	1992	1993	1994	1995
Staff Sals	195,000	195,000	195,000	195,000	195,000
Air Fares	25,000	25,000	25,000	25,000	25,000
Transportation	76,100	31,000	31,000	31,000	76,100
Management/Overhead	48,750	48,750	48,750	48,750	48,750
Utilities/Services	23,000	23,000	23,000	23,000	23,000
Accommodation	65,000	65,000	65,000	65,000	65,000
Specialist Visits	4,200	4,200	4,200	4,200	4,200
TOTAL	437,050	391,950	391,950	391,950	437,050
Grand TOTAL	2,049,950				

Source: Based on University of Duham. Center for Overseas Research
and Development
MAF information

Figure 3.3.3 Structure of Livestock Research Centers

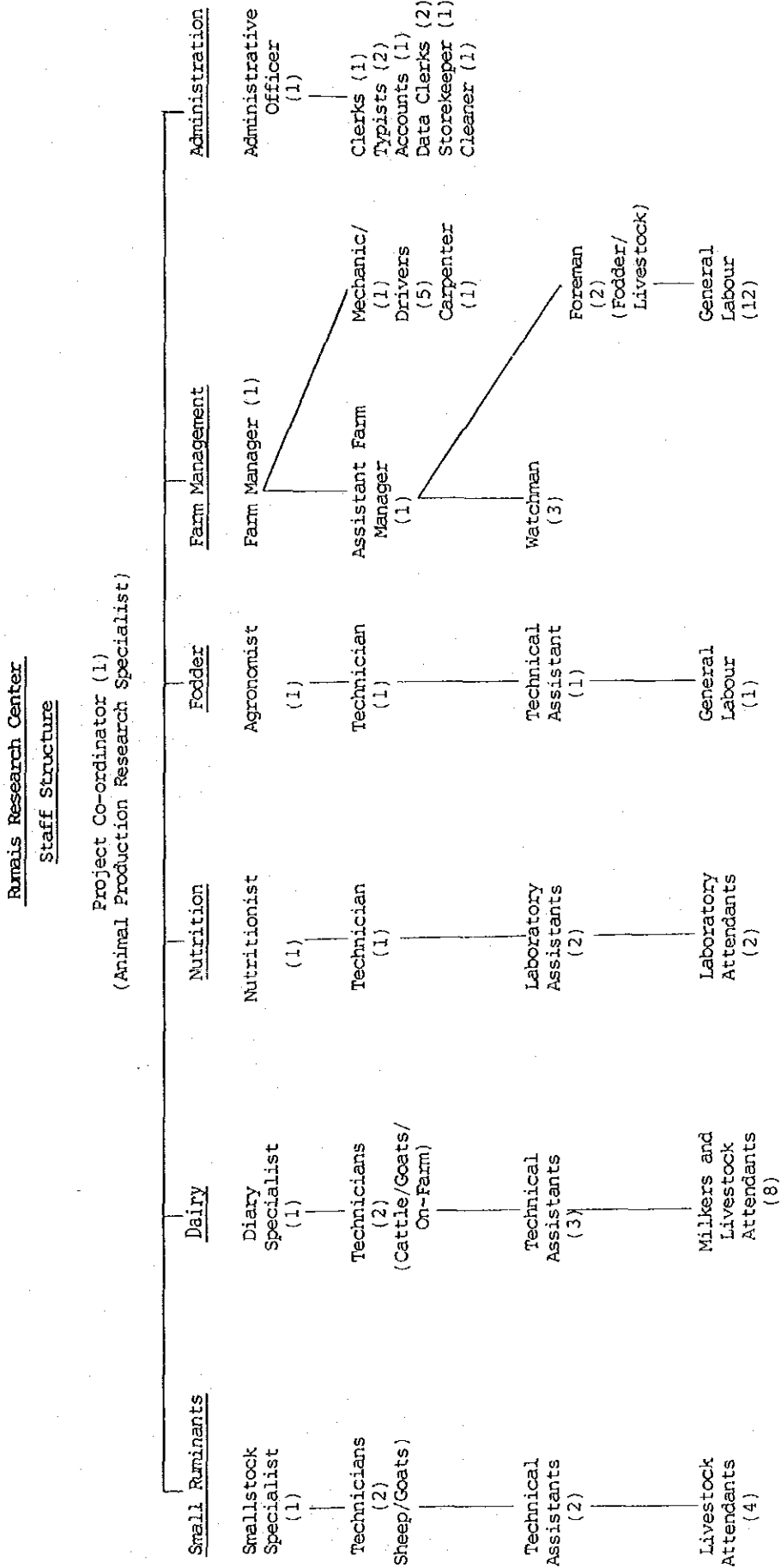


Figure 3.3.3 Structure of Livestock Research Centers (continued)

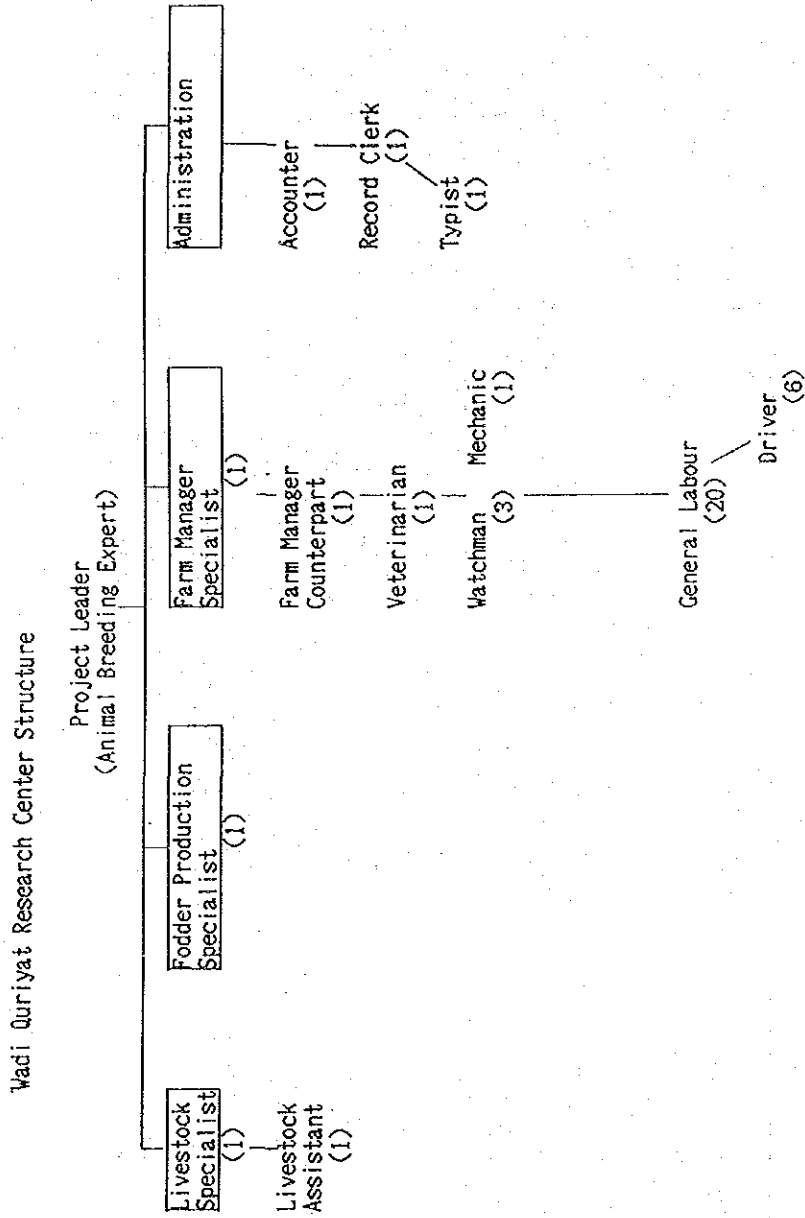


Figure 3.3.3 Structure of Livestock Research Centers (continued)
Sallah Research Center

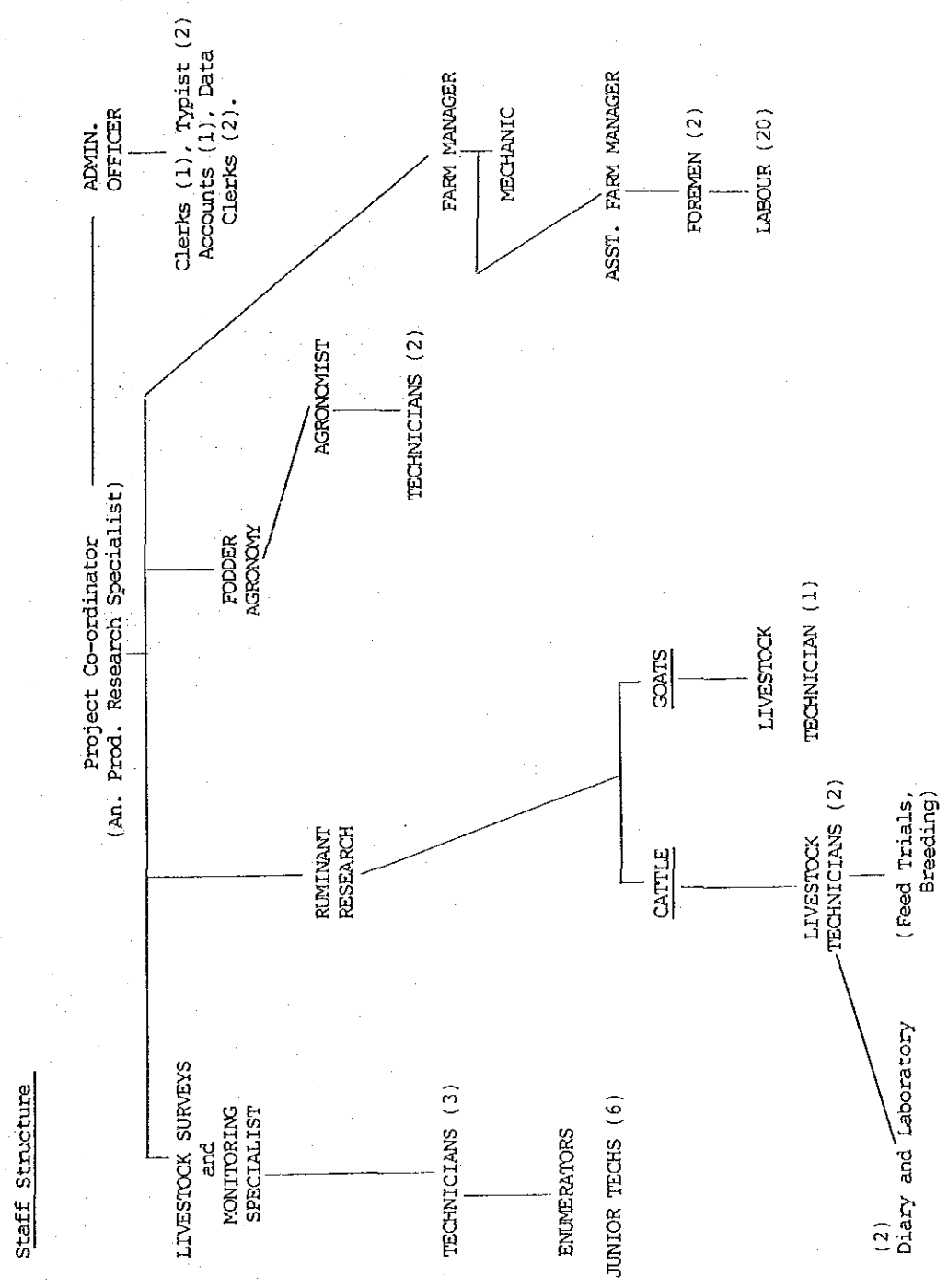


Table 3.3.24 Cost Estimation of NLM-1-1:
Company for Livestock Production

Item	Amount	Unit	Unit Price	Cost	Remark
Office	650	m ²	200	130,000	
Equipment	1	Set	80,000	80,000	
Vehicle	10	Cars	6,500	65,000	
Furniture	1	Set	30,000	30,000	
Parking	1	Set	10,000	10,000	
Store	150	m ²	110	16,500	Investment Total
Infrastructure	1	Set	30,000	30,000	361500
Working Capital	For Loan etc.			2,250,000	Government Responsibility
Sub-total				2,611,500	50% 1305750
(Op. Cost)					
Staff	2	men	10000	20,000	Government
Staff	20	men	5,000	100,000	Responsibility
Expenditure	12	Month	2,000	24,000	50%
Sub-total			x5years	720,000	360000
Total				3,331,500	
D/D and Preparation	1	Set	50,000	50,000	Government Responsibility
TOTAL				3,381,500	100% 50000

Source: JICA estimate

Note: This cost shows government burden.
Government Burden 1715750 R.O.

Table 3.3.25 Cost Estimation of NLM-1-2:
Cattle Fattening

Item	Character	Amount	Unit	Unit Price	Cost	Remark
(Facilities)						Beef Cattle
Pens	Pipe	42,775	m ²	25	1,069,375	Fattening
Sorting pen	Pipe	750	m ²	10	7,500	Government Responsibility
Dip		120		7	840	50%
Concentrates Store	Steel	175	m ²	70	12,250	
Vet. Clinic	R.C.	240	m ²	110	26,400	
Hayshed	Pipe	110	m ²	30	3,300	
Office	R.C.	150	m ²	30	4,500	
Parking Shed	Pipe	75	m ²	30	2,250	
Manager's House	R.C.	120	m ²	120	14,400	
Staff Housing	R.C.	120	m ²	120	14,400	
H. for Technicians	R.C.	100	m ²	120	12,000	
Machinery Shed	Pipe	90	m ²	30	2,700	
Workshop, Car Wash	Steel	70	m ²	60	4,200	
Generator Room	Steel	50	m ²	90	4,500	
Water Tank	R.C.	125		60	7,500	
Incinerator Pit		1	Set	250	250	
Weighbridge		1	Set	2,500	2,500	
Guard Room		6	Set	120	720	
Roads		3,000	m	20	60,000	
Fence		2,700	m	7	18,900	
Well		1	Set	17,000	17,000	Facilities-Total
(Machinery)						1,285,485
Tractor 65HP		3	Unit	6,500	19,500	
Tractor 45HP		4	Unit	4,500	18,000	
Feed Mixer Wagon		3	Unit	5,900	17,700	Feed 3.67kg/head. day
Front End Loader		4	Unit	5,500	22,000	
Unloading Trailer		1	Unit	1,700	1,700	
Fuel Tank		1	Unit	600	600	
Fuel Pump		1	Unit	300	300	
Animal Handling Equip.		1	Unit	4,000	4,000	
Tipper Truck		2	Unit	8,000	16,000	
Cattle Truck		2	Unit	10,000	20,000	
4WD-Vehicle		4	Unit	5,000	20,000	
Elec. Generator		1	Unit	2,500	2,500	
Workshop tools		1	Unit	1,000	1,000	
Lab. equipment		1	Unit	500	500	
Spray equipment		1	Unit	1,000	1,000	
Weighbridge		1	Unit	3,500	3,500	
Office Furniture		1	Unit	1,000	1,000	
Housing Furniture		1	Unit	6,000	6,000	
Pumping Plant		1	Unit	17,000	17,000	Machinery-Total
TOTAL					1,457,785	172,300
(Staff)						Operation Cost
Manager, Vet.	2.2	2	men	6,912	13,824	
Vet. Assistant	5.2	2	men	2,808	5,616	
Accountant	4.2	1	men	3,372	3,372	
Clerk	6.2	1	men	2,376	2,376	
Driver	5.2	6	men	2,376	14,256	for tractor
Attendant	3.4	8	men	1,776	14,208	
Driver		2	men	1,800	3,600	
Office Boy		1	men	1,200	1,200	
TOTAL					58,452	

Source: Based on 'Feasibility Study of Animal Projects', Arab Co. 1988

Note : Pilot Project 50,000R.O. and following

Government Support=50,000+928,893=978,893

Investment Working Capital and Training

1,457,785 ÷ 2 = 728,893 200,000 Total =

928,893

Table 3.3.26 Trial Calculation of the Profit on Jabal
Cattle Feeding

		Farm Management Plan(Cattle)		Local	
				80head	
Rough Revenue	Amount	Cost	Unit Price	Remark	
cull	8.9	1,788	200		
Young	15.1	904	60		
(Milk)	5.6	678	120		
By-product	5,883	1,324	0.225	/L Home consumption=Half	
		(1,324)		Milk 5883L	
Total		4,693			
Operating Cost					
Livestock Purchases					
Feed Hay	17.37	1,216	70	Rate of Purchased Feed	
Feed Concentrate	29.62	2,369	80	28% on Nutrition Base	
Feed Mineral	80	115	1.44		
Fertilizer					
Seed					
Pesticide					
Veterinary	80	112	1.4		
Market costs		0			
Transport	1562.5	188	0.12		
Repairs, Maintenance					
Fuel	1	36			
Depreciation	1	450	450	= 1Cargo Car	
Tools	1	20	20		
Labour				Working time/day	(Hour)
				feeding-observation	7
				cleaning	0
Unallocated cost					
Interest payment					
Taxes, Imposts					
Contingencies	5%	225			
Total		4,731			
		(1,324)	Profit-rate		
Profit		-38	-1 %		

Note: Herd number shows constant existing total heads
In this calculation, if ratio of purchased feed were
28% of total animal feed in this type of management,
it would be deficit management.

Table 3.3.27 Cost Estimation of NLM-1-3:
Cut Meat Processing
(Cut meat Processing)

Location	Scale	Item	Quantity	Unit	Unit Price	Cost	Remark
Slaughtering	75 heads/day	Facilities*	1	1set	331,800	331,800	1st year
Cut and Pack**		Vehicle	2		5,000	10,000	
		Building	450	m ²	150	67,500	1st year
		Equipment	1	1set	250,000	250,000	2nd Year
Chilling vehicle		Chilled Room	150	m ²	100,000	100,000	2nd Year
			2	Cars	25,000	50,000	2nd Year
Training		Labour	30	Persons	500	15,000	2nd Year
Working Capital			1	Set	250,000	250,000	
Total						1,074,300	

Source:* Based on 'Study for the Viability of Manufacturing Processed Meat':
Sir M. Macdonald and Partners Limited

** Based on 'An Assessment of The Viability of Manufacturing Processed Meat in Oman'

Government Burden Ratio 50 % = 537,150 R.O

Table 3.3.28 Cost Estimation of NLM-1-4:
Milk Collecting and Processing

Item	Character	Amount	Cost	Remark
(Main plant)				
Building	Concrete		180,000	
Generator Room			120,000	including 3 (400kva generator)
Pas. Plant			1,048,000	including U.H.T.
Guard Room			5,000	
Pump Room			10,000	including underground tank
Infrastructure			90,000	
Road			35,000	externally
Subtotal:			1,486,000	
(Collection C.)				
Equipment			17,000	including generator
Building			15,000	
Infrastructure			7,000	
Subtotal		X7	273,000	
(Institutional Support)				
Building		100	12,000	
Equipment			8,000	
Vehicle		2	13,000	
Training Fund			35,000	
Working Capital			234,000	including project support,
Subtotal			302,000	levies
Investment Total			2,061,000	
(Staff)				
Expert	6.1	1		for 4 years
Accountant	4.2	1		including above working capital
Clerk	4.2	1		

Source: Based on 'Milk Collection, Processing and Marketing Project in the Southern Region', GRH, 1988

Table 3.3.28 Cost Estimation of NLM-1-4:
Milk Collecting and Processing
Milk Collecting Project in the North

Item	Character	Amount	Unit	Cost	Remark
(Collection C.)					
Equipment			1 Set	17,000	including generator
Building	Concrete		1 Set	15,000	
Infrastructure			1 Set	7,000	
Subtotal		X5		195,000	
(Institutional Support)					
Building			100 m ²	12,000	
Equipment			1 Set	8,000	
Vehicle			1 Set	6,500	
Training Fund				20,000	
Subtotal				46,500	
(Op. Cost)					
Expert	6.1		1 man	9,744	
Assistant	4.2		1 man	3,372	
Expenditure			1 Set	2,400	
Materials			1 Set	1,000	
Subtotal		X5 years		82,580	for 5 years
Total				324,080	

Table 3.3.28 Cost Estimation of NLM-1-4:
Milk Collecting and Processing (continued)
Milk Processing Plant Phasing

Year	1	2	3	4	5	6	Total
Milk Plant in South	50,000	320,640	120,240	1,402,800	160,320	7,000	2,061,000
Milk Plant in North Initial Support		46,500					46,500
Annual Investment		55,516	55,516	55,516	55,516	55,516	277,580
Total	50,000	422,656	175,756	1,458,316	215,836	62,516	2,385,080
Government Burden 50%	25,000	211,328	87,878	729,158	107,918	31,258	1,192,540

Source: Based on Milk Collecting, Processing and Marketing Project in the Southern Region

Table 3.3.29 Cost Estimation of NLM-1-5:
Hides and Skins Development
PROJECT COST
(R.O. 1,000)

Project Year	1	2	3	4	5	Total
Hides & Skins Authority	101.40	25.04	-	-	-	126.44
Tannery	121.24	22.91	-	-	-	144.14
Collection Centre Credit	6.50	-	-	-	-	6.50
Project Office	136.27	63.62	-	-	-	199.86
Institutional Support	8.58	19.50	-	-	-	28.08
Working Capital	10.40	7.80	11.05	3.25	2.60	35.10
	384.384	138.866	11.05	3.25	2.60	540.124

Source: Based on "Feasibility Study for Livestock Related Cottage Industry", GRM, 1984

Government Burden Ratio 50 % = 270 R.O

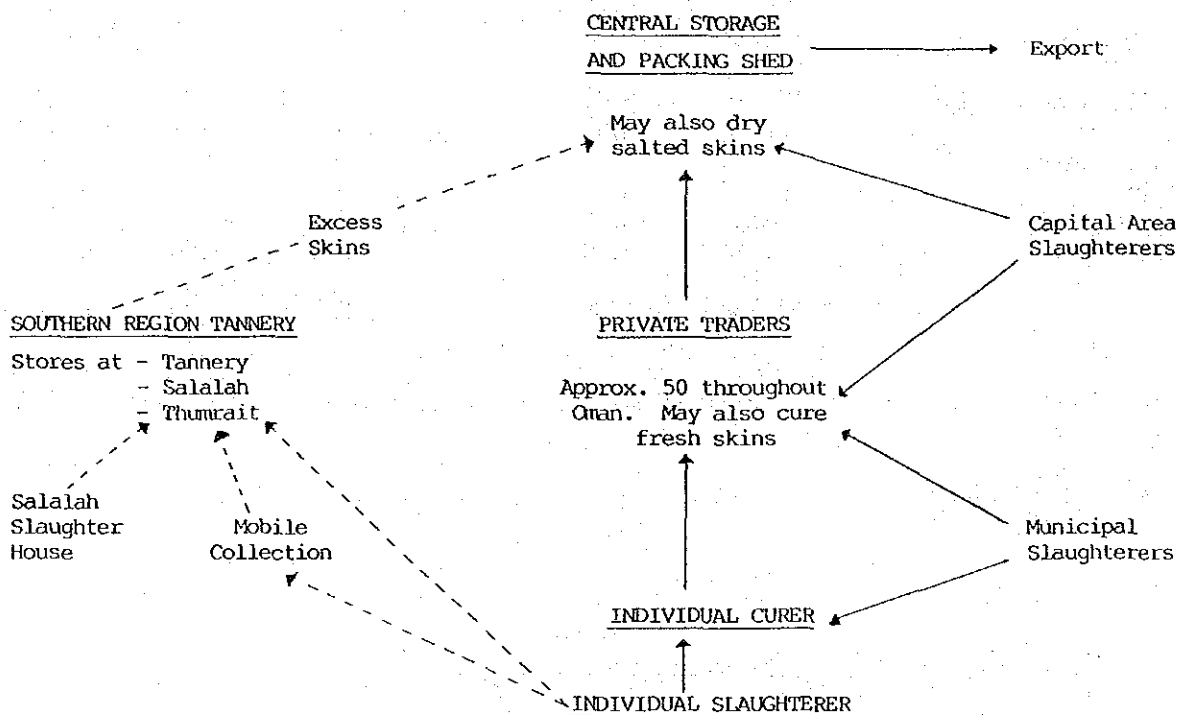
Table 3.3.31 Cost Estimation of NLM-1-6:
Cattle De-stocking Subsidy

Buying Price	L.W.kg	Selling Price	Difference	
R.O.	1.00	0.70	0.30	
Commission			0.10	
			0.40	Total
Average L.W. kg			125	
Buying Cost per Head			50.00	
(R.O.)				
Buying Head per Year			10,000	
Subsidy Total			500,000	

Note: Present Estimated number of Cattle in Jabal is around 160 thousand, and expected appropriate number will be around 90 thousand in the year 2000. Therefore, in coordination with public beef cattle fattening project, it would be necessary to reduce around 10 thousand's cattle per year for 7 years.

Table 3.3.30 Project Concept of Hides and Skins Development

HIDES AND SKINS COLLECTION AND MARKETING
PROJECT SCHEME



Note:

The proposed project sets out to collect as many as possible of the hides and skins currently being discarded in Oman. Through a series of agents located at strategic centres throughout northern Oman and the Southern Region, dry-salted skins will be purchased in Oman. Butchers, traders and the general public will be made aware of the importance of good hide and skin flaying and preservation techniques, and a price/grade structure will be introduced to reinforce it.

Hides and skins will be collected from the abattoirs and as many as 50 sites throughout the Sultanate. Intermediate processing of hides will be done, including tanning. Semi-processed and processed leather goods will be exported.

Table 3.3.32 Cost estimation of NLM-1-7:
Marketing Promotion

Marketing Promotion

Item	Character	Amount	Unit	Unit Price	Cost	remark
Table Egg	* Van 3ton	12	cars	10,000	120,000	to PAMAP
Collection	* Van 2ton	12	cars	7,200	86,400	to PAMAP
Bird Collection		10	cars	12,000	120,000	
sub total					326,400	
Advertisement		5	years	15,000	75,000	
Marketing Coordinator		5	men	15,000	75,000	1x5years
Driver		5	men	3,000	15,000	1x5years
Vehicle		1	car	6,500	6,500	
Expenditure		5	years	2,500	12,500	Including
sub-total					184,000	Vehicle
	sub totalx50%(Subsidy rate)				92,000	Cost
total					418,400	

Source: * Based on "Feasibility Study For Establishment of Poultry Project in Oman", GRM, 1988 and JICA estimate.

Table 3.3.33 Cost Estimation of NLL-3:
Livestock Input Company

Item	Government	Stock Holders	Private Company	Total
	20%	50%	30%	100%
New Feed Mill	982,520	2,456,300	1,473,780	4,912,600 *
Poultry Breeder Farm	376,400	941,000	564,600	1,882,000 **
TOTAL	1,358,920	3,397,300	2,038,380	6,794,600

Source: *Based on "Feasibility Study for Establishment of Animal Feed Mills, Arab Company for Livestock Development, 1988

**Based on "Feasibility Study for Establishment of Poultry Projects", GRM, 1988

Table 3.3.34 Cost Estimation of NLL-4-1:
Small Holder Poultry Production
Annual Costs of the Components of the Smallholder Poultry Project

Item	1991		1992		1993		1994		1995		TOTAL Cost
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	
Poultry Co-ordinator	1	4512	1	4856	1	4944	1	5082	1	5100	24000
Allowances, air fares etc.	1	8360	3	5360	1	5360	1	5360	1	5360	29800
Poultry Technicians	3	7848	3	9450	3	8712	3	8964	3	9216	43200
Allowances, air fares etc.	3	11412	3	5412	3	5412	3	5412	3	5412	33600
Transport purchase:											0
Lorries	2	17000	2	17000	2	17000	2	17000	2	17000	51000
1.5 Pick-ups	6	27000	-	-	-	-	-	-	-	-	27000
Shed Layers	195	341250	195	341250	195	341250	195	341250	195	341250	1706250
Shed Broilers	320	560000	320	560000	320	560000	320	560000	320	560000	2800000
Feed and Water Equipment:											0
Broilers: Brooders	320	6400	320	6400	320	6400	320	6400	320	6400	32000
Chick Water	3200	1600	3200	1600	3200	1600	3200	1600	3200	1600	8000
Chick Feeder	3200	1600	3200	1600	3200	1600	3200	1600	3200	1600	8000
Adult Water	1280	5120	1280	5120	1280	5120	1280	5120	1280	5120	25600
Adult Feeder	1920	9600	1920	9600	1920	9600	1920	9600	1920	9600	48000
Layers:											15600
Water	780	3120	780	3120	780	3120	780	3120	780	3120	15600
Feeder	1170	5850	1170	5850	1170	5850	1170	5850	1170	5850	29250
P.O.L. Pullets (000)	58.5	204750	58.5	204750	58.5	204750	58.5	204750	58.5	204750	1023750
D.O. Chicks (200,000)	1.92	480000	1.92	480000	1.92	480000	1.92	480000	1.92	480000	2400000
sub total		718040		718040		718040		718040		718040	0
Vaccines and Drugs											0
(@RO 20 per shed all sheds)	-	15340	-	30640	-	48060	-	66440	-	84820	245300
Demonstrations:											0
Labour (inc. allowances)	2	3000	2	3096	2	3192	2	3288	2	3384	15936
Pullets	600	2100	600	2100	600	2100	600	2100	600	2100	10500
D.O. Chicks (000)	12	3000	12	3000	12	3000	12	3000	12	3000	15000
Feed, Drugs, Equipmt. & Running Expenses	-	7000	-	7000	-	7000	-	7000	-	7000	35000
Training:											0
RO 12.00 per man day:	900	10800	900	10800	900	10800	900	10800	900	10800	54000
Training Bursaries	1	5000	2	10000	2	10000	2	10000	2	10000	45000
Running Expenses:											0
Lorry Drivers (inc. allowances)	4	7532	6	11404	6	11324	6	12136	6	12456	55352
Pick-ups running @ RO 1000 per yr.	4	7200	6	10800	6	10800	6	10800	6	10800	50400
Lorries running @ RO 500 per yr.	8	4800	8	4800	8	4800	8	4800	8	4800	24000
ANNUAL TOTALS		1761194		1750818		1772150		1774334		1793526	8055032

Source: JICA estimation on basis of MAF information

Table 3.3.35 Cost Estimation of NLL-4-2:

Intensive Livestock Production

Intensive Livestock Production

Item	Character	Amount	Unit	Unit Price	Cost	Remark
(A) Goat						
Sheep	Shed	80.0	m ²	31.25	2,500.0	
Assumed herds	Seed	4.5	kg	5.0	22.5	
40	Irrigation	0.8	ha	2,000.0	1,600.0	
	Machine	1.0	Set	100.0	100.0	(Subsidy rate 50%)
	Subsidy				4,222.5	Grass Cutting
					x300	
Sub-Total					1,266,750	
Cattle						
(B) Cow	Shed	60.0	m ²	31.25	1,875.0	
average herds	Seed	7.5	kg	5.0	37.5	
10	Irrigation	0.8	ha	2,000.0	1,600.0	
	Equipment	1.0	Set	350.0	350.0	Milking Machine
	Machine	1.0	Set	100.0	100.0	Grass Cutting
	Subsidy				3,962.5	
					x50	
Sub-Total					198,125.0	
(C) Beef Cattle	Shed	160.0	m ²	25.0	4,000.0	
40	Seed	7.8	kg	5.0	39.0	
	Irrigation	0.8	ha	2,000.0	1,600.0	
	Machine	1.0	Set	200.0	200.0	Grass Cutting
	Subsidy				5,839.0	
					x40	
Sub-Total					233,560.0	
(A)x10years					12,667,500	
(B)x10years					1,981,250	
(C)x10years					2,335,600	
Total					16,984,350	

Source: JICA estimate : Unit Price of Machine is 50% Subsidized

Note: This subsidy cover 10% of goats and Sheep, 30% of beef cattle, and 75% of dairy cow in Oman. (Except Jabal)

Table 3.3.35 Cost Estimation of NLI-4-2: (Alternative 2)
Intensive Livestock Production

Item	Character	Amount	Unit	Unit Price	Cost	Remark
(A) Goat						
Sheep	Shed	80.0	m ²	31.25	2,500.0	
Assumed herds	Seed	4.5	kg	5.0	22.5	
40	Irrigation	0.8	ha	2,000.0	1,600.0	
	Machine	1.0	Set	100.0	100.0	(Subsidy rate 50%)
	Subsidy				4,222.5	Grass Cutting
					x225	
Sub-Total					950,062.5	
Cattle						
(B) Cow	Shed	60.0	m ²	31.25	1,875.0	
average herds	Seed	7.5	kg	5.0	37.5	
10	Irrigation	0.8	ha	2,000.0	1,600.0	
	Equipment	1.0	Set	350.0	350.0	Milking Machine
	Machine	1.0	Set	100.0	100.0	Grass Cutting
	Subsidy				3,962.5	
					x37.5	
Sub-Total					148,593.8	
(C) Beef Cattle	Shed	160.0	m ²	25.0	4,000.0	
	Seed	7.8	kg	5.0	39.0	
	Irrigation	0.8	ha	2,000.0	1,600.0	
	Machine	1.0	Set	200.0	200.0	Grass Cutting
	Subsidy				5,839.0	
					x30	
Sub-Total					175,170.0	
(A)x10years					9,500,625	
(B)x10years					1,485,938	
(C)x10years					1,751,700	
Total					12,738,263	

Source: JICA estimate : Unit Price of Machine is 50% Subsidized

Note: This subsidy cover 7.5% of goats and Sheep, 22.5% of beef cattle, and
(Except Jabal)

55% of dairy cow(cross-bred) in Oman.

Table 3.3.36 Trial Calculation Regarding "Subsidy"

(Small Farm Development Support Project)
 Farm Management Plan (Goat Intensive 40 Heads)

In this section, some trial calculations are done in order to estimate the effectiveness of the subsidy. Table Below calculates the profit of farmer in case of accepting various government support.

Case: Loan (12%, 9%, 2%interest) Subsidy: (30%, 50%, this plan)

Profit -----see table below

Type	Contents	Profit	Repayment	Net Profit
12%interest	Rate/Year	904	635	269
9%interest		904	536	368
2%interest		904	336	568
30%subsidy	Remainder 2%interest	904	235	669
50%subsidy	Remainder 2%interest	904	168	736
Planned	Remainder 2%interest	904	8	896

Investment ----- 4323 R.0

Note: Replacement term is assumed for 15 years
 $\text{Payment rate} = \text{interest rate} / (1 - (1 - \text{interest rate})^{-n})$
 $\text{Annual Payment} = \text{Investment} \times \text{Payment rate}$
 "n" shows interest rate

Table 3.3.37 Cost Estimation of NLL-4-3:

A.I. Services for Dairy Cows

COST ESTIMATION (A.I. Nizwa, Salalah)

Item	Character	Amount	Unit	Unit Price	Cost	Remark
(1)Op. Cost (Staff)						
Specialist	2.2	1	man	6,912	6,912	housing, air fares etc
Inseminator	4.2	2	men	4,092	8,184	foreigner
Inseminator	4.2	1	man	3,372	3,372	Omani
Clerk	4.2	1	man	3,372	3,372	
Driver	3.2	1	man	1,932	1,932	
Attendant	4.3	1	man	1,776	1,776	
Running Cost		1	Set	21,000	21,000	from paper of Dept. of Animal Wealth
Expenditure		1	Set	1,000	1,000	drug etc
Sub-Total		Recurrent Budget			47,548	
(2)Investment						
Building		60		120	7,200	
Furniture		1		1,000	1,000	
Equipment		1		2,000	2,000	
Vehicle		2		6,500	13,000	
Training		1		7,000	7,000	
Sub-Total		Development Budget			30,200	

Source: JICA estimate on basis of MAF information

Note: This budget is for one A.I. Service Center. Centers' Scale are same in both.

Table 3.3.38 Cost Estimation of NLL-5:
Livestock Specialized Services

Population Survey(Census)180days		Survey Cost		Counted in Agriculture Sector	
Item	Amount	Unit	Unit Price	Cost	Remark
Vehicle Staff	40 Teams	40 Teams	1400	56000	Every5year
Specialist	40 Persons	40 Persons	2850	114000	
Assistant (Driver)	40 Persons	40 Persons	1200	48000	
Accommodation	240 men/mon	240 men/mon	300	72000	
Trip Cost (80x6 month)	480 men/mon	480 men/mon	150	72000	
Company's Expenditure (Staff costx1.0)				162000	
Sub-Total				524000	
National Disease Survey 60days x10					
Vehicle Staff	1 Car	1 Car	1200	1200	
Specialist	1 Person	1 Person	2000	2000	
Assistant (Driver)	1 Person	1 Person	600	600	
Accommodation (2x60days)	120 men/day	120 men/day	30	3600	
Trip Cost (2x2 months)	4 men/day	4 men/day	150	600	Allowance
Company's Expenditure(Staff costx1.0)				2600	
Sub-Total				106000	
Computer					
Market Survey 1year					
Vehicle Staff	3 Cars	3 Cars	2800	8400	
Specialist	5 Person	5 Person	8550	42750	
Assistant (Driver)	5 Person	5 Person	2400	12000	
Accommodation	5 men/yea	5 men/yea	1500	7500	
Trip Cost (5x12 months)	60 men/mon	60 men/mon	300	18000	
Company's Expenditure(Staff costx1.0)				54750	
Sub-Total				143400	
TOTAL				778400	
Study Cost					
Item	men.	month	Unit Pricex1.25x1.05	cost	
Corral Husbandry Establishment	each				
Marketing Facility Establishment	15	5000	6582.5	98437.5	
etc.					
					Every year

Table 3.3.39 Required Additional Manpower in Livestock Sector

Name of the Project	Project Period	REQUIRED MANPOWER AND THE NUMBER OF SUBSIDISED FARMERS							Total	Consultant Man/Month per year	Subsidized Farmers
		Specialist	Assistant	Clerk	Man Power Labour	Driver	Doctor				
Rangeland Revegetation Project in Southern Region											
① Establishment of Rangeland Management	2										About 1400
② Grazing Control	10										
Animal Health & Disease Control Project											
① Development of New Quarantines	5		24							17	41
② Animal Clinic Improvement	5		102							21	123
③ Laboratory Development	10	15	16	2	12					10	55
④ CAPP Vaccine Development	3										
⑤ National Vaccination	10										
⑥ Supplies of Veterinary Equipment	10										
⑦ Brucellosis Control in South	10										
Extension Development											
① Extension Method Improvement	10										
② Training Center Development				1							4
③ Development of Staff	5	81	120								201
Research Development											
① Developing Livestock Research Station	10										
② Research Management Consultancy	5										
Livestock Marketing Improvement Project											
① Company for Livestock Products	7	10	5	3	3					1	22
② Feedlot Fattening (Cattle)	5	1	2	2	9					1	23
③ Cut Meat Processing	3	1	2	4	15					2	24
④ Milk Collecting and Processing	6	1	3	10	19					3	36
⑤ Hides and Skins Development	3	7		2	103					4	116
⑥ Cattle Destocking Subsidy	5										
⑦ Marketing Promotion	5										
Livestock Input Company Project (Feed Mill)	2										
(Broiler Breeding Farm)											
Small Farm Development Support Project											
① Smallholder Poultry Production	5	11	18	6	21					5	61
② Intensive Livestock Production	10	3	1	2	100						106
③ A.I. Services for Dairy Cow											
Livestock Specialised Services											
① Livestock Census	1										
② National Disease Survey	10										
③ Marketing Survey	1										
④ Consultancy Services(Study)	10										
Total		139	293	34	286	24	50	826	2397	7875	