CHAPTER III ENGINEERING STUDY

Following the development scenario of the Agro-industrial Park as described in Chapter II, the engineering study was carried out to formulate the development plan.

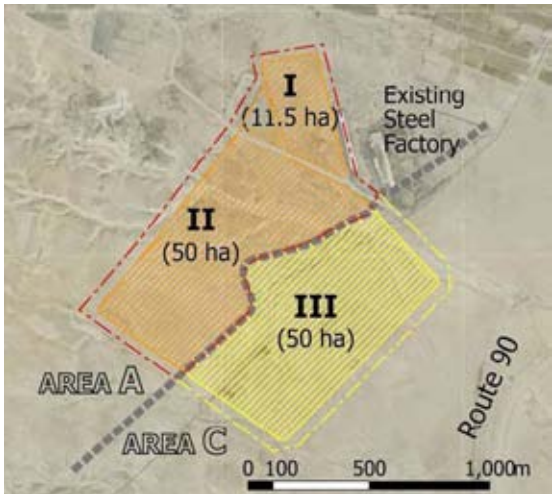
In this chapter, the condition of the candidate site for the Agro-industrial Park is summarized in Section III-1 and the basic conditions for planning of required facilities are presented in Section III-2. Subsequently, the engineering study for each facility, including the evaluation of the present condition of the candidate site, definition of design criteria, recommendation of appropriate systems, etc. are described in Sections III-3 and III-4 for off-site and on-site infrastructure, respectively.

III-1 Condition of Candidate Site for the Agro-industrial Park

The candidate site for the Agro-industrial Park is located at the southern fringe of Jericho City, which is about 4.5 km away from the city center. Said site covers unused land while some of its surrounding area is utilized mainly for irrigation, with no residential occupants. The northern part of the candidate site is being developed for the Palestinian Security Forces. There exists a steel factory on the northeast side, where steel products are frequently transported.

Land Ownership

The candidate site consists of two parts, namely, the state-owned land (11.5 ha) on the northern side of the existing road leading to the steel factory and a privately-owned land (100 ha) on its southern side. The privately-owned land is divided into "Area A" and "Area C". The boundary of each area traverses from the southwest to the northeast, as shown in the right picture.



Candidate Site

Topography and Geology

The elevation of the site ranges from -288 m to -313 m. It has a gradual slope of around 1.4 % from the west down to the east. In the private land, a *Wadi* (dried up river) flows from the west to the east. The *Wadi* has small run-off discharge occurring only after rainfall during the winter season.

As shown in the right picture, the ground of the candidate site is basically composed of fine-grained sandy clay.

In order to determine the basic characteristics of the site, topographic and geological surveys, which include soil

***Wadi* in the Candidate Site**

sampling survey and core drilling with standard penetration tests, were carried out during the Study Part 2. The topographic map and related survey information are attached in Volume 2, DWG 201 and 202.

Climate

The candidate site has predominantly Mediterranean climate, which prevails in and surrounding the Jericho area. The following Table III-1 shows the annual average monthly air temperature, rainfall and evaporation in Jericho for the past 25 years, i.e., from 1974 to 1998.

Table III-1 Annual Monthly Air Temperature, Rainfall and Evaporation at Jericho

Item	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Air Temperature (℃)	13.2	14.6	17.4	21.7	25.6	28.5	29.9	30	28.6	25.1	19.6	14.7	22.4
Rainfall (mm)	36	31	25	10	2	0	0	0	0	7	22	33	166
Evaporation (mm)	78	76	128	189	261	289	298	267	227	135	94	59	2,101

Source: Meteorological office, the Ministry of Transport

As shown in the above table, the annual rainfall in and surrounding Jericho is as low as less than 200 mm. It also indicates that rainfall occurs between October and May, while it rarely rains in the summer season from June to September. The monthly rainfall at Jericho is less than the monthly evaporation throughout the year.

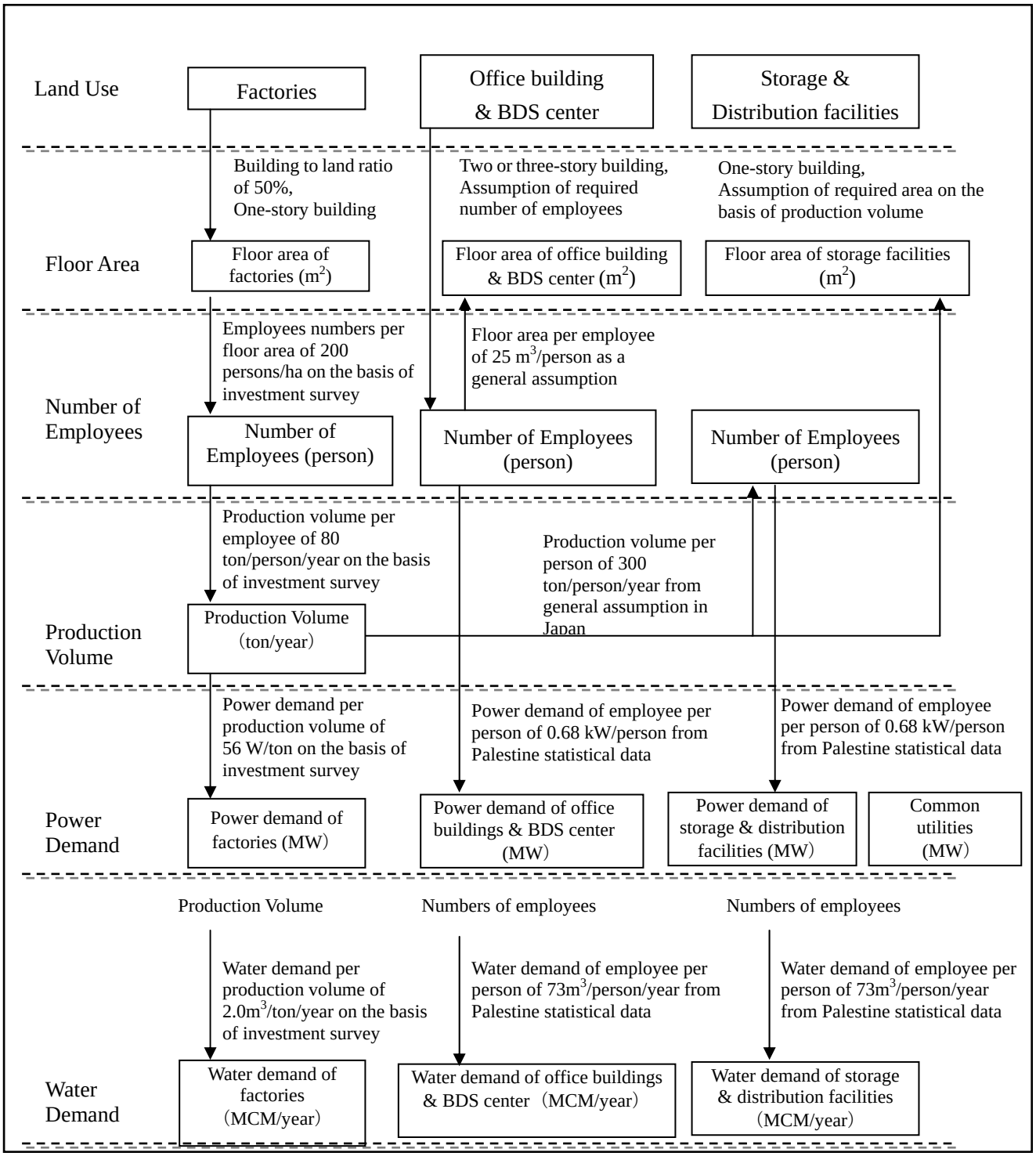
Access to the Candidate Site

The existing access road to the candidate site starts from the center of Jericho City towards the steel factory. Some parts of the road located near the city center are paved with asphalt while its remaining part is unpaved.

There is another unpaved road towards the west direction leading to the location of the Jericho Regional Hospital; however, its existing deteriorated condition appears not suitable for normal cars. There is also an existing 4 m-wide road from the steel factory towards Route 90, which consists of unpaved road between the steel factory and junction with the old road and the paved old road. However, this existing road remains unused and not linked to Route 90.

III-2 Expected Scale of the Agro-industrial Park

As a first step of the development planning, the expected scale of the Agro-industrial Park, including the employment population and production volume, is estimated based on the land use plan. Subsequently, power and water demands are also estimated on the basis of the employment population and production volume. The flow of estimation for the expected scale of the Agro-industrial Park is shown in Figure III-2. These expected production levels comprise the basic requirements for the infrastructure planning.



Source: JICA Study Team

Figure III-2 Flow of Estimation for Expected Scale of Agro-industrial Park

(1) Land Use Plan

As shown in Figure II-2-3 in Chapter II, the land use plan of the Agro-industrial Park is provisionally prepared in compliance with the basic concept of land use discussed in Section II-2, as well as the following assumptions:

a) Building coverage of a factory is assumed to be 50% based on the city planning standard for factory areas in Jericho Municipality.[1]

b) Factories and distribution facilities would be one-story buildings.

c) Office buildings would be three-storey structures.

d) Storage area is estimated based on the required storage volume, which is calculated on the basis of distribution and production volumes.

The planned land use area is thus as presented in Table III-2-1 below.

Table III-2-1 Planned Land Use Area

UNIT: m^2

Item	Site I	Site II	Sub-total (I+II)	Site III	Total (I+II+III)
Factory area	47,590	189,140	236,730	289,720	526,450
Office building area	12,760	10,000	22,760	9,940	32,700
BDS Center	0	8,990	8,990	0	8,990
Distribution area	14,330	24,070	38,400	22,150	60,550
Storage area		13,220	13,220	17,170	30,390
Park area	1,880	18,750	20,630	25,440	46,070
Common utility area	12,890	29,500	42,390	21,260	63,650
Parking area	4,100	16,290	20,390	19,890	40,280
Bus station/Security area	0	12,890	12,890	0	12,890
Internal road	14,370	69,470	83,840	95,930	179,770
Access road	0	17,950	17,950	2,090	20,040
Area required for *Wadi* improvement[2]	0	27,670	27,670	10,890	38,560
Sloped land due to land reclamation[3]	7,080	20,010	27,090	27,570	54,660
Unused area	0	42,050	42,050	0	0
Total	115,000	500,000	615,000	500,000	1,115,000

Source: JICA Study Team

The land use plan and development image for each development stage are shown in Volume 2, DWG 203 to 205 and DWG 210 to 214, respectively.

(2) Number of Employees

The number of employees in the Agro-industrial Park is estimated based on the following conditions:

a) The number of employees in factories is assumed to be 200 persons per hectare, in reference to the results of the investment survey.

[1] Source of the city planning standards of Jericho Municipality is the Engineering Department of the Jericho Municipality.

[2] The existing alignment of *Wadi* would be modified into an artificial canal with sufficient water flow capacity.

[3] Due to land reclamation works, the sloped land would be created at the boundary of areas with each elevation.

b) The number of employees in office buildings and the Business Development Service (BDS) center is estimated by assuming the required functions of each facility at each stage.

c) The number of employees in the distribution facilities is estimated on the basis of production and transaction volume per person (300 tons/year).

The resulting estimated number of employees by development stage is shown below.

Table III-2-2 Estimated Number of Employee

Unit: person

Facility	Stage I	Stage II	Sub-total (I+II)	Stage III	Total (I+II+III)
Factories	480	1,890	2,370	2,890	5,260
Distribution facilities	130	500	630	770	1,400
Office Building	80	100	180	100	280
BDS Center	10	20	30	0	30
Supporting Staff	10	10	20	10	30
Total	710	2,520	3,230	3,770	7,000

Source: JICA Study Team

(3) Production Volume

The production volume in the Agro-industrial Park is estimated to be 80 tons per person, based on the results of the investment survey, corresponding to the above estimated number of employees. Estimated production volumes for each development stage are shown below.

Table III-2-3 Estimated Production Volume

Unit: ton/year

	Stage I	Stage II	Sub-total (I+II)	Stage III	Total (I+II+III)
Production Volume	38,000	152,000	190,000	231,000	421,000

Source: JICA Study Team

Based on the land use plan, number of employees, and production volumes of the Agro-industrial Park mentioned above, the required input resources such as power and water supply and probable waste volumes are studied and discussed in Sections III-3 and III-4, for off-site and on-site infrastructure, respectively.

III-3 Off-site Infrastructure and Facilities Planning

On the basis of functions and facilities required for the Agro-industrial Park, off-site infrastructure is planned, as summarized in Table II-2-4 in Chapter II. The engineering studies for the following facilities are described hereinafter:

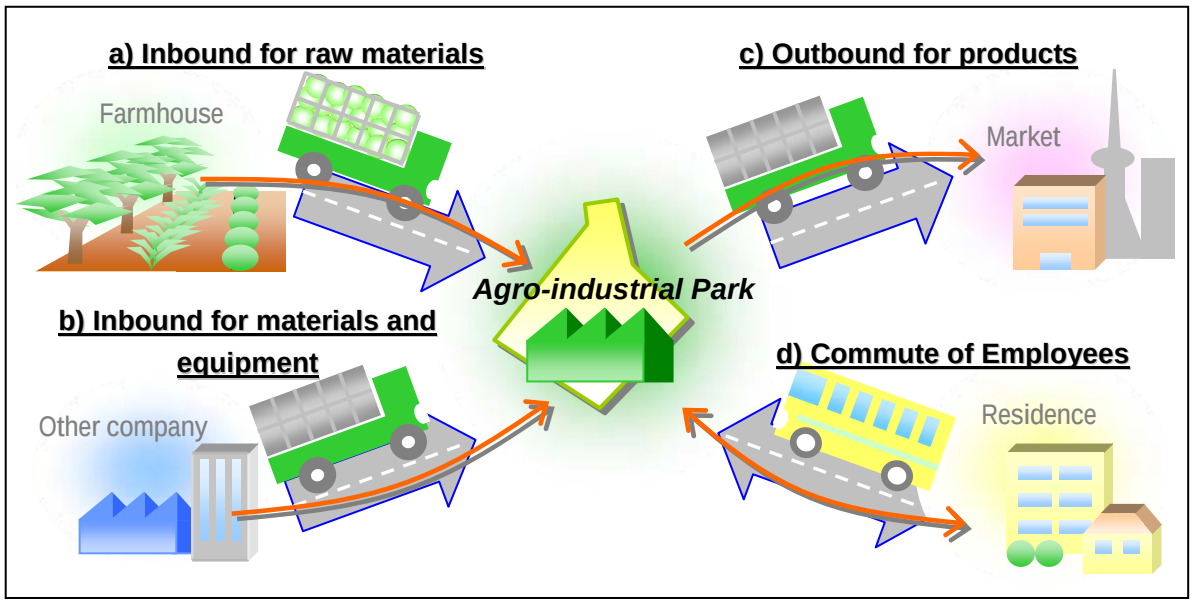
(1) Access roads
(2) Power supply facilities
(3) Telecommunication facilities
(4) Water supply facilities
(5) Wastewater treatment facilities
(6) Solid waste treatment facilities
(7) BDS Center building

(1) Access Roads

Functions of Access Roads

Major functions of the access roads to and from the Agro-industrial Park are assessed and categorized as follows:

a) Inbound transportation for raw materials: To procure raw materials from farmlands in Jericho and Al Auja.
b) Inbound transportation for materials and equipment: To procure materials and equipment for processing and packaging from other areas.
c) Outbound transportation for product shipping: To ship products to the market such as Jordan, the Middle East Gulf states, Israel and other countries.
d) Commuting employees: Employees living in/outside of Jericho commuting daily to and from the Agro-industrial Park.



Source: JICA Study Team

Figure III-3-1 Major Functions of Access Road for the Agro-industrial Park

Traffic Volume Forecasting

The daily traffic volume to and from the Agro-industrial Park is forecasted on the basis of the expected number of employees/factories, production volumes as estimated in Section III-2, as well as the results of the investment survey. Forecasting was conducted in two steps, namely, i) estimation of commuter's trips by classification, and ii) estimation of daily traffic volumes based on type of vehicles.

＜Estimation of Conceivable Trips＞

Four classifications of trips were considered with the following assumptions:

a) Commuting trips of employees are estimated for two directions, inbound and outbound, with the anticipated number of employees.

b) Business trips of visitors are assumed to be 10 trips per day for each factory.

c) Service and maintenance trips are required for maintenance of facilities in each factory. This is assumed to be four trips per day for each factory.

d) Regarding cargo trip, according to the result of the investment survey, the existing agro-industrial factories in the West Bank utilize various sizes of vehicles for its inbound transportation. It is probable that they would deliver and stock raw materials in large quantities, and then transport their products depending on market demands. The investment survey result shows the frequency of utilized vehicle size, as summarized below.

Table III-3-1 Standard Vehicle Size for Daily Use

Vehicle category	Loading capacity	Share of traffic volume	
		Inbound	Outbound
Single unit truck	Less than 5 ton	20%	23%
	Less than 10 ton	41%	28%
Intermediate semi-trailer (WB-12)	Less than 20 ton	27%	49%
Double Trailer Combination (WB-20D)	Less than 40 ton	12%	-

Source: JICA Study Team (Result of the investment survey as of 14 August, 2008)

Accordingly, daily cargo trips for the inbound and outbound transportation are estimated based on the projected daily productions (ton) and the above ratios of utilized vehicles for inbound and outbound transportation, respectively. Load capacity by type of trucks as inbound and outbound transportation, based on the annual production volume of factories, is shown below.

Table III-3-2 Number of Daily Cargo Trips

Purpose		Stage I	Stage II	Sub-total	Stage III	Total	formula
Product volume (ton/ year)		38,000	152,000	190,000	231,000	421,000	
Dairy Product volume (ton/ day)		125	502	627	762	1,389	Annual Product volume/303 days
Inbound Daily Cargo (trip/day)	Single unit truck (5t)	4	16	20	26	46	Total x 20%
	Single unit truck (10t)	9	33	42	51	93	Total x 41%
	Intermediate semi-trailer (20t)	5	23	28	33	61	Total x 27%
	Double Trailer Combination (40t)	2	10	12	15	27	Total x 12%
	Sub total	20	82	102	125	227	
Outbound Daily Cargo (trip/day)	Single unit truck (5t)	5	21	26	32	58	Total x 23%
	Single unit truck (10t)	7	25	32	39	71	Total x 28%
	Intermediate semi-trailer (20t)	11	45	56	68	124	Total x 49%
	Sub total	23	91	114	139	253	

Source: JICA Study Team

Based on the above assumptions, the daily number of trips to and from the Agro-industrial Park for each stage is estimated as summarized below.

Table III-3-3 Number of Trips to and from the Agro-industrial Park

Unit: trips/day

Purpose	Stage I	Stage II	Sub-total (I+II)	Stage III	Total (I+II+III)
Commute	1,420	5,040	6,460	7,540	14,000
Business	140	490	630	740	1,370
Service and maintenance	56	196	252	296	548
Inbound cargo (Single unit*[1](5t))	4	16	20	26	46
Inbound cargo (Single unit*[1](10t))	9	33	42	51	93
Inbound cargo (WB-12*[2])	5	23	28	33	61
Inbound cargo (WB-20D*[3])	2	10	12	15	27
Inbound cargo total	20	82	102	125	227
Outbound cargo (Single unit*[1](5t))	5	21	26	32	58
Outbound cargo (Single unit*[1](10t))	7	25	32	39	71
Outbound cargo (WB-12*[2])	11	45	56	68	124
Outbound cargo total	23	91	114	139	253
Total	1,659	5,899	7,558	8,840	16,398

*[1]: Single unit is the Single unit truck according to AASHTO vehicle classification.
*[2]: WB-12 is the double trailer combination according to AASHTO vehicle classification.
*[3]: WB-20D is the intermediate semi-trailer according to AASHTO vehicle classification.
Source: JICA Study Team

＜Estimation of Daily Traffic Volume＞

In accordance with the above daily number of trips, the types of vehicles to be employed for each trip are assumed as follows.

a) Commuters are assumed to consist of 20% of passenger cars and 80% of buses. The holding ratio of private cars in the West Bank is limited to 16.31/1,000 capita according to the statistics for 2006. This is to secure transportation for employees to go to the Agro-industrial Park in response to actual conditions. Moreover, in order to solve the traffic congestion caused by over three thousand commuting employees after Stage II, bus services are assumed. The number of passengers is defined as 1 person for a passenger car and 40 persons for a bus, respectively. Furthermore, the traffic volume of buses needs to be estimated as double since two round-trips are required in order for workers to commute to and from the Agro-industrial Park. It is considered that the buses leave the Agro-industrial Park empty once after dropping the workers off, and would also come back empty to pick them up.

b) Business trips are assumed to be 100% passenger cars.

c) Service and maintenance trips are assumed to be 100% single unit trucks.

d) Cargo trips are the summation of inbound and outbound transportation. Heavy trailer includes intermediate semi-trailer (WB-12) and double trailer combination (WB-20D).

In addition, it is necessary to consider the traffic volume from the existing steel factory.

The following three classifications of traffic volume are considered with the following assumptions:

a) Passenger cars are assumed to be used by 10% of the employees.

b) The factory owns 2 buses as transportation for their employees.

c) Regarding cargo trip, according to hearing survey, the factory uses 15 semi-trailers and 10 double trailers for each direction.

Based on the steel factory survey and the above assumptions, the daily number of traffic volume is as follows:

Table III-3-4 Number of Daily Traffic Volume of Steel Factory

Unit: vehicles/day [4]

Purpose		Number	Formula
Passenger car		17	Both direction x 10% of 85 employees
Bus		8	
Inbound Daily Cargo	Intermediate semi-trailer (20t)	30	
Outbound Daily Cargo	Double Trailer Combination (40t)	20	

Source: JICA Study Team

Accordingly, the daily traffic volume was estimated based on the above number of daily trips, and vehicles to be utilized for said trips. Estimated daily traffic volume for each development stage is presented in the table below.

Table III-3-5 Daily Traffic Volume to and from the Agro-industrial Park and Steel Factory

Unit: vehicles/day

Vehicle Category		Steel factory	Stage I	Stage II	Sub-total (I+II) *Inc. Steel factory	Stage III	Total (I+II+III) *Inc. Steel factory
Passenger car/ Van		17	423	1,500	1,940	2,250	4,190
Bus		8	52	210	270	300	570
Single unit truck		-	80	290	370	450	820
	In-bound	-	40	147	187	228	
	Out-bound	-	40	143	183	222	
Heavy trailer		50	20	80	150	110	260
	In-bound	30	8	34	72	45	
	Out-bound	20	12	46	78	65	
Total		75	575	2,080	2,730	3,110	5,840

Source: JICA Study Team

The access roads for the Agro-industrial Park shall be planned to accommodate the above traffic volume.

Access Road for Stage I

As shown in the above Table III-3-5, development in Stage I would generate small outbound traffic from the Agro-industrial Park, which could be accommodated by improving the existing surrounding roads as shown in Figure III-3-2. The existing roads to be improved consist of two road sections as follows:

[4] In case of that one car goes and returns, it should be counted as 2 vehicles for road planning.

＜Existing Road 1＞

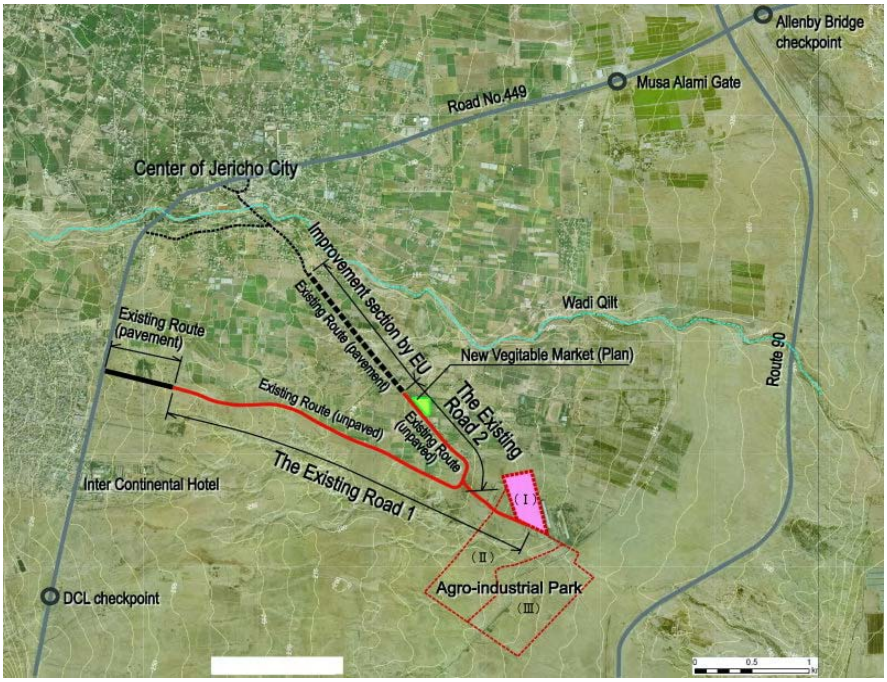
The road leading to the new residential area near the Jericho Regional Hospital in the westward direction, along the existing unpaved road beyond the boundary of the Agro-industrial Park;

＜Existing Road 2＞

The road between the junction of the existing road 1 to the center of Jericho City in the northwest direction, and the new vegetable and fruit market

According to information from Jericho Municipality, both existing roads 1 and 2 have been approved in the master plan of the road improvement plan for Jericho Municipality. The maximum road width is planned to be 20 m for all sections.

The dimensions, such as the width of the existing road 1, would be studied in consultation with Jericho Municipality, considering future improvement of the access roads for Stages II and III.



Source: JICA Study Team

Figure III-3-2 Road Improvement for Stage I

On the other hand, Jericho Municipality is proceeding with two projects in the southeast area of Jericho, which consists of the new vegetable and fruit market, and a road improvement project to develop the access road leading to market. The outlines of those projects are summarized as follows:

i) The New Vegetable and Fruit Market

There exists an old vegetable market at the center of Jericho Municipality. The operation of this old market causes a lot of traffic problems since the farmers' vehicles queue on the main street while waiting for their turn to enter the market area. According to the master plan report for the new vegetable and fruit market, a maximum of 45 farmers' vehicles line up along the Jerusalem road from 7:30 A.M. to 9:15 A.M. In order to avoid this traffic congestion, all the functions of the old market will be shifted to the new one.

ii) The Road Improvement Project

The width of the existing road between the center of Jericho Municipality and the site of the new vegetable and fruit market had been about 5 m. In order to have smooth access to the new market, the improvement of the road section (1.8 km long and 14 m wide) from the new market to the center of Jericho started from July 2008 and was completed in early 2009.

The implementation of these two projects has the following positive impacts on the Agro-Industrial Park:

(1) In case the new vegetable and fruits market commences operation, this would be one of the sources of fresh vegetables for the Agro-industrial Park. This can consequently cause a synergetic effect on the increase of transaction volume.

(2) After the improvement of the road for the new market is completed, and provided that the remaining road section from the new market to the Agro-industrial Park is improved (existing road 2 and part of existing road 1), the park would have better access from the center of Jericho, traversing the new market area.

(3) In addition to the improvement of existing road 2 and part of existing road 1, and if the full section of existing road 1 is improved, traffic from the Agro-industrial Park would have access to Route 1 and 90.

Existing land use along the existing road 1 is mostly agriculture lands. After the paved road section near the Jericho Regional Hospital, there exists a *Wadi* at the west-east direction, linked to the site of the Agro-industrial Park. Construction of a small bridge is required to cross the *Wadi*, consequently linking the road section near the hospital and the main section of existing road 1. The unpaved existing road 1 is used mostly by local farmers. A Bedouin community settlement exists along this road, about 200m west of the proposed Agro-industrial Park. According to Jericho Municipality, the land ownership of the Bedouin community settlement belongs to the Al Hussein Family. Assessment of the environmental and social considerations for existing road 1 is shown in Table III-3-6.

Table III-3-6 Assessment of Environmental and Social Considerations for Existing Road 1

Item	Possible impacts
Transportation efficiency	・ Possible heavy traffic congestion at the south Jericho checkpoint during the tourist peak season from March to April, and November to December. ・ Possible traffic congestion mixed with the general traffic from the surrounding areas. ・ Contribution to improvement of inner city road network.
Environmental Impact	・ Dust, fumes, noise and vibration by construction vehicles to the surrounding areas of the road construction and bridge construction site, on the *Wadi* and especially to the Jericho Regional Hospital and JDECO residential complex.
Social Impact	・ Land acquisition from private farmers. ・ Bedouin community settlement along existing road 1.* ・ Large construction and land acquisition cost. (Estimated total cost 38.9 million NIS)

Note: According to Jericho Municipality, Bedouin communities do not have rights to settle on the existing land. At present, the land belongs to the Al Hussein Family. Prior to start of construction work for existing road 1, Jericho Municipality has to discuss the issue of relocating the Bedouin community from the existing settlement area. The mitigation measure for this impact is described in 1), (7), Chapter 2, Table II-5-1.
Source: JICA Study Team

***Wadi* near Jericho Regional Hospital**

Agriculture land along unpaved existing access road 1

iii) The New Residential Complex Development Project

There is a new residential complex development project near the Agro-industrial Park. The project area is adjacent to the existing road 1 and 2, and close to the new vegetable market in Jericho. Land for the project is owned by PARC of Jericho. According to PARC, the land was sold to 70 private owners from outside of the Jericho area. The expected total number of residential units is 70-100 with an average residential population of 470 for the whole complex. Types of residential units are cottage houses or vacation-style houses. This residential complex will be directly affected during the improvement work for the existing road 1 and 2. Anticipated impacts on the residential area include dust, fumes, noise and vibration from construction vehicles during the construction work period.

Geometric Design of Improvement of the Existing Road for Stage I

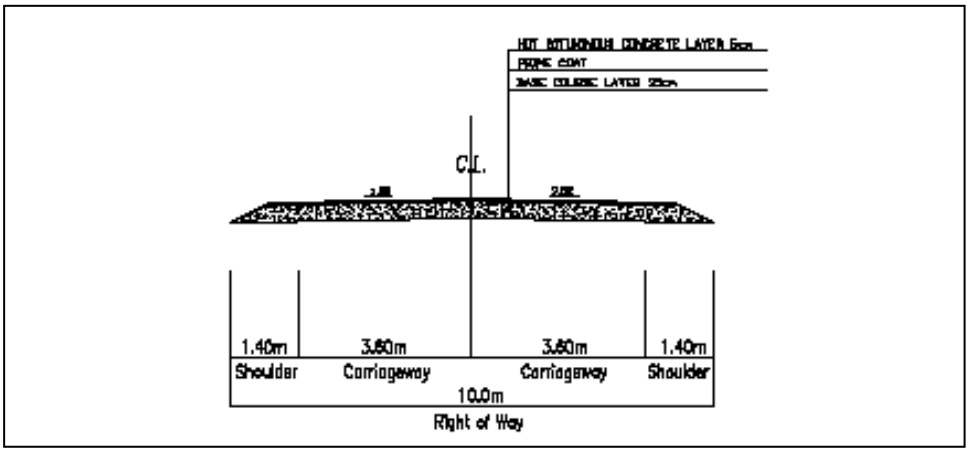
Geometric design of the improvement for the existing road for Stage I was based on "A Policy on Geometric Design of Highways and Streets" and "Design of Pavement Structures 1993" published by the American Association of State Highway and Transportation Officials (AASHTO). Improvement of the existing road for Stage I should be designed as a simple structure with low traffic. Design criteria and typical cross section of the access road for Stage I are shown in Table III-3-7 and Figure III-3-3, respectively.

The plan and profile of the access road for Stage I are shown in Volume 2, DWG 109 to 112. The detailed calculation of pavement design is shown in Volume 2, RD-1.

Table III-3-7 Design Criteria of Access Road for Stage I

Item		Access Road for Stage I
Design speed		40km/h
Number of lanes		2
Lane width		3.6m
Shoulder		1.4m both sides
Right of way		10m
Layer Thickness of Pavement	Asphalt concrete	5 cm
	Base course	35 cm

Source: JICA Study Team



Source: JICA Study Team

Figure III-3-3 Typical Cross Section of Access Road for Stage I

Access Road for Stages II and III

Since Study Part 1, three alternatives of access roads to the Agro-industrial Park for Stages II and III were considered. These alternatives were narrowed down to focus on the A-1 and A-2 routes for the outbound route in Study Part 2 as shown in Figure III-3-4. These were then enhanced in consideration of the expected functions, through the review carried out during Study Part 2. The corresponding new alternative titles are shown below.

＜Access Road A-1 (previous access road 1 in the Study Part 1)＞

New road to be constructed heading north of the Agro-industrial Park to Route 449.

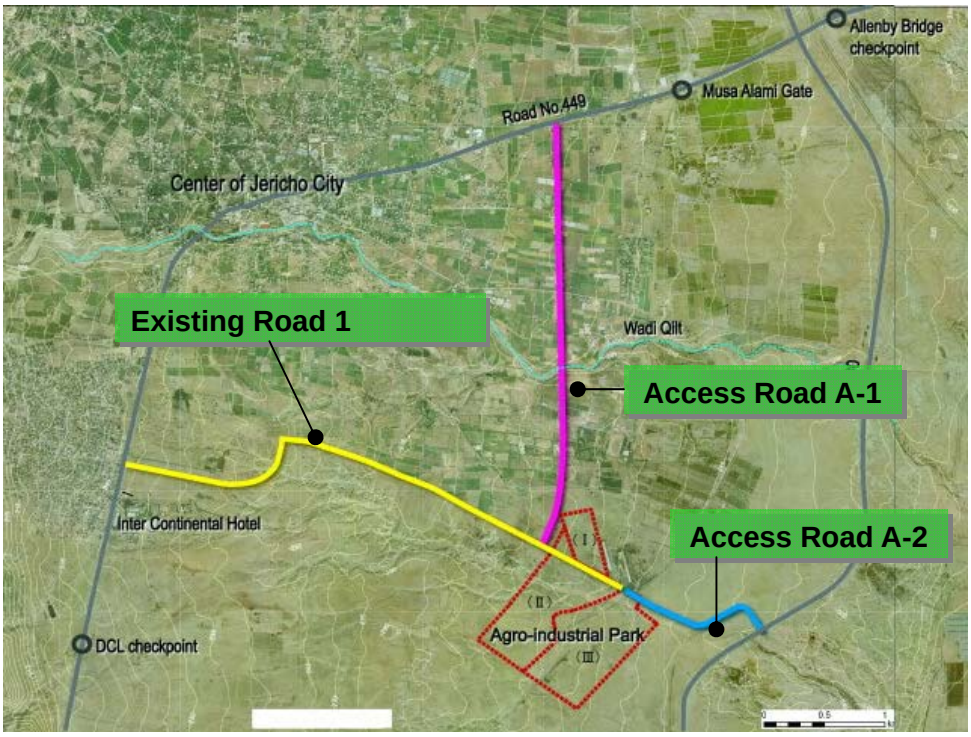
＜Access Road A-2 (previous access road 2 in the Study Part 1)＞

New road to be constructed heading east of the Agro-industrial Park along the existing old road, connecting to the existing Route 90.

Furthermore, the existing road 1 is supposed to function as an inbound route to the Agro-industrial Park, determined as follows:

＜Existing Road 1＞

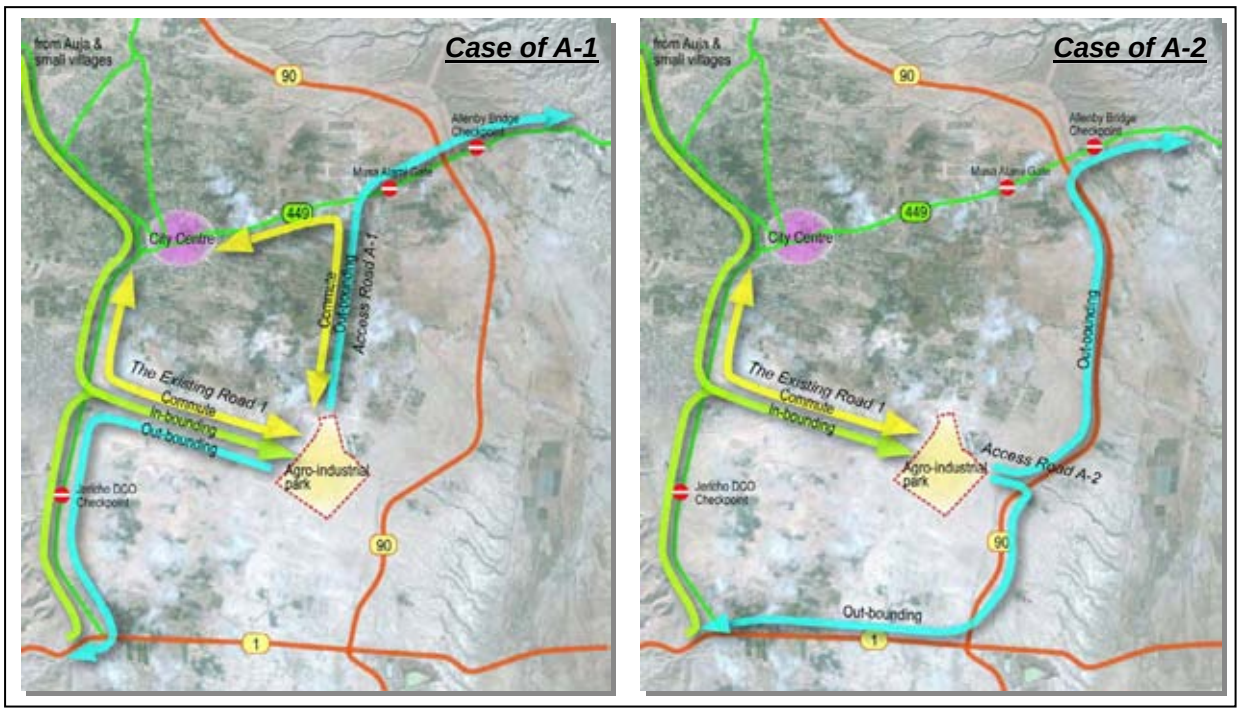
Road to be improved leading to Jericho Regional Hospital in the westward direction, along the existing unpaved road outside the boundary of the Agro-industrial Park.



Source: JICA Study Team

Figure III-3-4 Alternative Routes of Access Roads to the Agro-industrial Park

Potential traffic movements surrounding the Agro-industrial Park are illustrated in Figure III-3-5. As observed in the figure, access roads A-1 and A-2 would be categorized as cargo access roads, intended mainly for the smooth outbound transportation of goods from the park to the Allenby Bridge, while the existing road 1 would be categorized mainly as the smooth inbound access to the Park.



Source: JICA Study Team

Figure III-3-5 Traffic Movements Surrounding the Agro-industrial Park

Accordingly, the existing road 1 is recommended to be improved to meet the requirements for Stages II and III as inbound access for either case of access road A-1 or A-2. Both access roads are compared technically as alternative cargo access roads, and the results are as shown in Table III-3-8.

Table III-3-8 Comparison between Access Roads A-1 and A-2

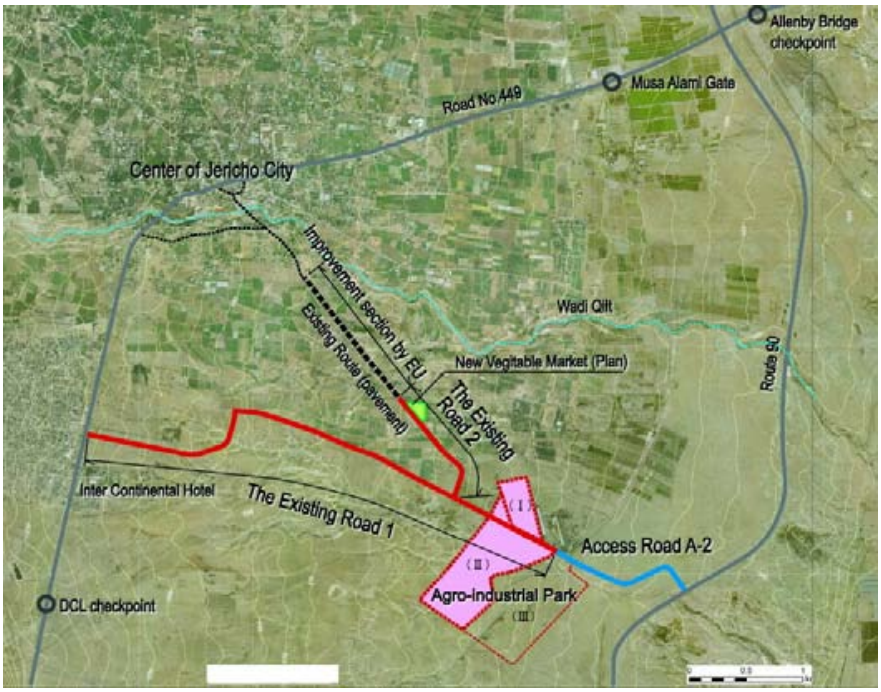
Item	Access Road A-1	Access Road A-2
Length	3.5 km	1.3 km
Status in Jericho Municipality Plans	It does not suit the existing urban development plan.	It has been approved in the master plan for road development.
Transportation Efficiency	It may cause traffic congestion due to general traffic from the surrounding urban areas.	It has the advantage in transportation time and smoothness.
Social and Environmental Concern	It may traverse an existing community, and cause serious negative impacts such as noise, vibration and risk of traffic accidents in the surrounding areas. Bridge construction is required across the *Wadi* Qilt River. Potential problem of land acquisition from private farmers. Agriculture and green areas exist along and near the existing route. Existence of recreational facilities, such as sports club and horse riding areas, located at a section between the *Wadi* Qilt River and the site of Agro-industrial Park. It may require a long period for land acquisition and construction works to be completed.	It will not cause considerable negative impacts since it will be located along vacant lands. Access road is located in Area C under the control of the Israeli authority. Improvement of the existing road requires administrative procedure to obtain approval from the Israeli authority.
Financial Concern	Construction cost is approximately 9.2 million US$	Construction cost is approximately 2.7 million US$

Source: JICA Study Team

Based on the above comparison and technical view points, access road A-2 is considered to be more appropriate than access road A-1.

As a result, improvement of the existing roads 1 and 2, and construction of A-2 with the full road width of 20 m are required to meet the traffic volume of Stages II and III as shown in Figure III-3-6. In the case of simultaneous development of Stages I and II, the access road construction requirement is still the same.

For the finalization of the alignment of access road A-2, discussions with the Israel side and PNA are required.



Source: JICA Study Team

Figure III-3-6 Access Road for Stages II and III

Geometric Design of Access Road

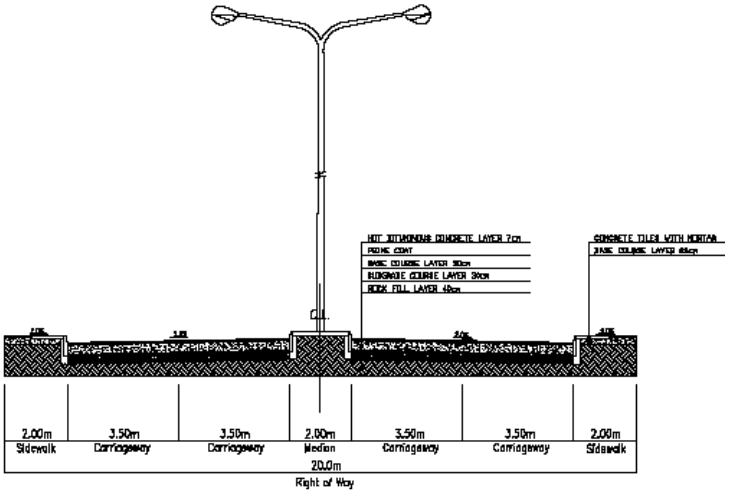
Geometric design of the access road was based on "A Policy on Geometric Design of Highways and Streets" and "Design of Pavement Structures 1993" published by AASHTO. The design criteria and typical cross section for the access road are shown in Table III-3-9 and Figure III-3-7.

The plan and profile for the access road for Stage II and III is shown in Volume 2, DWG 101 to 108.

Table III-3-9 Design Criteria for Access Road

Item		Access Road
Design speed		60 km/h
Number of lanes		4
Lane width		3.5 m
Median		2.0 m
Sidewalk		2.0 m both sides
Right of way		20 m
Max. super elevation		8%
Min. radius		113 m
Layer Thickness of Pavement	Asphalt concrete	7 cm
	Base course	30 cm
	Sub-base	30 cm

Source: JICA Study Team

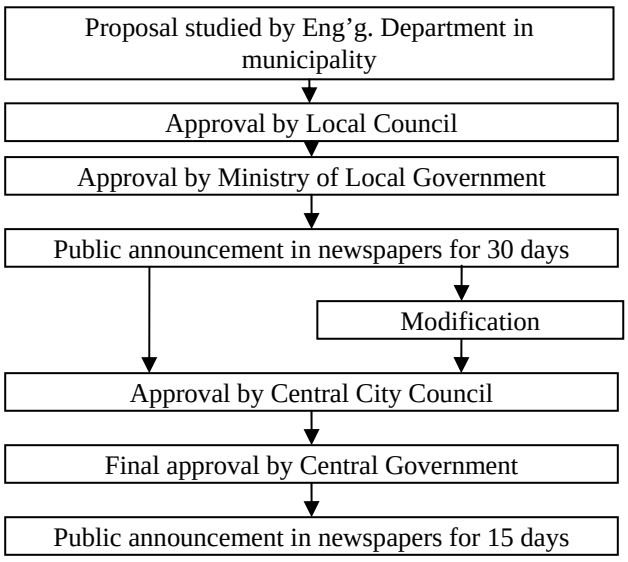


Source: JICA Study Team

Figure III-3-7 Typical Cross Section of Access Road

Approval Procedure for Road Planning

The figure below shows the standard approval procedure for planned roads. It takes a minimum of three months from the preparation of the proposal to final approval by the central government. Similar procedure will be required in case of design adjustments to the road width or alignment.



Source: Jericho Municipality

Figure III-3-8 Standard Approval Procedure for Road Planning

(2) Power Supply Facilities

Estimation of Power Demand

Power demand for the Agro-industrial Park is estimated on the basis of the power demand of factories, office buildings, the BDS center, distribution facilities, common utilities and road lighting.

1) Factories

In estimating the power demand for factories, the floor area based on the factory land area is defined. In this setup, the factory buildings are assumed to be one-storey with the building to land ratio set at 50%. [5]

Furthermore, the number of the factories' employees is determined by multiplying the assumed floor area of the factories by the number of employees per floor area. A mean value of 200 person/ha is assumed based on the results of investment survey.

On the basis of the assumed number of factories' employees, the annual production volume is estimated. This is determined by multiplying the number of factories' employees by the mean of production volume per employee. This target production volume is estimated to be 80 ton/person/year based on the result of investment survey.

Power demand for factories is estimated by multiplying the estimated annual production volume by the power demand per production volume. A mean power demand of 56 W/ton is considered based on the result of investment survey.

Table III-3-10 Power Demand for Factories

Item	Stage I	Stage II	Sub-total	Stage III	Total	Formula
Land use area (m^2)	47,590	189,140	236,730	289,720	526,450	
Floor area (m^2)	23,800	94,500	118,300	144,900	263,200	Land use area x 50%
No. of Employees (person)	480	1,890	2,370	2,890	5,260	Floor area x 200 person/ha
Production volume (ton/ year)	38,000	152,000	190,000	231,000	421,000	No. of employees x 80ton/ person/ year
Electric Power Demand (MW)	2.13	8.51	10.64	12.94	23.58	Production volume x 56W/ ton

Source: JICA Study Team

2) Office building and BDS center

Power demand for office buildings and the BDS center is estimated by multiplying the number of employees by power demand per employee, which is 0.68 kW/person. The number of employees is assumed based on the required positions to maintain the facilities.

Furthermore, with the formula shown below, the power demand per employee is determined by the power expenses per employee in other service industries, based on the Palestine statistical data of 2006.
Power demand per employee

= (Power expenses per employee: 221.5 USD/ person/ year) x (Shekel-US Dollar conversion rate: 4.45 NIS/USD (Year of 2006)) / (Electricity fee: 0.6 NIS/ kWh) / (Annual operating hours: 8 hours x 303 days) =0.68 kW/ person

Table III-3-11 Power Demand for Office Building and BDS Center

Item	Stage I	Stage II	Sub-total	Stage III	Total	Formula
Land use area (m^2)	12,760	18,990	31,750	9,940	41,690	
No. of Employees (person)	100	130	230	110	340	Assumption
Electric Power Demand (MW)	0.07	0.09	0.16	0.07	0.23	No. of employees x 0.68 kW/ person

Source: JICA Study Team

[5] Due to the land use regulation of Jericho Municipality, the designed building to land ratio of 50 % for factories' facilities is adopted.

3) Distribution facilities

Similar to that of the office building, power demand for distribution facilities is determined by multiplying the number of employees estimated from an assumed production scale by the power demand per employee of 0.68 kW/ person.

In addition, the annual production volume per worker in the wholesale market, which is 300 ton/person/year, is used as the design data for the estimation of number of employees.

Table III-3-12 Power Demand for Distribution Facilities

Item	Stage I	Stage II	Sub-total	Stage III	Total	Formula
Production volume (ton/ year)	38,000	152,000	190,000	231,000	421,000	
No. of employees (person)	130	500	630	770	1,400	Production volume / 300 ton /person/year
Electric Power Demand (MW)	0.09	0.34	0.43	0.52	0.95	No. of employees x 0.68 kW/person

Source: JICA Study Team

4) Common utilities

Power demand of each common utility is estimated on the basis of the power consumption required for the daily operation as shown in the following table.

Table III-3-13 Power Demand for Common Utilities

Item	Stage I	Stage II	Sub-total	Stage III	Total	Remarks
Water supply system (kW)	0	0.09	0.09	0	0.09	Desalination facilities
Wastewater treatment facilities (MW)	0.14	0.27	0.41	0.38	0.79	Treatment facilities
Solid waste treatment facilities (MW)	0.05	0.18	0.24	0.18	0.42	Treatment facilities
Total Electric Power Demand (MW)	0.19	0.54	0.73	0.56	1.29	

Source: JICA Study Team

5) Road lighting

The required power for road lighting is estimated based on the number of lighting utilities placed along major and minor roads, as follows:

Power of road lighting = Number of lighting utilities x Power per lighting utility

Assuming that power per lighting utility is 400 W for major roads and 250 W for minor roads, the lighting fixtures are to be placed at every 25 m, on a zigzag arrangement at both sides.

Table III-3-14 Power Demand for Road Lighting

	Item	Stage I	Stage II	Sub-total	Stage III	Total	Formula
Major road	Length of road (m)	172	841	1,052	1,358	2,410	
	No. of lighting utilities	14	67	84	109	193	Length of road/ 25m x 2
	Electric Power Demand (kW)	6	27	33	44	77	No. of lighting utilities x 400w
Minor road	Length of road (m)	664	2,838	3,502	3,764	7,266	
	No. of lighting utilities	53	227	280	301	581	Length of road/ 25m x 2
	Electric Power Demand (kW)	13	57	70	75	145	No. of lighting utilities x 250w
Total Electric Power Demand (kW)		19	84	103	119	222	

Source: JICA Study Team

Based on the above estimates, the total power demand for the Agro-industrial Park is presented below.

Table III-3-15 Power Demand for Agro-industrial Park

Unit: MW

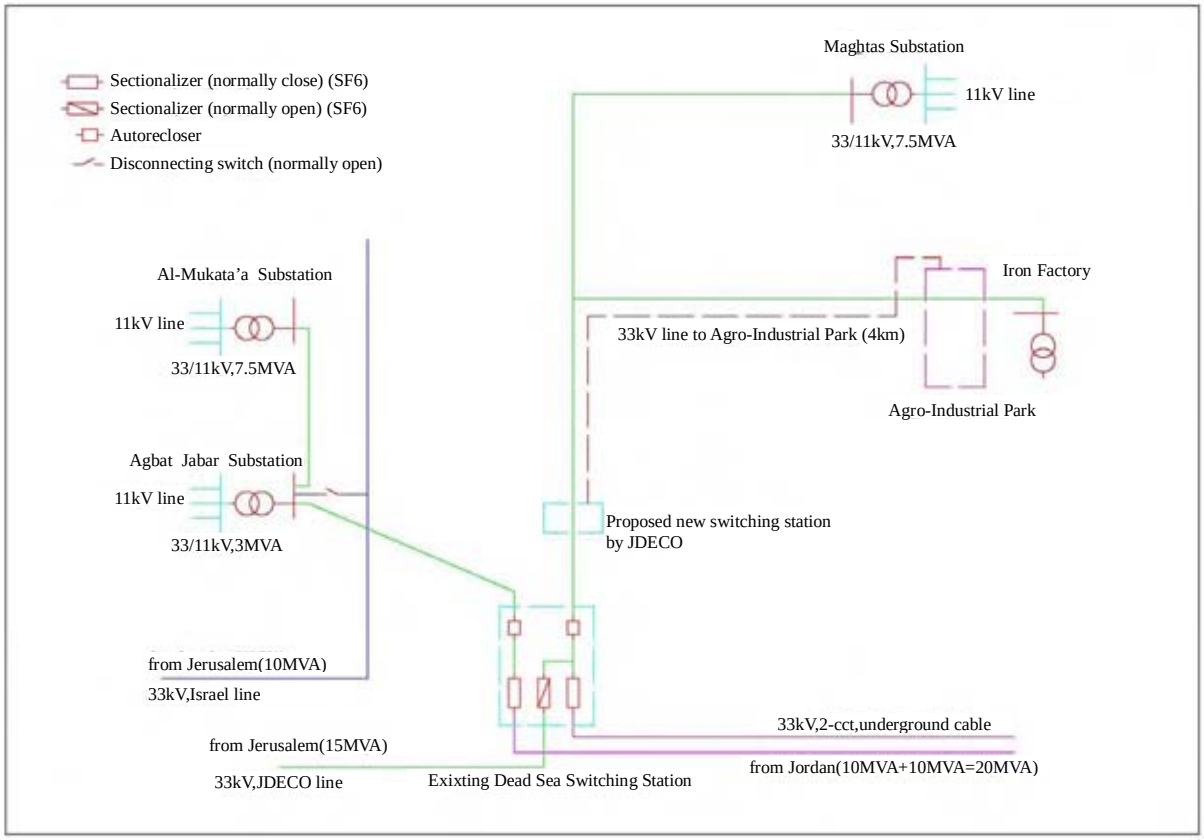
	Stage I	Stage II	Sub total	Stage III	Total
Factory	2.13	8.51	10.64	12.94	23.58
Office building and BDS center	0.07	0.09	0.16	0.07	0.23
Distribution facilities	0.09	0.34	0.43	0.52	0.95
Common utilities	0.19	0.54	0.73	0.56	1.29
Road lighting	0.02	0.09	0.11	0.12	0.23
Total	2.50	9.57	12.07	14.21	26.28
Value for planning	2.50	10.00	12.50	14.00	26.50

Source: JICA Study Team

Existing Power Supply Network in Jericho

As shown in Figure III-3-9, the present power supply in Jericho is 45 MVA in total, which consists of 20 MVA from the Jordan power system through two underground circuits of 33 kV, 15 MVA from Jerusalem through a JDECO-owned 33kV line, and 10 MVA also from Jerusalem through an Israeli-owned 33 kV line.

The JDECO power system in Jericho is largely dependent on the Jordan power system. Even the peak demand of 15 MVA in Jericho is being supplied only from this system, considering that the two lines from Jerusalem are not connected to the JDECO power system in Jericho.

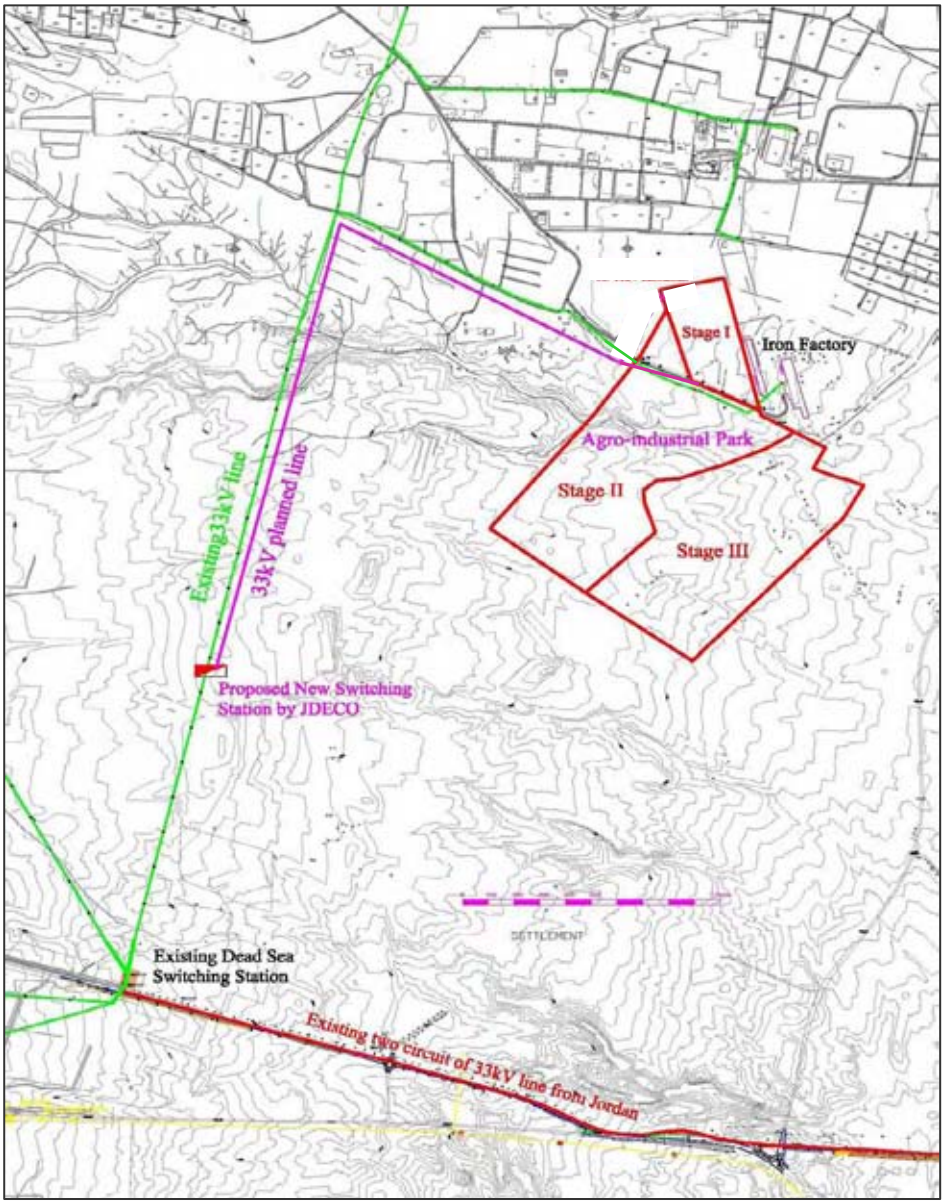


Source: JICA Study Team (confirmed by JDECO)

Figure III-3-9 Power Supply Network in Jericho

At present, JDECO receives power only from the Jordan power system, through two circuits of 33 kV lines. Said power is supplied to the Dead Sea Switching Station, consequently distributing it to Agbat Jabar and Maghtas substations located near the load center of Jericho City area. The feeder to Maghtas substation is also supplying power to the steel factory, which is located adjacent to the candidate site for the Agro-industrial Park, and to two other big customers. Accordingly, the new 33 kV line to the Agro-industrial Park should be constructed.

The layout of the 33 kV line, which will supply power to the Agro-industrial Park from the new Dead Sea Switching Station, is shown in Figure III-3-10.



Source: JICA Study Team (confirmed by JDECO)

Figure III-3-10 Location of Relevant Power Supply Facilities

Future Expansion Plan in Jericho

Power supply through the 33 kV line is not sufficient to accommodate the future load increase in the Jericho area. This is due to the limitation of its transmission capacity and its huge transmission loss. Recently,

JDECO submitted a new request to the authorities concerned to upgrade the line to 132 kV, which is compatible with the voltage supplied by the Jordanian electricity company. The 132 kV transmission line in the Jordanian side has been constructed up to King Abdallah Bridge, and is ready to be connected with the requested 132 kV transmission system from the Palestinian side.

To supplement the Dead Sea Switching Station, JDECO has started the construction work for a new switching station, which is located approximately one kilometer from the existing station, aiming at its commissioning by the end of 2008.

Power Supply for the Agro-industrial Park

As shown in Table III-3-15, the power supply to the Agro-industrial Park is planned to be 26.5 MW in total (2.5 MW for Stage I, 10.0 MW for Stage II, and 14.0 MW for Stage III). Said plan was explained to JDECO. Consequently, the possibility of power supply from JDECO was confirmed, considering the supply capacity of the existing power system in Jericho.

As described above, JDECO is proposing the new construction of a 132 kV transmission line to receive power from the Jordan power system. This 132 kV transmission line is expected to be completed within eight years. Accordingly, the power supply to the Agro-industrial Park of 26.5 MW by 2017 is considered to be totally guaranteed.

Facility Construction by JDECO

JEDCO is responsible for construction of power facilities consisting of 33 kV transmission line from the new switching station and facilities (33 kV distribution line, transformer and measuring meters) inside the park. The 33 kV transmission line will be financed by soft loans or grant from donors and power facilities inside the park is to be financed by developer.

JEDCO is responsible for operation and maintenance of 33 kV transmission line and power facilities inside the park. Operation and maintenance of power supply facilities is to be covered by electricity charges to customers.

<Transmission Line Facilities>

The transmission and distribution lines, which will supply power to the newly planned Agro-industrial Park, will be constructed by JDECO; however, the necessary land should be provided free by the land developer to JDECO.

Stable Power Supply

JDECO has already been supplying power to customers in Ramallah, Jericho and Bethlehem. The total number of customers in these three regions as of end of June, 2008 is 190,000, and peak demand is recorded as 310 MW.

The new Dead Sea Switching Station, from which power will be distributed to the Agro-industrial Park, is located 4 km from the park (along existing 33 kV lines) so that stable power supply is expected. Regarding the receiving voltage at the substation inside the park, rated 33 kV is expected to be stable due to its

proximity to the new Dead Sea Switching Station. The stand-by generating facility will be installed by customers, if required.

(3) Telecommunication Facilities

As a basic infrastructure, telecommunication lines are required in all the facilities inside the Agro-industrial Park. The required number of lines was preliminarily estimated based on the number of factories and other facilities, based on information from PalTel. The estimated number of telecommunication lines is shown below.

Table III-3-16 Required Number of Telecommunication Lines

	Stage I	Stage II	Sub-total (I+II)	Stage III	Total (I+II+III)
Required number of lines	30	150	180	150	330

Source: JICA Study Team

Off-site infrastructure of telecommunication facilities includes installation of cables required for the telephone and internet services from the existing telecommunications network. The estimated distance from the point of line origin, which is located along Route 1, is 3.5 km.

(4) Water Supply Facilities

Water supply is one of the critical issues for the development of the Agro-industrial Park. Water, in sufficient quantity and quality, is indispensable for the factories' operations. On the other hand, water resources surrounding the candidate site are extremely limited. The water supply plan is therefore formulated to secure the forecasted water demands in the Agro-industrial Park from all possible water sources.

Estimation of Water Demand

1) Factory

Similar to the power demand, the water demand for factories is estimated by multiplying the estimated annual production volume by the water demand per production volume. This water demand is set at a mean value of 2.0 m^3/ton/year based on the results of investment survey. The estimated water demand for the factories at each stage of development is shown below.

Table III-3-17 Water Demand for Factories

Item	Stage I	Stage II	Sub-total	Stage III	Total	Formula
Production volume (ton/year)	38,000	152,000	190,000	231,000	421,000	
Water Demand (MCM/ year)	0.08	0.30	0.38	0.46	0.84	Production volume x 2.0 m^3/ton/year

Source: JICA Study Team

2) Office building and BDS center

Water demand for office buildings and the BDS center is estimated by multiplying the estimated number of employees by water demand per employee of 73.0 m^3/person/year.

Water demand per employee is determined, with the formula shown below, based on water expenses per employee in other service industries as taken from the Palestine statistical data in 2006, which is 49.2 USD/person/year.

Water demand per employee
= (Water expenses per employee: 49.2 USD/person/year) x (Shekel-US Dollar conversion rate: 4.45 NIS/USD (Year of 2006)) / (Water fee: 3.0 NIS/m^3)
= 73.0 m^3/person/year

Table III-3-18 Water Demand for Office Buildings and BDS Center

Item	Stage I	Stage II	Sub-total	Stage III	Total	Formula
No. of Employees (person)	100	130	230	110	340	
Water Demand (MCM/year)	0.01	0.01	0.02	0.01	0.03	No. of employees x 73 m^3/person/year

Source: JICA Study Team

3) Distribution facilities

Also similar with the power demand, the water demand for distribution facilities is estimated by multiplying the estimated number of employees by the water demand per employee of 73 m^3/person/year.

Table III-3-19 Water Demand for Distribution Facilities

Item	Stage I	Stage II	Sub-total	Stage III	Total	Formula
No. of employees (person)	130	500	630	770	1,400	
Water Demand (MCM/ year)	0.01	0.04	0.05	0.05	0.10	No. of employees x 73m^3/ person/ year

Source: JICA Study Team

On the basis of the above estimates, the total water demand for the Agro-industrial Park is determined below.

Table III-3-20 Water Demand for Agro-industrial Park

Unit: MCM/year

	Stage I	Stage II	Sub total	Stage III	Total
Factory	0.08	0.30	0.38	0.46	0.84
Office buildings and BDS center	0.01	0.01	0.02	0.01	0.03
Distribution facilities	0.01	0.04	0.05	0.05	0.10
Total	0.10	0.35	0.45	0.52	0.97
Value for planning	0.1	0.4	0.5	0.5	1.0

Source: JICA Study Team

Required Quality and Quantity

Water quality required for food processing and production should be equivalent to that of drinkable water, as specified in the "Second Modified Draft of Drinking Water Quality Guidelines", which was published by PSI in December 2004 as the latest guideline for drinking water quality.

Water supply facilities are planned to accommodate daily and hourly fluctuation of water demand in the Agro-industrial Park. Design water quantities are thus assumed based on the following conditions:

a) Daily Average Water Demand (DAWD) is calculated by dividing the annual water demand by 365 days.
b) Daily Average Water Consumption (DAWC) is assumed to be the DAWD plus unaccounted water of 10%. The effective ratio is set at 90%.
c) Daily Maximum Water Consumption (DMWC) is assumed to be 1.8 times of the DAWC.
d) Hourly Maximum Water Consumption (HMWC) is assumed to be 1.3 times of the DMWC.

Daily and hourly fluctuations of water consumption are assumed based on the interview survey regarding operation hours during normal, peak, and/or idle periods, since reference data were not available.

Questionnaires were sent to the selected 16 factories and 11 factories replied. The ratio between the DAWC and DMWC, as well as the ratio between the DMWC and HMWC are calculated based on the results of the questionnaire as attached in Volume 2, WS-1.

Defined water quantities for each development stage are shown below. These design quantities are used for the planning and design of the water supply facilities.

Table III-3-21 Design Quantities of Water Supply System

Design Water Quantity	Unit	Stage I	Stage II	Sub-total (I+II)	Stage III	Total (I+II+III)
Annual water demand	MCM	0.1	0.4	0.5	0.5	1.0
Daily average water demand	m^3/day	274	1,096	1,370	1,370	2,740
Daily average water consumption	m^3/day	304	1,218	1,522	1,522	3,044
Daily maximum water consumption	m^3/day	547	2,192	2,739	2,740	5,479
Hourly maximum water consumption	m^3/hour	30	119	148	148	297

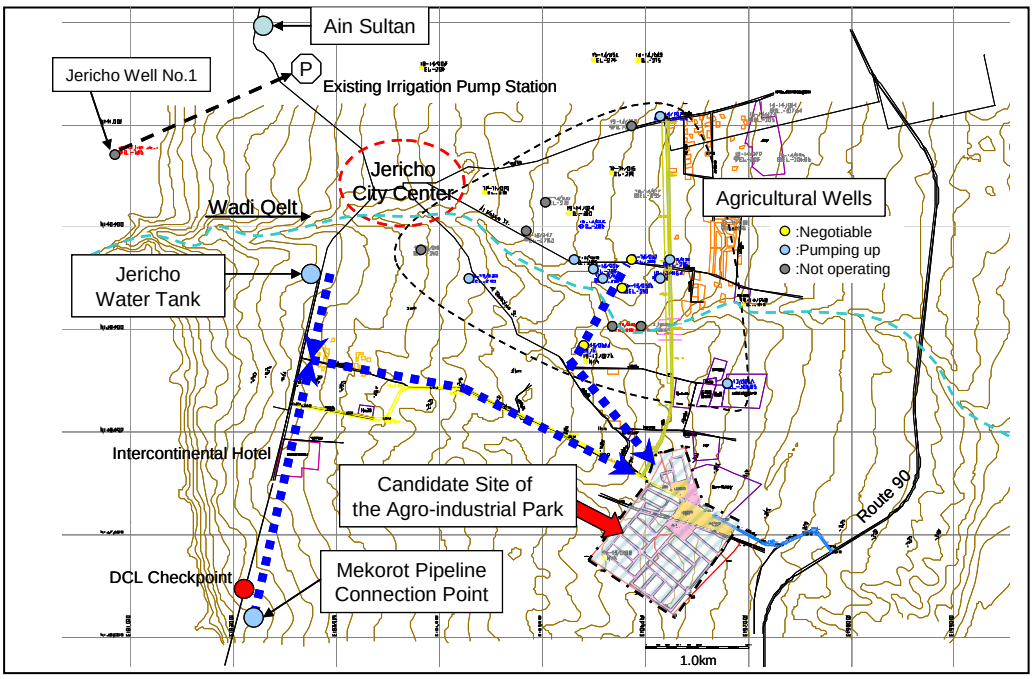
Source: JICA Study Team

Conceivable Water Source

Appropriate water sources for the Agro-industrial Park have to be identified to meet the water demand for each development stage. After field investigation and a series of discussions with PWA, the following four alternatives are identified as possible water sources for the Agro-industrial Park.

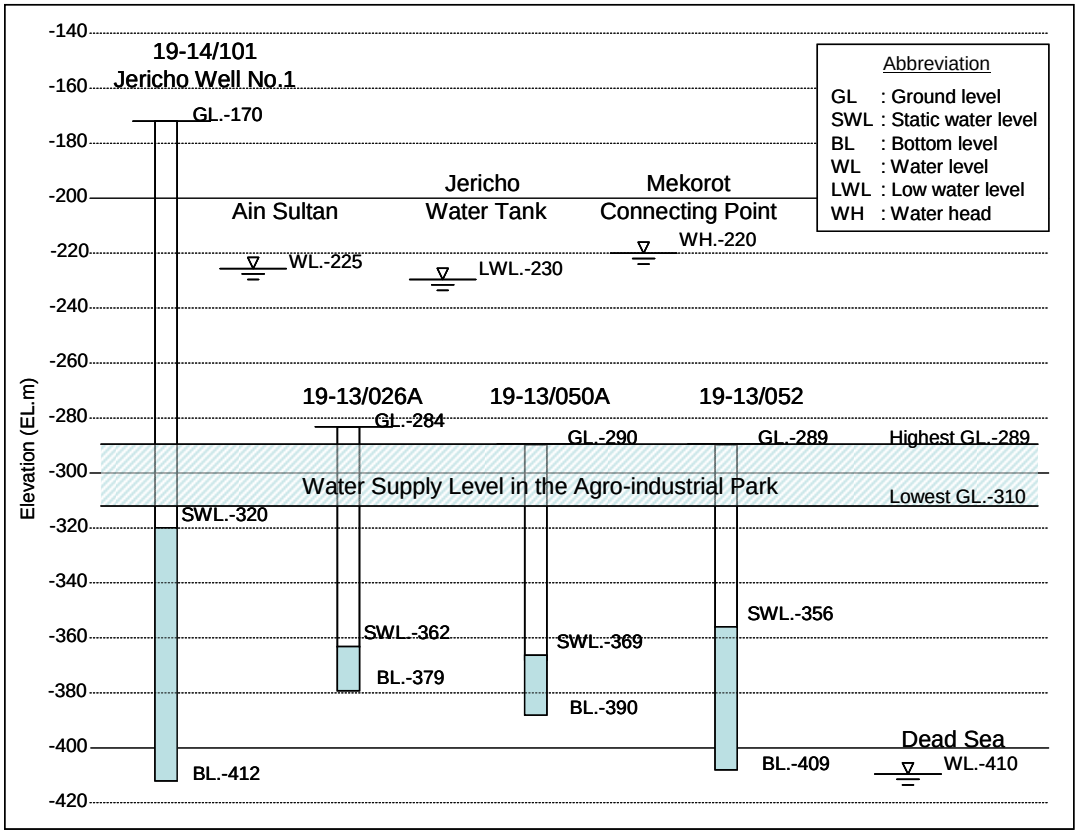
Alternative 1: Existing agricultural wells surrounding the Agro-industrial Park
Alternative 2: Water supply system of Jericho Municipality
Alternative 3: Water supply system of Israel (Mekorot)
Alternative 4: Water from a rehabilitated existing water source (Qilt spring)

Locations and elevations of the alternative water sources from 1 to 3 are shown in Figure III-3-11 and Figure III-3-12, respectively, while the present conditions of each potential water source are described below.



Source: JICA Study Team

Figure III-3-11 Locations of Alternative Water Source for the Agro-industrial Park



Source: PWA data base and JDECO topographic map

Figure III-3-12 Elevations of Alternative Water Sources for the Agro-industrial Park

<Alternative 1: Existing Agricultural Wells>

During the Study Part 2, field interview survey of owners or operators of agricultural wells was carried out at 17 wells, which are located between Jericho City center and the Agro-industrial Park. Results of the field interview survey are attached in Volume 2, WS-3 and summarized below.

Table III-3-22 Summary of Field Survey on Existing Agricultural Wells

	License No.	Present Condition	Well Depth (m)	Pumping Quantity (m^3/hour)	Quality
1	19-13/006	Pumping up	100	30	Brackish
2	19-13/015A	Pumping up	130	70	Brackish
3	19-13/018	Not operating	-	-	-
4	19-13/020	Pumping up	100	5	Drinkable
5	19-13/024A	Pumping up	90	35	Brackish
6	19-13/025A	Not operating	-	-	-
7	19-13/026A	Pumping up	95	75	Brackish
8	19-13/029A	Not operating	-	-	-
9	19-13/047	Not operating	-	-	-
10	19-13/048	Pumping up	112	55	Drinkable
11	19-13/049	Pumping up	75	35	Brackish
12	19-13/050A	Pumping up	120	50	Brackish
13	19-13/052	Pumping up	120	55	Drinkable
14	19-13/055	Pumping up	110	40	Drinkable
15	19-14/023	Not operating	-	-	-
16	19-14/037	Pumping up	120	15	Brackish
17	19-14/052	Not operating	-	-	-

Source: Results of interview by JICA Study Team in June 2008

Six wells are identified to be dried up (not operating). Out of eleven pumping wells, the water quality of seven wells is categorized as brackish water, while water from the remaining four wells is utilized for drinking.

Among these existing wells, three owners (19-13/026A, 19-13/050A, and 19-13/052) are interested in the development of the Agro-industrial Park, and have expressed willingness to supply water to the park from their wells. Present conditions of these three wells are summarized below.

Table III-3-23 Design Quantities of Water Distribution System

Well Code Number	19-13/026A	19-13/050A	19-13/052
Extraction license	Not available	136,000 m^3/year	241,000 m^3/year
Average abstraction	60,500 m^3/year	60,524 m^3/year	15,693 m^3/year
Well location	PGE 195,390 PGN 138,800	PGE 195,810 PGN 139,380	PGE 195,880 PGN 139,670
Well depth & diameter	95m / Φ14-12	100m / Φ10	120m / Φ10
Distance to the candidate site	2.1 km	3.0 km	3.3 km

Source: PWA data base

Other owners refuse to share their water since water quantity extracted from their wells decreases each year, and does not even meet their own demand mainly for agriculture.

<Alternative 2: Water Supply System of Jericho Municipality >

At present, Jericho Municipality has two water supply systems for domestic and agricultural water uses. The major water source for both systems is the "Ain-Sultan Spring", which is located northwest of the city center. The spring water has a constant quantity of about 650 m^3/hour, and is of drinkable quality. Forty two percent (42%) of the spring water is supplied for domestic use, while fifty-eight percent (58%) is for agricultural use.

Another water source exists on the western side of Jericho City center, known as "Jericho Well No.1". This was constructed by Israel in 1973 and had been controlled by Mekorot. The license of this well was transferred from Israel to PNA in 2000. Since then, however, the well has no pumping facilities and is not in operation. According to old records, the water quantity of Jericho Well No.1 varies annually depending on the amount of rainfall.

Jericho Well No.1 (as of June 2008)

PWA intends to rehabilitate Jericho Well No.1. The brackish water from the well is planned to be mixed with pure water from Ain-Sultan Spring at the existing irrigation pump station, then will be used for agriculture after achieving an acceptable salinity. As an urgent project, PWA is seeking for financial assistance for the re-installation of a well pump at Jericho Well No.1 and the construction of a pipeline from Jericho Well No.1 to the existing irrigation pumping station. Through this rehabilitation, it is expected that the water quantity for domestic use from Ain-Sultan Spring will increase, which will also sufficiently meet the required amount of water supply for the Agro-industrial Park in Stage I.

Taking into account the above situation, Jericho Municipality provisionally confirmed in Study Part 2 that it would be possible for them to supply water for Stage I of the Agro-industrial Park, with a quantity of 280 m^3/day and priced at 3.0 NIS/m^3. This however is based on the condition that the water from

Jericho Well No.1 becomes operational after its rehabilitation and that construction of the pipeline up to the existing irrigation pump station near Ain-Sultan Spring is implemented. Further adjustment of the amount of water supply for Stage I shall be made in the course of future discussions with Jericho Municipality.

Although water supply for Stages II and III from Jericho Municipality may be difficult due to their own increasing water demand, it is necessary to seek this possibility on the basis of test results of water quality and quantity of Jericho Well No.1 prior to the implementation stage.

<Alternative 3: Water Supply System of Israel (Mekorot Water) >

The water supply system of Israel is managed by Mekorot Water Company Ltd., which is a government-owned firm, and supplies water of about 800 million m^3 per year to Israel and Palestine for domestic, industrial, and agricultural uses.

According to the Israeli Water Authority (IWA), they are willing to supply drinkable water for Stage I of the Agro-industrial Park, with a quantity of 280m^3/day (15 m^3/hour as its maximum). The water unit price was not clarified; however the domestic price was reported to be 3.8 NIS/m^3 in Israel.[6]

Connection Point of Mekorot Pipeline (as of July 2008)

IWA indicated that the connection point of the Mekorot pipeline for water supply to the Agro-industrial Park is located near the DCL checkpoint, at the entrance to Jericho City. Distance between the connection point and the candidate site is approximately 5.8 km.

<Alternative 4: Water from a Rehabilitated Existing Water Source (Qilt Spring) >

The feasibility study on water resources development and management in the JRRV has been implemented with the technical assistance of JICA. As one of the outputs of the study, "improvement of the spring water conveyance system at Qilt Spring" was recommended. This recommendation includes unknown factors such as less available data, location in "Area C" and natural reserve area. Therefore, Alternative 4 is recommended for the long-term water resource development in the area.

Water Quality and Quantity Survey

In order to formulate a water supply plan, water quality and quantity surveys have been carried out in this study for the following four existing wells;

- Three existing agricultural wells (19-13/026A, 19-13/050A, and 19-13/052), owned by those who expressed interest in providing water to the planned Agro-industrial Park, and
- Jericho Well No.1 (19-14/101) which is expected to be an indirect additional water source for the Agro-industrial Park through the water supply system of Jericho Municipality.

[6] IWA strongly recommended to promote construction of wastewater treatment facilities and recycle water use system, since a lot of water is being wasted after only one usage in Jordan Valley.

The survey was carried out by the sub-contractor named "Al Manara International Company" between August and September 2008. The survey report is attached in Volume 2, SR-4 and results are summarized below.

Table III-3-24 Summary of Water Quality and Quantity Survey

Component	Symbol	Unit	Limit	19-13/ 026A	19-13/ 050A	19-13/ 052	19-14/ 101
Water Quality Survey							
Sampling date	-	-	-	03 Aug.	03 Aug.	03 Aug.	24 Aug.
Electrical Conductivity	EC	Us/cm	None	4,970	1,679	2,100	1,782
Arsenic	As	mg/L	< 0.05	< 0.005	< 0.005	< 0.005	< 0.005
Selenium	Se	mg/L	< 0.01	< 0.005	< 0.005	< 0.005	< 0.005
Fluoride	F	mg/L	< 1.5	0.75	0.55	0.66	0.40
Iron	Fe	mg/L	< 0.3	< 0.1	< 0.1	**0.33**	**0.88**
Copper	Cu	mg/L	< 1	< 0.02	< 0.02	< 0.02	0.02
Manganese	Mu	mg/L	< 0.1	< 0.02	< 0.02	< 0.02	**0.13**
Chromium	Cr	mg/L	< 0.05	< 0.02	< 0.02	< 0.02	< 0.02
Silver	Ag	mg/L	< 0.01	< 0.02	< 0.02	< 0.02	< 0.02
Sodium	Na	mg/L	< 200	**641**	156	191	152
Potassium	K	mg/L	< 10	**83**	**25**	**28**	**15**
Calcium	Ca	mg/L	< 100	**137**	74	80	87
Magnesium	Mg	mg/L	< 100	**176**	70	84	64
Bicarbonate	HCO_3	mg/L	None	664	337	323	267
Chloride	Cl	mg/L	< 250	**1,372**	**347**	**442**	**448**
Nitrate	NO_3	mg/L	< 50	**50**	33	44	25
Sulfate	SO_4	mg/L	< 200	**229**	97	170	44
Carbonate	CO_3	mg/L	None	< 3.5	< 3.5	21.6	< 3.5
Total Hardness	TH as $CaCO_3$	mg/L	< 500	**1,066**	475	**536**	479
Potential Hydrogen	pH	None	6.5 – 8.5	8.16	8.25	8.47	8.03
Total Dissolved Solids	TDS	mg/L	< 1,000	**2,783**	940	**1,155**	985
Turbidity	Turb.	NTU	< 1	0.52	**1.75**	**1.82**	0.95
Temperature	T	^oC	None	25.5	25.5	25.5	-
Total bacteria	TC	FCU	3	**90**	**50**	**88**	**TMTC** (3
Fecal bacteria	FC	FCU	0	0	0	0	**8**
Escherichia coli	E. Coli	FCU	0	0	0	0	**TMTC** (3
Organic matter	UV	Abs at λ= 254nm (4	3 – 10	0.9	0.9	0.9	Refer to note (5
Water Quantity Survey							
Pumping date	-	-	-	29 Aug.	29 Aug.	29 Aug.	23 Aug. 24 Aug.
Recommendable well abstraction	Q	m^3/hour	-	65	35	40	70

Notes 1. The above values shown are the highest values among the samples.
2. Values shown with **bold** have exceeded the limitation.
3. "TMTC" means "too much to count".
4. The value is from the Israeli guideline; no specific value from the Palestinian guideline .
5. Colonies were not clear in the cultured samples, unable to repeat the test due to closure of the well.

Source: Water quality and quantity survey in Aug. 2008.

Based on the above test results, the water quality and quantity of the three agricultural wells and Jericho Well No.1 are evaluated as described below.

<Three Agricultural Wells>

Three agricultural wells (19-13/026A, 19-13/050A, and 19-13/052) are planned to be used for the water supply of the Agro-industrial Park with drinkable water quality. As seen in the summary of the test results, water from these three agricultural wells have varied electrical conductivity (EC) values ranging from 1,600 to 4,900 μs/cm. This indicates that the water at the three wells is not drinkable. Particularly, concentrations of potassium (K), chloride (Cl), total hardness and total dissolved solids (TDS) values exceed the limits. It is therefore necessary that water from these three wells be treated to drinkable quality before supplying to the Agro-industrial Park. The water from 19-13/026A is required to be treated by membrane filtration, while the waters from 19-13/050A and 19-13/052 could be treated by coagulation settling or rapid filtration only. In this stage, water abstracted from the wells is planned to be desalinated all together by using a Reverse Osmosis (RO) plant, which is a reliable method that needs a high initial cost but will involve easy maintenance.

Regarding the abstraction quantities, the recommendable well abstraction quantity is 140m^3/hour in total. Daily and annual well abstraction capacity of wells is generally evaluated to be 20 hours per day and 210 days per year in Palestine. Accordingly, the abstraction capacity of the three agricultural wells is estimated as follows;

- Daily abstraction volume : 140 m^3/hour x 20 hours = 2,800 m^3/day
- Annual abstraction volume : 140 m^3/hour x 20 hours x 210 days = 588,000 m^3/year

It is noted that 20-30% of abstracted water will become wastewater through the treatment process, and therefore, the effective water volume from these agricultural wells is limited to only 70-80% of the above abstraction volume.

<Jericho Wells No.1>

The abstracted water from Jericho Well No.1 is planned to be mixed with Ain-Sultan spring water and supplied for agricultural use. Based on the results of the water quality analysis, the water have an EC value of about 1,700 μs/cm (=1.7 dS/m), and the salinity concentration (chloride) and total bacteria are too much to count, exceeding the limitations for water from Jericho Well No.1.

At present, the specifications of water quality for agricultural use are not defined in PNA, although a guideline on salinity consistency is issued by the Ministry of Agriculture, as shown below.

Table III-3-25 Salinity Tolerance of Major Crops Growth

Unit: dS/m

Major Crops surrounding Jericho	Threshold Value EC_e	10% Yield Loss EC_e	25% Yield Loss EC_e	50% Yield Loss EC_e
Corn, sweet	1.7	2.5	4.0	6.0
Cucumber	2.5	3.3	4.4	6.3
Squash/ Pumpkins	3.9	4.9	5.9	7.9
Tomato	2.5	3.5	5.0	7.6

Source: Guideline of Salinity Consistency, Ministry of Agriculture

Generally speaking, it seems that treatment for total bacteria may be required to avoid any bad effect on crops, but treatment for salinity concentration may not be required because the EC and TDS values are low enough and might decrease further if mixed with water from Ain Sultan.

For the abstraction quantities, the recommendable well abstraction quantity is 100 m^3/hour in total. Based on the Israeli operation records, however, Jericho Well No.1 has the characteristic of possibly increasing the salts in the water through intensive pumping, which comes from the saline lower aquifer. Thus, the abstraction quantity for Jericho Well No.1 should be limited to 70m^3/hour and thereby, the abstraction capacity is estimated as follows:

- Daily abstraction volume : 70 m^3/hour x 20 hours = 1,400 m^3/day
- Annual abstraction volume : 70 m^3/hour x 20 hours x 210 days = 294,000 m^3/year

Water Supply Plan

Through a series of discussions with PWA and IWA, data collection, field investigation, and water quality and quantity survey, the availability of water from the three well alternatives for the Agro-industrial Park is confirmed as tabulated below.

Table III-3-26 Lined-up Water Supply Quantity for the Agro-industrial Park

Unit: m^3/day

Item	Agricultural Wells			Water supply system of Jericho Municipality	Mekorot Water	Total
	19-13/ 026A	19-13/ 050A	19-13/ 052			
Water at source	75m^3 x 7hr = 525	40m^3 x 9hr = 360	30m^3x22hr = 660	320	280	2,145 (100%)
Unused water	157 (30%)	108 (30%)	198 (30%)	32 (10%)	28 (10%)	523 (24.4%)
Available water for the Agro-industrial Park	368 (70%)	252 (70%)	462 (70%)	288 (90%)	252 (90%)	1,622 (75.6%)

Notes: 1. Well abstraction quantity per hour and pumping hours are defined by JICA Study Team based on the discussion with well owners, extraction licenses, and water quality and quantity survey results.
2. Unused water is assumed to be 30% of water leakage during transmission and wastewater at treatment facility for the agricultural wells, and 10% of leakage during transmission for Jericho & Mekorot water.

Source: JICA Study Team

Corresponding to the lined-up water supply quantity, DAWD is estimated to be 274 m^3/day, 1,370 m^3/day, and 2,740 m^3/day in total for each stage, respectively as shown in the previous Table III-3-21. Therefore, it is probable that water required for Stage I is covered by water supply from Jericho Municipality, and the water required for Stage II is covered by the additional water supply from the agricultural wells. However, the water required for Stage III is not covered by the total lined-up water supply quantity of 1,622 m^3/day, as shown in Table III-3-26. The possible water sources for Stage III consist of the following three alternatives:

<Alternative A: Water Supply System of Jericho Municipality>

As mentioned in the previous paragraph, the abstraction capacity of Jericho Well No.1 is estimated to be 1,400 m^3/day, i.e. 294,000 m^3/year.

At present, 58% of the water from the Ain-Sultan Spring, which is equivalent to 3,303,000m^3/year, is supplied for agricultural use in the water supply system of Jericho Municipality.

As shown in Table III-3-20, the estimated water demand for Stage I is 100,000 m^3/year, which is 34% of the additional water by abstraction from Jericho Well No.1. It is planned that the water demand for Stage I be supplied from Jericho Municipality, in return for the water supply from Jericho Well No.1 for agriculture use. Then, the remaining 66% of additional water from Jericho Well No.1 is reserved for future domestic use of Jericho Municipality, and it may not be supplied for the Agro-industrial Park.

On the other hand, according to the "Dimensioning of water supply, sewer and storm run-off pipes", which is one of the planning and design guidelines published by PWA in 2000, unaccounted-for water in the water supply system of Jericho Municipality, is assumed to be 40-50% (250-320 m^3/hour) of the water source because of leakages in the pipeline network. If it is possible to reduce the ratio of unused water in the water supply system by 10% (65m^3/hour, i.e. 1,560 m^3/day) through the rehabilitation of the pipeline network, it will allow a guaranteed water supply for Stage III.

<Alternative B: Water Supply System of Israel (Mekorot Water) >

Mekorot supplies approximately 50 million m^3 per year of drinking water for the West Bank of Palestine, as shown below.

Table III-3-27 Water Balance by Mekorot in Palestine

Unit: million m^3/year

	Water Supply			Water Source		
	West Bank	Jordan Valley	Total	West Bank	Israel	Total
Palestine	43	7	50	20	30	50
Israeli Residence	25	23	48	25	23	48
Total	68	30	98	45	53	98

Source: Result of interview to IWA by JICA Study Team

The estimated water demand of some 1,370 m^3/day for Stage III of the Agro-industrial Park is equivalent to 0.50 million m^3 per year, which is only 1% of the water supply quantity for the West Bank and Jordan Valley of PNA (50million m^3/year).

Although the detailed conditions of the water supply system of Mekorot is unknown, Mekorot water is a most reliable water source to provide the shortage water for the Agro-industrial Park in Stage III. Therefore, it is necessary to continue the negotiation with Mekorot on water supply for Stage III.

<Alternative C: Water supply from rehabilitated existing water source (Qilt spring)>

As one of the outputs of the feasibility study on water resources development and management in the JRRV, the "improvement of spring water conveyance system at Qilt spring" was recommended. This recommendation includes unknown factors such as less available data, location in Area C and presence of a natural reserve area. Although this alternative is recommended for the long-term water resource development, it should be studied in the course of the implementation of Stages I and II.

These three alternatives shall be considered in-depth in the course of implementation of Stages I and II. For the cost estimate of the water supply system for Stage III, Alternative B was selected because of the stable water supply capacity from Mekorot water and the possibility of the most practical cost estimate.

Based on the above discussions, the water supply plan is formulated as summarized in Table III-3-28.

Table III-3-28 Proposed Water Supply Plan

Unit: m^3/day

Item	Stage I	Stage II	Sub-total (I+II)	Stage III	Total (I+II+III)
1. Water Supply from Agricultural Wells					
1-1. 19-13/026A					
- Water at source	-	525	525	-	525
- Unused water (30%)	-	156	156	-	156
- Water at the Agro-industrial Park (70%)	-	368	368	-	368
1-2. 19-13/050A					
- Water at source	-	360	360	-	360
- Unused water (30%)	-	108	108	-	108
- Water at the Agro-industrial Park (70%)	-	252	252	-	252
1-3. 19-13/052					
- Water at source	-	660	660	-	660
- Unused water (30%)	-	198	198	-	198
- Water at the Agro-industrial Park (70%)	-	462	462	-	462
Sub-total of Agricultural Wells	**0**	**1,082**	**1,082**	**0**	**1,082**
2. Water Supply from Jericho Municipality					
- Water at source	320	-	320	-	320
- Unused water (10%)	32	-	32	-	32
- Water at the Agro-industrial Park (90%)	**288**	-	**288**	-	**288**
3. Water Supply from Mekorot					
- Water at source	-	-	-	1,522	1,522
- Unused water (10%)	-	-	-	152	152
- Water at the Agro-industrial Park (90%)	**-**	**-**	**-**	**1,370**	**1,370**
Total Water Supply Quantity at the Agro-industrial Park (1+2+3)	**288**	**1,082**	**1,370**	**1,370**	**2,740**
Estimated Water Demand (DAWD)	274	1,096	1,370	1,370	2,740
Balance	+14	-14	±0	±0	±0

Source: JICA Study Team

Backup Water Source for Emergency

In addition to the main water supply, a backup water source was considered against unforeseeable conditions, such as pollution of the water source, damage of water transmission pipeline, etc., to avoid interruption of factories' operations in the Agro-industrial Park.

It is recommended that a water transmission pipeline from Mekorot be constructed in Stage I, and utilized as backup water source for Stages I and II considering its stable capacity and quality of water supply, while water demand for Stages I and II are covered by Jericho Municipality and by the agricultural wells, respectively.

The backup water source for Stage III shall be studied considering the main water source for Stage III in due course. For the cost estimate of the backup system for Stage III, it was assumed that water supply will be using a separate pipeline of Mekorot water to come up with a practical cost estimate.

Preliminary Design of Water Transmission Pipeline

The main function of a water transmission pipeline is to convey water from the source to the water tank in the Agro-industrial Park, in order to accommodate the DMWC. The transmission pipelines for the park are designed based on the following conditions:

＜Alignment＞

The water transmission pipeline is designed to be located along the existing or planned road for the Agro-industrial Park in view of easy maintenance.

It is noted that the area covered by the water supply system of Jericho Municipality is located about 1.0 km away from the candidate site. However, the actual water supply discharge and water consumption in the system had not been measured and evaluated. Therefore, the transmission pipeline from the water supply system of Jericho Municipality is planned to be 4.8 km between the existing water tank of the water supply system of Jericho Municipality and the Agro-industrial Park.

＜Flow Velocity＞

Flow velocity shall be faster than 0.3 m/s to avoid settlement of sediments in the pipe, but shall be lower than 3.0 m/s to avoid abrasion of the pipe.

The required diameter of the transmission pipeline from each water source is examined by the Hazen-Williams formula as expressed below:

$$I = 10.666 \times C^{-1.85} \times D^{-4.87} \times Q^{1.85}$$

where, I : gradient (‰)
C : flow velocity coefficient 120(-)
D : inside diameter (m)
Q : flow discharge (m^3/s)

Calculation results are attached in Volume 2, WS-4, and summarized below.

Table III-3-29 Required Distance and Diameter of Water Transmission Pipelines

Item	Agricultural Wells	Jericho	Mekorot
Distance	3.3 km	4.8 km	6.0 km
Diameter	150-250 mm	100 mm	175 mm

Source: JICA Study Team

Due to the topographic conditions, it is noted that water from Jericho Municipality and Mekorot can be conveyed to the water tank in the Agro-industrial Park without any pumping system.

The general layout of the water supply facilities is shown in Volume 2, DWG 131. The hydraulic gradient lines along the water transmission pipeline are presented in Volume 2, WS-5.

Accessories

Accessories of the water transmission facilities, such as sluice valve, air valve, drain valve, check valve, and flow meter, are arranged following the planned network as shown in Volume 2, DWG 132.

Required Operation and Maintenance

In order to ensure the proper functions of the water transmission and treatment facilities, the following operation and maintenance activities will be required:

a) Regular inspection of the water transmission pipelines in order to determine the necessity of repairing,
b) Regular operation of desalination facilities,
c) Regular maintenance of desalination facilities, including replacement of membranes and mechanical spare parts, water quality analysis, etc., and
d) Clearing and/or repair works for the water transmission pipelines and desalination facilities to be undertaken as frequently as necessary.

Required personnel and equipment for the above operation and maintenance activities were assumed as follows:

- Maintenance Engineer who is responsible for ensuring the good condition of the water supply facilities and for collection of water tariffs. One engineer will be assigned for all three stages.
- Water Quality Manager who is responsible to ensure water quality in the system. One engineer will be assigned for all three stages.
- Inspector/ assistant who shall work under the Maintenance Engineer and Water Quality Manager. The number of the required Inspectors is assumed to be 1 personnel per 5 km of pipeline network length (including the distribution network).
- Operator and laborers who are responsible for the desalination facilities. The number of the required personnel is assumed to be two operators and four laborers based on the available references of the desalination facilities manufacturer.
- An office and water quality analysis equipment are required for regular activities, and pipeline, valves and others will be required for repair works following damaged condition.

It is noted that the above personnel and equipment will be responsible for both off-site and on-site water supply facilities.

Recommendation for the Next Stage

It is recommended that the following issues be studied and clarified before the project implementation.

＜Desalination of Abstracted Water from Wells＞

In this study, abstracted water from the three agricultural wells is considered to be desalinated all together by using a RO plant. However, the qualities of abstracted water from the three wells vary widely. A comparative study between combined treatment and separated treatment is required for the optimum plan.

＜Rehabilitation of Water Supply System in Jericho Municipality＞

As mentioned in the discussions above, unaccounted-for water in the water supply system in Jericho Municipality is assumed to be 40-50% (250-320 m^3/hour) of the water source. However, the actual conditions of supply discharge, water consumption, and leakages in the pipeline network are not measured and evaluated. Study and planning for rehabilitation of the water supply system in Jericho Municipality is considered necessary in order to generate further effective water.

(5) Wastewater Treatment Facilities

Necessity of Wastewater Treatment

Out of 59 municipalities in the West Bank, only five own wastewater treatment facilities, as shown in Table III-3-30. About 30%-40% of the West Bank population is served by this sewerage system.

Table III-3-30 Existing Wastewater Treatment Facilities in West Bank

Municipality	Year of Construction	Year of Rehabilitation	Capacity (m^3/day)	Type of Treatment
Al-Bireh	1998	-	5,750	Extended aeration process (Oxidation ditch)
Jenin	1992	2000	760	Aerated lagoon, Polishing pond
Hebron	1988	-	Unknown	Algal pond (now unutilized)
Tulkarem	1975	-	200	Stabilization pond
Ramallah	1973	2003	4,000	Aerated pond, Stabilization pond

Source: JICA Study Team average inflow in 2005

Among the above five wastewater treatment facilities, only the Al-Bireh wastewater treatment facilities is properly operated while the remaining four have difficulties in sustaining proper operation due to deterioration of the facilities and overload in wastewater volume.

The Agro-industrial Park is planned to be developed in Jericho City. There is no municipal wastewater system in Jericho, and thus people are commonly using individual cesspits[7], which are required to be emptied periodically by cesspit cleaner trucks. Since Jericho Municipality does not provide cesspit cleaning services, the private sector provides said services without any restriction on management of wastewater in Jericho Municipality. As a result, according to the information from *The Jericho Regional Development Study Project*, wastewater is dumped to the *Wadi*, causing serious pollution to the groundwater.

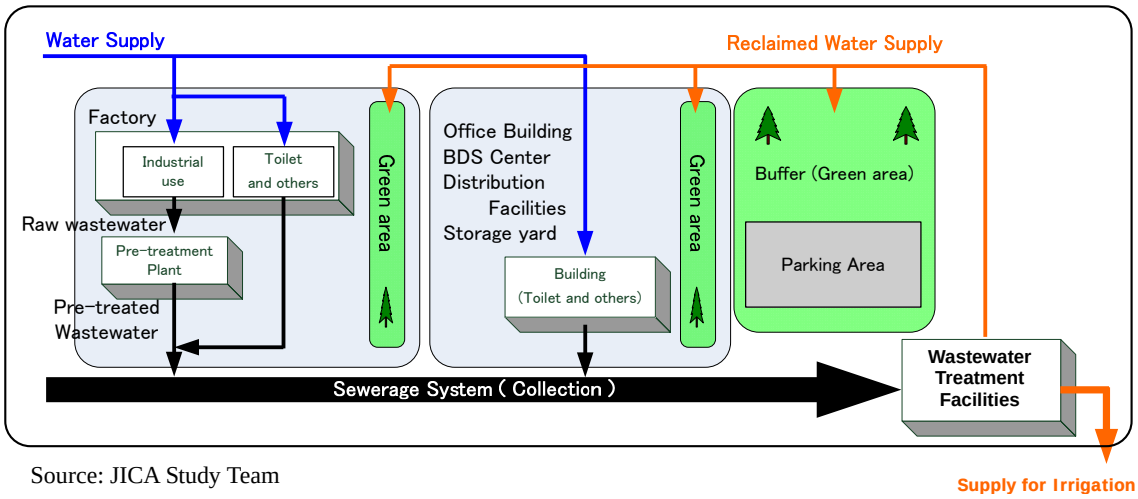
A domestic wastewater system in Jericho City was previously proposed in the Master Plan of Jericho Regional Development Study, but has not been implemented.

For wastewater treatment in the Agro-industrial Park, an appropriate system shall be established in order to avoid any negative impacts on the social and natural environmental conditions in accordance with the Palestine standard, as well as to realize recycled water use.

Treatment Flow

The schematic flow of wastewater treatment is illustrated in Figure III-3-13.

[7] A cesspit consists of a storage type and filtration type. In Jericho, the filtration type is mainly adopted. In case of filtration type, solid materials do not infiltrate into the ground and the cesspit should be emptied periodically by cesspit cleaner trucks.



Source: JICA Study Team

Figure III-3-13 Schematic Flow of Wastewater Treatment in the Agro-industrial Park

Wastewater treatment would be based on biological treatment application considering micro-organism activities, which is a common wastewater treatment method. Wastewater treatment is planned in two steps, i.e. pre-treatment by each water user, and final treatment in the wastewater treatment facilities, as explained below.

< Pre-treatment by each Water User >

Quality of wastewater may vary depending on water use in each factory and facility. Each factory and facility shall release their wastewater to the sewerage system considering an allowable influent quality. Special pre-treatment shall be conducted by each factory and facility by means of construction and operation of pre-treatment facilities, as required.

The milk processing factory, meat products factory, and pickles factory are selected as main candidate factories to locate in the Agro-industrial Park. In case of these factories, the features of raw wastewater and examples of pre-treatment facilities are summarized as shown in Table 3-31. The requirement of the first treatment depends on the water quality of the raw wastewater, which is related to the production process of each factory.

Table III-3-31 Features of Raw Wastewater and Pre-Treatment Facilities for Sample Factories

Type of Factory	The feature of Raw Wastewater and Pre-Treatment Facilities	
Milk Factory	Raw Wastewater Features	The effluent is discharged with high concentrations of chlorine, which comes from cleaning of liquid of bottle-washing machine is changed.
	Pre-Treatment Facilities	Screen: trash removal Wastewater Neutralization Tank: pH control and residual chlorine removal
Meat Product Factory	Raw Wastewater Features	The effluent contains high concentration of BOD, SS, and oil, because of the commingling of blood, meat and fat.
	Pre-Treatment Facilities	Screen: trash removal Flow Equalization Tank : improvement of flow fluctuation Chemical Precipitation Tank : removal of SS and Oil
Pickles Factory	Raw Wastewater Features	The effluent from pickling contains acetic acid.
	Pre-Treatment Facilities	Screen: trash removal Wastewater Neutralization Tank : pH control

Source: JICA Study Team

< Final Treatment in the Wastewater Treatment Facilities >

Influent from each factory and facility would be transmitted by a wastewater pipeline to the wastewater treatment facilities for final treatment. In the wastewater treatment facilities, the influent will be finally treated to meet the allowable quality, and consequently, release recycled water for use in the Agro-industrial Park, for agricultural use in the surrounding areas, and/or recharging into groundwater.

In cases that materials requiring chemical treatment, such as heavy metals and oils, are included in the wastewater, pre-treatment shall be carried out at each factory to maintain the micro-organism activities in the wastewater treatment facilities.

Treatment Quality

The quantity, load, and quality of the influent to the wastewater treatment facilities are determined under the following conditions:

a) Influent quantity

- The effluent from the manufacturing process in each factory is estimated to be 90% of the water supply, considering utilization of water in the production process and through boiler consumption.
- The effluent from toilets in the factories and office buildings is estimated from the number of employees multiplied by the volume of DAWC per person (73.0 m^3/per/year), of which value is mentioned in the Palestine statistics.

b) Influent load

- The effluent from the manufacturing process in each factory is properly pre-treated to meet the discharge standards to the sewerage system.
- Maximum BOD and SS in effluent from each factory is limited to 1000 mg/L or less, which corresponds to those of Ramallah and Al-Bireh, where the sewerage system is properly maintained in Palestine.
- The effluent from toilets in the factories and office buildings is assumed to be of same quality as the municipal effluent (BOD, SS: 500mg/L).

c) Influent quality

- The influent quality of the wastewater treatment facilities is calculated by dividing the total influent load by the total influent quantity.

The treatment items, design treatment capacity, and effluent quality of the wastewater treatment facilities are determined as follows:

a) Treatment items of wastewater treatment facilities

- Materials such as heavy metals, which are not biodegradable, are assumed to be properly pre-treated in each factory.
- Based on the effluent standard of Palestine, BOD, SS, T-N, and *Fecal Coliform* are treatment items for checking.

b) Design treatment capacity of the wastewater treatment facilities

- The design treatment capacity of the wastewater treatment facilities is determined to allow proper treatment of the influent quantity.

c) Effluent quality from the wastewater treatment facilities

- Effluent quality from the wastewater treatment facilities is determined to meet the effluent standard established by the Israeli-Palestinian Joint Water Committee.
- PSI established the standards "Treated Wastewater" for reclaimed water use. With this standard, the effluent from the wastewater treatment facilities in the Agro-industrial Park is categorized as "High quality treated wastewater (A)", so it can be used to sprinkle gardens.

Influent quality to and effluent quality from the wastewater treatment facilities are as shown in Table 3-32.

Table III-3-32 Design Parameters of Wastewater Treatment Facilities

Major Parameter	Influent Quality (before treatment)	Effluent Quality (after treatment)
BOD_5	650 mg/L	20 mg/L
TSS	650 mg/L	30 mg/L
T-N	80 mg/L	25 mg/L
Fecal coli	—	200MPN/100mL

Source: JICA Study Team

Required Capacity

Wastewater quantity fluctuates hourly and seasonally. This fluctuation of the wastewater quantity is determined from the water supply plan as follows:

a) Daily maximum wastewater quantity is assumed to be 1.8 times of the daily average wastewater quantity, and
b) Hourly maximum wastewater quantity is assumed to be 1.3 times of the daily maximum wastewater quantity.

The capacity of the wastewater treatment facilities is determined to properly treat the daily maximum wastewater quantity. Defined wastewater quantities for each development stage are shown below.

Table III-3-33 Design Quantities of Wastewater Treatment

	Unit	Stage I	Stage II	Sub-total (I+II)	Stage III	Total (I+II+III)
Design wastewater flow	m^3/day	270	920	1,180	1,360	2,540
Design maximum daily wastewater flow	m^3/day	470	1,650	2,120	2,450	4,570
Design maximum hourly wastewater flow	m^3/day	620	2,150	2,760	3,180	5,940
	m^3/hour	25.8	89.6	115.0	132.5	247.5

Source: JICA Study Team

The calculation sheet for the design quantities of wastewater treatment is attached in Volume 2, WT-1.

Recommended Wastewater Treatment Facilities

Wastewater shall be treated at the wastewater treatment facilities to satisfy the design parameters specified in Table III-3-33, particularly the required denitrification while the facilities are in operation to serve the Agro-industrial Park. The following four systems are feasible to provide denitrification:

- Oxidation ditch process with denitrification,
- Sequence batch reactor process
- Recycled nitrification/denitrification process, and
- Nitrification–denitrification using endogenous respiration process

Among the above systems, the oxidation ditch process is recommended for the wastewater treatment facilities of the Agro-industrial Park due to the following reasons:

- Less-odor process, which is desirable since the facilities will be located within the Agro-industrial Park,
- Less impact due to fluctuation of influent quantity (effect on the microorganism activities), and
- Simple O&M activities needed and relatively cheaper operation cost.

Following the above conditions and required capacity, the design criteria for the wastewater treatment facilities are proposed as shown in Table III-3-34. As presented in the table, a case of combined wastewater treatment facilities for Stages I and II was considered.

Table III-3-34 Recommended Wastewater Treatment Facilities

	Area（ha）	Treatment Capacity (m^3/day)	Type of treatment
Stage I	11.5	470	Oxidation ditch process
Stage II	50.0	1,650	
Stage I+II	61.5	2,120	
Stage III	50.0	2,450	

Source: JICA Study Team

It is noted that the “oxidation ditch process” will require a large area, but which needs only a few mechanical equipment as compared to the other systems.

Schematic Design of Wastewater Treatment Facilities

The dimensions and capacity of the wastewater facilities are designed based on Japanese design standard. However, adoption of a simple monitoring control system and minimization of spare machine are considered to correspond to the project characteristics and development scale. The layout plan of the wastewater treatment facilities for each case is shown in Volume 2, DWG 141 to 144.

Sludge Disposal Solution

Sludge would be dewatered to reduce its volume, and would be transferred to the final disposal site. The volume of dewatered sludge and hauling frequency with truck are shown in Table III-3-35.

Table III-3-35 Volume of Dewatered Sludge and Hauling Frequency

	Dewatered Sludge Volume(m^3/day)		Hauling Frequency (days)
	Daily Average	Daily Maximum	
Stage I	0.8	1.7	12.5
Stage II	2.9	6.0	3.4
Stage I+II	3.7	7.7	2.7
Stage III	4.2	8.9	2.4

Source: JICA Study Team
Note: To calculate hauling frequency, a 10-ton truck is assumed.

Use Application of Treated Water (Reclaimed Water)

The reclaimed water from the wastewater treatment facilities would be used to sprinkle green and park areas in the Agro-industrial Park, while the surplus of reclaimed water is sold to a dates farm, which is located at the northeast side of the existing steel factory.

Demand for reclaimed water in the Agro-industrial Park is calculated by multiplying the green area by the monthly water requirements of facilities (mm) in Jericho. The evaporation amount is quite different in summer and winter, thus the water requirement of the facilities is estimated for both seasons. Estimated quantity of reclaimed water to be used in the Agro-industrial Park and to be sold to the dates farm near the site in the summer and winter seasons are shown in Table III-3-36.

Reclaimed water sold to the dates farm is planned to be mixed with water from the wells and supplied for irrigation, but the quality of the reclaimed water indicates it can be used for irrigation directly.

Table III-3-36 Volume of Reclaimed Water Usage

	Design Daily Wastewater Flow (m3/day)	Design Daily Reclaimed Water Supply **in Summer Season (m^3/day)**		Design Daily Reclaimed Water Supply **in Winter Season (m^3/day)**	
		For Agro-industrial Park	For around Agro-industrial Park	For Agro-industrial Park	For around Agro-industrial Park
Stage I	261	226	35	113	148
Stage II	915	804	111	402	513
Stage I+II	1,176	1,030	146	515	661
Stage III	1,356	996	361	498	858

Source: JICA Study Team

Operation and Maintenance of Wastewater Treatment Facilities

Operation and maintenance of the wastewater treatment facilities shall include many activities such as removal of screenings, operation and maintenance of facilities for wastewater and sludge treatment, complement of disinfectant and coagulant, landscaping service, water quality examination, and so on. Therefore, special staff for operation and maintenance of the wastewater treatment facilities is necessary.

Civil works and electro-mechanical facilities have to be checked and repaired at fixed intervals. The mechanical and electrical facilities should be replaced within a 20-year interval and civil works should be reconstructed in about 45 years.

Quality of the reclaimed water should be checked by the maintenance staff periodically, and an external examination of the effluent quality of the wastewater treatment facilities should be carried out by PWA monthly, to maintain the efficient functioning of the wastewater treatment facilities.

Others

1) Wastewater Treatment in the Facilities of Casino Resort (Intercontinental Hotel) in Stage I

There are wastewater treatment facilities in Casino Resort (Intercontinental Hotel), which uses oxidation ditch process. At present, the influent quantity of the wastewater treatment facilities in the resort has decreased enormously because the casino was closed down, thus the owners are willing to accept wastewater from around Intercontinental Hotel to keep the biological treatment function of the wastewater facilities. The possibility of treatment of wastewater of the Agro-industrial Park by use of the treatment facilities in Casino Resort was thus studied. However, it was found that the pneumatic transportation of wastewater up to the resort is difficult because of its far distance of five km from the Agro-industrial Park and its elevation is higher than Agro-industrial Park by 60 m.

Therefore, it was assumed that wastewater treatment would be carried out by the Agro-industrial Park through its own the wastewater treatment facilities.

2) Common Wastewater Treatment Facilities with Jericho Municipality

In Jericho City, there is no wastewater treatment system, and they have cesspits in each house. The wastewater and sludge stored in cesspits are trucked by vacuum car and discarded to the *Wadi*. Due to the discard of raw wastewater to *Wadi*, there is a possibility of groundwater pollution.

Though the PNA requested the Japanese Government for the construction of a common wastewater treatment facilities in Jericho Municipality under a grant aid program several years ago, it has not been implemented yet. Construction of common wastewater treatment facilities in Jericho Municipality is therefore worth considering. In the cost estimate of this study, however, the wastewater treatment facilities required for the Agro-industrial Park was considered independently. In case that the common wastewater treatment facilities will be constructed in Jericho Municipality, the wastewater treatment facilities for the Agro-industrial Park is not required, and the wastewater treated in the pre-treatment plant of each factory in the Agro-industrial Park will be discharged to the common wastewater treatment facilities in Jericho Municipality through the wastewater network.

a) Recommended process of wastewater treatment

The candidate site for the common wastewater treatment facilities is located in a wide and open farm at the northeast side of the existing dumping site. The oxidation ditch process is recommended because of its comparatively easy operation.

b) Wastewater Collection System

In Jericho City now, wastewater and sludge stored in cesspits are trucked by honey wagon to a waste repository and discarded to the *Wadi*. A part of wastewater seems to leak out from the cesspits to the ground, and thus causes contamination of groundwater. For environmental protection therefore, it is necessary to construct a wastewater collection system.

c) System to collect the sewage service charge

At present, the water service charge in Jericho City is collected through inspection meter and bill collection. The rate of bill collection is 75% of the total amount, which is relatively a high rate. It is assumed that collection of the sewerage service charge will use the same collection system as the water service charge.

d) System and Technical Level of Operation and Maintenance (O&M)

There is no organization in charge of the sewerage system in Jericho Municipality. However, there is plan of establishment of the organization to manage the sewerage system to meet future requirement.

There is a modern sewerage system in Al-Bireh City, which utilizes the oxidation ditch type treatment method. Therefore, the service charge collection system should be transferred from the Al-Bireh City through training. In addition, technical transfer by the supplier of the treatment equipment to the municipality for specific operation and maintenance of the treatment plant is necessary.

(6) Solid Waste Treatment Facilities

Under present conditions, the capacity of the existing solid waste treatment yard in Jericho is quite limited. The urgent policy decision by PNA on solid waste treatment in Jericho is a pressing issue, considering the construction of the Agro-Industrial Park and rapid increase in the number of residents and visitors.

One of the main measures in the Palestinian Environmental Strategy for Solid Waste Management is to adopt environmentally friendly disposal methods such as separation of recyclable materials and composting organic wastes to be used as fertilizer for agricultural purposes. Activities of the solid waste treatment systems such as recycling and composting in the Agro-industrial Park would be planned based on the concept of "Zero-Emission". This will serve as a model activity which would contribute to the Palestinian Environmental Strategy for Solid Waste Management.

Amount of Solid Waste

Solid waste generated in the Agro-industrial Park is likely divided into the following five types:

< Recyclables >

Recyclables, such as paper, glass, metals and plastic are mainly used for packaging of materials or products. These could be sold to recyclers. Broken wooden pallet for shipping of products may also be generated and could be sold.

< Food Processing Waste >

Food processing waste would be generated primarily from the production lines. Depending on the type of business, there are many types of food processing waste such as confectionery, meat, greenstuffs, etc.

< Wood >

Wood is mainly derived from wood pallets that are used to transport products or deliver materials for productions. Used wood pallet would be solid waste to be used as resources.

< Dewatered Sludge>

Dewatered sludge would be generated in the wastewater treatment facilities intended to treat wastewater generated from the production lines of a factory after primary treatment by the individual company. It also includes human waste of each factory's occupants and visitors of the Agro-industrial Park.

< Other Wastes >

Other wastes are materials that could not be sold due to unsuitability for recycling and composting. Bone is one of the unsuitable food processing wastes for composting due to its difficulty to be decomposed.

For each type of solid waste mentioned above, the amount was estimated with reference to the results of the investment survey and the sampling data based on interviews and observation.

a) Amount of recyclables (corrugated board, metals, etc.), food processing waste and wood is estimated based on the unit generation by sampling 18 food industrial companies existing in Palestine.

b) Amount of dewatered sludge is estimated as Suspended Solids (SS) in consideration of the water supply volume, effluent standard, and type of wastewater treatment.

c) Amount of human waste included in the dewatered sludge is estimated in consideration of the unit generation of human waste from occupants.

d) Amount of other wastes is assumed to be 10% of estimated amount of paper, plastic and food processing waste.

The estimated amount of solid waste for each development stage is as follows:

Table III-3-37 Volume of Solid Waste from the Agro-industrial Park

Unit: ton/day

	Stage I	Stage II	Stage I+II	Stage III	Stage I+II+III
Recycling	**1.0**	**5.1**	**6.1**	**5.1**	**11.2**
Paper& Cardbord	0.6	3.1	3.7	3.1	6.8
Plastic	0.3	1.3	1.6	1.3	2.9
Metal	0.1	0.7	0.8	0.7	1.5
Glass	0.0	0.0	0.0	0.0	0.0
Feed	**0.1**	**0.5**	**0.6**	**0.5**	**1.1**
Food Waste	0.1	0.5	0.6	0.5	1.1
Composting	**2.7**	**13.5**	**16.2**	**13.5**	**29.7**
Food Waste	2.0	10.0	12.0	10.0	22.0
Wood	0.7	3.5	4.2	3.5	7.7
Disposal	**1.1**	**4.5**	**5.6**	**5.8**	**11.4**
Dewatered Sludge	0.8	2.9	3.7	4.2	7.9
Other Wastes	0.3	1.6	1.9	1.6	3.5
Total	**4.9**	**23.6**	**28.5**	**24.9**	**53.4**

Note: Amount of food waste for feeds is estimated on the condition that five percent of total amount of food processing waste is going to composting.
Source: JICA Study Team

Treatment Methods

Application technologies or treatment methods by type of waste are shown in Table III-3-38. Sorting, storage and composting are categorized as "off-site", while the other activities, including collection and internal transportation of generated solid waste and external transportation are categorized as "on-site".

Food processing and wood wastes would basically be treated at composting facilities inside the Agro-industrial Park. However, food processing waste could also be reused as feeds based on the individual decisions/agreement between the tenants and farmers.

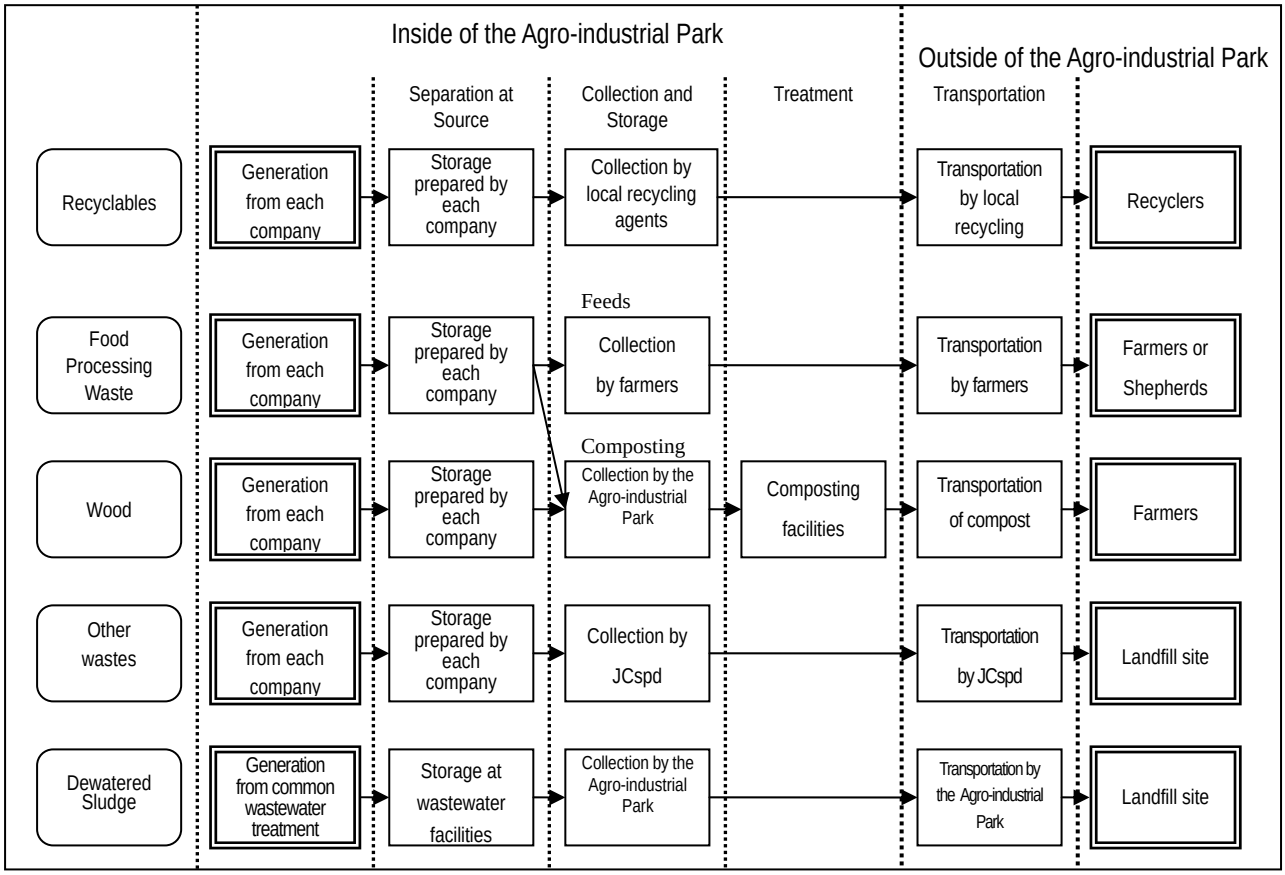
Table III-3-38 Application Technology or Treatment Methods of Solid Waste

	Off-site		On-site				
Type of waste	Sorting and storage	Composting	Collection and internal transportation	External transportation	Recycling	Feeds	Landfill
Recyclables	○	-	○	○	○	-	-
Food Processing Waste	○	○	○	○*	-	○	-
Wood	○	○	○	○*	△	-	-
Other Wastes	○	-	○	○	-	-	○
Dewatered Sludge	○	-	○	○	-	-	○

(○): Application technologies or treatment methods
(△): In case that wood is not used for composting, alternatively, it could be categorized as recyclables.
*: Food processing and wood wastes are transported as compost in case of on-site treatment.
Source: JICA Study Team

Treatment Flow

The treatment flow for solid waste is shown in the following Figure III-3-14, assuming that the above technologies or treatments are applied for each type of waste. Inside the Agro-industrial Park, each type of waste is separated at the source, collected, and put in storage bins prepared by each company/factory. Outside the Agro-industrial Park, recyclables are sold, and sludge and other wastes are transported to the landfill site. In case that food processing waste can be reused as feeds, it is transported to outside the park and then treated. The detailed treatment flows of each type of waste are shown in the Table III-3-39.



Source: JICA Study Team

Figure III-3-14 Proposed Solid Waste Treatment Flow

Table III-3-39 Proposed Solid Waste Treatment Process

Type of waste	Treatment Process	Remarks
Separation of Wastes	The tenant (company) of the Agro-industrial Park should separate wastes at source based on the categories designated by the management unit of the Agro-industrial Park.	The at-source separation of waste is expected to secure the efficiency in the treatment process after collection of wastes and to keep the quality of separated waste.
Recyclables	Recyclables would be separated and stored in the storage bins of each company. Local recycling agent(s) designated by the management unit of the Agro-industrial Park would collect the recyclables from each storage bin and transport them to recyclers outside of Palestine. The recyclables could be sold; however, the selling price depends on the amount of waste and their discharge conditions.	There are recycling agents to collect recyclables and transport and sell them to recycling companies outside of Palestine. Therefore, it is preferable to utilize the existing system in order to reduce the burden on the Agro-industrial Park as much as possible.

Type of waste	Treatment Process	Remarks
Food Processing Waste	Basically, the management unit would recommend for each company to provide the food processing waste to nearby sheep herder as feeds under their responsibilities. In case that companies do not have a way to hand over food processing waste as feeds, they have to separate the food processing waste at their storage. It would be kept in plastic containers with a lid. Staff of the Agro-industrial Park would pick it up and transport to composting facilities inside the Agro-industrial Park. At the composting facilities, food processing waste could be diverted to compost through several processes. Finally, the staff of the Agro-industrial Park will transfer it to farmers and sell it.	There are food processing companies willing to hand over the food processing waste to farmers as feeds for sheep and goats. However, it may take a long time to introduce the method to produce feeds made of food processing waste, since some specific processes are necessary to produce feeds suitable for sheep and goats. Therefore, the production of feeds is not considered in the Agro-industrial Park. A composting technology is recommended to be introduced because it is one of the developed technologies in the world. However, there are fewer experiences about composting in Palestine and surrounding areas. Therefore, technical transfer when the Agro-industrial Park would be operated is necessary.
Wood	Wood would be separated and stored at storage bins of each company. Staff of the Agro-industrial Park would pick it up together with food processing waste at one time, and transport it to the composting facilities inside the Agro-industrial Park. At the composting facilities, wood will be converted to sawdust by a cutting machine and used to adjust the moisture content of food processing waste.	Wood could be sold or recycled as fuel at bread shops, etc. However, it could also be used as a precious material to effectively adjust moisture contents of food processing wastes. If the sawdust would be short for the composting process due to shortage of wood or contamination of wood by chemicals, the compost itself would be used as returned compost for the moisture control instead of sawdust.
Other Wastes	The management unit of the Agro-industrial Park would contract with JCspd to collect other wastes from storages of each company and transport them to the landfill site. It will be necessary to pay the fee for the collection and transportation service.	JCspd is responsible for domestic and commercial wastes which are unsuitable materials for recycling and composting, such as used tissue papers, bones, etc. JCspd would collect and transport them to the landfill site, although excluding toxic waste.
Dewatered Sludge	After dewatering at the wastewater treatment facilities inside the Agro-industrial Park, the sludge would be transported to be the landfill site by the Park's management unit.	Responsible organization (s) for treatment of sludge is not clear in Palestine and it is under discussion. It is recommended that the management unit of the Agro-industrial Park transport it to the landfill site by itself. However, it is necessary to confirm the acceptability of the landfill site such as Jenin or other areas under initiative of the Environmental Quality Authority (EQA). Sludge could be diverted to compost; however, sludge would be transported to a landfill site in consideration of the common practices and sentiments of people and tenants of the Agro-industrial Park.

Source: JICA Study Team

Required Equipment and Facility for Composting

Equipment and facilities related to composting are categorized as off-site processes. Details of the equipment and facilities are listed below.

Table III-3-40 Equipment and Facilities for Composting

Items	Required Main Equipment and Facilities
Buildings	Building for composting facilities, office, primary fermentation room, secondary fermentation room, storage of compost, building for deodorization, place to wash containers, and wastewater tank.
Equipment/ facilities for pre-processing	Receiving chute, grinding machine, blending tank, sawdust machine
Equipment for primary and secondary fermentation	Sprinkler system, ventilation systems
Deodorization equipment	Tamping for deodorization, sprinkler system, ventilation systems (blower and fan duct), hoisting curtains, mobile plastic house for mixing, plastic house for receiving chute
Equipment for storage of compost	Trommel
Other equipment	Testing equipment, computer and printer

Source: JICA Study Team

Process and Design of the Composting Facilities

Composting mainly consists of four processes as follows:

1. Initial process

Food processing waste is collected and transported to the composting facilities established at the Agro-industrial Park. The received food processing waste is put into a receiving chute by taking it out from the plastic containers. The food waste is then transferred and cut in order to standardize the food material sizes and to make the sizes smaller for better fermentation of the materials. After cutting, the moisture content of the materials is adjusted by adding the sub-material of sawdust.

2. Primary fermentation

In this process, fermentation of the materials is accelerated with aeration by turning over or through a ventilation pipe equipped at the bottom of the first fermentation room. Turning over with a wheel loader is proposed for ease of machinery maintenance. The period of primary fermentation is around three weeks. Primary fermentation rooms are covered with hoisting curtains in order to avoid leakage of odor at the fermentation rooms. It is opened only once a week when turning over is conducted by a wheel loader. In order to remove the odor, air in the primary fermentation rooms is sent to a deodorization equipment by a ventilator.

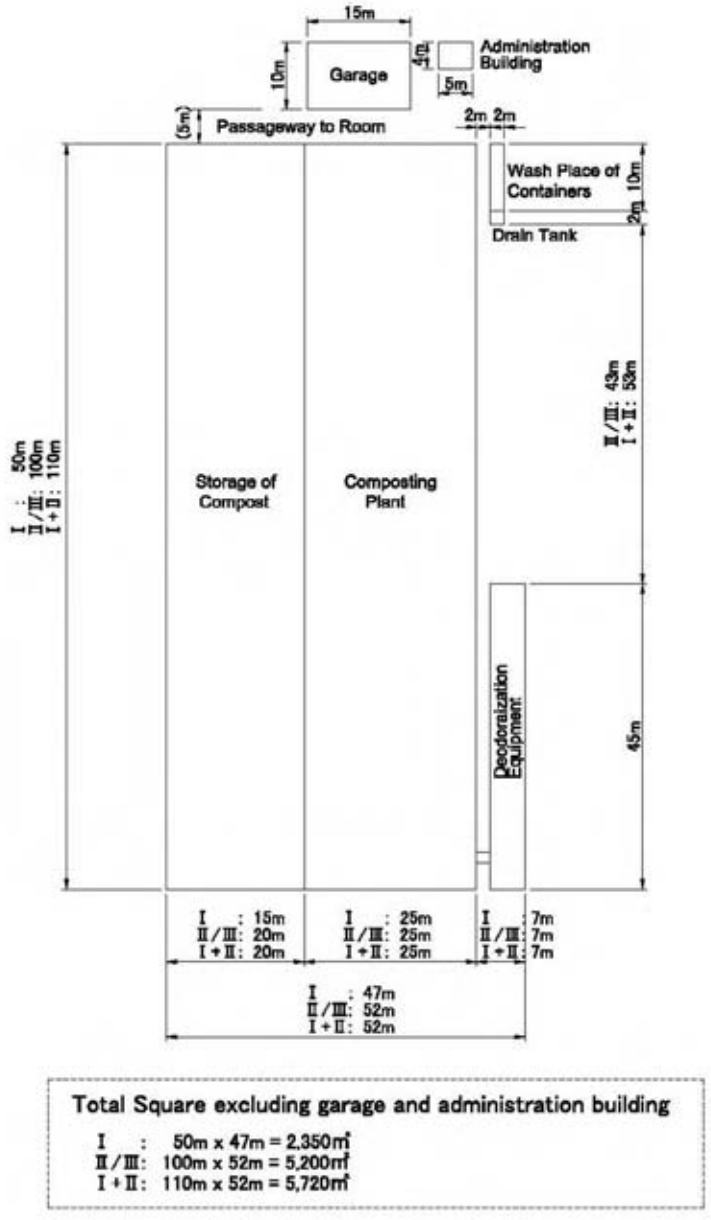
3. Secondary fermentation

In the secondary fermentation process, aeration is conduced by a wheel loader once or twice a month. The period of the second fermentation is around 45 days. Secondary fermentation rooms are also covered by hoisting curtains to avoid leakage of odor from the rooms. It is opened only once or twice a month when turning over is conducted by a wheel loader.

4. Storage

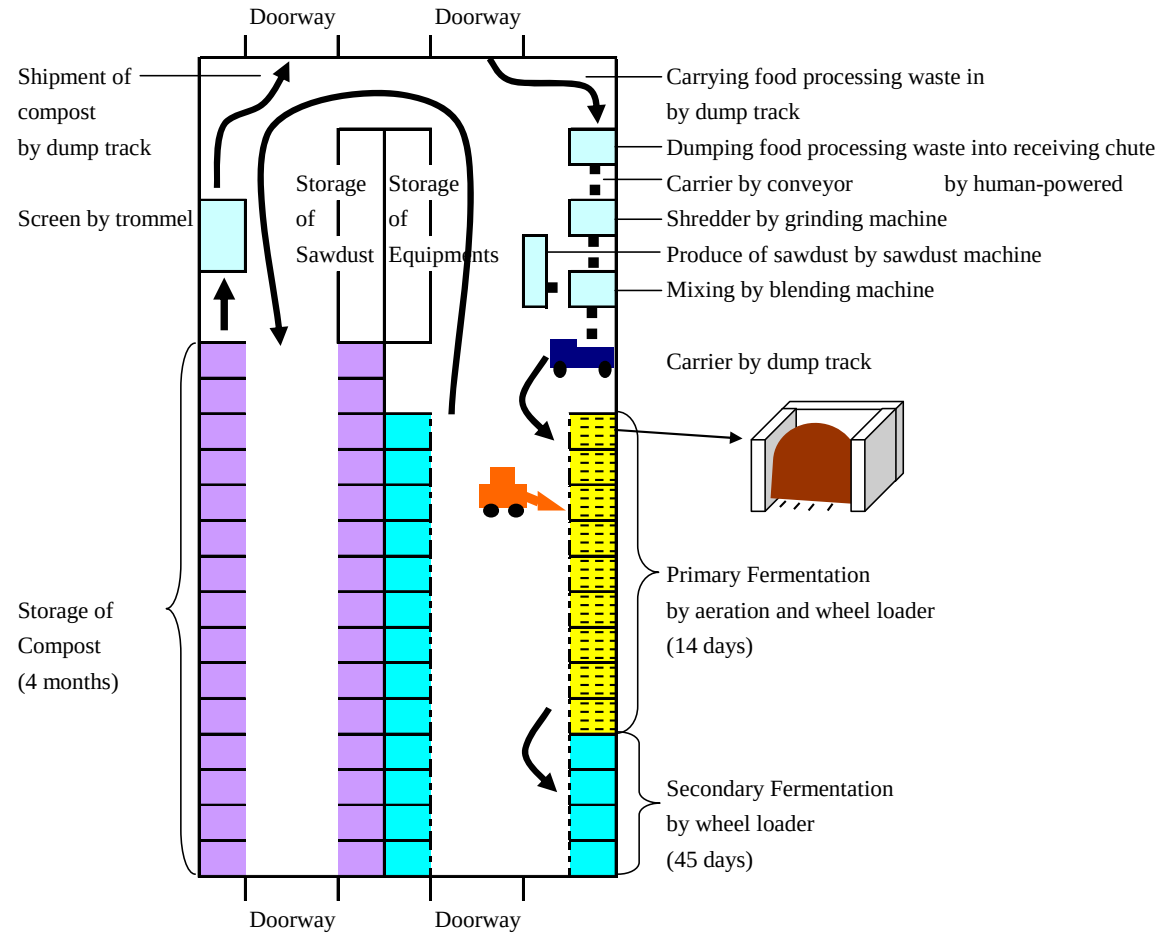
After fermentation is complete, compost is stocked prior to the distribution to farmers. The storage period is about four months.

An illustration of the composting facilities and the processes of composting are shown in Figures III-3-15 and III-3-16, respectively.



Source: JICA Study Team

Figure III-3-15 Illustration of Composting Facilities



Source: JICA Study Team

Figure III-3-16 Illustration of the Composting Process

Issues to be considered on solid waste management

The following items should be considered:

a) It is recommended that the management unit of the Agro-industrial Park investigate the category of production and waste to be generated by each company under the supervision of the EQA before they move into the Agro-industrial Park. This is in order to have an idea on the quality and quantity of wastes and the possibility of chemical substances to contaminate food processing waste.

b) Companies to move into the Agro-industrial Park would be requested as follows:
- To accept the above-mentioned inspection by the Park's management unit and EQA
- To separate wastes on the basis of material separation manual of the Agro-industrial Park
- To prepare storage containers to separate wastes following the specifications stated by the management unit of the Agro-industrial Park

c) Technical transfer is necessary to operate the composting facilities and control environmental issues such as prevention of odor leak.

d) Operation and maintenance manual of composting facilities should be developed in order to ensure the quality of compost and take countermeasures for environmental issues.

e) Points for design to establish the composting facilities in the Agro-industrial Park are as follows:
- It should be established to avoid exposure of odor from the fermentation rooms to the air.

- Related processes or specifications should be adjusted according to the available type of conveyor, dumping deodorization, and materials to adjust moisture contents of food processing wastes.

f) The turning over of materials by wheel loader should be conducted at weekends when many companies are closed, since there is a possibility of odor leakage from the composting facilities to the outside environment.

(7) BDS Center Building

As described in Chapter II, the BDS Center is proposed to be established in order to provide business support to the tenant enterprises in the Agro-industrial Park. The services provided would be as follows:

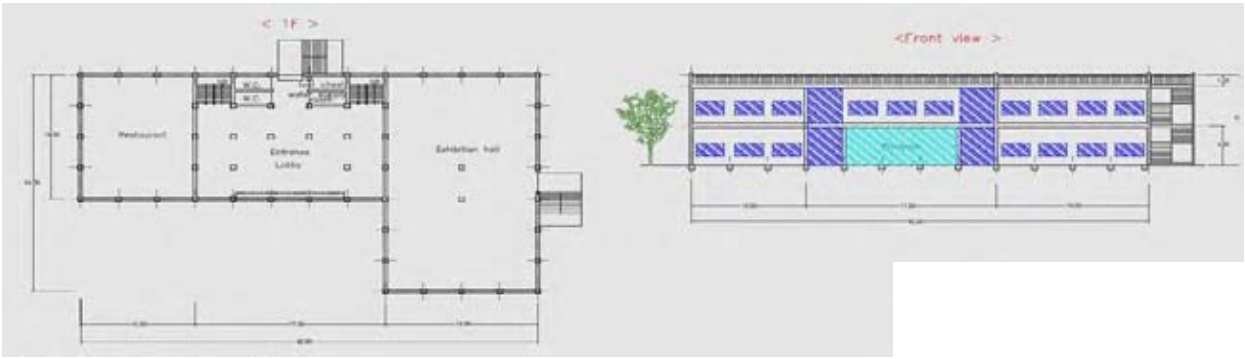
a) Introduction/ development of business support schemes,
b) Arrangement of training/seminars, and
c) Provision of market information/ business consultation.

BDS Center

Market

Exhibition Hall

The BDS Center would be planned to operate the above services at the northern part of the Stage II area, in order to provide the customers with easy access through the entrance gate, which is separated from the other gates for each lot. The BDS Center is planned to be a two-storey building with business support offices, meeting and seminar rooms, an exhibition hall and other necessary facilities. The preliminary design of the BDS Center is shown in Figure III-3-17 and Volume 2, DWG 285 and 286.



Source: JICA Study Team

Figure III-3-17 Plan and Front View of BDS Center

The required floor area for the BDS center is estimated as follows:

Table III-3-41 Required Floor Area of BDS Center

	Require Floor area
Total Floor area (m^2)	1,100
-Floor area for office (m^2)	250
-Meeting room (m^2)	150
-Exhibition hall (m^2)	350
-Seminar room (m^2)	200
-Restaurant (m^2)	150

Source: JICA Study Team

III-4 On-site Infrastructure and Facilities Planning

On the basis of the functions and facilities required for the Agro-industrial Park, on-site infrastructure is preliminarily planned as summarized in Table II-2-5 in Chapter II. The engineering studies for the following facilities are described hereinafter.

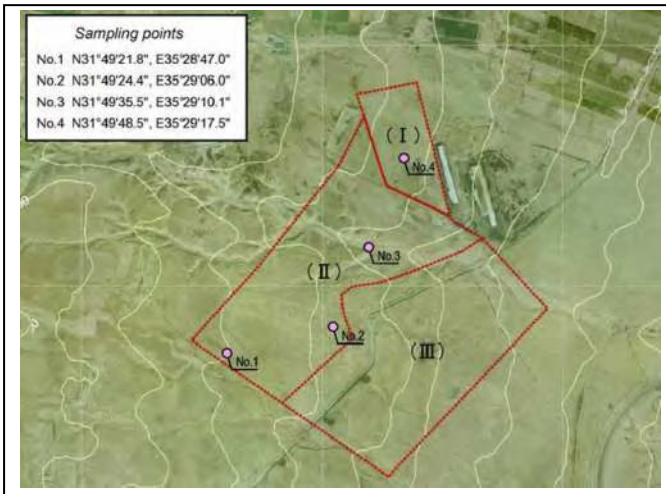
(1) Land reclamation
(2) *Wadi* improvement
(3) Internal road
(4) Storm water drainage channel
(5) Power distribution facilities
(6) Telecommunication distribution facilities
(7) Water distribution facilities
(8) Wastewater collection facilities
(9) Solid waste collection facilities
(10) Security facilities
(11) Buildings

(1) Land Reclamation

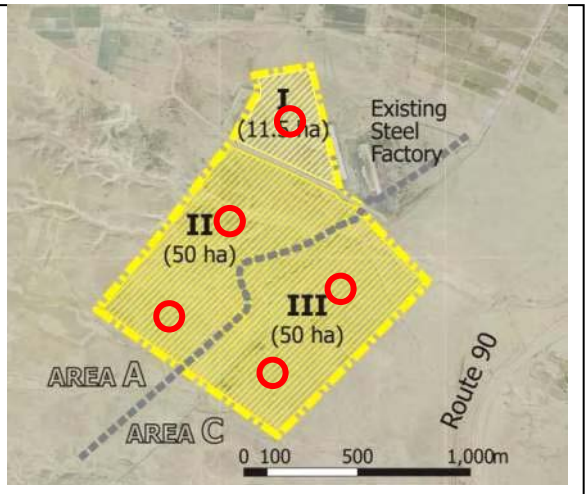
Foundation Treatment

The Agro-industrial Park is planned to be developed in a desert land. The soil conditions in the candidate site vary, but mainly consist of sandy soil, with minimal moisture content. In order to determine the basic characteristics of sandy clay, and to evaluate the foundation strength and geological conditions at the candidate site, a geological survey was carried out in Study Part 2 as summarized below.

- Soil sampling test at four points, and
- Core drilling with a depth of 20 m, and Standard Penetration Tests with interval depths of 1.5 m at five points



Location of Soil Sampling Test



Location of Core Drilling and SPT Test

Source: JICA Study Team

Figure III-4-1 Locations of Geological Survey

Soil sampling and laboratory tests were carried out in May 2008, while core drilling and standard penetration tests were conducted in July 2008. Locations of each testing point are shown in Figure III-4-1. The reports for the soil sampling tests and geological investigations are attached in Volume 2, SR-2 and SR-3, respectively.

As a result of the soil sampling tests, the basic characteristics of the soil were identified as shown in Table III-4-1.

Table III-4-1 Result of Soil Sampling Test

		Sample 1	Sample 2	Sample 3	Sample 4
Moisture Content (%)		8.1	3.6	5.5	2.6
PH value		7-8	7-8	7-8	7-8
Atterberg Limits	Liquid limit	29.1	34.7	49.0	39.3
	Plastic limit	19.0	23.0	35.4	26.4
	Plasticity Index	10.1	11.7	13.6	12.9
Specific Gravity		2.542	2.45	2.501	2.459
Direct Shear Parameters	C (KN/m2)	12	13	15	14
	Ø(º)	14	12	15	13

Source: JICA Study Team

On the basis of observation results of collected samples from the five drilled boreholes, it was confirmed that the whole site for the Agro-industrial Park within the explored depth of 20 m consists of un-cemented alluvium, loose to medium dense, fine grained silts to sandy silts, with cemented particles in gravel form. This type of soil association is located mainly in Jericho City and the Al-Auja areas. This soil type responds to irrigation, producing various crops, mainly subtropical and tropical fruits, such as citrus, bananas and dates.

As a result of the core drilling and standard penetration tests, the N-values of the foundation were estimated as shown in Table III-4-2.

Table III-4-2 Result of Standard Penetration Test

	Borehole No.1	Borehole No.2	Borehole No.3	Borehole No.4	Borehole No5
N-value (depth 0 to 10 m)	9 - 23	14 - 30	7 - 17	23 - 50	18 - 25
N-value (depth 10 to 20 m)	37 - 50	32 - 50	21 - 50	50<	26 - 47

Source: JICA Study Team

Based on characteristics of the soil samples and the results of the standard penetration tests, it was confirmed that the candidate site has sufficient bearing capacity, which is required for foundation of normal structures in the Agro-industrial Park. However, the following construction procedure will be required to ensure stable foundation in the area:

a) For embankment areas, excavated soils will be used for embankment, with proper control on moisture content, embankment thickness of about 40 cm in each layer, and compaction by vibrating roller of 10-15 ton class;
b) For excavation areas, proper compaction by vibrating roller of 10-15 ton class is required upon excavation, and
c) For weak foundation, if any, foundation replacement or soil improvement may be partially required.

Soil Sampling

It is noted that further foundation treatment might be required for some heavy facilities or structures such as the water supply reservoir tank and wastewater treatment facilities. Such special foundation treatment shall be considered based on the bearing capacity estimated for each structure shown in Table III-4-3.

Table III-4-3 Bearing Capacity of Structures of Common Utilities

Facilities		Stage	Sample No. (Soil Sampling Test)	Long-term, permissible bearing capacity	Limit vertical bearing capacity degree	Adhesive power	Angle of internal friction	Tilt angle of load
				qa (kN/m^2)	qu (kN/m2)	c	φ	θ
Foundation of water supply reservoir tank	Radius:6.5m	I	4	**59**	178	14	13	0
	Radius:12m	II	4	**61**	184	14	13	0
	Radius:13.5m	III	4	**62**	185	14	13	0
Wastewater treatment facilities	Rectangle:50×100m	I	4	**71**	213	14	13	0
	Rectangle:85×120m	II	3	**98**	295	15	15	0
	Rectangle:85×120m	III	3	**98**	295	15	15	0

Source: JICA Study Team

Planning of Land Reclamation

Land reclamation for the Agro-industrial Park will be formulated based on the following basic conditions:

a) Excavation and embankment volumes should be balanced as much as possible, in order to avoid large-scale spoil banks or the necessity for a quarry site;
b) Excavation and embankment slopes are basically designed to be 1:2 and protected with sod-facing;
c) The bulking factor of soil is set to be 0.95; and
d) As the land surface of the site is heterogeneous and may contain vegetation, the top soil up to ten cm in depth shall be discarded.

The balance of earth works is planned as shown in Table III-4-4.

Table III-4-4 Balance of Earth Works

	Lot I	Lot II	Lot III	TOTAL	Remarks
① Soil Disposal	-11,500	-50,000	-50,000	-111,500	Top soil 10 cm
② Excavation	36,150	499,850	377,450	913,450	
③ Excavation for internal road foundation	11,000	47,800	69,600	128,400	
④ Bulking factor	0.95	0.95	0.95	0.95	
⑤ Usable embankment materials	44,792	520,267	424,697	989,757	(②+③) x ④
⑥ Embankment	39,250	404,775	508,525	952,550	
⑦ Balance	5,542	115,492	-83,828	37,207	⑤-⑥

Source: JICA Study Team

Land reclamation was planned based on the available topographic data with 0.5 m interval of contour lines. As a result of calculations of the balance in earth works, it was confirmed that the volume of excavated materials is sufficient for embankment in Lots I and II, and short in Lot III. Therefore, the surplus excavated materials in Lots I and II shall be kept near the boundary of Lots II and III.

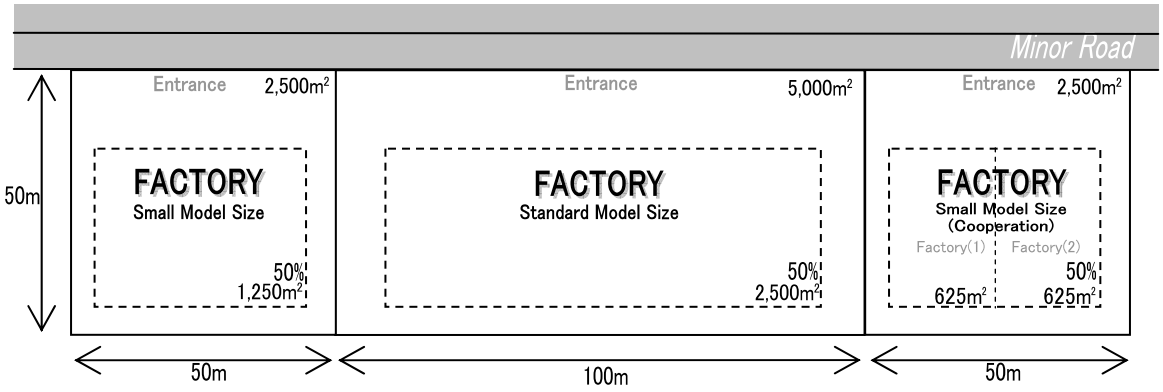
The land reclamation plans are shown in Volume 2, DWG 206 to 209.

Layout Planning

The candidate site would be allocated for the following areas after the land reclamation. The layout planning concept for each area is described below.

<Factory Area>

Some 40-50% of the total development area in the Agro-industrial Park would be allocated for factory areas. This consists of several sizes of land spaces. A building-to-land ratio of each land is scheduled to be limited within 50% based on the city planning standards of Jericho Municipality.[8] Most allocated land sizes for factory areas are planned to be 0.25 ha and different land sizes would be available for large- and small-scale locators/tenants, as shown below.



Source: JICA Study Team

Figure III-4-2 Standard Size of Factory Land

Factory area is arranged based on the following concepts:

- Small-sized lands would be allocated near the central area of the Agro-industrial Park, to be occupied by small-scale companies, in providing careful business development services,
- Large-sized lands would be allocated at the back side of the Agro-industrial Park, and
- All lands shall have access to a minor road to maintain smooth transportation.

The following regulations of building would be applied for each land in the factory area.

Table III-4-5 Regulations of Building in Land

Project or usage classification	Maximum				Minimum		
	Construction percentage	Floors Percentage	Number of floors	**Establishment** Height (m)	Front Distance (m)	Back Distance (m)	Side Distance (m)
Large Industrial Assemblies	50%	300%	Undetermined	Undetermined	10	8	6
Factories	50%	300%	6	23	10	5	4
Light Factories and art crafts	50%	300%	4	16	6	4	3

Source: Regulations of Jericho Municipality

[8] The city planning standards of Jericho Municipality is obtained from the Engineering Department of the Jericho Municipality.

<Distribution Area/ Storage Area/ Truck yard>

Distribution areas should be provided to support the tenant companies' packing and collection/delivery of products. This is arranged at places near the entrances, for smooth transportation.

In the storage area, there would be warehouses and refrigerated facilities for keeping raw materials and products. Storage areas would be arranged at places near the distribution area.

Storage

Table III-4-6 Required Floor Area of Storage

Floor size(m^2)	I	II	III	total	assumption
Products storage area	1,390	5,870	8,000	15,260	*1
Raw materials storage area	600	2,520	3,430	6,550	*2
Administration	50	150	200	400	each building 50m^2
Control/Machine room	50	150	200	400	each building 50m^2
Common space	210	870	1,190	2,270	floor 5% (passage,lavatory,etc)
Total	**2,300**	**9,560**	**13,020**	**24,880**	

Note: *1; 0.75 ton/m2: 80% rate of storage, 7days storage & 70% margin
*2; 0.75 ton/m2: 80% rate of storage, 3days storage & 70% margin
(Vegetables: 0.5 ton/m2, fruit: 1.0 ton/m2 in Japan)

Source: JICA Study Team

Since spaces for the frequent movement of trucks is necessary in these areas, a building-to-land ratio would be 40% or less.

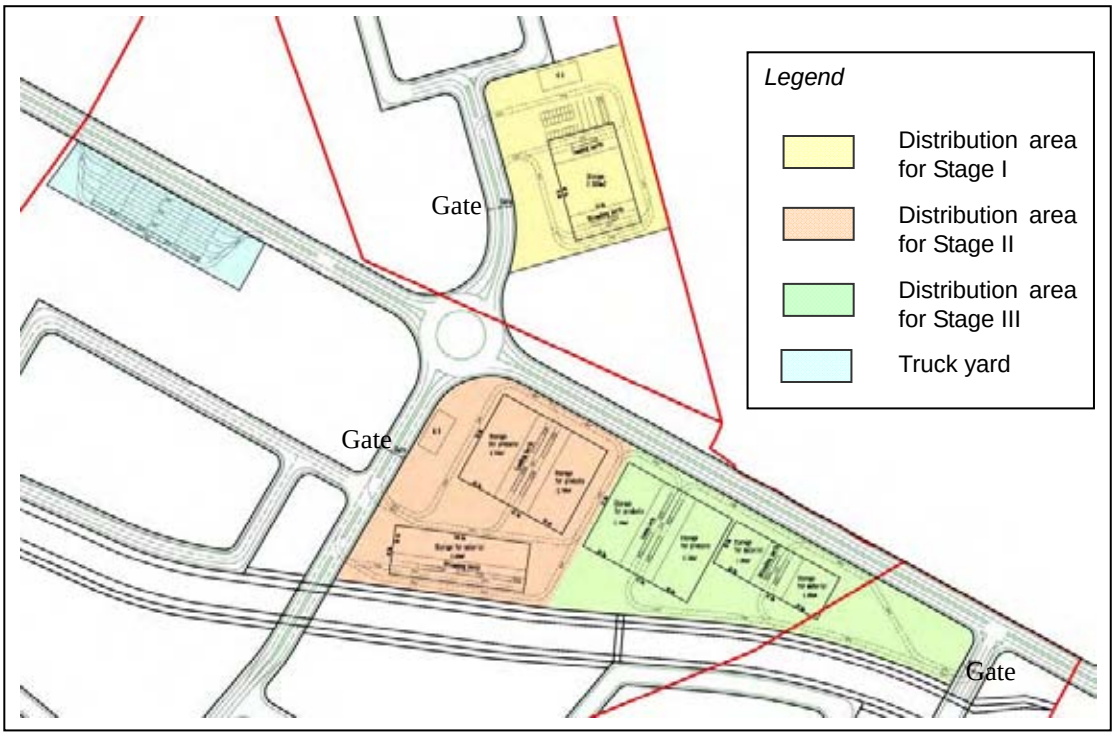
The truck yard should be designed and constructed to prevent cargo traffic congestion to the entrance gate in Stages II and III. Inbound cargo trucks temporarily stand-by in the truck yard and move to the entrance gate after obtaining instructions from traffic controllers. As a result of the estimation below, the required berths will be 27 in number.

Table III-4-7 Required Number of Berth in Truck Yard

Destination	Total trips in-coming and out-going (trips/day)	Total coming cargo trucks (vehicles/ day)	Gate capability per 5minutes	Gate capability for 4 hours (7:00am-11:00am)	Number of berth in truck yard
Stage I	43	22	2trucks	96	-
Stage II or Stage III	437	219	4trucks	192	27

Source: JICA Study Team

The design of the distribution areas and truck yard is shown in Figure III-4-3 and Volume 2, DWG 228 and 229.



Source: JICA Study Team

Figure III-4-3 Design of Distribution Area and Truck Yard

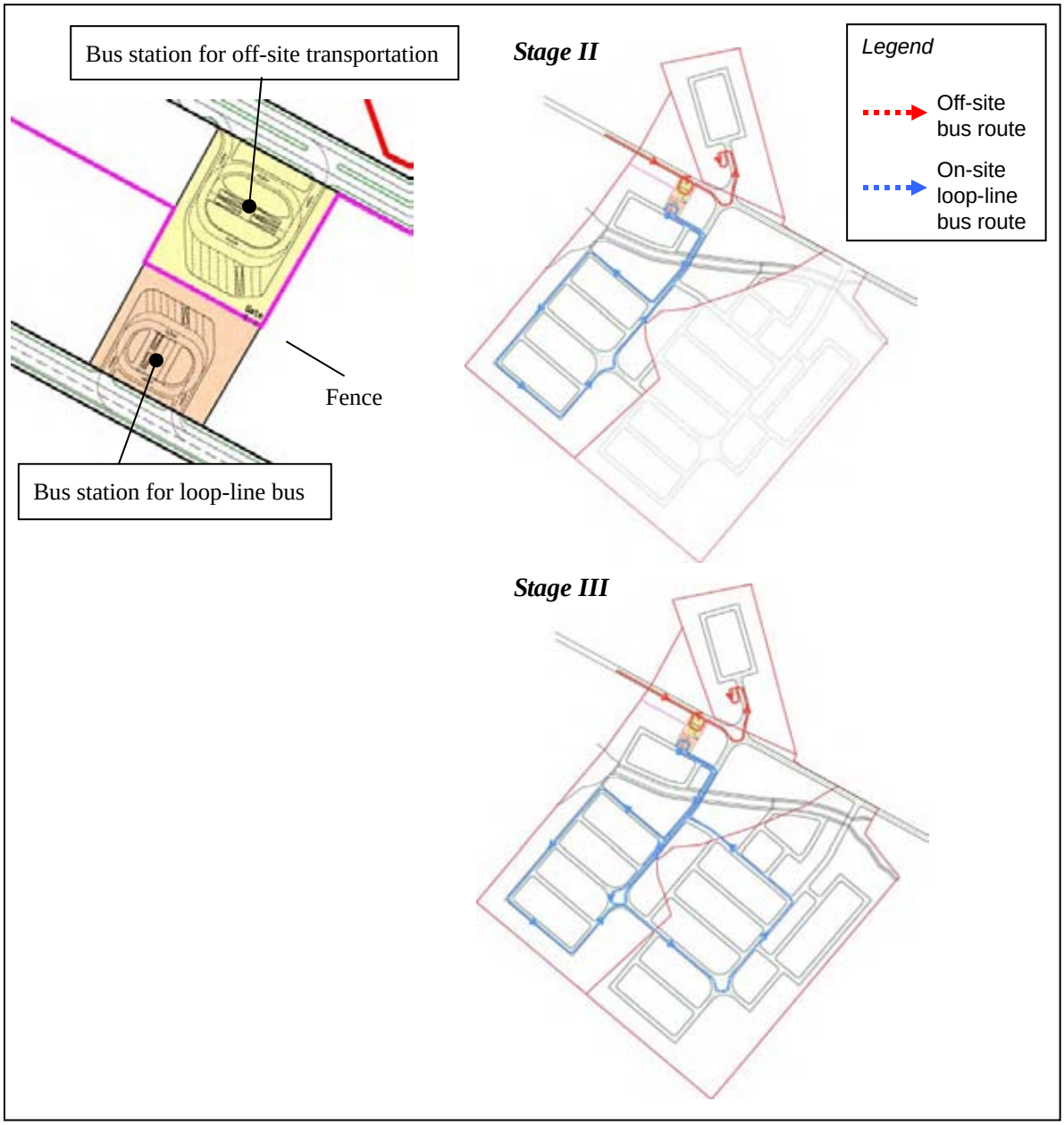
<Bus station>

As shown in Table III-3-3 in Section III-3, the number of trips for commuters in each stage was assumed to reach 1,420 trips/day in Stage I, 6,460 trips/day in Stage II, and 14,000 trips/day in Stage III. A mass transportation system should be set-up to limit traffic congestion due to movement of heavy vehicles.

Bus transportation system between center of Jericho City and the Agro-industrial Park would be arranged. The bus size is assumed to be large size with 40 seats. Bus stations in the Agro-industrial Park will be located at the sites of office buildings in Stage I and at the south side of the access road in Stage II as an off-site bus station.

In addition, loop-line buses for internal transportation of employees would be arranged in Stages II and III. The size of the loop-line buses is assumed to be small with 20 seats and the bus stations will be located beside the off-site bus stations as mentioned above. Fences will be installed to separate off-site bus stations from loop-line bus stations.

The design of bus stations and bus routes are shown in Figure III-4-4 and Volume 2, DWG 230.



Source: JICA Study Team

Figure III-4-4 Design of Bus Stations and Bus Routes

<Parking Area>

Parking areas are set-up in all factories for employees and visitors on the basis of the expected vehicle numbers, with a space of 25 m^2/vehicle, including the access way. The parking area is designed to effectively utilize the irregular land shape and secure reasonable walking distances to the factories.

Table III-4-8 Parking Area

	I	II	I+II	III	I+II+III
Parking area (m^2)	4,100	16,290	20,390	19,890	40,280
Effective parking area excluding a green area of 10%(m^2)	3,690	14,661	18,351	17,901	36,252
Parking lot(car)	148	586	734	716	1,450

Source: JICA Study Team

<Green and Park Area>

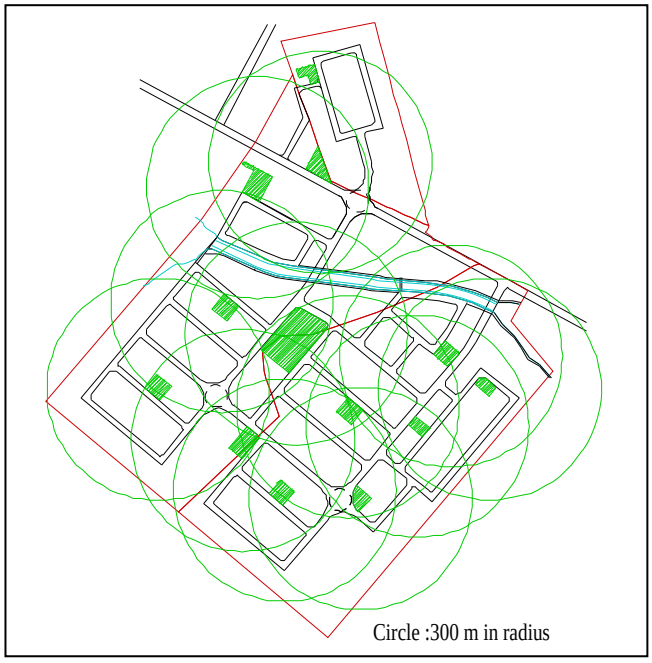
It is recommended to provide greens and parks in the Agro-industrial Park in view of enhancing human well-being, improvement of workplace, as well as fire prevention. In the Agro-industrial Park, the green and park zone is planned to cover twenty percent (20%) of the total development area, in reference to the regulation applied in Japan by the Factory Location Law.

a) Park

Each park is arranged to be located within a distance of 300 m from each factory, as shown in Figure III-4-5. The crossing line between "Area A" and "Area C" shall be allocated for the Central Park, as a symbolic area of the Agro-industrial Park with green paths and a pond as shown in Figure III-4-6 and Volume 2, DWG 291 and 292.

b) Green Zone in the Factory Areas

Eight percent (8%) of each factory land area shall be allocated as green zone. A sample of the green zone allocation in each land size is shown below.



Source: JICA Study Team

Figure III-4-5 Plan of Park Allocation

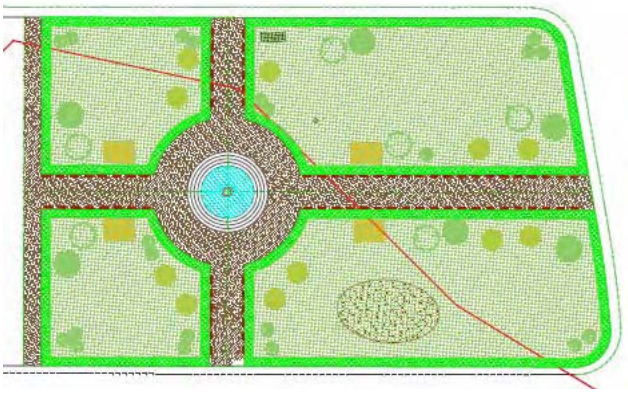
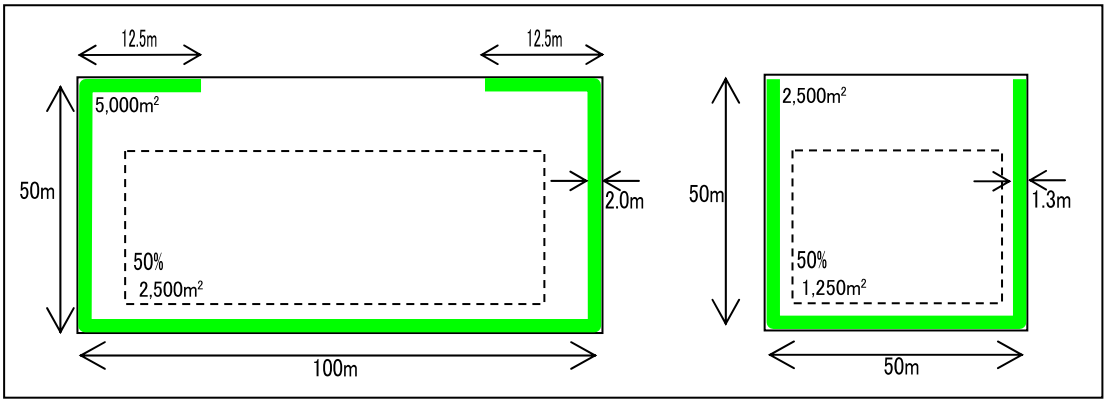


Figure III-4-6 Image of Central Park



Source: JICA Study Team

Figure III-4-7 Sample of Green Zone Allocation in Each Land of Factory Area

c) Green Zone in Common Area

The ratio of the green zone in the common areas is set according to each function, as follows:

- 25% of common utility area,
- 20% of office area and BDS center,
- 15% of bus rotary, and
- 10% of parking lot.

The *Wadi*, road green strips, pathways, and buffer areas are also counted as green zones.

Park/Green

Based on the above conditions, green and park areas are planned as summarized below.

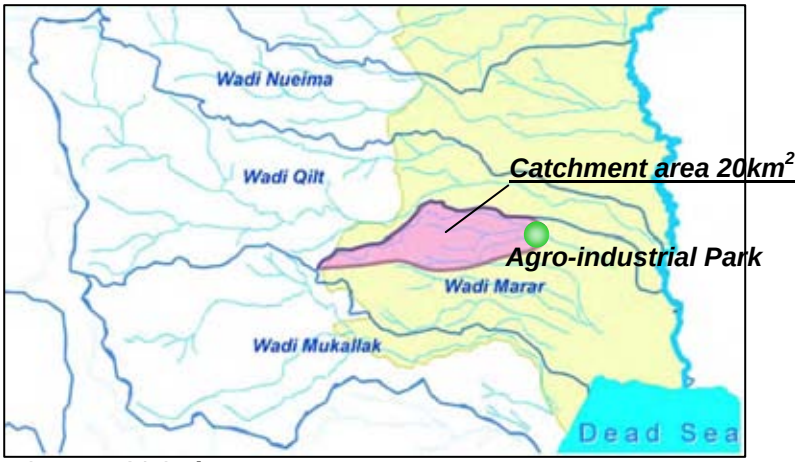
Table III-4-9 Planned Green and Park Area

	I	II	I+II	III	I+II+III	Assumption
Park	1,880	18,750	20,630	25,440	46,070	
Wadi	0	27,670	27,670	10,890	38,560	
Office/BDS area	2,552	3,798	6,350	1,988	8,338	20% of area
Common utility area	3,223	7,375	10,598	5,315	15,913	25% of area
Road green strip	800	3,860	4,660	5,330	9,990	length x 2 x 0.5
Parking	410	1,629	2,039	1,989	4,028	10% of area
Bus rotary	0	1,934	1,934	0	1,934	15% of area
Sloped land due to land reclamation	7,080	20,010	27,090	27,570	54,660	
Road(off-site) green strip	0	1,440	1,440	160	1,600	length x 2 x 0.8
Total Green space(1)	**15,945**	**86,466**	**102,410**	**78,682**	**181,092**	
Area space	115,000	500,000	615,000	500,000	1,115,000	
Green ratio(1)	**13.9%**	**17.3%**	**16.7%**	**15.7%**	**16.2%**	
Factory & other area	61,920	226,430	288,350	329,040	617,390	Factory/Distribution/Storage
Green of a factory	4,954	18,114	23,068	26,323	49,391	8% of area
Total Green space(2)	**20,898**	**104,580**	**125,478**	**105,005**	**230,483**	
Green ratio(2)	**18.2%**	**20.9%**	**20.4%**	**21.0%**	**20.7%**	

Source: JICA Study Team

(2) *Wadi* Improvement

A *Wadi* crosses the center part of the candidate site from the west to east direction, with a catchment area of 20 km^2, located in the *Wadi* Marar basin. This basin does not cover the western highlands where rainfall is comparatively high as shown in Figure III-4-8. Therefore, influence of run-off due to rainfall in this catchment area is not critical.



Source: JICA Study Team

Figure III-4-8 Catchment Area of *Wadi* Marar

Design Flood Discharge

Although the run-off due to rainfall is not significant, part of the *Wadi* located in the candidate site shall be improved and protected against probable flood to avoid erosion due to water flow. However, hydrological data for this *Wadi* is hardly available. According to information from nearby residents, run-off takes place in recent years with a depth of 20-30 cm, when rainfall occurs for a few months during the winter season.

In order to determine the probable run-off discharge of various recurrence periods of this *Wadi* at the Agro-industrial Park, the flood data analyzed on the *Wadi* Kafrein Dam in the Jordan River East Bank is transposed to the Agro-industrial Park using Creager's formula.

The Creager's formula is expressed as:

$$Q_p = 46 \times C \times A^{\alpha}$$

$$\alpha = 0.894 \times A^{-0.048} - 1$$

where, C : Creager's coefficient or C value
k : Catchment area (miles^2)
Q : Specific discharge (feet^3/sec/miles^2)

It is generally accepted that the Creager's C value in the basins with different catchment areas remains almost the same if their basin conditions, including rainfall intensity and geologic conditions, are similar. Moreover, in the report on Studies of Raising Kafrein Dam (May 1992), the probable floods of various recurrence periods are estimated by transposing the Creager's C values derived through the frequency analysis for annual maximum peak discharges in the *Wadi* Ware basin in Jordan.

Applying the Creager's C values estimated for the Kafrein Dam in Jordan, the probable floods for catchments of the *Wadi* of the site are estimated as shown in the following Table III-4-10:

Table III-4-10 Estimated Probable Floods of *Wadi* in the Site

Return Period	Kafrein Dam Site (CA=161 km^2)		*Wadi* at Agro-industrial Park(CA=20 km^2)	
	Peak Discharge (m^3/s)	Creager's C Value (-)	Probable Flood (m^3/s)	Specific Discharge (m^3/s/km^2)
2-year	42	1.56	11	0.5
10- year	106	3.94	27	1.3
25-year	154	5.72	39	2.0
50- year	**218**	**8.10**	**55**	**2.8**
100-year	267	9.92	68	3.4

Source: JICA Study Team

Wadi Kafrein has a continuous run-off discharge during winter while the *Wadi* at the candidate site has a run-off depending on the rainfall. Therefore, it is possible that the above estimate is on the safe side. Accordingly, a 50-year probable flood of 55 m^3/s is adopted as the design discharge for *Wadi* improvement, taking into account a reasonable factor of safety.

Basic Concepts

Wadi improvement is planned based on the following basic concepts:

＜Alignment＞

Wadi alignment after improvement is designed as a gentle curve along the existing *Wadi*.

＜Channel Width＞

In view of securing available space for the factory area and related facilities, the width of *Wadi* is expected to be as narrow as possible. On the other hand, an extreme decrease of width of the *Wadi* through some artificial structure may cause erosion of the riverbed and/or river bank due to fluctuations of flow velocity. Taking both requirements into consideration, the design width is considered as 20 m at the bottom instead of the present average bottom width of 30 m.

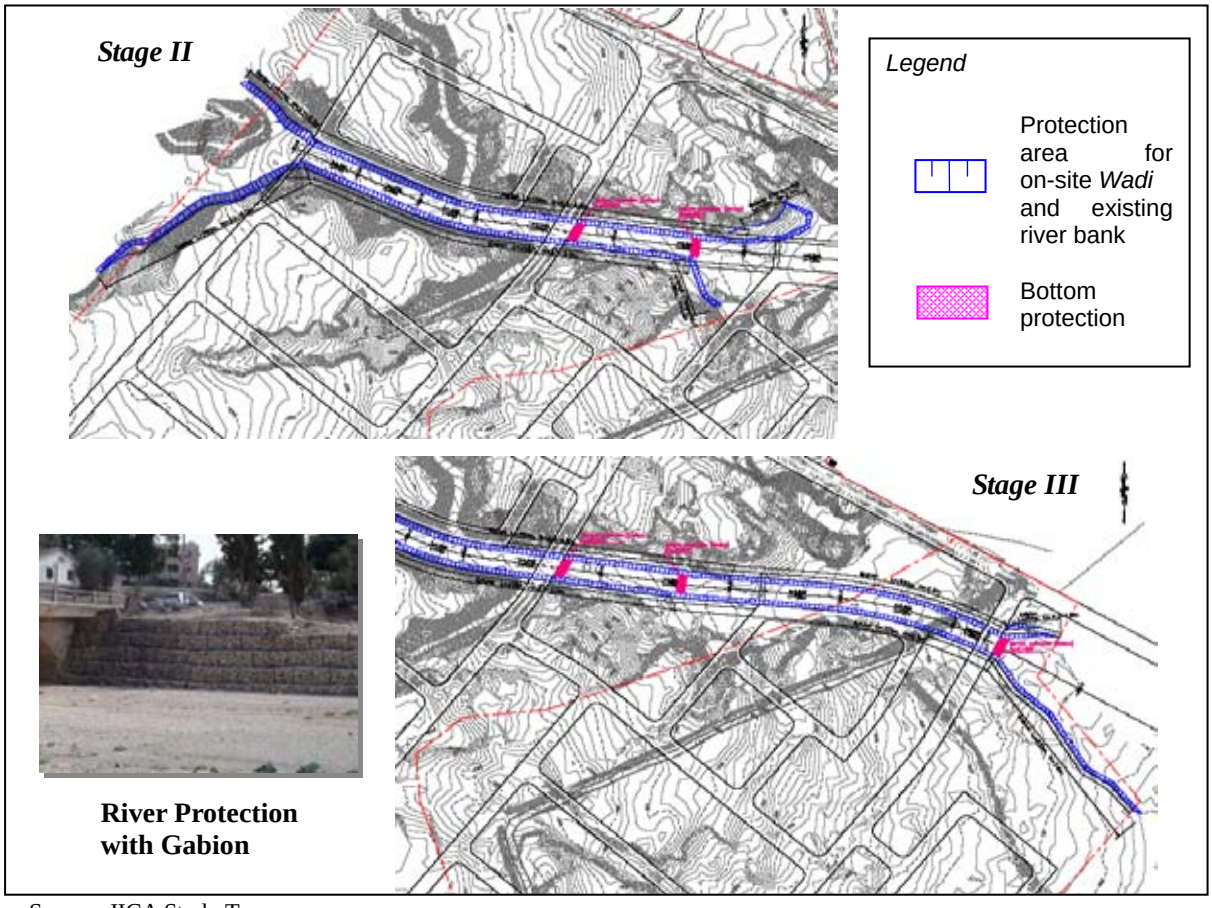
＜Channel Depth＞

Design depth is planned to be 2.5 m in order to minimize the height of river protection. The river bank will be further protected with gabions and appropriate volume of backfill materials behind the gabions.

＜Protection Works ＞

Since the geological condition of this area is sandy clay which is weak against erosion due to water flow, protection works are required to prevent partial erosion downstream of the bridges and at inlet and outlet portions of the area for each construction stage. The detailed protection method and area are shown in Figures III-4-9 and Volume 2, DWG 241 to 243.

It is noted that protection works shall be arranged within “Area A” before starting the development of Stage III as shown in Figure III-4-9.



Source: JICA Study Team

Figure III-4-9 River Improvement and Protection Area

Flow Conditions

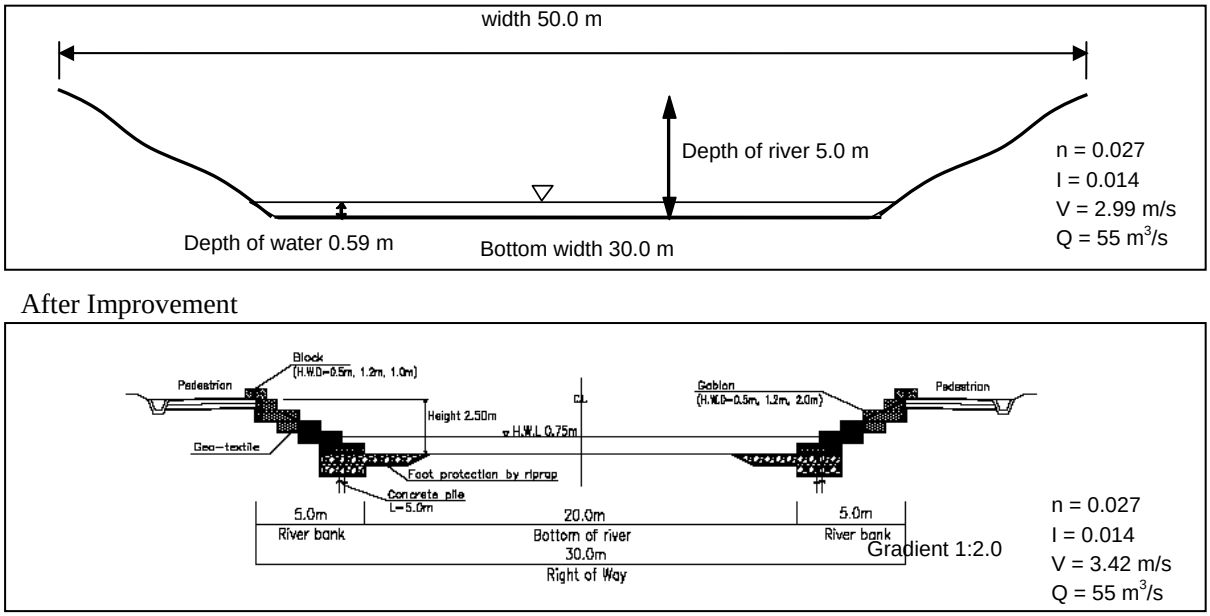
Flow conditions of *Wadi* in the present condition and after improvement are examined by applying the Manning's Formula, as expressed below.

$$V = 1/n \times R^{2/3} \times I^{1/2}$$

$$Q = V \times A$$

where, V : flow velocity (m/s)
n : roughness coefficient (-)
R : hydraulic radius (m)
I : flow gradient (-)
Q : discharge (m^3/s)
A : section area of flow (m^2)

Based on the results of the calculation, the typical cross section of *Wadi* improvement was determined as shown in Figure III-4-10. Flow depth changes from 0.59 m to 0.75 m, while flow velocity increases from 2.99 m/s to 3.42 m/s.



Source: JICA Study Team

Figure III-4-10 Typical Cross Section of *Wadi* Improvement

(3) Internal Roads

Geometric Design of Internal Roads

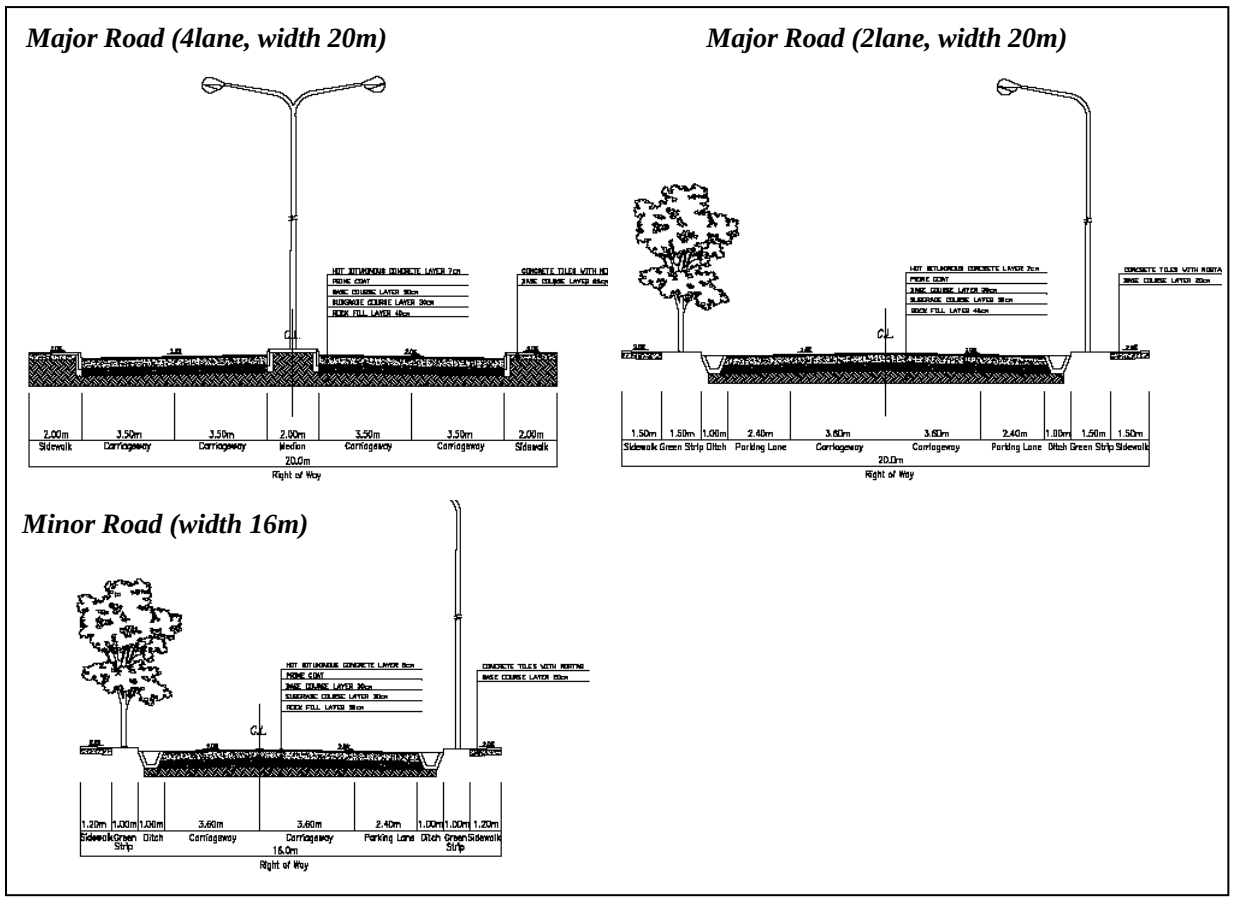
As mentioned in Section III-2, the traffic volume in the Agro-industrial Park is forecasted to be about 5,840 vehicles/day in total for Stages I, II and III, as shown in Table III-3-5. In order to realize smooth traffic movement inside the Agro-industrial Park, the internal road network is designed according to the classification of "major road" and "minor road". Major roads serve both mobility and accessibility, while minor roads serve accessibility to each factory. Therefore, major roads are classified as collector roads, and minor roads are classified as local roads in accordance with the AASHTO specifications. In addition, it is possible that traffic congestion might occur at the check gate in Stage II, which functions as the main

entrance to the Agro-industrial Park after the said stage. Therefore, the major road to be located near this gate should have four lanes in total (two lanes for each side) in order to ensure smooth traffic flow. The design criteria and typical section of the internal roads are defined as shown in Table III-4-11 and Figure III-4-11.

Table III-4-11 Design Criteria of Internal Roads

Item		Major road		Minor road
		4 lane	2 lane	
Classification		Urban Collector	Urban Collector	Urban Local
Design speed		50 km/h	50 km/h	40 km/h
Number of lanes		4	2	2
Lane width		3.5 m	3.6 m	3.6 m
Parking lane		-	2.4 m both sides	2.4 m one sides
Median		2.0 m	-	-
Green strip		-	1.5 m both sides	1.0 m both sides
Sidewalk		2.0 m both sides	1.5 m both sides	1.2 m both sides
Right of way		20 m	20 m	16 m
Max. super-elevation		6%	6%	4%
Layer Thickness of Pavement	Asphalt concrete	7 cm	7 cm	5 cm
	Base course	30 cm	30 cm	30 cm
	Sub-base	30 cm	30 cm	30 cm

Source: JICA Study Team



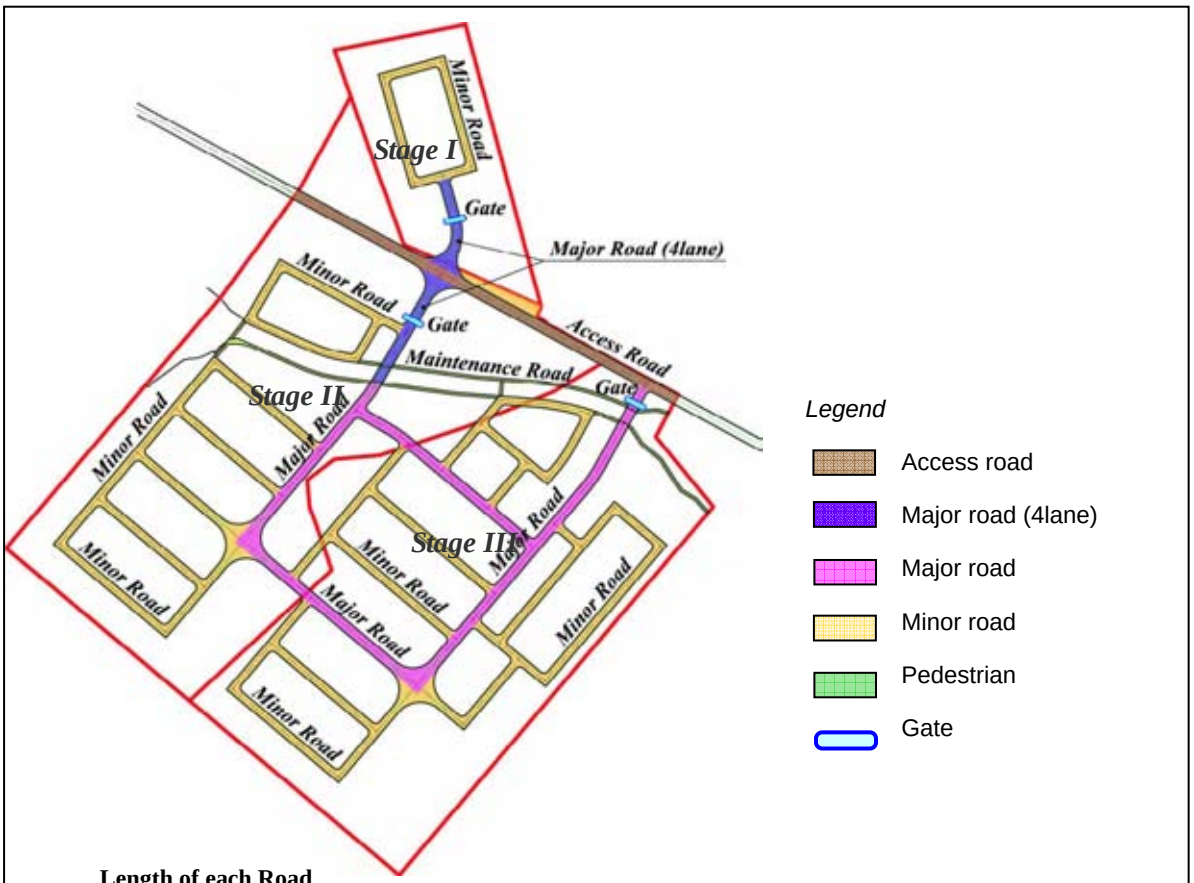
Source: JICA Study Team

Figure III-4-11 Typical Cross Section of Internal Road

Layout of Internal Road Network

The internal roads network is arranged as shown in Figure III-4-12, taking into account the following conditions:

a) Access to the Agro-industrial Park is limited only to the major road in order to ensure security control. Three check gates are provided on the major roads at each stage,
b) Roundabout system, which is commonly used at traffic intersections in Palestine, is applied at three major intersections along the major roads,
c) Major and minor roads are arranged to ensure smooth traffic for each development stage, and
d) A maintenance road is provided with a width of 5 m along the *Wadi* for its inspection.



Length of each Road

Classification	Stage I	Stage II	Sub -total	Stage III	Total
Major Road (4-lane)	172m	298m	470m	-	470m
Major Road (2-lane)	-	582m	582m	1,358m	1,940m
Minor Road	664m	2,838m	3,502m	3,764m	7,266m
Maintenance road	-	845m	845m	633m	1,478m

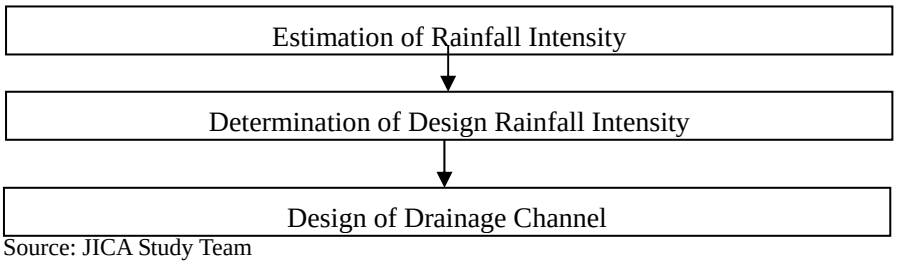
Source: JICA Study Team

Figure III-4-12 Planned Network of Internal Road

The plan, typical sections of the internal roads, and layout of bridges are shown in Volume 2, DWG 221 to 226.

(4) Storm Water Drainage Channel

Although annual rainfall in Jericho is relatively small as shown in Table III-1-1, the drainage system in the Agro-industrial Park should be designed with enough capacity to release storm water into the *Wadi*. The design procedure for the storm water drainage channel is shown in Figure III-4-13 below.



Source: JICA Study Team

Figure III-4-13 Design Procedure for Storm Water Drainage Channel

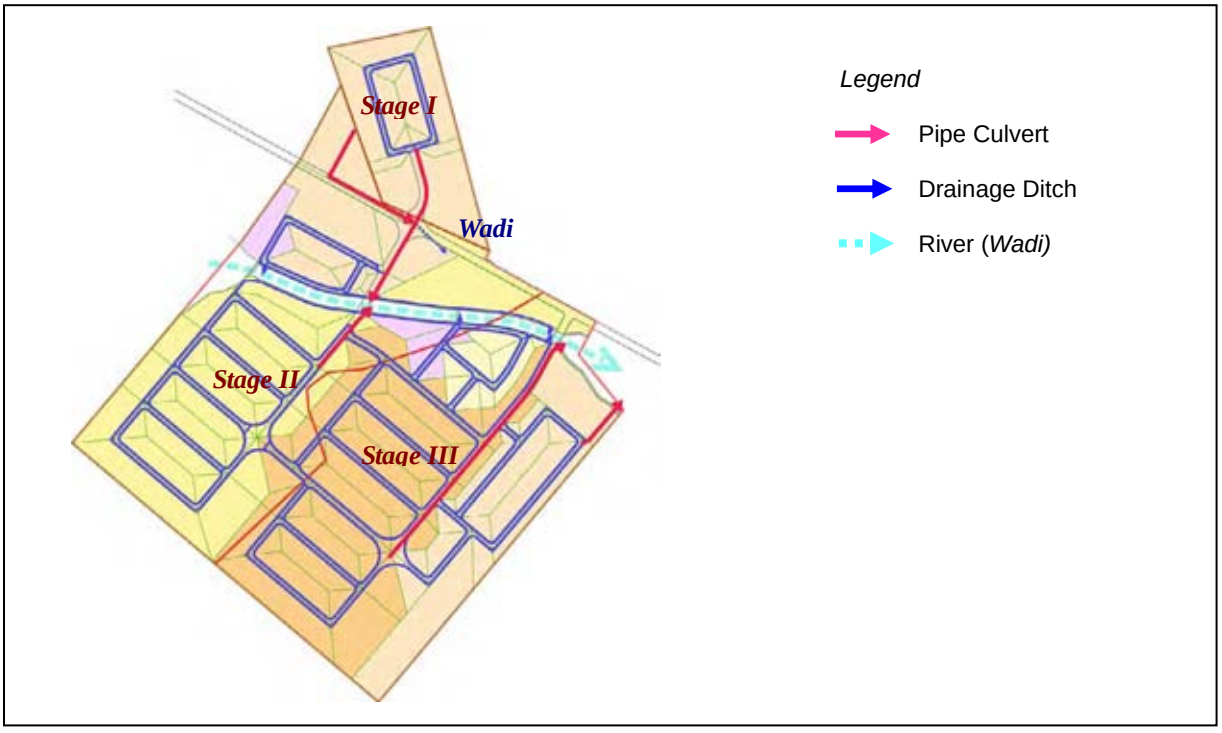
The storm water in the Agro-industrial Park is planned to be collected into roadside ditches along the road network and released to the *Wadi*. Pipe culverts are installed in sections where setting up of the roadside ditch is difficult. As a result of the calculation for storm water drainage, the drainage type and design discharge are shown in Table III-4-12 below and the designed drainage network is shown in Figure III-4-14.

Table III-4-12 Result of Storm Water Drainage Design

Drainage No.	Drainage area (ha)	Drainage type	Volume of Storm Water (m^3/s)
107	22.65	Pipe Culvert 800 mm	0.680
192	1.68	Roadside Ditch	0.012
307	26.18	Pipe Culvert 800 mm	0.812
507	31.62	Pipe Culvert 800 mm	0.949
582	1.95	Roadside Ditch	0.062
594	2.97	Roadside Ditch	0.092
605	16.36	Pipe Culvert 800 mm	0.507
801	3.64	Roadside Ditch	0.106

Source: JICA Study Team

The design calculations for storm water drainage are compiled in Volume 2, RD-2.



Source: JICA Study Team

Figure III-4-14 Planned Network of Drainage

The detailed plan of the drainage network is shown in Volume 2, DWG 227.

It is noted that a temporary drainage channel is required after the completion of Stage I, in order to release the surface water into the *Wadi* through the area in Stage II which is yet to be developed. This temporary drainage channel will be demolished in the next development stage.

(5) Power Distribution Facilities

Required Facilities

The electric power to the Agro-industrial Park will be supplied from the new Dead Sea Switching Station through a 33-kV transmission line. Power distribution facilities in the industrial park will be part of the on-site infrastructure.

<Distribution Line>

The overhead distribution lines inside the Agro-industrial Park would have a voltage of 33 kV, i.e. the 33-kV transmission line from the new Dead Sea Switching Station will be extended inside the Agro-industrial Park as distribution lines and will supply the power to each customer. The supply voltage to customers with medium or small power consumption will be 400V through 33kV/400V distribution transformers. As for the big consumers, the power may be supplied with the same voltage of 33kV.

<Demarcation Point between JDECO Facilities and Customers>

In case of power supply by 33 kV or 400 V lines, the demarcation of facilities between JDECO and the customer will be as follows.

- Facilities up to, and including the measuring device, (Watt-hour meter) are JDECO's property
- Facilities other than the measuring device are the customer's property
- The necessary land space to install the measuring device should be provided to JDECO by the land developer or by customers without charge.

The proposed distribution line route and the location of 33kV/400V distribution transformers are shown in Volume 2, DWG 251.

Electricity Tariff

Electricity tariff currently applied to customers in Ramallah and Bethlehem is shown in Table III-4-13. These multiple tariff systems started on March 11, 2008. This was decided based on the power demand, and classified into three ranks, i.e. off-peak rate as Rate A, medium load rate as Rate B, and peak load rate as Rate C, to which the highest tariff is applied.

Table III-4-13 Existing Multiple Tariff System by JDECO

Items	Unit	For Low Voltage Connections			For Medium Voltage Connections		
Fixed charge	NIS	178.2566			291.2581		
Variable charge		Rate A	Rate B	Rate C	Rate A	Rate B	Rate C
Winter	NIS/kWh	0.1820	0.5050	0.8826	0.1567	0.4686	0.8162
Summer	NIS/kWh	0.2401	0.6334	0.9799	0.1695	0.5354	0.8414
Spring & Fall	NIS/kWh	0.2303	0.4803	0.7501	0.1613	0.4022	0.6601

Notes: The above mentioned prices do not include VAT.
Season durations are as follows:
Winter: Dec. 01 to Mar. 31, Spring: Apr. 01 to June 30, Summer: July 01 to Sept. 30, and Fall: Oct. 01 to Nov. 30.
Source: JDECO

(6) Telecommunication Distribution Facilities

As a basic infrastructure, telecommunication distribution facilities are required in all the facilities inside the Agro-industrial Park. On-site infrastructure for telecommunication distribution facilities includes supply, installation, testing and commissioning of the system, which consists of lines, underground ducts, manholes, distribution boxes, etc. The detailed plan of the distribution system has been made on the basis of the design criteria of PalTel and the site conditions after construction of common utilities and factories.

(7) Water Distribution Facilities

Basic Concepts

The water distribution facilities mainly consist of water supply tanks and the distribution pipeline network. The distribution facilities are planned based on the following concepts:

- Water supply tanks are located at the highest area in Stages I and II, respectively, because of the following reasons; i) transmission pipelines from probable water sources would be reached along the access road on the left bank of the *Wadi*, ii) transmission pipelines do not cross the *Wadi*, and iii) for convenience of maintenance during operation.
- Distribution pipeline network is classified into two kinds, i.e., main loop lines and branch lines. The main loop lines are arranged outside of each development stage, and the diameter of the main loop line is larger than the branch line in order to secure smooth water flow in the network.
- Distribution pipeline network is set up along all major and minor roads in the Agro-industrial Park. Basically, the pipeline is arranged below the sidewalks to minimize crossing the roadway in order to avoid traffic disturbance during operation and maintenance works.

Diameter of the Distribution Pipeline

The function of the distribution pipeline network is to distribute stored water in the water supply tank to each service point in order to accommodate the hourly maximum water consumption (HMWC). Minimum water pressure in the network shall be higher than 2 Bars (equivalent to a water head of 20 m) following the "Planning and Design Guidelines, Dimensioning of Water Supply, Sewer and Storm Run-off Pipes (2000)".

In order to define the required diameter of the pipes, the pipeline network calculation was carried out by using the software named "Epanet2", which is available at the website of EPA: United States Environmental Protection Agency, and commonly used for planning and designing of pipe networks in Palestine.

Details of the calculations are compiled in Volume 2, WS-6. The designed pipe diameters with their lengths are summarized in Table III-4-14.

Table III-4-14 Required Pipeline Length of Distribution System

Unit: m

Item	Stage I	Stage II	Sub-total (I+II)	Stage III	Total (I+II+III)
Ductile pipe, DN75	1,490	3,130	**4,620**	5,260	9,880
Ductile pipe, DN100	120	160	**280**	2,810	3,090
Ductile pipe, DN200	0	1,660	**1,660**	0	1,660
Ductile pipe, DN300	0	1,430	**1,430**	0	1,430

Source: JICA Study Team

The water distribution network is shown in Volume 2, DWG 261. The diameter and calculated pressure in the water distribution pipelines are shown in Volume 2, WS-7.

Accessories

Accessories of the water distribution facilities, such as sluice valves, air valves, drain valves, fire hydrants, flow meters, and water meters, are arranged following the planned network as shown in Volume 2, DWG 262.

Effective Storage of Water Tank

The function of the water tank is to receive and store the water from the transmission pipeline to regulate fluctuation of the hourly water demand and to provide fire-fighting water. Required effective storage is calculated by the following formula which is indicated in the "Design Guidelines for the Construction of Water Tanks (2003)":

$$S_e = A + B + C$$

where, S_e : total effective storage (m^3)
A : fire suppression storage capacity (m^3)
B : equalization storage capacity equal to 25% of DMWC (m^3)
C : emergency storage capacity (m^3)

The effective storage of the water tank required for each stage is shown in Table III-4-15.

Table III-4-15 Required Effective Storage of Water Tank

Unit: m^3

Item	Stage I	Stage II	**Stage I+II**	Stage III
A. Firefighting effective storage capacity	120	120	**120**	120
B. Equalization storage capacity	137	548	**685**	685
C. Emergency storage capacity	64	167	**201**	201
Total	321	835	**1,006**	1,006

Source: JICA Study Team

Type and Size of Water Tank

Based on the pipeline network calculation, the water head at the water tank is required to be 25.5 m (El. -268.0 m). In order to secure this water head, there are two options, to adopt i) a tower type of water tank or ii) on-ground type water tank with booster pump.

The first option requires more expensive initial investment, but almost free operation cost because water is supplied by gravity. The second option has an advantage of lower initial investment, but operation cost is required continuously, as well as the possibility of water supply interruption due to power supply outages or mechanical malfunctioning of the pump. Many industrial estates thus adopt distribution systems without a pump facility as much as possible. Accordingly, the first option, which is the tower-type water tank, is selected for the preliminary design.

Following the above considerations, design of the water tanks for each stage is prepared as shown in Volume 2, DWG 263 and 264 under the following assumptions:

- The water tank is designed to be reinforced concrete and not steel in order to minimize changes in the stored water quality. The existing water tanks in Jericho Municipality are also of the reinforced concrete type.
- Difference between the high water level (HWL) and low water level (LWL) in the water tank is defined to be 5 m in depth following the existing water tanks in Jericho Municipality. All water tanks have the same HWL of El.-263.0 m and LWL of El.-268.0 m to secure the same water head.

Foundation of the Water Tank

Bearing stress of the water tank and the stored water for each stage is estimated to be 80-130 kN/m^2. On the other hand, the bearing capacity of the foundation soil is estimated at approximately 60 kN/m^2 based on the result of geological survey in Study Part 2. Thereby, concrete piles shall be installed to make up for the deficiency in the bearing capacity of the soil foundation.

The quantity of concrete pile is estimated based on the following conditions:

- Size of pile is assumed with diameter of 0.5 m, and depth of 10.0 m,
- Bearing capacity at pile tip is 60 kN/m^2, and
- Surround friction force is 150 kN/m^2.

It is noted that the stability analysis and structural calculation for the water tank is not carried out in this study. Therefore, the bearing stress and required concrete piles shall be defined based on the design conditions in the next stage.

Required Operation and Maintenance (O&M)

In order to ensure a functional water distribution system, the following O&M activities will be required:

a) Regular reading of water meter, calculation and collection of water tariff,
b) Water sampling and quality analysis in order to maintain good water quality,
c) Regular inspection of the water supply tank and the distribution pipeline network in order to determine the necessity of repairs, and
d) Clearing and/or repair works of the water supply tank and the distribution pipeline network as required.

Required personnel and equipment for the above activities were estimated as described in Section III-3 (4). One maintenance engineer, one water quality manager, inspectors, and assistants will perform O&M works for all water supply facilities.

Recommendation for the Next Stage

It is recommended that the following issues be studied and clarified before the project implementation.

＜Minimum Water Pressure in the Water Distribution Networks＞

The minimum water pressure in the distribution network is specified to be 2.0 Bars (equivalent to a water head of 20 m) in order to ensure enough water pressure for water supply to the customers and for fire fighting. In case this criterion is changed to 1.5 Bars, the construction cost of the on-site water supply facilities will be reduced by 10 to 20%.

In general, factories in Palestine have their own water tanks and therefore, 2.0 Bars of water pressure is not required for water supply to factories. The existing fire fighting facilities and activities surrounding Jericho Municipality have not been surveyed in detail.

On the other hand, the minimum water pressure applied in Japan is smaller than the above values. The "Design Criteria for Water Supply Facilities" published by the Japan Water Works Association (JWWA) specifies the minimum water pressure of 0.15 MPa (=1.5 Bar) for direct water supply to two-storey buildings and indicates a minimum water pressure of 0.10 MPa (=1.0 Bar) for fire fighting.

Therefore, it is recommended to consider applying these minimum water pressures in order to minimize the initial investment cost.

(8) Wastewater Collection Facilities

As explained in Section III-3, wastewater from each factory and facility after their pre-treatment is collected into the wastewater treatment facilities. After the relevant processes, treated water is reclaimed for agricultural use in the Agro-industrial Park, and/or recharged into groundwater. The following are the related facilities required as on-site infrastructure.

Wastewater Collection Facilities

Wastewater collection facilities are required to collect effluent from each factory and facility in accordance with the following basic concepts:

a) Separate system, which is a system to transport wastewater and storm water separately, while storm water drainage is planned to utilize the drainage ditches beside the roads,

b) Industrial wastewater and sewage from toilets, etc. are collected into the same pipe to avoid duplication of facilities, and

c) Wastewater is transported as free flow by gravity basically to avoid the possibility of choking in pipes and eliminate construction and maintenance cost for pumping.

The wastewater collection facilities would be designed to meet the hourly maximum discharge as follows:

Table III-4-16 Hourly Maximum Discharge per Unit Area for Wastewater Treatment

Stage	m^3/hour/ha
I	1.74
II	1.38
III	2.04

Source: JICA Study Team

Layout design of the wastewater collection facilities was made with reference to the following standards of Palestine and Japan:

a) Planning and Design Guidelines (published by PWA)
   - Construction and installation of pipes in water supply and sewerage trenches,
   - Dimensioning of water supply, sewer and storm run-off pipes,
   - Pumping station for sewerage, and

b) Planning and Design Guidelines of Sewerage System (published by the Japan Sewage Works Association).

Redistribution System of Reclaimed Water

In order to redistribute the reclaimed water inside and outside of the Agro-industrial Park, a distribution pipe network with a water reservoir and pumping system should be constructed.

The pipe network is an underground facility along the road in the Agro-industrial Park, similar to the water supply system. On the other hand, the pipeline to the dates farm near the Agro-industrial Park should be constructed separately from the pipe network in the Agro-industrial Park.

The wastewater network and reclaimed water network is shown in Volume 2, DWG 271 and 272.

(9) Solid Waste Collection System

Collection and internal transportation, external transportation, recycling, production of feeds and landfill are categorized as on-site activities. The equipment required for collection and internal transportation of food processing waste and wood, and external transportation of dewatered sludge and compost, are as described below:

Table III-4-17 Equipment for Solid Waste Treatment On-site

Treatment method	Required Equipments
Collection and internal transportation	Dump truck to collect food processing waste and wood from storages of each company and transport them to the composting facilities Dump truck to move materials in a process of composting Wheel loader to turn over materials to accelerate fermentation
External transportation	Dump truck to transport compost to farmers Dump truck to transport dewatered sludge to a landfill

Note: Quantity of the required equipment and facilities depend on the amount of waste for each stage.
Source: JICA Study Team

Issues to be considered on solid waste management

The following issues should be considered for solid waste management:

- It is necessary to reconfirm the collection and transportation fee for other wastes, which could not be sold due to unsuitability for recycling and composting, at the implementation stage through meetings and discussions with JCspd.
- It is necessary to secure landfill site(s) with enough capacity to carry in wastes and sludge from the Agro-Industrial Park, and JCspd needs to clarify conditions to accept them with those who are

responsible for landfill site(s). The landfill and wastes transportation issues should be discussed between PNA, Jericho Municipality and JCspd.

- It is necessary to gather information on local recycling agents and consider how to involve them in collection of recyclables, including concrete conditions on how to hand over the recyclables to them.

(10) Security System

On security matters in the Agro-industrial Park, the overall security and the on-site security should be considered separately. For overall security in general, access routes of inbound and outbound transportation are the important issues. On the other hand, an on-site security system shall be studied to establish a suitable system for the Agro-industrial Park, considering a balance between the degree of risk controls and cost required

Overall Security Issues

Present situation

Impediments to movement and access of cargo and people are the critical issue for business operation in the West Bank. Eighty five (85) manned checkpoints physically regulate Palestinian vehicles from using the West Bank roads. A different permit is generally issued depending on the type of vehicles. Since few private driver are able to get permits, Palestinian people are forced to move by public transportation or private cars have to make a detour using the secondary roads.

According to "*Cargo Movement and Access Monitoring and Reporting*" published by Pal Trade, time spent for waiting and checking per truck (averagely 2 to 2.5 hours), regulation (height of pallets) and unpredictable close at commercial terminals would render private business to constraints such as delay in delivery, damages to cargoes and high transportation cost. It would take more than 3 hours for passage of perishable products under the current back-to-back system.

Improvement measures observed

The Gaza Industrial Estate (GIE) is only the industrial estate that is still under operation. Business Man Cards (BMC) were issued to tenant enterprises in GIE so that holders of this BMC were able to pass through checkpoints by private passenger cars. The method of BMC could be applied to tenant enterprises in the Agro-industrial Park.

Palestinian private delivery companies are currently planning to establish pack houses near commercial terminals located in the boundary between Israel and the West Bank. Palestinian manufacturers store their products in pack houses and operators of pack houses deliver products to Israel through commercial terminals. This method will reduce waiting time since operators of pack houses are able to inform the security authority of advance notice in real time and can comply with the urgent order from buyers.

The Allenby Bridge Terminal has already introduced the facilitation of smooth passage and advance notification (24 hours advance notice) for all commercial vehicles. The customs in the Terminal regularly receives advance information about cargo, vehicle and driver and informs the security office so that

outbound cargo from the Agro-industrial Park smoothly can pass through the Allenby Bridge. However advance notification (24 hours advance notice) has not been applied to checkpoints so that cargo trucks are sometimes forced to undertake unnecessary checks.

Access Roads

Based on Study Part 2 of Phase II, there are two alternative access roads for outbound route leading to the Allenby Bridge, namely, access road A-1 and access road A-2, as described in Section III-3. From the security and operational viewpoint, access road A-2 is preferable for Stages II and III, because of following reasons:

- ✓ Access road A-2 provides two gates for entrance and exit. Since the basic flow of vehicles is in only one direction from West to East, security control activity and gate operation will be simpler.
- ✓ Access road A-1 provides a gate for entrance and exit at the same point. Accordingly, the security system will be concentrated at the entrance and the flow of vehicles will be complicated.

In the case of the Jenin industrial estate, the security committee organized by the member organs of PNA and the Israeli side (COGAT and Ministry of Defense) has long discussed the possibility of access road directly linking to the nearby arterial road and conversion of area jurisdiction from C to B. The same committee shall be requested to discuss the issue on access road A-2 in the near future.

Nearby Checkpoints and Terminals

The current DCL checkpoint is not a commercial terminal. Inbound transportation for raw materials and equipment through this checkpoint to access the Existing Road 1 shall increase when implementation of the Agro-industrial Park shifts to Stage II. The DCL checkpoint currently allows inbound transportation for raw materials and equipment to enter Jericho City but prohibits vehicles from leaving the city through the same checkpoint. Thus, facilitation for commercial vehicles and permission of outbound transportation through this checkpoint will be a critical agenda with the security authorities. Given the prevailing circumstances that it would take time to allow access road A-2 to be used for outbound transportation, the Musa Alami Gate would be alternatively used for outbound transportation for products. Currently, the gate has two lanes for incoming and outgoing vehicles. In summer, a long queue of waiting vehicles has been often observed. A priority lane for outgoing vehicles through this gate during the summer peak time shall be one of improvement measures to be discussed with the security authorities.

In parallel with the selection of the access road with concerned authorities, operational and institutional improvement of the nearby checkpoints (the DCL checkpoint and the Musa Alami Date) and the Allenby Bridge Office will be further discussed, aiming to achieve a smooth and efficient transportation network. Such improvement measures are summarized below:

a) Increase in efficiency and handling capacity at checkpoints and terminals
b) Advance notification of shipment to security authorities
c) Public announcement of closure and opening hours of checkpoints and terminals

d) Joint procurement and delivery system

In particular, joint procurement and delivery system would be vital for business operation of tenant enterprises in the Agro-industrial Park. The proposed system indicates that a trusted delivery/transport company collects goods for/from tenant enterprises and takes a necessary procedure for security inspection on behalf of those enterprises.

Supply Chain

Today's business especially those that rely on the supply chain such as the "just –in-time" industry, are dependent on expedient processing, shipping and delivery of their products. Access to relevant information meaning the status of cargo, is essential to properly managing a business's supply chain. This is of particular interest to crossing points (commercial terminals) located between Israel and the West Bank. A cargo tracking system that can monitor the status of cargo in real time, would make the shippers instruct a driver of a cargo truck about any inquiries raised by the security authority at commercial terminals. This would offer a reduced processing time at commercial terminals and also provides the security authority with the more reliable cargo information.

Other Security Methods

The intention of the security authority to maintain the current back-to-back system would remain unchanged so that to reduce processing time at checkpoints or commercial terminals shall be the significant issue to tenant enterprises inside the Agro-industrial Park. It would take more than three hours to inspect consignment of fresh vegetables and fruits at the Betunia commercial terminal, according to *the Cargo Movement and Monitoring* surveyed the PalTrade. The so-called Known Trader Program that was practiced in other country would reduce processing time since the Program's customers inspected by the security authority periodically are those trustable by the security authority. Another method is to develop a certified inspection process within the Park, approved by the security authority. This method entrusts the third party to manage security inside the Park, which was proposed by Turkey that is responsible for development of the Tarquimiya industrial estate.

On-site Security

Security Measures in GIE

Security measures in GIE are supposed to be those meeting protection of the estate premises and cargo inspection at exist gate. Cargo inspection equipment (scanner) was donated by USAID. Since the security authority pays much concern to security of outbound cargoes, introduction of scanners was essential as security measure of GIE.

On-site Security Measures in the Agro-industrial Park

In order to consider the facilities for on-site security in the Agro-industrial Park, object persons, key procedures, and infrastructure are identified as follows:

Object persons : Employees, clients, routine transients, and visitors
Procedures : Admissions, inspection, packaging, shipping, receiving, and delivery

Infrastructure: Office building, factories, all infrastructures such as power supply and water supply system, etc.

The required security system has been studied for each item mentioned above and efficient security system should be arranged considering security levels and potential risks. It was clarified in the course of Study Part 3 that high security system including a cargo tracking system using GPS and cargo inspection equipment such as scanner is estimated to be in the range from USD 10 million to USD 30 million. The level of security costs around USD 10 million will put the financial burden on a developer, leading to vulnerability of financial feasibility. On-site security would thus take two steps. The first step shall be the minimum security requirement that would prevent intruders from trespassing into the park premises. The minimum security requirements shall be those commonly acceptable for all locators (tenants). The security measures, at the minimum level, consist of fencing, cameras, patrolling cars and control monitoring system.

Table III-4-18 Components of Security System

Category	Specific Examples
Detection Components	Cameras,
Delay Component	Fencing, Concrete wall around secure area
Response Components	Patrol Security Officer, Stationary guards at gates
Security Management System	Security Integration, Cable and Wireless Communication, Inspection system of park premises

Source: JICA Study Team

In the case for a stage-wise development of the Agro-industrial Park, security level requirements should be suitable at each stage. In Stage I, it is expected that the total pedestrian, vehicle and cargo traffic will be low, and thus, the procedural duration will have minimal impact. Therefore, the minimum security requirements may be considered in conducting inspections. However, as the Agro-industrial Park progresses and attracts more businesses, reduced processing time will become crucial, hence, the need for more advanced technologies such as high volume scanners will be needed. Provision of scanners and vehicle tracking system (GPS) would enhance security reliability of outbound vehicles, which would render cost-effective transportation to tenants. In the meantime, this would lead to high cost of on-site security system. Thus, scanners and vehicle tracking systems are further taken into account at Stage II when cargo traffic flow is expected to grow. Scanners and vehicle tracking system should be considered and discussed further in the sub-committee.

The baseline for measuring an acceptable level of on-site security would be how cargo and people can smoothly move and access to the Allenby Bridge or the commercial terminals through checkpoints. If cargo tracking system would reduce time and cost required for delivery, it will be worthwhile implementation. Security components that hold the most relevance to the Agro-industrial Park within the West Bank include the status of traders or manufacturers passing through internal checkpoints, and secure supply chain management.

Issues to be further discussed

- Responsible organizations and procedures for considering a security system in Area A and Area C should be confirmed.

- The measures for smooth passage through the check points should be studied in detail, and efficient security measures should be arranged upon further discussions between Palestine and Israeli authorities.

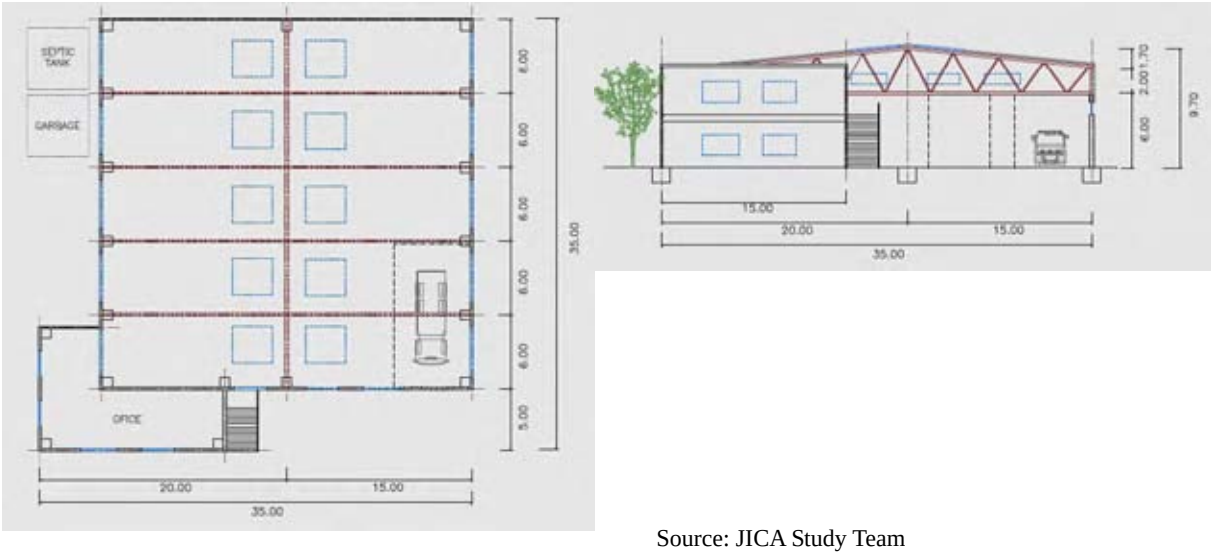
(11) Building

The following buildings are planned to be set up in the Agro-industrial Park.

Standard Factory Building

In order to provide opportunities for small-scale tenants which do not have enough funds to construct new factory buildings, standard factory buildings would be planned to be constructed in the Agro-industrial Park. Provisionally, 50% of the factories in Stage I is planned to be built as a standard factory building. The preliminary design of a rental standard factory is shown in Figure III-4-15 and Volume 2, DWG 287.

Factory



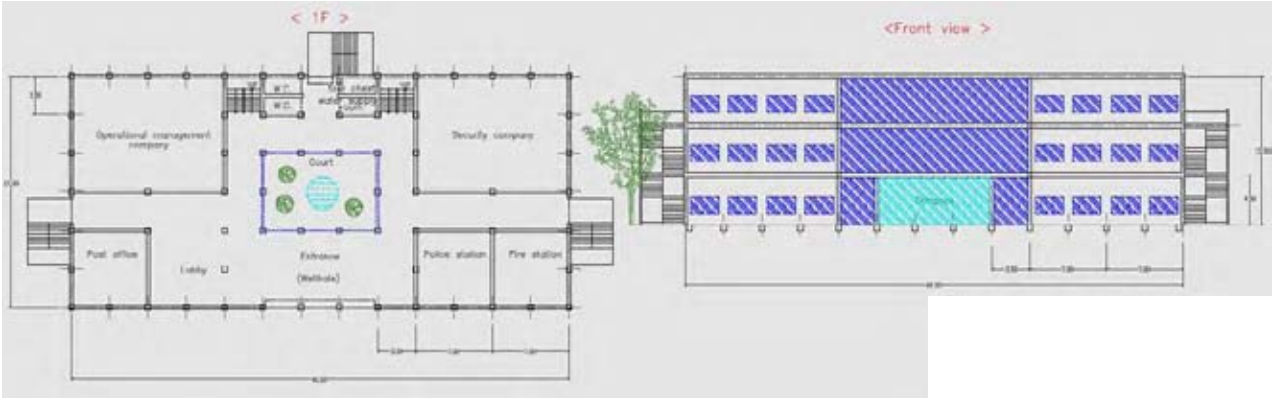
Source: JICA Study Team

Figure III-4-15 Plan and Front View of Rental Factory

Office Building

An office building is required to manage and maintain real estate and common utilities such as water and power supply systems, wastewater and solid waste treatment facilities, etc. Furthermore, public services such as a police station, fire station, post office, telecommunication office, meeting rooms and restaurants, shall be located in the same building. The office building, supposedly a three-storey structure, would be located at the center area of each lot. The preliminary design of office buildings are shown in Figure III-4-16 and Volume 2, DWG 281 to 284.

Restaurant



Source: JICA Study Team

Figure III-4-16 Plan and Front View of Office Building

The required floor area for the office buildings are estimated as follows:

Table III-4-19 Required Floor Area of Office Building

	Required Office Area				
	Stage I	Stage II	Sub-total	Stage III	Total
Floor area (m^2)	2,750	2,900	5,650	3,150	8,800
-Office (m^2)	2,500	2,500	5,000	2,500	7,500
-Restaurant (m^2)	150	300	450	450	900
-Meeting room (m^2)	100	100	200	200	400

Source: JICA Study Team

III-5 Cost Estimation

(1) General

The estimates of the project costs were prepared through an iterative process based on the estimated unit costs and the following basic conditions:

- Price levels at early September 2008
- Costs are estimated in Israeli Shekel (NIS) for the local currency portion and United States Dollar (USD) for the foreign currency portion
- USD 1.0 is equivalent to NIS 3.6, Euro 0.7 and JY 108

It is noted that unit costs were allocated in the local currency (NIS) and foreign currency (USD), which is based on the cost of locally available resources and that of imported resources which cannot be provided in Palestine, respectively.

The construction cost of the infrastructures is divided into off-site and on-site costs:

- Off-site:

a) General requirements, b) Access roads, c) Power supply, d) Water supply, e) Wastewater treatment facilities, f) Solid waste management, g) Telecommunication lines, and h) BDS center

- On-site:

a) General requirements, b) Land reclamation, c) River improvement, d) Roads, e) Storm water drainage channel, f) Water supply, g) Power supply, h) Wastewater treatment, i) Solid waste management, j) Telecommunication, k) Security facility, l) Parks, m) Office building, n) Model factory ,and o) Car parking.

The construction cost is summarized in Volume 2.

Other components of the project cost are estimated as follows:

- Land acquisition

Unit rates of land were collected from the government offices in Ramallah and Jericho.

- Administration expenses

Administration expenses were assumed to be 1.5 % of the sum of construction cost and land acquisition/compensation costs.

- Engineering service cost

The engineering service costs required for basic design, detailed design, assistance in bidding procedures, and construction supervision were estimated at a rate of 12 % of the sum of the construction cost, land acquisition/compensation cost and administration cost.

- Physical contingency

Physical contingency to consider incidental factors at this feasibility study was assumed at a rate of 10 % of the sum of the construction, land acquisition/ compensation, administration and engineering costs.

The project costs are estimated as shown below.

Table III-5-1 Project Costs for Stages I, II and III

Unit: Thousand

Description	Stage I			Stage II			Stage III		
	L.C. (NIS)	F.C. (USD)	Total Equiv. (USD)	L.C. (NIS)	F.C. (USD)	Total Equiv. (USD)	L.C. (NIS)	F.C. (USD)	Total Equiv. (USD)
Construction cost	60,745	8,487	25,361	182,708	11,565	62,317	137,545	11,988	50,194
Off-site	18,657	5,356	10,539	76,002	7,641	28,753	21,261	8,262	14,167
On-site	42,088	3,131	14,822	106,706	3,924	33,564	116,284	3,726	36,027
Land acquisition	928		258	18,598		5,166	14,907		4,141
Administration	925	127	384	3,019	173	1,012	2,287	180	815
Engineering services	7,512	1,034	3,121	24,519	1,409	8,220	18,568	1,460	6,618
Physical contingency	7,011	965	2,912	22,885	1,315	7,672	17,331	1,362	6,177
Total	**77,121**	**10,613**	**32,036**	**251,729**	**14,462**	**84,387**	**190,638**	**14,990**	**67,945**
							(NIS)	(USD)	(USD)
Grand total project cost for Stages I, II and III							**519,489**	**40,065**	**184,368**

Source: JICA Study Team

Table III-5-2 Project Costs for Stages (I+ II) and III

Unit: Thousand

Description	Stage (I+II)			Stage III		
	L.C. (NIS)	F.C. (USD)	Total Equiv. (USD)	L.C. (NIS)	F.C. (USD)	Total Equiv. (USD)
Construction cost	223,941	16,358	78,564	137,545	11,988	50,194
Off-site	79,448	9,701	31,770	21,261	8,262	14,167
On-site	144,493	6,657	46,794	116,284	3,726	36,027
Land acquisition	19,135		5,315	14,907		4,141
Administration	3,646	246	1,258	2,287	180	815
Engineering services	29,607	1,992	10,217	18,568	1,460	6,618
Physical contingency	27,633	1,859	9,535	17,331	1,362	6,177
Total	**303,962**	**20,455**	**104,889**	**190,638**	**14,990**	**67,945**
				(NIS)	(USD)	(USD)
Grand total project cost for Stages (I+ II) and III				**494,600**	**35,445**	**172,834**

Source: JICA Study Team

Further details of the project costs are shown in Volume 2 CE-1 and CE-2.

(2) Cost Estimate

Due to the lack of readily available data, data collection and cost estimates have been made through the following methods:

a) Civil works

The prices of materials and rental cost of equipment in Jericho City were examined together with the Jericho Municipality office to find the most realistic prices prevailing in the market near the project site. Unit costs of bridge and building works were assumed from the collected data.

b) Water supply facilities

The cost data of water supply facilities were collected from suppliers in Ramallah, from which the costs of pipes, valves, accessories and desalination facilities were estimated.

c) Wastewater treatment facilities

Due to the limited cost data collected in Ramallah, additional data were collected from a manufacturer in Japan and the cost thereof were estimated in line with the basic design and standard criteria for the facilities to be imported.

d) Solid waste treatment

Cost comparison was made to procure the solid waste treatment facilities from domestic and foreign suppliers considering the importance of O&M. Through the above process, the costs of the solid waste treatment facilities were estimated based on the assumption that the facilities would be supplied by domestic suppliers.

e) Power supply and telecommunication facilities

Costs for power supply and telecommunication facilities were estimated on the basis of the primary cost data provided by JDECO and PalTel, respectively.

f) Security facilities

In line with the design requirements, the costs for security facilities comprising such components as cameras, CMS, communication system and security management system were estimated to a minimum possible extent.

(3) Annual Costs

a) Service Life

The service life to be adopted for the calculation of re-investment and residual values of particular infrastructure components at the evaluation period is assumed as follows:

- Civil works 45 years
- Roads 20 years
- Mechanical and electrical equipment 20 years
- Vehicles 10 years

b) Annual costs of O&M

The annual O&M costs for civil structures, roads, and buildings are assumed as follows:

- Civil works 0.5% of construction cost
- Roads 1.0% of construction cost
- Buildings 0.5% of construction cost

The annual O&M costs for water supply, wastewater treatment and solid waste treatment facilities were estimated considering the following items:

- Staff (Manager, Maintenance Engineer, and laborers)
- Water quality test
- Power consumption
- Chemicals for treatment

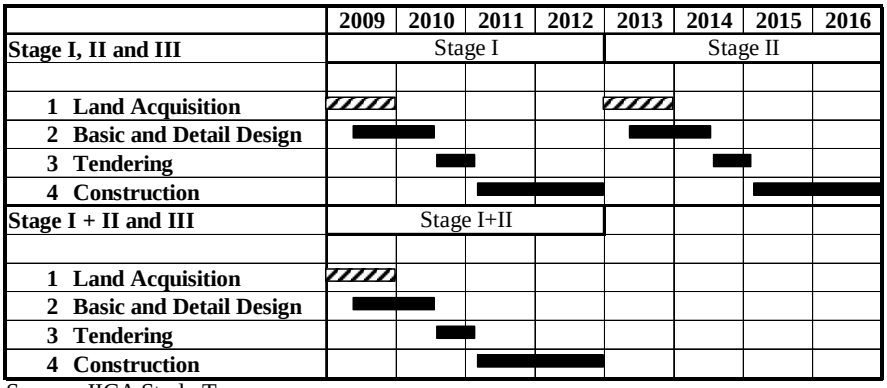
III-6 Implementation Plan

According to the stage-wise development plan, the Agro-industrial Park shall be developed in three stages as mentioned in Chapter II. Stage I development is provisionally scheduled to commence in 2009, starting from a relatively small-scale development in the lot of Area A (Lot I: 11.5 ha) and complete the construction work at the end of 2012. After that, Stages II (Lot II: 50.0 ha) is assumed to follow in a time span of 4 years. In reality, the commencement of Stage II depends on the investment demand during Stage I.

On the other hand, it is ideal to implement Stages I and II simultaneously if the investment demand is deemed sufficient. In this case, Stages I and II development is scheduled to commence on 2009 and construction work to be completed by the end of 2012.

The commencement of Stage III depends on further discussions with PNA and Israel, and on the progress of land acquisition by PNA.

Figure III-6 shows the implementation plans for the two patterns of the stage-wise development plan.



Source: JICA Study Team

Figure III-6 Overall Implementation Plan

CHAPTER IV BUSINESS PLAN OF THE AGRO-INDUSTRIAL PARK

IV-1 Business Scheme for the Establishment of the Agro-industrial Park

The land lot for stage I of the Agro-industrial Park project is owned by the PNA while those for stages II and III are currently possessed by a private family. In order to accomplish the project as a whole, the latter two parcels of land have to be purchased or secured from this family by the PNA or by a prospective developer.

To reduce the initial investment cost and to sustain the project's viability, it is prerequisite to assume that the land lots for stages II and III shall be purchased or secured by the PNA and then leased to a developer on a concession basis with a minimal concession fee.

Based on such condition, two business schemes for the establishment of the Agro-industrial Park were assessed. These are by private sector initiative and by public sector initiative.

(1) Scheme A: Private Sector Initiative

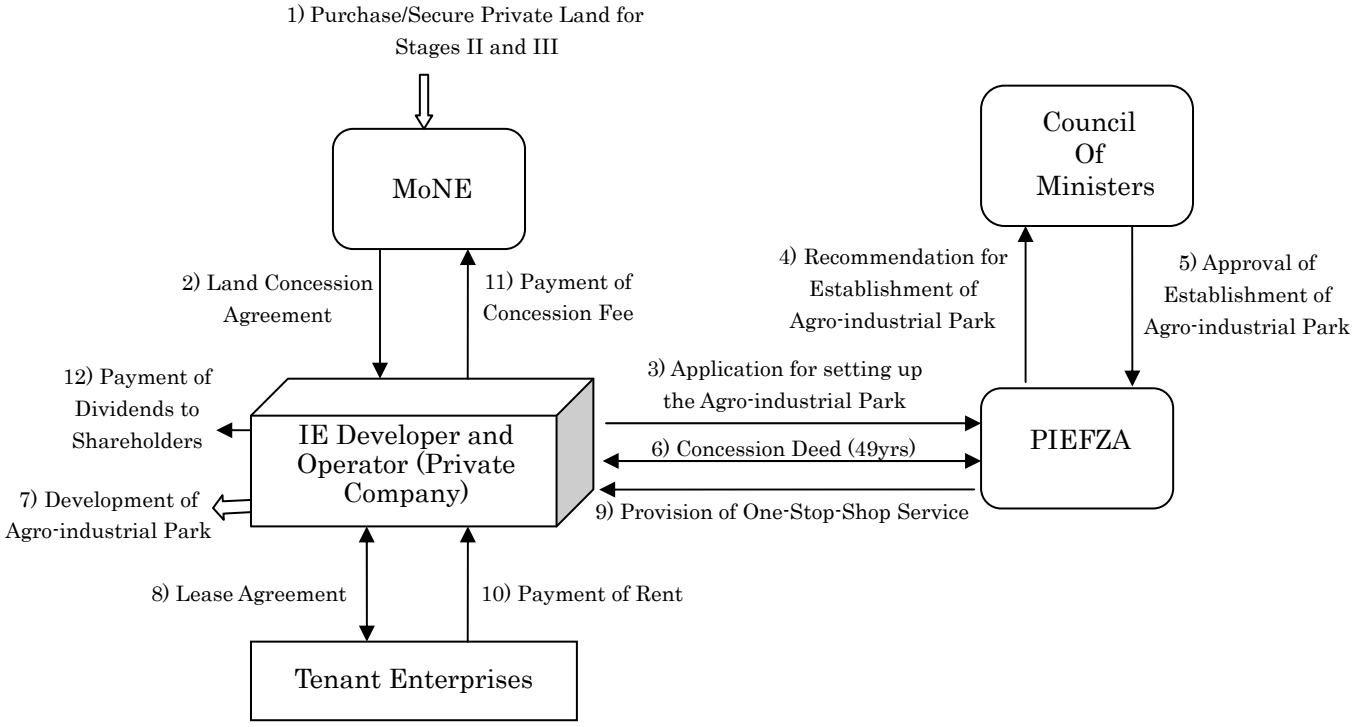


Figure IV-1-1 Business Scheme by Private Sector Initiative

The above figure shows the business scheme and flow by a private sector initiative under the condition that the lands for stages I and II (possibly stage III in the future) shall be leased by the PNA to a private sector developer on a concession basis.

A developer may be a subsidiary or one division of the existing company or a newly set-up private company with shareholders who owe limited liabilities. The prospective developers shall raise the capital

from the private sector to develop the Agro-industrial Park, then operate and manage it for a maximum of 49 years based on a land concession deed to be concluded with the PIEFZA. The PIEFZA shall regulate and supervise the private developer during the course of the development and implementation of the Agro-industrial Park. It shall also cooperate with the developer in the marketing activities and shall act as a one-stop shop to provide the tenant enterprises with the necessary administrative services at site. Scheme A is a typical business frame for the private sector and therefore, a developer shall naturally have to secure enough profit from the development and operation of the Agro-industrial Park.

(2) Scheme B: Public Sector Initiative

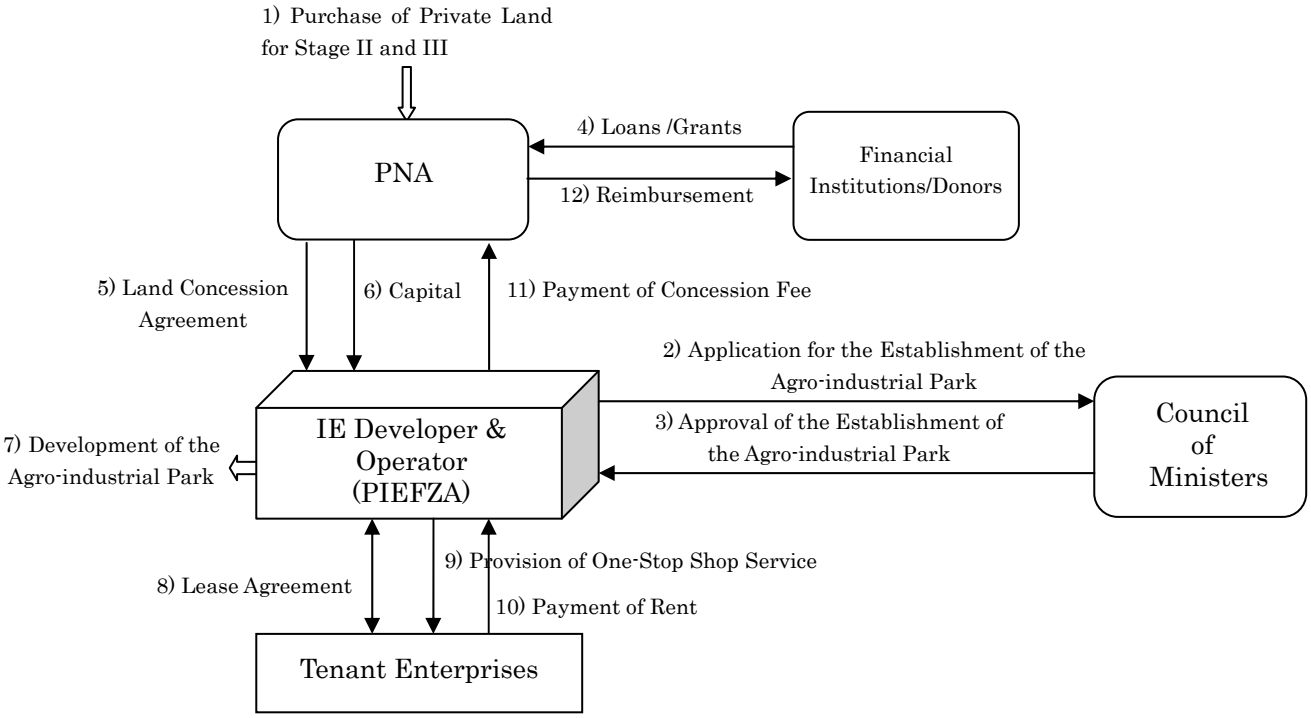


Figure IV-1-2 Business Scheme by Public Sector Initiative

The above figure shows the project scheme and flow by public sector initiative. In this type of scheme, the PIEFZA could be the project executing organization as a developer and operator. Article 5.5 of the "Law No.10/1998 regarding the industrial estates and industrial free zones" states that "the direct development of industrial estates and industrial free zone" is one of the PIEFZA's tasks"

Under the current financial situation of the PNA, the capital with large grant elements has to be secured initially. Such capital shall be taken by the PNA/MoF from the various donors and/or soft loan providers and then lent to PIEFZA. The initial investment cost of on-site infrastructure development components shall be financed by the PNA's own fund in the form of equity investment to a public developer and soft loans to be borrowed from the international financial institutions. The PIEFZA would then be responsible for generating enough profit to pay back the loans, while the grant fund could be used as a part of the capital for the development without bearing any interest.

The industrial estates and export processing zones (EPZs) have long been the tools utilized by developing

countries to invite FDI for the promotion of industries. According to ILO data[31], there were about 3,600 such zones in the world since 2006. Among them, more than 900 zones are located in Asia and only 50 are in the Middle East. Although the majority of the zones in Asia have been developed by private initiative, public sector initiative has also played a major role at the earlier stages of zone development. In some countries like Thailand or China, zone development by public sector initiative is still prevailing. In the Philippines, the first four EPZs were developed by its government.

(3) Lease Rates

The following table shows the lease rates in other industrial estates in the region. As compared to annual lease rate for open plots, plots with factory in the industrial estates in Palestine are higher than those in industrial estates in the neighboring countries such as Jordan and Syria. The marketable lease rate in Palestine is in the range of US$ 8 to US$ 12 per m^2 for open plots, and US$ 25 to US$ 80 per m^2 for plots with factory.

Table IV-1-1 Annual Plot and Office Lease Rents

Industrial Estate	Area / Country	Open plot (USD/ land plot m^2)	Plot with factory (USD / land plot m^2)	Office Space (USD / floor space m^2)
Jenin Industrial Estate (2008) /1	Jenin	10.00	80.00	-
Gaza Industrial Estate (2008) /2	Gaza	10.00 - 12.00	28.00	53.00
West Nablus Industrial Estate (2008) /3	Nablus	-	28.57 (JD20.00)	-
Nablus Industrial Estate (1998) /4	Nablus	8.00	26.00	-
Municipal industrial estates in West Bank (1998) /5	West Bank	8.00 – 9.00	35.00 – 45.00	-
Industrial estates in Jordan (2008) /6	Jordan	1.40 – 4.20	14.10 – 23.00	-
Industrial estates in Syria (1998) /4	Syria	3.00	15.00	-
Industrial estates in Erez (1998) /4	Erez, Israel	-	48.00 – 144.00	-
Kiryat Arie (1998) /4	Tel Aviv, Israel	8.00	-	-

Source: JICA Study Team based on various sources:
/1 JIE Feasibility Study updated in November 2007 /2 Information from PIEDCO,
/3 Interview from tenant companies in West Nablus Industrial Estate operated by Nablus Municipality
/4 Nablus Industrial Estate Feasibility Study in 1998 /5 Market survey in JIE Feasibility Study in 1998
/6 Abdullah II Ibn Al-Hussein Industrial Estate, Al Hassan Industrial Estate, Al Hussein Bin Abdullah II Industrial Estate, Aqaba International Industrial Estate, Ma'an Industrial Estate, and Al Muwaqar Industrial Estate

According to the PCBS statistics (Economic Survey 2006, Labor Force Survey and Agricultural Survey 2005/06), the situation of the firms in the manufacture of food and beverages in Palestine is shown in the following table.

[31] "ILO database on export processing zones (Revised)", April 2007, International Labor Office

Table IV-1-2 Situation of Firms with over Five Employees in the Food and Beverage Sector of Palestine (2005)

Number of entities	395
Number of Employees	5,011
Average Annual Sale	USD640,829-
Average Gross Value Added	USD151,143-
Average Rent of Building	USD2,701-

Source: PCBS's unpublished data for 2005/2006

The annual lease rates for open plot and plot with factory in the Agro-industrial Park are assumed to be US$ 10 and US$ 45 per m^2 respectively. If a company, having an average of 12.7 employees, rents a standard open lot of 2,500 m^2 with a standard factory building (SFB) floor area of 1,250 m^2 in the Agro-industrial Park, the company would have to pay USD 25,000 for the open land. On top of it, the company has to bear the construction cost of the factory of about USD 56,250 in the case of SFB. The ratio of such lease fees over the average gross value added is 16.5% in the case of open land, or 37.2% in the case of SFB. This implies that the planned standard lease fees could be beyond the bearable limit for small-scale private enterprises in the food and beverage sector.

The following table shows the detailed tenancy rates and selling price by the industrial estate in the neighboring countries.

Table IV-1-3 Rate Setting of Industrial Estates in Neighboring Countries

Country	Name of Industrial Estate	Selling Price	Tenancy Rate (USD/m^2/year)
Jordan	Abdullah II Ibn Al-Hussein	Open Lot: 75 SFB: 120 – 150	Open Lot: 3.5 SFB: 21.1
	Al Hassan	Open Lot: 42 SFB: 106 – 141	Open Lot: 3.5 SFB: 21.1
	Aqaba International	Open Lot: 40 SFB: 235	Open Lot: 4.0 SFB: 23.0
Syria	Lattakia, Allepo		Open Lot: 3.0 SFB: 15.0
UAE			Open Lot: 0.46 – 1.8
Egypt	Six of October	Open Lot: 19.3 – 26.4	Open Lot: 1.75 – 3.5 SFB: 3.7 – 7.0
Israel	Erez	Open Lot: 160 – 200	SFB: 48.0
	Tel Aviv	Open Lot: 800	Open Lot: 8.0

Source: JICA Study Team

It is evident that tenancy rates in US$/$m^2$/year for open lot with SFB in the industrial estates in the neighboring countries are far lower than those in the industrial estates in Palestine. The neighboring countries offer more attractive rental rates, compared with those offered in Palestine. Besides the rent, the manpower cost and utility charges are also lower in those other countries. This could be a big obstacle to the promotion of Foreign Direct Investment (FDI) in Palestine.

Accordingly, the initial investment cost of on-site infrastructure components would need public financial assistance in order to reduce the annual lease rates for open plot and plot with factory, even under business scheme of private sector initiative.

(4) Priority Industries

In stages I and II of the Agro-industrial Park development, the number of investors or the number of industrial lots is planned as indicated below.

Table IV-1-4 Number of Firms to Locate in the Agro-industrial Park

Space	Number of Firms
Less than 0.25 ha	10
0.25 ha	31
0.5 ha	19
Over 0.5 ha	3
Total	63

Source: JICA Study Team

In the Chapter II, agribusiness industries such as trading of fresh vegetable and fruit and food processing industries are to be prioritized for tenant enterprises in the Agro-industrial Park. The number of firms with more than five employees in the manufacture of food and beverages has increased to 521 in 2007 while those with more than ten employees have remained at 135. In order to achieve 90% occupancy of the Agro-industrial Park, 42.2% of the existing large-scale firms involved in the manufacture of food and beverages in Palestine have to move into the Agro-industrial Park within four years after the start of its operation.

Table IV-1-5 Number of Establishments in Operation in the Manufacture of Food and Beverages

No. of Employees	100+	50-99	20-49	10-19	5-9
No. of Firm	4	7	19	105	386

Source: Table 6-1, Number of Establishments in Operation, PCBS 2007

Thus, from the viewpoint of absolute number of local firms in the food and beverage manufacturing sectors, the priority industries in the Agro-industrial Park should target other industries such as textile and furniture. As shown in Table II-2-2, the factory area is planned to accommodate agribusiness industries and supporting industries, whose occupancy rates are 95% and 5%, respectively. If other industries are included, the occupancy rate shared by agribusiness industries would be lower than the planned rate (95%).

IV-2 Management and Operation Plan

(1) Service Plan

1) Necessary Functions of the Agro-industrial Park

The functions required for the operation and management of the Agro-industrial Park are summarized below.

Table IV-2 Necessary Functions of the Agro-industrial Park

Functions	Activities
Customer service (Governmental)	• One-stop shop services (Administrative licensing, approvals, permits, etc.) • Trouble shooting (Mediation of disputes or troubles in the operation of tenant enterprises in terms of labor relation, operation of the Agro-industrial Park, etc.)
Operation and maintenance of infrastructure and utility	• Supply of utility • Waste treatment • Maintenance of infrastructure and utility facilities • Environmental control
Security and safety	• Security control to prevent trespassing • Security control over cargoes • Safety control (provision of safety control over flammable contents etc.)
Marketing	• Provision of information to the prospective investors • Promotion activities • Closing of land lease contract
Supporting service	• Supporting services such as restaurants, canteens, shops, etc., as may be added from time to time • Business development services
Administration	• General administration • Billing and accounting • Legal service • Procurement • Website management
Labor-related service (Optional)	• Placement service • Vocational training

Source: JICA Study Team

The PIEFZA shall be responsible for the governmental services such as one-stop shop services (administrative licensing, approval and permits, etc.) and trouble shooting for labor disputes and in the operation of the Agro-industrial Park.

The rest of the services shall be under the responsibility of a private developer in the case of the business scheme by a private sector initiative, and under the responsibility of PIEFZA in the case of a public sector initiative. The services such as security/safety control and supporting services may be contracted out to qualified private companies.

2) Generation of Incomes from the Operation and Management of the Agro-industrial Park

The Agro-industrial Park is expected to generate adequate income from its management and operation. The income sources of a developer may include the following.

a) Management fees for maintenance work of the park's infrastructure and facilities;

b) Electricity and water supply charges;

c) Waste treatment charges (both for solid and liquid wastes) and collection of garbage;
d) Annual rentals of open plots, plots with factory and office buildings;
e) Fees for providing vocational training programs, workshops and seminars; and
f) Placement fees of employees and workers.
g) Rents and/or service charges of the service apartment for the expatriates;
h) Rents and/or service charges of the dormitories for the employees and workers

The developer shall be directly responsible for the efficient operation and maintenance of the on-site infrastructure, and its facilities, and labor-related services in order to generate sufficient income from the above sources. The security/safety control and supporting services may be contracted out to private companies and a developer would collect rents of office building from private companies.

The service apartments for expatriates and the dormitories for employees who commute from remote areas would be provided by the tenant enterprises employing them. The developer may render such services and contract local private property companies to secure said service apartments and the dormitories. Such services can be divided into two types such as: 1) rental charged to users if a developer purchases the properties from the private companies, and 2) service charges to the tenant enterprises if a developer introduces the properties to them.

(2) Organization Plan

The operation and management scheme of the Agro-Industrial Park may be formed as shown below.

1) Organization for the Management and Operation of the Agro-Industrial Park

The Agro-industrial Park shall have two sections, namely, the Agro-industrial Park Advisory Board that will serve as the advising and supervising body, and the Operating Section which has four offices. The proposed organization of the Agro-industrial Park is shown in the figure below.

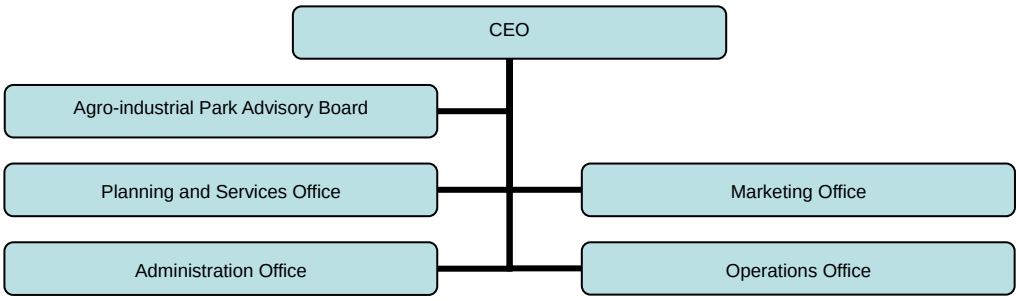


Figure IV-2-1 Proposed Organization of the Agro-industrial Park

2) Functions and Organizations of the Offices in the Agro-industrial Park

(a) CEO

- The CEO shall be responsible for the planning, implementing and supervising the management and operations of the Agro-industrial Park. He shall also be responsible for the profit gain and loss

derived from the park's operation, and shall deal with any vital issues or problems that may arise from related activities. The CEO shall also take the full responsibility to the shareholders of the company or the PNA in case of public sector initiative.

(b) The Agro-industrial Park Advisory Board

- The Agro-industrial Park Advisory Board shall discuss the operational strategies, problems on routine activities, and desirable countermeasures upon the requests of the tenant enterprises.
- The Board shall also assist the one-stop shop office of the PIEFZA in the conciliation and mediation of labor-related issues and/or disputes.
- The Agro-industrial Park Advisory Board shall consist of the following members:
  - CEO of the Agro-industrial Park;
  - Representative of PIEFZA's One-Stop Shop Office;
  - Representative of Jericho Municipality;
  - Representative of the Tenant Enterprises Association; and
  - Representative of an accredited labor union in the Agro-industrial Park.

(c) Planning and Services Office

- The Planning and Services Office is the section responsible for planning the user services and other activities in the Agro-industrial Park, and the setting of fees for lease, rentals and services.
- This office also sets and supervises the rules and regulations in terms of the management and operation of the Agro-industrial Park.
- It is responsible for the planning, implementing and managing of the businesses inside and outside of the Agro-industrial Park, which may include those related to real estate, food and other services such as the serviced apartments, dormitories, restaurants, central kitchen for factory lunches, kiosks, etc.
- The proposed organization of the Planning and Services Office is shown in the figure below.

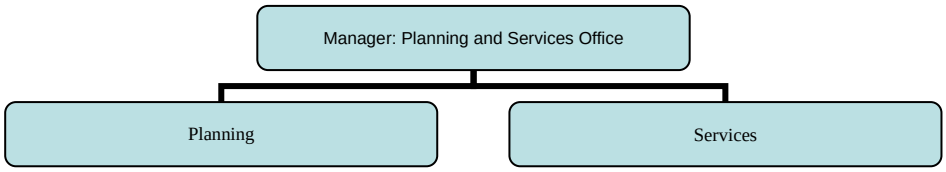


Figure IV-2-2 Proposed Organization of Planning and Services Office

(d) Marketing Office

- The Marketing Office shall be responsible for the planning and implementing the marketing activities of the Agro-industrial Park and for establishing the marketing network in and out of the country, targeting the prospective tenant enterprises to lease in the Park.
- This office shall also conclude with the tenant enterprises concerning lease contracts for open lots or SFBs, operation and management contracts, utilities supply contracts, waste treatment consignment contracts, sales agency agreement with sales agents, and etc.
- The proposed organization of the Marketing Office is shown in the figure below.

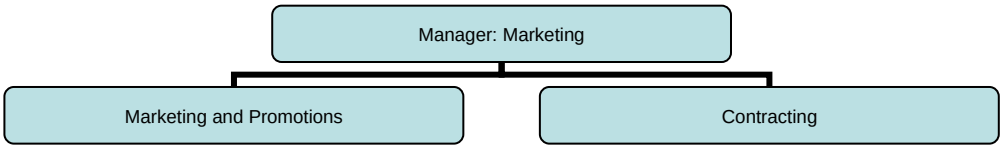


Figure IV-2-3 Proposed Organization of Marketing Office

(e) General Affairs Office

- The General Affairs Office shall be the secretariat of the Agro-industrial Park, and shall also be in-charge of the billing, accounting, procurement, website management, legal matters, general affairs, etc.
- It shall be responsible for concluding the management consignment contracts with the outside service providers in case of outsourcing part of the operation and maintenance jobs.
- It shall also be the coordinating and cooperating partner of the one-stop shop office of the PIEFZA on a daily basis.
- The proposed organization of the Administration Office is shown in the figure below.

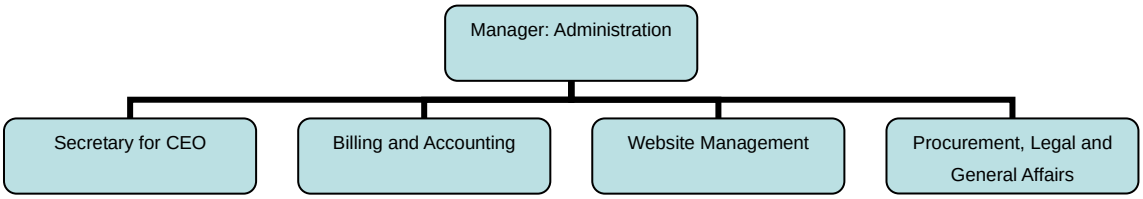


Figure IV-2-4 Proposed Organization of Administration Office

(f) Operations Office

- The Operations Office is responsible for assuring the adequate and reliable supply of electricity and industrial water in the premises of the tenant enterprises.
- It shall also be responsible for providing the solid waste and waste water treatment services.
- It shall be responsible for the maintenance work of the facilities of the park, including its internal roads.
- It shall maintain security inside the Agro-industrial Park and provide safety-related services that pertain to fire preventive measures.
- It shall monitor the maintenance work, which shall be outsourced.
- The proposed organizational structure of the Operations Office is shown in the figure below.

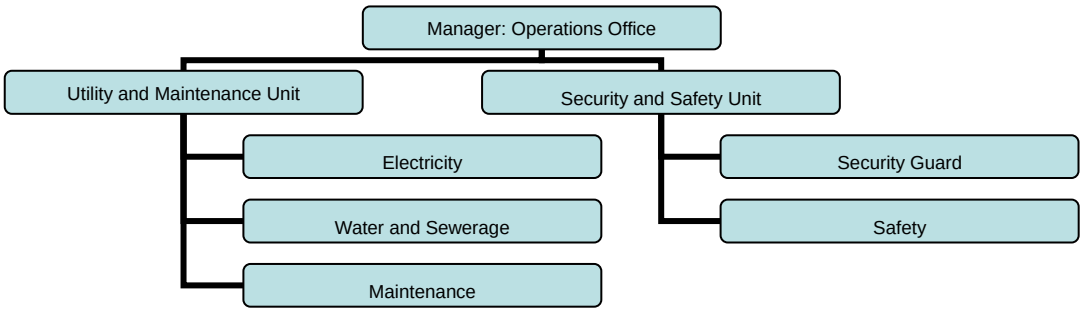


Figure IV-2-5 Proposed Organization of Operation Office

(g) Labor Service Office

- The Labor Service Office shall act as a placement office where job seekers can file and register their employment applications, and where employers may source potential candidates for employment. This office shall maintain files of prospective staffs and workers that are selected through appropriate screening.
- The proposed organization of the Labor Service Office is shown in the figure below.

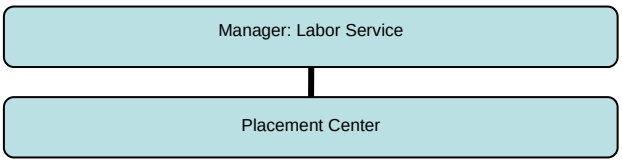


Figure IV-2-6 Proposed Organization of Labor Service Office

(3) Plan of Operation

1) Open Lot and SFB

- The standard space for the open lot and SFB is 0.25 ha for both stages I and II. According to the regulation, the factory space in such lot shall be a maximum of 1,250 m^2. It is noted that there will be 38 lots of this size.
- For the convenience of smaller-sized firms, 22 lots of less than 0.25 ha will be made available.
- Development target area: 11.5 ha (state land in Area A for stage I) and 50 ha (private land in Area A for stage II).
- Lot allocation: 32.01 ha of which 26.45 ha are for open lot, 2.38 ha for SFB and 3.18 ha for office building. Spaces of SFB and office building for lease are 11,900 m^2 and 6,750 m^2.

2) Security

- The surrounding fence, made of steel mesh, shall be installed around the site.
- Outdoor fixed camera, mobile monitoring camera, DVR for the cameras and Controlling Monitoring System (CMS) shall also be installed.
- Security patrol, provided with two patrol cars, is also recommended to be done on site.

- A tracking system for cars and cargo scanner at the main gate of the site shall be installed to meet the needs and further requests of the tenant enterprises.

3) Labor Service Office as a Placement Center

- As one of the core functions of the Agro-industrial Park, the Labor Service Office is recommended to serve as the placement center for the park. It will liaise with the outside public organizations in promoting the hiring and mobilization of the workers in the Park.
- After administering the screening tests to the prospective workers, the Labor Service Office will be able to collect relevant information on qualified workers and introduce them to the tenant enterprises searching for workers. Upon successful acceptance and employment of workers, the Labor Service Office may charge placement fees to the employers.

4) Cooperation with the One-Stop Shop Office

- In Article 3 of the "Law No.10/1998 regarding industrial estate and industrial free zone", it is stipulated that the PIEFZA shall be the "one-stop shop" in industrial estates where the tenant enterprises can obtain all permits, licenses, and official registrations needed for joining the Agro-industrial Park.
- The General Affairs Office of the Agro-industrial Park is expected to help the one-stop-shop providing their services to the tenant enterprises in a timely manner. Such assistance of the General Affairs Office include the establishment of flow dissemination of the administrative notices among the tenant enterprises, preparation of explanatory information of licenses and/or permits and their procedures required for the business operation in the Park, organizing the seminars for the information of new administrative rules, procedures, etc.

IV-3 Marketing and Promotion Plan

(1) Pricing Policy

Considering that the land and factory lease fees of the Agro-industrial Park are relatively high, a multiple pricing policy has to be considered.

Although only annual lease fees are planned to be introduced, a lump sum payment for 49 years may be offered at lower rates. For this payment plan, it may be inevitable to admit investors with a 49-year lease agreement and allow them to transfer their rights to another investor at a higher price during the contract period. The capital gain generated from such transfer may be shared by the original investor and the developer.

In order to promote the occupancy of the Agro-industrial Park at an earlier stage, reduced rates may be offered to the potential investors at the inception stage. In practice, such promotional discount offers, typically 10%, can be observed in some industrial estates in other Asian countries. While such pricing option yields lower profitability at the inception stage of the operation, the higher occupancy in an early stage may spur more demand in the subsequent stage.

(2) Marketing Activities

Due to the limited number[32] of prospective investors in Palestine, a large-scale marketing activity, for example mass media including advertisements on TV or in magazines, would not be suitable. On the contrary, target-specific activities have to be planned. The process of marketing activities can be summarized as follows.

- Sufficient publicity materials, information and marketing materials such as project explanatory materials, brochures, plot map, sample contract, and rules and regulations for the park's operation and management have to be prepared before starting marketing activities
- Statistical and profile data of the firms in the food and beverages sector in Palestine have to be collected and examined. In this process, a firm's profile analysis must be done carefully so that the target firms will be selected without mistake. To do this, it is important and necessary to establish close cooperation with various institutions involved in the industrial promotion.
- Small gatherings of target firms can be arranged based on the information and analyzed profile of such firms in order to promote the Agro-industrial Park. Such gatherings, which can be organized under the cooperation of the institutions involved in industrial promotion, must be held by type of business, area or size of the firms.
- Staff members of the Marketing Office would go to target firms in order to conduct the more detailed consultation and persuasion regarding their investment into the Agro-industrial Park.

If possible, the Marketing Office would coordinate with financial institutions as to financial assistance

[32] The number of large-scale companies is small not only in the agricultural and food processing sectors but also in all other sectors. According to the article "The Palestine Federation of Industries" contained in pages 44-46 of "This Week in Palestine" No.126, October 2008, there are only about 100 companies in the industrial sector having more than 100 employees.

arrangements for target firms.

In case the development of the park shall be carried out by public sector initiative, and considering that PIEFZA has limited experience and expertise in marketing activities, it is advisable for the PIEFZA to invite talented and competent marketing resource persons from the outside or contract out private sector companies specializing in marketing activities.

In the case of FDIs in the park, the PNA's overseas offices would be of great help in the marketing activities. Either the private sector developer or the PIEFZA could continue maintaining the close contacts with all the overseas Palestine-related outlets. They must aim to disseminate the information on the Agro-industrial Park through these PNA overseas offices. A developer may also cooperate with Palestine Trade Center (PalTrade) in approaching overseas prospective investors as well.

(3) Marketing Network

1) In inviting the potential local investors, the cooperative relations have to be established with the following institutions:
   - PalTrade;
   - Federation of Palestinian Chambers of Commerce, Industry and Agriculture (FPCCIA);
   - Palestinian Federation of Industries (PFI); and
   - Palestine Food Industry Association (PFIA).

2) In inviting FDI providers, the contact targets would include the following:
   - The PNA's overseas representative offices;
   - Palestine Businessmen Councils overseas;
   - Chamber of Commerce and Industry located in foreign countries;
   - Industrial associations in foreign countries;
   - Foreign Trade Promotion Organization (TPO); and
   - International donors and NGOs.

IV-4 Financial Analysis

(1) Objective

Based on the business schemes presented in the section IV-1 above, the JICA Study Team prepared a financial analysis to estimate the financial viability of the Agro-Industrial Park development from the viewpoint of a developer who undertakes the on-site infrastructure development and management. Due to the heavy initial investment requirements in "Business Scheme A" wherein the private entity makes the investments in developing the on-site infrastructure, ensuring the profitability of the private sector may be considered challenging. In the case of "Business Scheme B" wherein the public entity undertakes the on-site development, the developer enjoys a profitability requirement lower than that of the private sector, and has an access to the donor assistance as funding source. There is still some uncertainty in the sense that additional public funding is necessary for both the off-site and on-site developments.

In this section, the financial analysis is conducted for the on-site infrastructure development components as the project scope for both in the abovementioned business schemes A and B. The assumed subject phases for the analysis are as follows: a) Stage I only (implementation period: 2009-2011), b) Stage I, II: stage-wise development (implementation period: 2009-2015), and c) Stages I+II: simultaneous development (implementation period: 2009-2011). Since the implementation of stage III in Area C is subject to an agreement between the PNA and Israel, stage III is not included in the financial analysis.

(2) Public Financial Assistance for the Initial Investment

1) Funding Requirement for the Initial Investment

Table IV-4-1 shows the basic funding requirement of a developer for the on-site infrastructure development. The land acquisition cost is excluded from the funding requirement based on the assumption that the land acquisition necessary for both on-site and off-site development is funded and executed by the PNA.

Table IV-4-1 Summary of Cost for On-site Infrastructure

(unit: USD1000)

Item		Stage I Only	Stage I, II (Stage- wise Development)	Stages I+II (Simultaneous Development)
B01	General requirements	908	3,324	3,120
B02	Land reclamation	1,957	15,898	15,898
B03	*Wadi* improvement	0	2,574	2,577
B04	Internal Roads	1,458	9,613	9,613
B05	Storm water drainage channel	309	1,346	1,335
B06	Water distribution facilities	1,184	3,832	3,091
B07	Power distribution facilities	490	2,640	2,640
B08	Wastewater collection and reclaimed water redistribution facilities	210	1,273	1,073
B09	Solid waste collection facilities	703	1,358	872
B10	Telecommunication distribution facilities	16	94	94
B11	Security facility	2,544	3,624	3,624
B12	Parks	30	341	341
B13	Office building	2,406	5,785	5,433
B14	Model factory	5,971	5,971	5,971
B15	Car parking	349	2,832	2,832
Total		**18,535**	**60,506**	**58,515**

* Including administration (1.5%), engineering services (12%) and physical contingency (10%), excluding price contingency
Source: JICA Study Team

2) Public Financial Assistance

To ease the developer's large financial burden from the initial investment costs of site development, it is necessary to make appropriate adjustments in defining the responsibilities between the developer and the PNA. In the case of the expected low profitability, the PNA with donor funding may be required to undertake a certain part of on-site infrastructure development, depending on the degree of financial and commercial viability of the on-site development and management. In this financial analysis, options 1 to 3 are assumed based on the portion of public sector financial assistance, and are presented in Table IV-4-2.

Option 1 (no public assistance)

This case applies the basic differentiation mentioned previously wherein a developer finances all the on-site infrastructure development.

Option 2 (base case)

The PNA undertakes the investments in basic on-site infrastructure components (land reclamation, *Wadi* improvement, internal roads, storm water drainage, water supply tank and solid waste management) as their assistance to the developer. In addition, on-site telecommunication distribution facilities are assumed to be constructed by the telecommunication company.

Option 3 (additional public assistance)

In addition to the public assistance in option 2, on-site infrastructure of wastewater treatment and security facility is implemented by the PNA and excluded from the developer's scope.

Table IV-4-2 Options and Initial Investment Costs for the Developer

Item		Option 1	Option 2	Option 3
B01	General requirements	○	○ *1	○ *1
B02	Land reclamation	○	-	-
B03	*Wadi* improvement	○	-	-
B04	Internal Roads	○	-	-
B05	Storm water drainage channel	○	-	-
B06	Water distribution facilities	○	○ *2	○ *2
B07	Power distribution facilities	○	○	○
B08	Wastewater collection and reclaimed water redistribution facilities	○	○	-
B09	Solid waste collection facilities	○	-	-
B10	Telecommunication distribution facilities	○	- *3	- *3
B11	Security facility	○	○	-
B12	Parks	○	○	○
B13	Office building	○	○	○
B14	Model factory	○	○	○
B15	Car parking	○	○	○
Initial Investment Cost (Thousand USD) *4		**Option 1**	**Option 2**	**Option 3**
a) Stage I Only		**18,535**	**13,411**	**10,515**
b) Stage I, II (Stage-wise development)		**60,506**	**26,356**	**20,856**
c) Stages I + II (Simultaneous development)		**58,515**	**25,230**	**20,268**

*1 General requirements mean contractor's temporary buildings, warehouse and repair shops including removal of these facilities after completion of the works. Pro rata allocation is applied for private developer share in Option 2 and 3 based on initial investment cost covered by public financial assistance.
*2 Water supply tank is implemented by the PNA.
*3 Implemented by the telecommunication company
*4 Includes administration (1.5%), engineering services (12%) and physical contingency (10%), excluding price contingency
Source: JICA Study Team

(3) Revenue and Cost Structure

1) Revenue

Plot and Office Lease

In schemes A and B, the plot and office rental from the tenant companies is the major revenue source for a developer. Land lease takes the forms of an open plot without structure being leased to the tenant companies who construct factories using their own investment funds, while the plot with factory is being leased including the building structure. Office space is leased by unit space for the other commercial activities.

The levels of lease rates must be set not only to compensate the initial and recurring costs of the park but also to be competitive with the rates offered by the other industrial estates. Table IV-1-1 shows that the lease rates in the industrial estates in Palestine are not competitive compared to those in the industrial estates in the neighboring countries. In the financial analysis, the different sets of lease rates for open plot, plot with factory and office building are assumed considering the prevailing market rates.

Service Fees and Rates

Service fees and rates are also charged by a developer to tenants on the services provided by the utility companies for the exclusive use of the Agro-industrial Park in order to cover at least the operation and maintenance costs of said companies. The fees charged in the park should be competitive to the normal tariff levels for the same services provided outside of the park.

Service fees are applied to the water supply and sewerage services at metered rates. Security rates and service rates are applied to security and other common facilities, respectively. Electricity and telecommunication services are directly charged by the respective utility companies. Revenue sharing will be applied to some services based on the division of responsibilities between the PNA and the developer. In the case of GIE, water supply and sewerage charges are shared by PIEFZA (PNA) and the private developer (see Table IV-4-3).

Table IV-4-3 Service Fees and Rates at GIE

Service	Off-site operation	On-site operation	Rate	Charged by
Potable water	PIEFZA	PIEFZA/PIEDCO*	USD1.50/m^2	PIEFZA/PIEDCO
Brackish water	PIEFZA	PIEFZA/PIEDCO	USD0.40/m^2	PIEFZA/PIEDCO
Sewerage	PIEFZA	PIEDCO	USD0.57/m^2	PIEDCO
Security Rate	-	PIEDCO	4% - 9% of Rent Rate	PIEDCO
Service rate (Other common facilities)	-	PIEDCO	3% - 6% of Rent Rate	PIEDCO

* Palestine Industrial Estate Development Company, the private developer of GIE
Source: JICA Study Team based on PIEDCO information

2) Operation and Maintenance Costs

As in the case of on-site infrastructure developed by a developer, the components financed by the PNA in options 2 and 3 will also be operated and maintained by the developer. Exceptions to this modality are as follows:

- Operation and maintenance of on-site electricity and telecommunication facilities are normally undertaken by the electricity and telecommunication companies, respectively.
- The PNA shall operate and maintain the water supply tank which they developed, as well as the off-site water supply facilities.

(4) Financial Analysis

1) Methodology

The following financial analysis is demonstrated from the viewpoint of a developer to estimate the financial viability indicated as the equity internal rate of return (equity IRR) through cash flow projections for both schemes A and B. In options 1 to 3 presented above, the analysis estimates the level of the PNA's assistance in on-site infrastructure development in order to raise its viability.

Different equity IRR targets are applied to both schemes A and B. For scheme A implemented by a private developer, interviews with Palestinian private developers indicate that the equity IRR expected in similar projects ranges from 13% to 17% under nominal rates. The real rates of 10.6% to 14.5% deflated with the inflation estimated below are assumed as the indicative targets of equity IRR.

In scheme B implemented by a public developer, a minimum rate of 4% per annum of the weighted average capital cost is assumed as the indicative target IRR, with reference to the Asian Development Bank guidelines.

2) Assumptions

(a) Inflation

Following the basic premise of discounted cash flow analysis, all the cost and revenue streams are presented in constant 2008 prices. As for the equity IRR and interest rate, the estimated average inflation rate of 2.18%[33] is applied to convert the nominal rates into constant (real) rates.

(b) Plot Area for Lease

In accordance with the land use plan, the plot areas for lease are estimated as indicated in Table IV-4-4 below. Occupancy rates of each development scenario are assumed to rise to 90% in three or four years after commencement of the operation (see the Table IV-4-5).

Table IV-4-4 Plot Area for Lease

(m^2)

		Stage I Only	Stage I, II (stage-wise)	Stages I + II (simultaneous)
Open plots for lease	- Factory area	23,800	212,900	212,900
	- Distribution and storage area	14,300	38,400	38,400
	- Designated Storage	0	13,200	13,200
Plots with model factory		23,800		23,800
Office space	Office building	2,500	5,400	5,400
	BDS Center	250	1,350	1,350

Source: JICA Study Team

[33] Average of estimated inflation from 2006 to 2013, retrieved from World Economic Outlook Database, IMF (April 2008)

Table IV-4-5 Occupancy Rates

(%)

		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year
Stage I only		50	70	90	90	90	90	90	90
Stage I, II	Stage I	50	70	90	90	90	90	90	90
(stage-wise)	Stage II	-	-	-	-	50	70	90	90
Stages I+II (simultaneous)		30	50	70	90	30	50	70	90

Source: JICA Study Team

(c) Funding of the Developer

Scheme A: Private Developer

In Scheme A, a debt-to-equity ratio of 1.0 is assumed for a private developer's initial funding structure; i.e. 50% of the initial investment cost is financed by borrowing in each option[34]. The rest of the funding requirement is covered by its own funds, i.e. equity of the company. The loan conditions are assumed as per Table IV-4-6, based on the general available corporate loans in the Palestinian market.

Table IV-4-6 Assumed Loan Conditions

Loan amount	50% of initial investment cost in each case scenario
Interest rate	Nominal 8% fixed rate (Real interest rate after conversion: 5.4%)
Repayment period	7 years repayment period after 2 years grace period

Source: JICA Study Team

Scheme B: Public Developer

In Scheme B, the PNA will finance the initial investment needs of a developer either by grant or loan. As indicated in PRDP 2008-2010, the whole development budget of the PNA is to be financed by the external donors, wherein the donors' funds will be considered as its main financial source. In this case, it is assumed that the PNA lends concession loans provided by the donor(s) to the developer on the on-lending basis. The conditions applied for the present financial analysis are as per Table IV-4-7 which is based on the conditions applied by the World Bank Trust Fund Credit to GIE development. It is assumed that 80% of the investment requirement is provided by the loan while the rest is subsidized through the PNA's own funds, financed from its revenue or external budget support in the form of equity investment to a public developer.

Table IV-4-7 Assumed Concession Loan Conditions

Loan amount	80% of initial investment cost in each case scenario
Interest rate	Nominal 0.75% fixed rate plus 2.00% on-lending spread (2.75%) Real interest rate after conversion: 0.60%
Repayment period	30 years repayment period after 10 years grace period

Source: JICA Study Team

[34] JIE feasibility study updated in 2007 assumes 40% of equity and 60% of debt for the financial projection, whereas most of the funding requirement of the private developer is financed by equity investment (over 60%) in GIE and JIE. This indicates that long-term corporate loans are not abundant in the Palestinian market and considered as auxiliary source of funding for expansion needs for existing projects. The debt-to-equity ratio for the present financial analysis is assumed by the JICA Study Team based on maximum equity investment amount probably acquired by the private developer in Option 1, i.e. approximately USD25 million.

(d) Disbursement Schedule of Initial Investment

Table IV-4-8 shows the assumed disbursement schedule in accordance with the implementation plan presented in section III-6 (Chapter III).

Table IV-4-8 Disbursement Schedule (On-site Infrastructure Investment)

(%)

	First year	Second year	Third year	Fourth year
Land Acquisition*	50	50	0	0
Base construction cost (incl. physical contingency)	0	0	0 - 60**	40 -100**
Administration (incl. physical contingency)	20	40	20	20
Engineering services (incl. physical contingency)	20	40	20	20

Note: * Land acquisition for Lot II is to be secured by the PNA
**Disbursement schedules of base construction cost are individually determined by type of infrastructure. Engineering services under the public scheme is assumed to be financed by a public developer.
Source: JICA Study Team

(e) Land Lease

In order to enhance the financial viability of the on-site development, it is assumed that the PNA-owned land is to be lent to the public developer or private developer without any charge.

(f) Operation and Maintenance Costs

Administration Cost

Administration staff cost is assumed as per Table IV-4-9 based on the management and operation plan. Other overhead expenses are assumed at 90% of the staff cost[35].

Table IV-4-9 Administration Staff Cost

Section / Office	Position	Unit Cost (USD/yr.)	Stage I		Stages I+II		Stages I+II+III	
			No.	Annual Cost	No.	Annual Cost	No.	Annual Cost
CEO	CEO	50,400	1	50,400	1	50,400	1	50,400
Planning and Service Office	Manager	33,600	1	33,600	1	33,600	1	33,600
	Planning	16,800	2	33,600	2	33,600	2	33,600
	Services	16,800	1	16,800	2	33,600	3	50,400
Marketing Office	Manager	33,600	1	33,600	1	33,600	1	33,600
	Marketing and Promotions	16,800	1	16,800	2	33,600	2	33,600
	Contracting	16,800	1	16,800	1	16,800	1	16,800
Administration Office	Manager	42,000	1	42,000	1	42,000	1	42,000
	Secretary to CEO	16,800	1	16,800	1	16,800	1	16,800
	Billing and Accounting	16,800	1	16,800	2	33,600	3	50,400
	Website Management	16,800	1	16,800	1	16,800	1	16,800
	Procurement	16,800	1	16,800	1	16,800	1	16,800
	Legal	16,800	1	16,800	1	16,800	1	16,800
	General Affairs	16,800	1	16,800	1	16,800	2	33,600
	Drivers	5,604	2	11,208	3	16,812	4	22,416
Staff Cost Total			**17**	**355,608**	**21**	**411,612**	**25**	**467,616**
Other Administration Cost (90% of staff Cost)				**320,047**		**370,451**		**420,854**
Total Administration Cost				**675,655**		**782,063**		**888,470**

Source: JICA Study Team estimation

[35] The ratio is estimated based on the statistical figures of service sector activities shown in Economic Survey Series 2006, Palestinian Central Bureau of Statistics; the ratio of overhead expenses to compensation of employees is 87.3%.

Operation and Maintenance Cost of Infrastructure

The operation and maintenance of the on-site infrastructure is estimated as per Table IV-4-10 based on experience in a similar type of project.

Table IV-4-10 Operation and Maintenance Cost of On-site Infrastructure

On-site Infrastructure Component	Annual Operation and Maintenance Cost	Remarks
Wadi Improvement	0.5% of capital cost	O&M by the developer in all options
Roads	1.0% of capital cost	O&M by the developer in all options
Storm water drainage channel	0.5% of capital cost	O&M by the developer in all options
Water supply	0.5% of capital cost	O&M of components constructed by the public sector is undertaken by the public in Option 2 and Option 3
Power supply	-	Undertaken by electricity company
Wastewater treatment	0.5% of capital cost	O&M by the developer in all options
Solid waste management	Stage I: USD 30,000 Stage I & II: USD 76,000* Stage I, II: USD 104,000*	O&M by the developer in all options * O&M cost of Stage I, II stage-wise development is higher than that of stage I & II Simultaneous development, because the former case needs more infrastructure than the later case.
Telecommunications	-	Undertaken by telecommunications company
Security facility	Stage I: USD 281,000 Stage I & II: USD 833,000 Stage I, II: USD 833,000	O&M by the developer in all options
Parks	0.5% of capital cost	O&M by the developer in all options
Office building	0.5% of capital cost	O&M by the developer in all options
Model factories	0.5% of capital cost	O&M by the developer in all options
Car parking	0.5% of capital cost	O&M by the developer in all options

Source: JICA Study Team

Based on the above, the operation and maintenance costs borne by the developer were calculated and are shown in Table IV-4-11 for the three options.

Table IV-4-11 Annual Operation and Maintenance Costs of Developer (USD millions/year)

	Stage I only	Stage I, II	Stages I+II
Operation and maintenance of infrastructure, and security costs	0.38	1.15	1.12

Source: JICA Study Team

(g) Plot and office lease rates

The lease rates of factory plots and office space are assumed as per Table IV-4-12. The four lease rates are assumed based on a comparison with other industrial estates, for purposes of carrying out the sensitivity analysis in the subsequent section.

Table IV-4-12 Annual Plot and Office Lease Rates

	Open plot (USD/ land plot m^2)	Plot with factory building (USD / land plot m^2)	Office Space (USD / floor space m^2)
Lease rate 1	8.00	35.00	70.00
Lease rate 2	9.00	40.00	80.00
Lease rate 3	10.00	45.00	90.00
Lease rate 4	12.00	45.00	90.00

Source: JICA Study Team based on various sources

(h) Service fees and rates

Service rates are applied to utility services such as water supply, sewerage, security and other common facilities, in order to fully cover the operation and maintenance expenses except for the security. Table IV-4-13 shows service fees and rates (only the developer's share) assumed for respective services.

Table IV-4-13 Service Fees and Rates (Developer's Share)

Service Fee / Rate	Stage I Only	Stage I, II (stage-wise)	Stages I+II (simultaneous)	Remarks
Security Rate *1	6.0%	6.0%	6.0%	Recurrent costs are estimated as 30~52% of lease revenues and cannot be covered by the assumed security rate.
Service Rate *2	USD 1.7/m^2	USD 1.1/m^2	USD 1.1/m^2	Recurrent costs are fully covered at 90% occupancy rate.

*1 Rates applied on plot and office rent rates
*2 Rates applied on lease area
Source: JICA Study Team

(i) Other assumptions

Other assumptions (such as project life, reinvestment, depreciation, and income tax rate) considered in the financial analysis are shown in Table IV-4-14. The project life (evaluation period) of Scheme B is assumed to be 44 years by taking into consideration the repayment period of the donor's loan (10 years grace period plus 30 years repayment period). On the other hand, the project life of Scheme A is assumed to be 24 years based on economic life of major facilities of the agro-industrial estate (namely, electrical and mechanical equipment). The Scheme A based on the project life of 44 years was also evaluated to check financial feasibility of the project[36].

Table IV-4-14 Other Assumptions

Project life	Scheme A: 24 years (including 4-year implementation period and 20-year operating period) Scheme B: 44 years (including 4-year implementation period and 40-year operating period)
Economic life of assets	Vehicle: 10 years, Electrical and mechanical equipment: 20 years, and Civil works: 50 years * Reinvestments of expired assets were included in the cash flow. Capital cost for reinvestment activities was assumed to be wholly covered by project operating entity.
Depreciation	2.5 to10% yearly depreciation calculated by straight-line method with no salvage value
Income tax	7-year tax holiday followed by 10% income tax on net profit for an additional period up to 20 years

Source: JICA Study Team

3) Results

Scheme A: Private Developer

The results of the financial analysis for scheme A are presented in Table IV-4-15 to17. The target equity IRR (10.6% to 14.5%) is achieved only in simultaneous development of stages I+II for option 3, with the lease rate 4.

Table IV-4-15 Summary of Financial Analysis of Independent Development of Stage I: Scheme A

Annual lease rate (per m^2)	Option 1	Option 2	Option 3
Lease rate 1 (open plot USD8.0, plot with factory USD35.0, office space USD70.0)	Below 0	Below 0	Below 0
Lease rate 2 (open plot USD9.0, plot with factory USD40.0, office space USD80.0)	Below 0	Below 0	Below 0
Lease rate 3 (open plot USD10.0, plot with factory USD45.0, office space USD90.0)	Below 0	Below 0	Below 0
Lease rate 4 (open plot USD12.0, plot with factory USD45.0, office space USD90.0)	Below 0	Below 0	0.30%

Source: JICA Study Team

[36] Even if evaluation period of 44 years is also adopted for the financial analysis for Scheme A, the change in evaluation period has an insignificant influence on the FIRR (± 1.5 % point at a maximum), and which has no influence on judgments of financial feasibility of each evaluated case.

Table IV-4-16 Summary of Financial Analysis of Stage I, II (Stage-wise Development): Scheme A

Annual lease rate (per m^2)	Option 1	Option 2	Option 3
Lease rate 1 (open plot USD8.0, plot with factory USD35.0, office space USD70.0)	Below 0	Below 0	0.30%
Lease rate 2 (open plot USD9.0, plot with factory USD40.0, office space USD80.0)	Below 0	1.94%	3.76%
Lease rate 3 (open plot USD10.0, plot with factory USD45.0, office space USD90.0)	Below 0	4.45%	6.90%
Lease rate 4 (open plot USD12.0, plot with factory USD45.0, office space USD90.0)	0.20%	6.95%	9.85%

Source: JICA Study Team

Table IV-4-17 Summary of Financial Analysis of Stages I+II (Simultaneous Development): Scheme A

Annual lease rate (per m^2)	Option 1	Option 2	Option 3
Lease rate 1 (open plot USD8.0, plot with factory USD35.0, office space USD70.0)	Below 0	Below 0	0.63%
Lease rate 2 (open plot USD9.0, plot with factory USD40.0, office space USD80.0)	Below 0	2.40%	4.20%
Lease rate 3 (open plot USD10.0, plot with factory USD45.0, office space USD90.0)	Below 0	5.00%	7.32%
Lease rate 4 (open plot USD12.0, plot with factory USD45.0, office space USD90.0)	0.87%	7.76%	10.64%

Source: JICA Study Team
Note: Financially feasible option (equity IRR more than 10.6%) is highlighted in yellow

Scheme B: Public Developer

The results of the financial analysis for Scheme B are presented in Table IV-4-18 to20. Except for stage I, the target equity IRR (4%) is achieved in most of the cases examined. The equity IRR is drastically improved from Scheme A because of the long-term concession loan with low interest that was assumed as the main funding source for a public developer.

Table IV-4-18 Summary of Financial Analysis of Independent Development of Stage I: Scheme B

Annual lease rate (per m^2)	Option 1	Option 2	Option 3
Lease rate 1 (open plot USD8.0, plot with factory USD35.0, office space USD70.0)	Below 0	Below 0	Below 0
Lease rate 2 (open plot USD9.0, plot with factory USD40.0, office space USD80.0)	Below 0	Below 0	Below 0
Lease rate 3 (open plot USD10.0, plot with factory USD45.0, office space USD90.0)	Below 0	Below 0	5.49%
Lease rate 4 (open plot USD12.0, plot with factory USD45.0, office space USD90.0)	Below 0	2.30%	13.75%

Source: JICA Study Team
Note: Financially feasible options (equity IRR more than 4.0%) are highlighted in yellow

Table IV-4-19 Summary of Financial Analysis of Stage I, II (Stage-wise Development): Scheme B

Annual lease rate (per m^2)	Option 1	Option 2	Option 3
Lease rate 1 (open plot USD8.0, plot with factory USD35.0, office space USD70.0)	Below 0	2.73%	10.38%
Lease rate 2 (open plot USD9.0, plot with factory USD40.0, office space USD80.0)	Below 0	14.05%	18.51%
Lease rate 3 (open plot USD10.0, plot with factory USD45.0, office space USD90.0)	Below 0	19.06%	23.40%
Lease rate 4 (open plot USD12.0, plot with factory USD45.0, office space USD90.0)	6.65%	22.54%	26.90%

Source: JICA Study Team
Note: Financially feasible options (equity IRR more than 4.0%) are highlighted in yellow

Table IV-4-20 Summary of Financial Analysis of Stages I+II (Simultaneous Development): Scheme B

Annual lease rate (per m^2)	Option 1	Option 2	Option 3
Lease rate 1 (open plot USD8.0, plot with factory USD35.0, office space USD70.0)	Below 0	5.09%	12.06%
Lease rate 2 (open plot USD9.0, plot with factory USD40.0, office space USD80.0)	Below 0	15.29%	19.32%
Lease rate 3 (open plot USD10.0, plot with factory USD45.0, office space USD90.0)	0.54%	20.11%	24.03%
Lease rate 4 (open plot USD12.0, plot with factory USD45.0, office space USD90.0)	7.56%	24.44%	28.51%

Source: JICA Study Team
Note: Financially feasible options (equity IRR more than 4.0%) are highlighted in yellow

To estimate the possible lease rate reduction by taking stage I+II simultaneous development under scheme B, the necessary lease rate setting was calculated to meet the target equity IRR of 4.0% as per Table IV-4-21. The results in option 1 show that the required lease rates are slightly higher than the existing industrial estates in Palestine. By taking option 2, the lease rates will be much lower than those offered by the competitors.

Table IV-4-21 Lease Rate Setting to Meet Target Equity IRR (Simultaneous Development of Stages I+II)

Annual Lease Rate	Option 1	Option 2	Option 3
Open Plot (USD per m^2)	10.8	7.9	7.3
Plot with factory (USD per m^2)	45.0	35.0	35.0
Office space (USD per m^2)	90.0	70.0	70.0

Source: JICA Study Team

The same analysis was made for the independent development of stage I under Scheme B (see Table IV-4-22). The lease rates turn out to be higher than those offered by the other industrial estates in Palestine as well as the surrounding countries. The estimated rates in option 3 to meet the target equity IRR of 4 % appears to be competitive to the lease rates planned for the Jenin Industrial Estate.

Table IV-4-22 Lease Rate Setting to Meet Target Equity IRR (Independent Development of Stage I)

Annual Lease Rate	Option 1	Option 2	Option 3
Open Plot (USD per m^2)	12.9	10.0	9.9
Plot with factory (USD per m^2)	50.0	48.0	45.0
Office space (USD per m^2)	100.0	96.0	90.0

Source: JICA Study Team

(5) Conclusions of the financial analysis

It is concluded based on the financial analysis that the financial viability of the business scheme by private sector initiative (scheme A) would be difficult to achieve for the Agro-industrial Park, considering the calculated results of the equity IRRs.

Meanwhile, the estimated equity IRRs in the business scheme by public sector initiative (scheme B) turns out to be generally greater than the average cost of the capital (4% per annum) in the case of options 2 and 3 of the stage-wise development and the simultaneous development of stages I and II. The lease rates of open plot can be reduced to USD 7.9 for open plot in option 2 and can be further reduced to USD 7.3 in option 3, in the case of the simultaneous development of stages I and II. The estimated lease rates for open plot in the range of USD 7 to USD 8 are competitive for the GIE and lower than the planned rate (USD 10) for the Jenin Industrial Estate.

In the case of independent development of stage I under scheme B, the project was estimated to be financially viable only when adopting higher lease rates (lease rate 4: open plot USD 12, plot with factory USD 45, and office space USD 90) as compared with prevailing lease rates in Palestine, assuming active public assistance (Option 3). If all on-site and off-site infrastructures of stage I will be totally financed by public sector, the estimated lease rates to meet the target equity IRR of 4 % are: 1) USD 2.0 for open lots,

2) USD 8.0 for SFBs and 3) USD 16 for offices. These lease rates appear less costly than those in the surrounding regions. Accordingly, in order to materialize independent development of stage I, further public sector financial assistance with substantial grant element will be required.

Nevertheless, a business scheme by public sector initiative is subject to various conditions such as: 1,) equity fund from the PNA for 20 % of initial investment cost, 2) borrowing of soft loans from international financial institutions for 80% of the initial investment cost, and 3) institutional strengthening of PIEFZA as a public developer. It should be realized that a public developer must exert efforts to achieve the occupancy scenario for the park such as 30 % in the 1st year, 50% in the 2nd year, 70% in the 3rd year and 90% in the 4th year.

As described in section IV-3, the pricing policy and marketing activities would be worth considering for the fulfillment of the above occupancy scenarios. There are two options that can be considered for pricing policy, namely, 1) less costly lease rates for initial entrants (as the investors return the land plot or factory space to a public developer after the contract expires the latter offers revised/higher rates to new investors), and 2) the application of pricing shift from less costly rates to feasible rates for all investors.

There exist only a limited number of local manufacturers in food and beverage sector as shown in Table IV-1-4. Marketing activities should target not only the priority industries but also the other sectors such as furniture and textile industries.

The current income tax incentive is given to investors whose investment amount is more than USD 100,000 according to the “Law No. 10/1998 regarding Industrial Estates and Industrial Free Zones Law” (see Annex D-33). In the meantime, it is significant to attract SMEs which have not enjoyed current tax incentive in order to facilitate more investment in the Agro-industrial Park. Therefore the minimum investment ceiling currently provided to the enterprises with investment amount of USD 100,000 should be lowered.

CHAPTER V ADMINISTRATIVE ARRANGEMENTS AND BUSINESS SUPPORT

This chapter discusses the administrative arrangements for project implementation and operation of the Agro-industrial Park (section V-1), and the business support schemes for providing technical assistance for tenants (section V-2).

V-1 Organizational Arrangement for Implementation and Management

This section focuses on four issues namely, i) organizational and financial arrangements of project implementation, ii) technical issues on project implementation, iii) investment promotion, and iv) industrial promotion. It is recommended that these issues should be discussed at the level of the steering committee[36] consisting of the PNA officers, project-related organizations, and the four identically thematic sub-committees under the steering committee. The discussions and the decisions at the committee and subcommittees should be shared without delay among the relevant stakeholders and the donor community, for the efficient implementation of the project.

(1) The Steering Committee for the Implementation of the Agro-industrial Park

(i) The Steering Committee

The members of the steering committee will consist of a number of project stakeholders from the PNA authorities, local administration body and other concerned parties. Each of them will participate in the Agro-industrial Park development project with different functions and capacities. Said development would hardly be implemented if their contributions were not harmonized during joint discussions.

Since the Phase I study, a wide range of issues related to the Agro-industrial Park, such as technical cooperation in agriculture and water resources management, necessity of business development support for the tenant small and medium scale enterprises (SMEs), and engineering for the project development, have been taken up during a series of general meetings, chaired by the MoP. The discussions were conducted when required, in accordance with the progress of the Study.

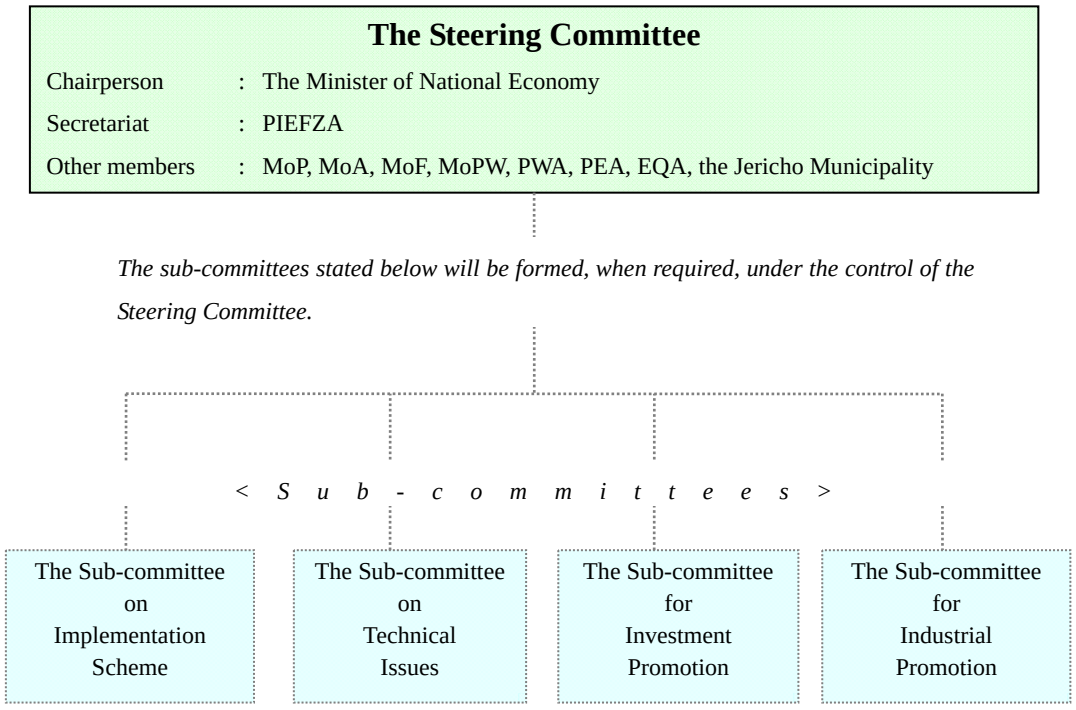
Due to the need for further discussion and cooperation among the major stakeholders towards the implementation of the Agro-industrial Park development project, the JICA Study Team proposes the establishment of the steering committee[37]. The committee shall be chaired by the Minister of National

[36] There is a steering committee, namely Steering Committee for the Corridor for Peace and Prosperity, which was officially formed on the PNA's Cabinet decision on the date of 22 October 2007. It is stated in the stipulation of the Steering Committee that specialized technical committees would be formed when they are required. It is mutually understood among the PNA stakeholders that the idea of establishing a special steering committee for the Agro-industrial Park development shall meet the definition of the said technical committees under the Steering Committee for the Corridor for Peace and Prosperity.

[37] For other industrial park projects in Palestine under the initiative of PIEFZA, a project steering committee or a project technical committee has been formed. For example, the Jenin Industrial Estate (JIE) has a technical committee involving members from the relevant agencies such as MoPW, MoLG, PWA, PEA, etc., which has been functioning to solve difficulties/constraints in engineering issues. The steering committee for the industrial estate project in Bethlehem has been launched, chaired by MoNE and involving an Advisor of Prime Minister's Office, the Mayor of Bethlehem, the Governor of Bethlehem, Chamber of Commerce and Industry in Bethlehem, and the French Consul General. For the IT Park in Hebron, PIEFZA prepares a plan to establish a steering committee involving the University of Politechnique, MoPW,

Economy, and will include representatives from PIEFZA, MoP, MoA, MoF, MoPW, PWA, PEA, EQA, and the Jericho Municipality. Its members will be responsible for taking up discussions on technical issues regarding implementation scheme, investment promotion, industrial promotion and engineering measures related to the Agro-industrial Park. They will also prepare related reports and acquire necessary approvals from each ministry in due course, so that decisions made are duly efficient. The PIEFZA as the secretariat shall be responsible for management and appropriation of budget for the steering committee.

Since the steering committee must be well organized and should efficiently function as a central coordinator among its members, the area-specific discussion functions should be transferred to its sub-committees and its secretariat. The established sub-committees to be assigned are in the areas of a) organizational and financial arrangements for project development (implementation scheme), b) technical issues, c) investment promotion, and d) industrial promotion[38]. Figure V-1 shows the organizational structure of the steering committee and its sub-committees.



Source: JICA Study Team

Figure V-1 Proposed Organizational Structure of the Steering Committee

In the Study Part 3, the JICA Study Team has supported the establishment of the steering committee for the Agro-industrial Park in cooperation with MoNE and PIEFZA. This was realized by doing a preparatory member selection and drafting of an official agreement for the formulation of the committee. It is recommended that organizing and managing of the proposed steering committee commence prior to the implementation stage.

MoHE, MoTel, MoF, PITA, etc.

[38] The BDS Center, once completed, will take care of industrial promotion supporting tenant SMEs. (cf. V-2)

(ii) The Sub-committees under the Steering Committee

As mentioned above, the steering committee would be more efficiently managed by letting its sub-committees handle in-depth area-specific discussions. It is proposed that the following four thematic sub-committees be established under the control of the Steering Committee. The sub-committees will basically consist of the technical personnel of the steering committee members' organizations, while other relevant stakeholders may also be invited if necessary.

All the sub-committees are expected to render its best occasions in order to execute necessary coordination among various stakeholders of the project. Each participant will be required to understand the project objectives and to share the most updated information and timetable, so that project development will progress in a timely manner.

a) The Sub-committee on Implementation Scheme

The sub-committee on implementation scheme will deal with the organizational arrangement and the financial arrangement for the project implementation. This aspect is one of the core factors for the appropriate business scheme for the Agro-industrial Park.

Since the organizational arrangement and the financial arrangement are highly correlated, it would be reasonable to discuss both issues during the same sub-committee meetings as part of the implementation scheme.

As stated in Chapter IV, the business scheme by a public sector initiative turned out to be financially sustainable. PIEFZA will implement the Agro-industrial Park development project as a public developer, and would also be responsible for one-stop-shop services, operation and maintenance of infrastructures and utilities, marketing and administration inside the park. Role-sharing and demarcation for off-site infrastructures is to be further discussed. The sub-committee on implementation must highlight who will be responsible for the operation and maintenance of wastewater and solid waste treatment facilities. Security and supporting services such as catering, joint procurement and transportation services would be operated and maintained by a private sector under the supervision of PIEFZA. The institutional arrangement for the implementation and operation of the on-site/off-site facilities development will be foremost in the agenda of this sub-committee.

As for the financial arrangement, the issues to be discussed will cover financial planning together with financial resource arrangement for the project implementation. Section IV-4 provides cost and funding projection.

This sub-committee is primarily comprised of the member organizations such as MoNE, PIEFZA and MoF. MoNE, as the primal board member of PIEFZA is responsible for role/mission/legal status of PIEFZA as public developer. PIEFZA should prepare and develop its middle term business development plan in which it would be transformed into public developer. MoF is requested to appropriate PNA's own capital (equity) and identify sources of soft loans.

On-site infrastructure and facilities

One of the foremost agenda will be the equity fund for 20% of the initial investment cost, and borrowing of soft loan from international financial institutions for the remaining 80% to finance the on-site infrastructure and facilities. The likely financial sources of equity fund will be the external financing of the PNA and Palestinian Investment Fund (PIF). As of 2006, external financing for the PNA's fiscal budget support and public investment accounted for USD 740 and USD 170 millions, respectively. The PNA will have to arrange about USD 5 millions as equity fund in the case of Option 2 for simultaneous development of stages I and II. Said amount would be within the target of the external financing for public investment. PIF as a public investor has many experiences of investing various development projects. PIF's fund would be invested as paid-in capital. MoF shall be the borrower of the soft loan to be on-lent to a public developer (PIEFZA). PIEFZA as an implementer shall make the loan agreement with international financial institutions. Lending and on-lending conditions shall be the matters to be discussed by this sub-committee.

Off-site infrastructure and facilities

Financial sources of off-site infrastructure and facilities will be a grant or soft loan from donors. PIEFZA shall be the borrower of soft loan and make the loan agreement with donors, while the PNA (MoF) shall guarantee the soft loan.

Meanwhile, the stakeholders should consider the most updated circumstances before the final arrangements are made.

b) The Sub-committee on Technical Issues

The sub-committee on technical issues will deal with engineering issues related to the construction of the Ago-industrial Park. The matters to be discussed include a variety of issues at the technical levels involving planning, and construction, both for off-site and on-site facilities.

This sub-committee will function, in particular, as a forum where the prospective contractors and implementers of the on-site/off-site facilities will have to be organized to discuss specific roles. PIEFZA shall coordinate the different stakeholders who will be responsible for off-site infrastructures such as power transmission (JDECO) and water supply (Jericho Municipality). PIEFZA meanwhile shall be solely responsible for on-site infrastructures and facilities. The participants of this sub-committee may therefore include the parties mentioned in section V-1 (3).

Like the Technical Committee for the Jenin industrial estate, the sub-committee on technical issues will be comprised of PIEFZA as a secretariat and other infrastructure-relate agencies such as MoPW, PEA, PWA, and the Jericho Municipality.

c) The Sub-committee for Investment Promotion

The sub-committee for investment promotion will deal with promotion of direct investments into the Agro-industrial Park. PIEFZA, as the implementing agency, will have the ultimate responsibility for this direct investment promotion. However it will need the cooperation of PIPA and other national and international organizations.

The sub-committee will discuss issues involving the one-stop-shop services that will support PIEFZA's investment promotional activities, enhance the legal/regulatory framework to improve the investment environment such as provision of various sorts of incentives and other policies that are considered effective in promoting investments.

As stated in IV-3 of the Chapter IV, PIEFZA would invite talented and competent marketing resource persons from the outside or contract out private sector companies specializing in marketing activities. In order to identify prospective investors in Palestine, target-specific activities shall have to be planned based on statistical/profile data on prospective investors and firms attended in Ramallah investment promotion seminar held in November 2008.

The sub-committee on investment promotion will be comprised of PIEFZA, PIPA, PalTrade, PFI and PFIA. To date, investment promotion activities have been implemented by PIPA and PIEFZA respectively. This sub-committee would trigger off formulation of the better investment promotion framework such as basic policy of investment promotion, pricing policy and marketing strategy and activities, and amendment of income tax incentives). Both PIEFZA and PIPA should coordinate to tackle those issues. Other stakeholders would assist PIEFZA in identification of potential investors based on their information network.

d) The Sub-committee for Industrial Promotion

The Sub-committee for industrial promotion will deal with the promotion of business activities of the prospective investors in the industrial park. The issues to be discussed by the sub-committee include support activities for the tenant SMEs for their business development/improvement in areas such as supply system, logistics, technology and marketing system.

The BDS Platform designed as an advisory committee for business promotion of SME will be the first step to realize the business support services under a public-private partnership to be implemented in the proposed BDS Center. The sub-committee on industrial promotion should do the initial preparatory work for establishment of the BDS Platform. Such an initial preparatory work shall be done primarily by MoNE and MoA.

(2) Institutional Capacity Strengthening of PIEFZA

PIEFZA is mandated by the Palestinian Law No.10/1998 (PIEFZL) to undertake the development of industrial estates and industrial free zones, directly or through a developer[39]. PIEFZA is designated as the executing agency for the development of the Agro-industrial Park. In addition, it has to support this project in its capacities as regulator/supervisor, investment promoter, and one-stop-shop service provider, which are discussed in sections V-1 (2) (i), (ii) and (iii), respectively.

For all of these roles, PIEFZA will need capacity strengthening on human resources and financial resources. Neither its current number of staff nor its budget is sufficient for PIEFZA to accomplish its planned activities. The skills acquired by its staff (PIEFZA Gaza where about 50 staffs work for operation and

[39] Article 5.5.

maintenance, one-stop-shop service and marketing) through its experience in the Gaza Industrial Estate project have not been properly disseminated to the staff members of PIEFZA Ramallah who are working for its current West Bank operations.

Considering these, PIEFZA's own effort is very limited and ineffective. It is therefore recommended that to attainment such capacity strengthening, experts with appropriate skills should be hired or the existing staff be trained through the financial or technical assistance of the donor community. The Office of Prime Minister recently decided to increase the current and development budget for PIEFZA and contributed to the increase of its staff in the areas of environment and engineering.

(i) Capacity as the Implementing Agency

The role of PIEFZA as the implementing agency is discussed in detail in Chapter II. Majority of its current staff for the West Bank operation need enhancement of expertise, which will be vital for the implementation and management of the Agro-industrial Park. PIEFZA Ramallah has only 17 staff members as of November 2008 mainly due to the PNA's budget constraints. Such small number of staff is insufficient for PIEFZA to implement/operate the planned projects by itself. In addition, they are not competent enough, both in skills and experience, to sufficiently manage such projects. These circumstances indicate that technical assistance and grants for capacity strengthening of both human and financial resources should be extended to PIEFZA, in order to initiate training of its existing staff and hire skilled personnel.

(ii) Capacity as the Regulator/Supervisor

Serving as the developer[40], PIEFZA will be the regulatory and supervisory administrative body of the tenant firms in the Agro-industrial Park. The Agro-industrial Park development may burden PIEFZA with increased responsibilities such as project management activities including licensing, performance monitoring and report preparation[41], and for providing the proposed one-stop-shop services (please refer to section V-1 (2) (iv) "Capacity as the One-stop-shop Service Provider").

While PIEFZA as the industrial estates regulator determines the condition of a concession deed[42], its Board of Directors has the authority to grant concession for a project development upon the decision of the Council of Ministers, based on its internal procedures[43]. This means that The Director General of PIEFZA[44] will need an appropriate number of technical experts who will be able to screen applications received, and administrative staff who will handle the internal procedures in a timely manner. In this regard, it is essential that technical assistance from the donor community be extended for the required training and staff employment.

[40] Article 26, PIEFZL.
[41] Article 5.12, PIEFZL. The Board of Directors of PIEFZA also supervises industrial estates and publishes periodic reports, based on Article 10.2.
[42] Article 25, PIEFZL.
[43] Articles 5.2, 5.3, 5.4, 5.11, 18, 19, 20, 21 and 22, PIEFZL.
[44] The Director General of PIEFZA in Ramallah.

(iii) Capacity as the Investment Promoter

The PIEFZA Board of Directors is responsible in promoting industrial estates locally and internationally[45], in cooperation with the concerned authorities. Its aim is to attract investment in the industrial estates, directly/indirectly developed under the administration of PIEFZA[46].

PIPA[47] is responsible for FDIs promotion at the national level[48] by disseminating to the foreign countries the general information on the attractiveness of business in Palestine, in cooperation with other national/international organizations dealing with commerce, trade and investment. Hence, PIEFZA could more efficiently and effectively execute their mission in industrial estate promotion under close cooperation with PIPA.

(iv) Capacity as a One-stop-shop Service Provider

The major benefit of establishing one-stop-shop services is to extend prompt services to meet the investors' needs for smoothly pursuing their investment, instead of the existing complicated method. It is expected to provide a variety of information related to investment and facilitate required procedures.

Similar to other countries, the one-stop-shop services will cover following: (i) provide information on economic and regional data that will support industries and surrounding administrative areas, (ii) provide guidance for the competitiveness and incentives of the location, (iii) offer support services such as administrative scrivener and tax accountant, (iv) introduce related institutions, associations and enterprises who could be partners as investors. It is expected that these services, as positive incentives for investors and entrepreneurs, would attract and promote investment to the Agro-industrial Park.

There could be two types of the one-stop-shop service office, largely defined in reference to similar cases, depending on organizational structures. One is to set-up by assembling the relevant institutions at one place where all the necessary procedures could be completed within the one-stop-shop service office. The other is to open a single window as one-stop service office for the investors, in which necessary information and facilitation for investment would be provided to the potential investors, supported by relevant institutions. In the latter case, it is not necessary to assign and allocate permanent staff in the one-stop-shop service office from the related institutions, while they need to be networked closely. Use of electronic network might be encouraged in consideration of the application process volume to ensure more prompt provision of services.

In case the planned Agro-industrial Park would be developed according to stages, the single-window-type one-stop-shop services would be reasonable in terms of cost and flexibility, rather than in allocating permanent staff in charge from the relevant institutions. Meanwhile, it must be networked well with the relevant institutions in order to promptly and efficiently respond to the investors' needs, under the full commitment and coordination.

[45] Article 10.3, PIEFZL.
[46] The developer may promote the industrial estate with authorization from, and in coordination with, the Board of Directors (First Paragraph, Article 28, ditto).
[47] Article 16 of the Law on the Encouragement of Investment in Palestine ("Investment Law") stipulates that the functions of the Board of Directors of PIPA shall include attracting investors to Palestine (Clause 3), and development of a close working relationship with the concerned Palestinian authorities to share a unified national investment strategy (Clause 13).
[48] Article 16, Investment Law. Including policy advice, enforcement monitoring the legal/regulatory framework, and research on development and modernization of the legal/regulatory framework.

(3) Management of Off-site Infrastructure for the Agro-industrial Park

Based on the business plan study in Chapter V, in terms of financial viability, around 80% of the total development cost is deemed to be secured through soft loans arranged by the PNA, while the remaining 20% shall depend on the equity fund source in Palestine. This means that most of the on-site/off-site facilities planned for the Agro-industrial Park are necessary to be covered by the public finance, with the understanding that they have relatively high public nature regardless if the facility is defined as on-site or off-site.

Given the general understanding above while considering the public nature of each facility, the prospective construction undertakers and financial contributors of the off-site components are expected. Designation of the off-site infrastructure operators will require further discussions among the relevant stakeholders of the sub-committees under the steering committee.

a) Access Road

Existing road improvement and new road construction are planned to secure smooth accessibility to and from the Agro-industrial Park, according to development stages. Since the access road is anticipated to contribute not only to the Agro-industrial Park development project but also to the users in the vicinity, it will have positive impacts to the local economy. The improvement/construction and the daily maintenance works of the access road should be implemented by the Ministry of Public Work and the Jericho Municipality respectively.

b) Power Supply

The construction works of the off-site power supply facility, which include the transmission lines of 33 kV from the nearest JDECO sub-station to the Agro-industrial Park, will be undertaken by JDECO by utilizing grant or soft loans from donors. After completion of the works, JDECO shall take the responsibility for the operation and maintenance of both the on-site and off-site facilities, by collecting electricity tariff from the tenant enterprises.

c) Telecommunication Facility

In the case of usual subscribers, PALTEL, a commercial telecommunication service provider, installs a connection line from a nearby switching facility to a new customer at its own expense. It is proposed that PALTEL installs and operates the off-site telecommunication facility (connection line from the PALTEL area station and on-site telecommunication facilities) and then enter into contract directly with the tenant firms of the Agro-industrial Park[49]. However, it might finally depend on further discussions among the relevant stakeholders as to who would bear the construction costs of the off-site facility.

d) Water Supply Facility

The water transmission pipeline needs to be installed from the designated water sources to the development site. There are three potential water sources so far identified and technically studied in Chapter III, i.e., existing irrigation wells, existing water system of the Jericho Municipality, and Mekorot.

[49] In the case of the Jenin Industrial Estate, PALTEL will contract directly with the customers (the tenant firms) and will charge them according to the tariff schedule.

It is proposed that the construction works of the off-site water supply facilities are to be undertaken the Jericho Municipality by utilizing grant or soft loan from donors. Daily operation of the off-site water supply facility shall be undertaken by the Jericho Municipality or PIEFZA. Operation and maintenance cost for the off-site facility (transmission pipeline) shall be initially borne by the operator and be recovered through a revenue-sharing scheme in which the developer could share with the operator the surcharge collected from the tenants in proportion to their cost expenses (considering the operation and maintenance costs for a certain period, both for on-site and off-site).

e) Wastewater Treatment Facility

The final treatment facility will be developed geographically within the boundary of Agro-industrial Park, to accommodate daily throughput. Raw waste water will be pre-treated individually by each factory, and processed under the responsibility of the municipal services. Since there are no existing public entities managing collective wastewater treatment facilities in Jericho, the final treatment facility will need to be constructed and operated under public funds and ownership (not PIEFZA). However, PIEFZA should construct the on-site facility (sewage network). Since both on-site and off-site facilities will consist of an integrated network inside the Agro-industrial Park, these could be more efficiently managed as an integrated operational system. In such a case, PIEFZA should either operate the facilities by itself or outsource the operation. The revenue-sharing scheme may apply to the water treatment service, in which the service fee revenues collected from the tenants will be shared between PIEFZA (the on-site developer, or the operator, if outsourced) and the non-PIEFZA public entity that will own the off-site facility, in proportion to their respective operational expenses. The operational scheme will need to be discussed at the steering committee and the subcommittee on implementation scheme.

f) Solid Waste Treatment Facilities

The system for resource recycling, composting, sludge dewatering, and treatment of other solid wastes is planned to be introduced in consideration of environmental protection. While it is planned for public needs, there is no existing relevant public entity that could manage the entire system. The developer, PIEFZA, will need to establish the management system, in cooperation with EQA, the tenant firms, and other stakeholders, leaving most of the following treatment procedures to the responsibility of the outside service providers:

- The recyclables will be sorted out by each tenant firm and collected by designated private agents of recycled resources at the market price, or free-of-charge.
- The composting plant to recycle food-processing waste would need to be installed by non-PIEFZA public funds, and operated by PIEFZA with its hired in-house engineers, since no entity has been identified as a capable long-term operator. The operating costs will be recovered through the service rate (surcharge) collected from the tenants and the sales of the compost output.
- Sludge will be treated by the dewatering facility, to be installed with public funding. Management will be by the PIEFZA, with the operating costs recovered by the service rate (surcharge).
- Collection from each tenant and transportation to a landfill site of other solid wastes will be outsourced to JCspd. The fees payable will be recovered by the surcharge.

V-2 Business Support Scheme for Industrial Promotion

As described in Chapter II, the planned Agro-industrial Park is expected to contribute to the future goals on industrial promotion in the JRRV, i.e. “improvement in agriculture”, “promotion of agro-industry” and “enhancement of competitiveness in the export market. According to the results of a market survey in Jordan and the Gulf countries conducted by the JICA Jordan Office, at least three major issues need to be solved to achieve the aforementioned goals. These are “stable supply of products”, “improvement of quality and safety” and “reduction of transaction costs”.

Although domestic enterprises are expected to be the major players in the Agro-industrial Park, it is undeniable that most of the agricultural products traders and enterprises in food processing industries in Palestine are the SMEs[50], especially small enterprises where employment size per company ranges from five to nine workers. Therefore, appropriate business support schemes which would enhance business activities of the SMEs should be developed to attract them to invest in the Agro-industrial Park.

This section deals with the necessary framework for providing appropriate business support schemes to the tenant enterprises and related parties in the Agro-industrial Park. It consists of four parts namely, existing condition of the food processing industry in the West Bank, existing business support schemes and its features, demand estimate of business support, and establishment of the BDS Center and the BDS Platform.

(1) Existing Condition of the Food Processing Industry in the West Bank

Outline of the Food Processing Enterprises

As indicated in the following table, there exist only 21 enterprises in Jericho Governorate engaged in the manufacture of food and beverages. Assuming the Agro-industrial Park accommodates tenant enterprises employing more than 10 employees[51], only three enterprises in Jericho Governorate may be considered as the potential tenant enterprises. Therefore, most of the invited potential tenant enterprises must be from outside of Jericho.

Table V-2-1 Number of Enterprises for Manufacture of Food and Beverages in Jericho Governorate

Economic Activity	Employment Size Group						Total
	1-4	5-9-	10-19	20-49	50-99	+100	
Manufacture of food and beverages	13	5	2	1	0	0	21

Source: PCBS 2007

[50] The Small Enterprises Center (SEC) has adopted the following definition of SMEs: self-employed entrepreneur (single person operation), micro enterprises employing 2-4 persons, small enterprises employing 5-9 persons, and medium enterprises employing 10-25 persons.

[51] As mentioned in the Table II-2-2, land size per factory in the Agro-industrial Park is classified into four categories: i) ~0.25 ha, ii) 0.25 ha, iii) 0.5 ha, and iv) 0.5 ha~. Assuming the land size per factory in the first category is 0.125 ha, floor area is estimated to be about 0.06 ha per factory based on the land use regulation of Jericho Municipality stipulating that a building-to-land-ratio is limited within fifty percent (50%). This size of floor area (0.06 ha) would accommodate about 12 employees considering that the number of employees per hectare in a food processing industry is around 200, according to the investment survey. Based on this result, JICA Study Team assumes that the enterprises employing more than 10 employers would be potential tenant enterprise of the Agro-industrial Park.

The following table shows the number of enterprises in the West Bank engaged in the manufacture of food and beverages by employment size group. According to the statistics of PCBS 2007, the number of enterprises employing more than ten people is 135.

Table V-2-2 Number of Establishments in Operation in the West Bank

Economic Activity	Employment Size Group						Total
	1-4	5-9-	10-19	20-49	50-99	+100	
Manufacture of food and beverages	1,417	386	105	19	7	4	1,938

Source: PCBS 2007

The following table shows the number of member enterprises of the Palestinian Food Industry Association (PFIA) by employment size group. The number of member enterprises in the West Bank that employs more than ten employees is 113.

Table V-2-3 Distribution of Member Enterprises of PFIA (based on the size of employees)

1-4	5-9-	10-19	20-49	50-99	+100	unknown	Total
4	16	49	35	14	15	6	139

Source: PFIA directory

According to Table V-2-2 and Table V-2-3 above, the number of potential tenant enterprises in the West Bank employing more than ten people is estimated to range from 110 to 135, while the number of factories that the Agro-industrial Park can accommodate in stages I and II, as planned, is 63. It seems difficult for the Park to be occupied only by enterprises which employ more than ten employees. Therefore, small-sized enterprises employing from five to nine employees also must be targeted as the tenant enterprises. It is thus necessary to enhance the business performance of the small-sized enterprises from the various aspects such as the number of employees, production scale, and technical improvement so that these small-sized enterprises will be able to invest in the Agro-industrial Park.

Analysis of Supply Chain

The Phase I Study found that price of existing export products from Palestine are generally less competitive in the market because of the dependence on imported raw materials[52], and relatively high wages and transportation costs. As for the movement of goods on both imported raw materials and exported products, it was identified in the course of the Study Part I that many enterprises pointed out delays in deliveries due to Israeli security inspections at checkpoints and commercial terminals such as Tarqumia and Betunia, including the time required for back-to-back reloading process. Frequent changes of time and schedule for the inspections also lead to unpredictable delivery activities particularly for enterprises which pass through checkpoints. The back-to-back process at commercial terminals and the Allenby Bridge gives rise to increased transportation costs and damages to raw materials and products. In addition, import limitations imposed on some chemical substances used for food processing impedes business activities of the food processing industry. Appropriate countermeasures to remove and/or relax such limitations, would have considerable advantages to the Agro-industrial Park. Based on the result of the Study Part 1, the following

[52] Raw materials of meat and dairy products, and bottles and packaging materials highly depend on imports in Palestine.

ideas may be proposed as possible countermeasures to improve movement and access to the Agro-industrial Park.

<Short-term Improvement: Operational improvement>

a) Improve efficiency and handling capacity of checkpoints and commercial terminals through increase in staff and extension of opening hours.
b) Facilitation of smooth passage of registered drives/vehicles.
c) Advance notification of shipment to security authorities.
d) Announcement of closure and opening hours.
e) Priority lanes for perishable goods

<Long-term Improvement: Facility and Institutional improvement>

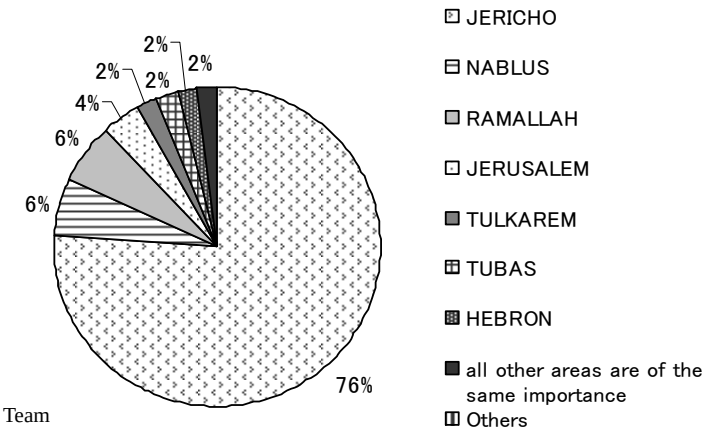
f) Increase in capacity of facilities at terminals
g) Priority lanes for perishable products]
h) Warehouse and cooling facility at terminal
i) Joint procurement/ delivery system in the Agro-industrial Park

The more detailed description of the short and long-term improvement was presented in Final Report of the Study Part 1.

Potential of Jericho as an Export Terminal

Since the Agro-industrial Park is expected to function as an export terminal to Jordan and other Gulf countries, domestic export enterprises would be the prime target being the potential tenant enterprises. According to the export directory of 2007 published by PalTrade, there are about 50 existing export enterprises in the food processing industry in Palestine, while the capacity of the Agro-industrial Park can accommodate 63 factories as planned in stages I and II. Moreover, based on the investment survey[53]conducted in the course of the Study Part 2, 76% of the surveyed enterprises replied that Jericho is the best region for investment (see Figure V-2-1). As for their target market (see Figure V-2-2), more than half of the surveyed companies selected Jordan as their best market in the future, while around one fourth of them selected the Gulf countries (mainly Saudi Arabia and United Arab Emirates). Although 50 of the surveyed enterprises vary in size from small to large-scale manufacturers based on their number of employees or their production amount and sales, it could be concluded that all of these enterprises express interest in Jericho as a suitable location for investment, and Jordan as its market should invest in the Agro-industrial Park. Furthermore, it could also be understood that most of the surveyed enterprises anticipate the future potential of the Jericho region in terms of its good accessibility to export markets.

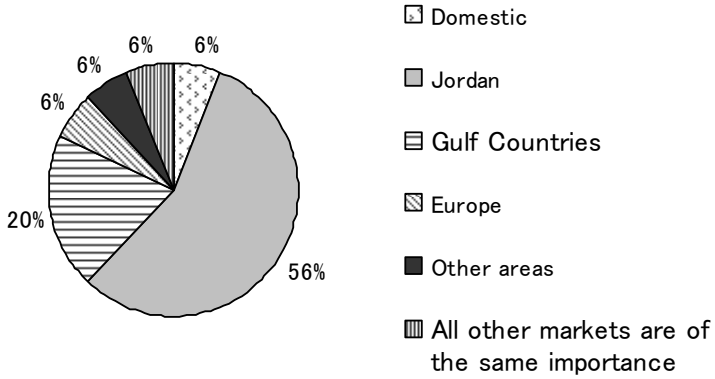
[53] The number of the sample enterprises is 50 in the following five sectors: food processing, perishable food, animal feeds, pharmaceuticals, and supporting services.



N (the number of samples) =50

Source: JICA Study Team

Figure V-2-1 Selection of Region for Investment



N (the number of samples) =50

Source: JICA Study Team

Figure V-2-2 Target Market for the Future

(2) Existing Business Support Schemes and its Features

Table V-2-4 shows organizations which have business support schemes in Palestine[54]. There exists a variety of business supporting services such as business consultation, assistance in the acquisition of certifications (e.g. GAP, ISO series), access to financial support, and provision of market information.

[54] Since support schemes on agriculture including assistance to farmers are considered as business support in the broad sense for the procurement of raw materials, these schemes are also mentioned in the table as business support schemes.

Table V-2-4 Major Business Support Schemes in Palestine

No	Name	Status	Activities	Donor's support
Business support Schemes				
1	Ministry of National Economy (MoNE)	Government	- Support programs for industrial promotion policies, services, monitoring and planning including SMEs promotion	UNIDO
2	Ministry of Health (MoH)	Government	- Inspection of hygienic management for factories	
3	Ministry of Labor (MoL)	Government	- Support programs: training/ seminars for human resource development	
4	Palestine Standards Institution (PSI)	Government	- PS Mark certification, provision of information on regulations standards	
5	Palestine Federation of Chambers of Commerce, Industry and Agriculture (PFCCIA)	Federation	- Issuing certificate of origin to export product - Consulting services, Training/seminars - Promoting Palestinian products in domestic and export market	UNDP, EU USAID etc.
6	Palestine Food Industry Association (PFIA) * Industrial Modernization Center (IMC)	Association	- Training/seminars on quality management, certificate (ISO22000, HACCP etc.) and marketing etc. - Consulting on product development and technical upgrading, etc. - Promoting Palestinian agro and food processing products	
7	Palestinian Businessmen Association (PBA)	Association	- Provide federal business man cards(BMC) - Trade promotion - Human resource development - Market and sector development	
8	Palestine Shippers Council (PSC)	Association	- Collective negotiations, Cooperation arrangements, Advisory services - Provide the latest information - Direct assistance to Palestinian shippers - Training workshops	UNCTAD, UNDP
9	Small Enterprise Center-Palestine (SEC)	Non-profit organization	- Improving the performance and quality of services delivered by local consultants and BDS providers. - TOT and TOC Training programs. - Training: vocational, managerial, language and computer skills.	GTZ
10	Palestinian Agricultural Relief Committees (PARC)	Non-profit organization	- Training and Support on farming, product processing and development to empower rural farmers. - Supporting product export as a fair trade by establishing a commercial company under PAR.	UNDP, IFAD, EU, Netherland, Government of Japan
11	Arab Center for Agricultural Development (ACAD)	Non-profit organization	- Business Financial Support services to the poor and low-income Palestinian producers.	EU, GEF, IDB etc.
12	Palestine for Credit & Development	Non-profit organization	- Provide micro-finance services. - Group Guaranteed Lending and Savings (GGLS) program.	Ireland Aid, DFID, USAID etc.
13	Palestine Trade Center / PalTrade	Non-profit organization	- Promoting Palestinian products for export market - export facilitation and marketing information, etc. - Training/seminars on promotion, quality improvement and - Technical upgrading	USAID, IFC, World Bank, IDB, Norway
14	The Economic and Social Development Center- Palestine (ESDC)	Non-profit organization	-Technical assistance and transfer of knowledge for business planning	
15	Birzeit University	University	- Provides Training/educational Activities on administration and management, counseling and social work, gender, environmental issues, small micro-enterprises, investment and credit, computer skills etc.	
16	Al-Najah National University	University	- IT and communication services including Consulting, programming - Project management - Technical consultation	
17	Al-Quds University	University	- Research on agro-food sector	
18	Paltel Group	Private sector	- Setting up IT/telephone/LAN	
19	WASSEL Distribution & Logistics Services	Private sector	- Logistic services	
20	Global Group for Administrative Consultancies	Private sector	- Training for Management	
21	Business Excellence Services Co. Ltd (Besco)	Private sector	- Basic training on food sanitation - Consulting for certification of ISO series/GAP	
Support schemes to farmers and farmer's cooperatives				
22	Ministry of Agriculture (MoA)	Government	- Support programs for agricultural marketing	
23	Palestinian Farmers' Union	Union	- Raise farmers' general awareness regarding their benefits and economical, social and political rights - Activate affecting sides' role in farmers' issues and problems	Swiss Government, Government of France etc.
24	The Agricultural Cooperative Union	Union	- Education and training for cooperatives - Agricultural marketing and processing cooperation	
25	Reef Finance	Non-profit organization	- Loan for farmers and farmer's cooperatives	Netherlands

Source: JICA Study Team

The business support schemes of the PNA agencies, private sectors, and donors are summarized as follows.

Support Scheme by the PNA

The PNA agencies provide specific services. For example, the MoNE provides administrative services such as industrial licenses, company registration, and export/import certification and implements technical assistance programs for the modernization of enterprises through the assistance of UNIDO. Meanwhile, Support schemes to farmers and farmer's cooperatives are interpreted as services in a broad sense. The MoA assists farmers in post-harvesting, and research and development. MoA also provides agricultural extension services in cooperation with the National Agricultural Research Center (NARC) which conducts research on the improvement of agricultural productivity. In this way, the PNA agencies provide services to enterprises at subsidized prices with the availability of financial/technical assistance from the donor agencies.

Business Support Scheme Provided by the Private Sector

Many non-profit organizations such as PalTrade, Industrial Modernization Center (IMC), Small Enterprises Center (SEC), and Palestinian Agricultural Relief Committee (PARC) play a responsible role to support business in Palestine. PalTrade provides business support services on export promotion, marketing, e-marketing, web page designing, and other related services to an estimated 170 registered members in all sectors. IMC, the affiliate organization of PFIA, has support programs on quality improvement and the acquisition of certifications for the industrial sector. For the agribusiness and food processing industry, IMC provides periodical consulting services on ISO or HACCP to its member-enterprises. SEC contributes to the development of the Palestinian private sector, in particular, micro and small enterprises, through the provision of various kinds of trainings, consultation to entrepreneurs, and business information. SEC also provides special training programs to local consultants and BDS providers in order to improve the performance and quality of their services. The existence of SEC is significant since most SMEs are not able to either identify their needs objectively or access providers for their needs. PalTrade, IMC, and SEC mostly rely on donor-assisted projects for the extension of their services. PARC empowers farmers in pre-harvest and post-harvest farm technology, and GAP certificate by utilizing the profits generated from its own factories in the West Bank.

There are many consulting companies in the area of management and market information. On the other hand, there are only few private consulting companies specializing in technology and product development in the agribusiness and food processing industries.

Donor's Support Scheme

The role of the donor community is vital in providing business support programs in Palestine, from launching a project to maintaining and monitoring the services, for instance, the establishment of the SEC supported by GTZ and the implementation of the Palestinian Agribusiness Partnership Activity (PAPA) project funded by USAID. While many donors prefer to utilize supporting institutions and private business support providers directly for their projects, there are only a few of such service providers in the private sector. Thus, the donors' strategy for business support programs has primarily been focused in supporting facilitators whose major role is the gradual expansion of business support programs based on analyses of

users' needs. A parallel strategy involves the identification and training of private service providers.

(3) Demand of Business Support for the Agro-industrial Park

Anticipated Business Support Schemes

Based on the review of existing conditions of food processing industries, and current business support schemes intended to attract SMEs in investing in the Agro-industrial Park, the anticipated business support schemes can be summarized as follows (refer to Table V-2-5). These are particularly related to the three targets for the enhancement of export, i.e. "stable supply of products", "improvement of quality and safety" and "reduction of transaction costs".

Table V-2-5 Anticipated Business Support Schemes

Demand of business support	Support services	Support providers
(1) Stable supply of raw materials		
- Quality improvement of raw materials	GAP certificate/ post harvest Joint procurement system	PSI/MoA/PFIA/PARC/ESDC/ Private sector
- Stable supply of raw materials (quantity)		Palestinian Farmers Unions Palestinian union of agricultural workers
(2) Improvement of quality and safety		
Production improvement	ISO series / HACCP	PFIA/ IMC
- Quality improvement	Laboratory testing	Birzeit University
- Food safety improvement		MoH/MoA/MoNE/PSI/ Private sector
	5 S/ Kaizen	
- Production management （HRD）	Packaging technology/skills	
- Packaging improvement		
Management improvement （HRD）	Trainings for management / accounting	Private sector
- Management / Accounting	Trainings for ICT	Private sector
- ICT improvement		
Financial access		
- Loan programs	Loan programs for SMEs and farmers	Reef Finance / ACAD
- Credit guarantee system	Credit guarantee system	Banks
- Transportation insurance	Transportation insurance	
Product development		
- Design development	Design development / improvement	IMC/ Private sector
- Branding	Branding strategy	PalTrade/ Private sector
Administrative procedure		
- Registration / Licensing	One-Stop-Shop-Services	PIEFZA/ MoNE
(3) Reduction of transaction cost		
Market access	Market information	PalTrade/ PBA/
- Market information (regulations/ trend)	Trade fairs program	PalTrade/ Private sector
- Introduction of trade fairs	Business consultation	Private sector
- Business consultation		
Logistics improvement		
- Improvement of warehouse system	Joint warehouse/ cold warehouse	Private sector
- Improvement of distribution system	Cold chain/ common distribution center	PSC/Private sector
- Improvement of transportation (back-to-back system)	Efficient distribution system	PSC/ Private sector

Source: JICA Study Team

Remaining Issues

There exist a variety of business support schemes in Palestine, which include assistance on agricultural improvement that provide appropriate services to the tenant enterprises in the Agro-industrial Park and to their raw material suppliers such as agricultural cooperatives and farmers. However, the following issues still need to be further improved to enhance business support schemes in Palestine.

<Gap of Service Menu between Supply and Demand>

The number of organizations which provide specific services such as legal, market information on export countries, and production technology/product development is still limited compared to those that provide general services on business management such as accounting and auditing.

<Gap of Service Price between Supply and Demand>

In general, most Palestinian SMEs are still unable to access business support services, particularly those provided by private consulting firms due to high service costs. If these SMEs are organized as a group and the necessary support services are provided to them, their accessibility to the business development schemes will therefore increase since the cost per SME will consequently reduce.

<Weakness of the Role of Government>

In order to fill in the aforementioned gaps on business support schemes in Palestine, the PNA may take necessary countermeasures. However, in reality, implementation of business support to SMEs by the PNA as well as organizations providing business support services depend highly on financial assistance from the donors. Furthermore, since the several donors have direct support schemes to the private organizations, due to the weakness of coordinating functions by the PNA, the donor support to the government and private organizations are implemented separately in many cases. In the current trend, support for the private business has been promoting under the public and private partnership (ppp). Thus an establishment of an appropriate structure such as the BDS Platform based on ppp is strongly recommended.

(4) Establishment of Business Development Services (BDS) Center and BDS Platform for the Agro-industrial Park

Establishment of BDS Center in the Agro-industrial Park

It is proposed that a BDS Center be established as one of the incentives of the Agro-industrial Park. The center aims to provide various kinds of business support such as introduction/development of business support schemes including financial support, arrangement of trainings/seminars, and provision of market information/business consulting services to the tenant enterprises in the Agro-industrial Park. The services provided by the BDS Center would contribute in improving the business performance of those tenant enterprises in terms of efficiency and profitability, and attracting other enterprises to participate/invest in the Agro-industrial Park in the future.

The expected roles of the BDS Center are listed as follows:

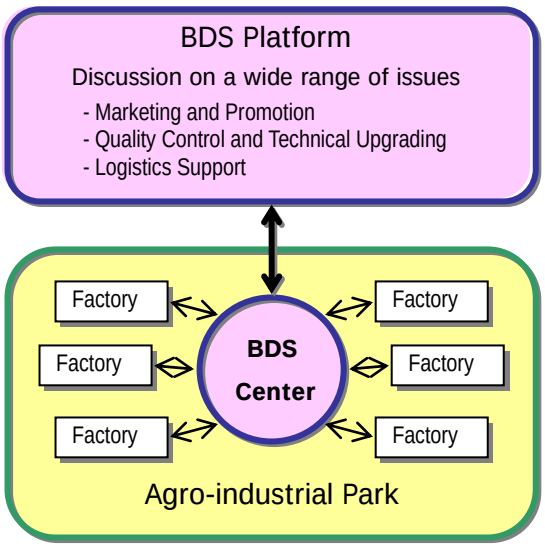
- Introduction of business support providers, including the provision of market information and business consultation;
- Formulation of necessary support programs; and

- Facilitation of the implementation of support programs.

In order to secure a stable supply of raw materials, the training of farmers for obtaining GAP certificate in the Jericho area can be organized by the BDS Center. To improve the quality and safety of the products, the BDS Center may introduce appropriate business service providers such as management consulting firms, universities which have laboratories for testing, and support organizations for acquiring ISO series and HACCP certificates. Overseas market information such as regulations and trade fairs can also be provided through cooperation with a trade promotion organization, i.e., PalTrade. The BDS Center could provide the link between business support providers and the tenant enterprises/factories in the Agro-industrial Park as well as related parties like raw materials suppliers, i.e. farmers, traders and small-sized manufacturing enterprises. Therefore, it is expected to act as a supporting organization of the Agro-industrial Park, which can become the production base for agro-industry as well as an export terminal in the JRRV.

Establishment of the BDS Platform

The tenant enterprises can gain privileges through the services of the BDS Center. However, there are several serious issues caused by distinctive bottlenecks in the Palestinian economy such as high transaction costs or weakness of SMEs which may not be solved by the BDS center alone. These issues still exist and are a cause of concern by all related parties of the Agro-industrial Park. Hence, appropriate countermeasures should be taken into consideration. For instance, the organization of a contract farmer's union consisting of individual farmers in Jericho would help contribute to the stability in the supply of raw materials to the Agro-industrial Park. Arrangement of group training courses would also enable SMEs to participate in valuable trainings such as HACCP and ISO series at low cost. The establishment of joint facilities such as a packaging/distribution center and cold warehouse funded by financial support schemes would have a significant impact in the reduction of transaction costs of each tenant enterprise. These activities cannot be planned and conducted by the BDS Center alone, but could be realized with the strong cooperation of various stakeholders led by the government's initiative.



Source: JICA Study Team

Figure V-2-3 Schematic Image of BDS Platform and BDS Center

It is therefore proposed that an advisory committee for the BDS Center, namely, the BDS Platform, be established, consisting of relevant stakeholders from both the public and private sectors. In the BDS Platform, a wide range of issues could be discussed, which could include potential problems of the BDS Center as well as practical solutions and technical assistance that may be provided by the government. Figure V-2-3 illustrates a schematic image of the BDS Platform and the BDS Center.

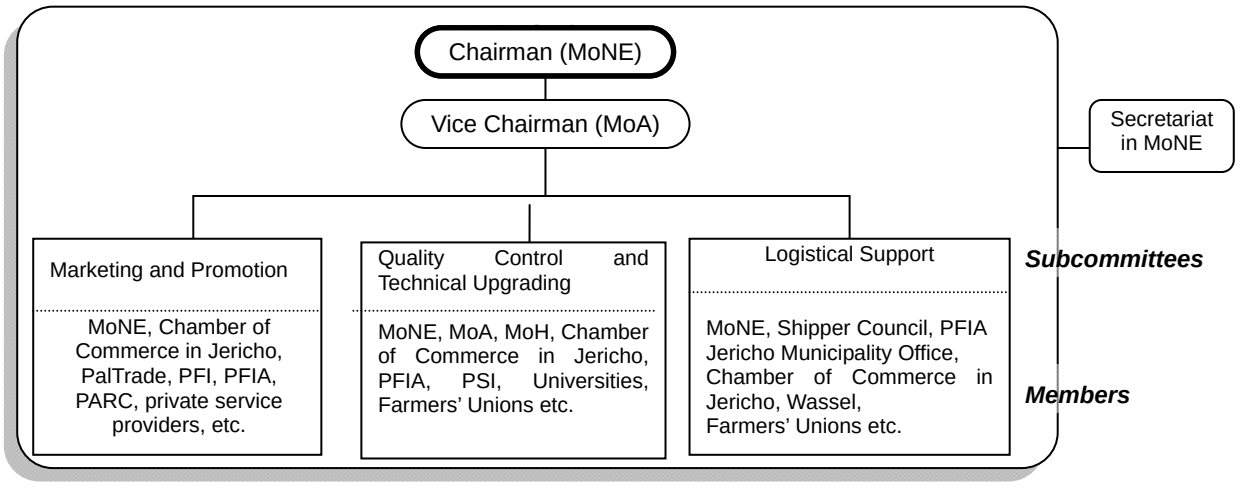
Implementation Structure

<BDS Platform>

The BDS Platform is designed as an advisory committee under a public-private partnership scheme in order to provide the necessary advice on the activities of the BDS Center. The members of the BDS Platform are tentatively planned as follows:

Central Government	Ministry of National Economy, Ministry of Agriculture, Ministry of Health, PIEFZA
Local Government	Jericho Municipality office
Business Support Schemes (Providers)	Chamber of commerce for Industry and Agriculture in Jericho, PalTrade, PFIA, PSI, Shipper Council, PARC, farmers unions, research institutes, Business consulting firms, logistics firms, etc.

Figure V-2-4 presents a schematic image of the BDS Platform. It would be chaired by MoNE, under which a vice chairman from MoA and three subcommittees are designated. In this platform, key issues related to the activities of the BDS Center shall be discussed to determine appropriate solutions and necessary countermeasures to be taken.



Source: JICA Study Team

Figure V-2-4 Schematic Image of BDS Platform

The first step in the mobilization of the BDS Platform and the BDS Center would involve the setting up of three subcommittees namely, i) marketing and promotion, ii) quality control and technical upgrading, and iii) logistical support.

(1) Marketing and Promotion

In Palestine, most of the enterprises lack marketing and promotion skills, resulting in the loss of export opportunities. Some of them are not aware of the importance of marketing and promotion. Thus, the subcommittee should discuss specific agenda such as market information, promotion of Palestinian products, domestic and international exhibitions, business matching, and seminars/training for marketing and promotion.

(2) Quality Control and Technical Upgrading

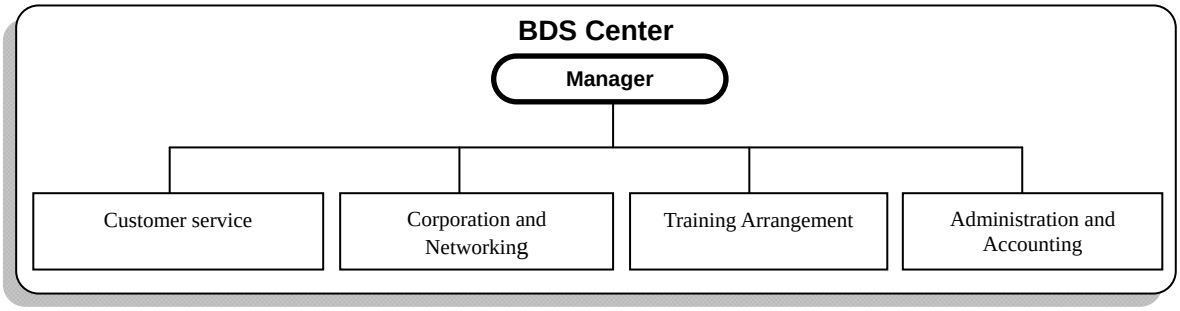
To achieve competitiveness in the export market, enterprises must have international certificates such as ISO 22000 in the field of quality control. They must also improve their processing and packaging technology. Thus, the subcommittee should discuss agenda items such as seminars/training for quality control, packaging and IT, acquisition of certificates of international standards (e.g. ISO 22000, HACCP), and research and development facilitation.

(3) Logistical Support

Enterprises are vulnerable to high transportation costs and damages caused by delays and the unpredictability of deliveries due to the current movement restrictions. Since most of the enterprises are SMEs, they need logistical support such as a collective delivery system so that losses in cost, time and damages are minimized. The sub-committee on logistical support should therefore discuss as key agenda items, facilitation for the cold chain and for the efficient utilization of logistics.

<BDS Center>

Relative to the management of the BDS Center, the Industrial Development Department of MoNE shall be the leading stakeholder in charge of facilitation of services at the BDS Center. An appropriate number of staff from MoNE will be assigned for the BDS Center and will be expected to take the role of facilitator. Figure V-2-5 is an expected organization structure of BDS Center. At the beginning stage, total five personnel will be assigned as staffs of the center.



Source: JICA Study Team

Figure V-2-5 Expected Organization Structure of the BDS Center

The manager shall be responsible for the entire operation of the BDS Center and provide the necessary advice on business activities upon the request of the tenant enterprises. It would be worthy to consider recruiting a person from the private sector with experience in the business field, to become the manager of the BDS Center. The customer services staff is in-charge of the provision of services related to inquiries such as the introduction of suitable business support service providers. The corporation and networking plans staff formulates business support programs with the cooperation of other relevant organizations based on the demand of the tenant enterprises. The training staff will organize various kinds of activities related to trainings/seminars. At the initial stage, as aforementioned, the BDS Center provides appropriate services to the tenant enterprises in the three fields, i.e., i) marketing and promotion, ii) quality control and technical upgrading, and iii) logistical support. The types of services to be provided by the BDS Center would be

expanded gradually according to the requests of the tenant enterprises. The operational budget of the center must be fully supported by the PNA at least during the initial stages of development. However, from the viewpoint of its long-term sustainability, it would be appropriate for the BDS Center to adopt a self-generated income system in the future by collecting membership fees or service fees from the tenant enterprises, based on the number of tenant enterprises as well as the improvement of services provided by the center. During the commencement stage of operation, the BDS Center office will be temporarily set up in a designated office building for the Agro-industrial Park. Once the construction of the BDS Center is completed and equipped with business support offices, seminar/meeting rooms, exhibition hall, and other necessary facilities, its operations will move to this new building and provide more enhanced services.

Significance of the BDS Center and BDS Platform as a Base of Industrial Promotion

The BDS Center, as a facilitator of business support schemes in the Agro-industrial Park, should identify the actual demands and/or constraints of the tenant enterprises and take necessary actions. As for the issues which cannot be solved by the BDS Center, it should seek advice from the BDS Platform. The BDS Platform would discuss the root of issues raised by the BDS Center and formulate new support programs if necessary, by fully utilizing its network. As a result, the BDS Center would be able to facilitate new support programs to the tenant enterprises.

Through the interaction between the BDS Center and the BDS Platform, a feedback system for solving problems of the tenant enterprises should be established based on public-private partnership. This practical experience can be a good model for the industrial promotion in Palestine.

However, for further discussion, the following points should be shared among all the stakeholders concerned of the Agro-industrial Park in terms of agro-industry promotion in the West Bank.

- Although most enterprises in the food processing industry are SMEs, some of them that are currently exporting and those that plan to export, are considered potential tenant enterprises. Thus government-assisted programs should be developed for these enterprises.
- While there are only 21 food processing enterprises in Jericho[55], it has a comparative advantage on the production of fresh vegetables and fruits, in particular, during the winter season (from November until March). Therefore, business support programs linking farm producers and the tenant enterprises need to be arranged. In short, the BDS Center is to be placed as a base of industrial promotion in the regional development of Jericho with the cooperation of other JICA technical cooperation projects such as agriculture improvement, community development, and water resources management.
- Capacity building of MoNE and PIEFZA is indispensable for the success of the management/operation of both the BDS Center and the BDS Platform. Furthermore, since Intifada 2000, the budget of the Palestinian government highly depends on financial assistance from donors[56]. Under such special conditions, continuous financial assistance from donors is absolutely imperative in developing the private sector and capacity building of the government.

[55] PBSC 2007
[56] According to the MoNE, almost all of the project budgets including support programs to SMEs are funded by donors.

Chapter VI Conclusions and Recommendations

The Phase II Study concludes that a business scheme by private sector initiative would be difficult for the Agro-industrial Park development based on the results of financial viability of a developer. Therefore, a business scheme by public sector initiative is assumed to discuss the further development of Agro-industrial Park. In this chapter, the conclusions and recommendations leading to the proposed implementation stage are presented, based on the results of this feasibility study.

(1) Business Schemes of the Agro-industrial Park

The Study presents two business schemes, i.e. business schemes by a private developer and by a public developer. For both schemes, the financial analysis is made based on public financial assistance options in which part of the on-site infrastructure would be financed by grant funds of donors since the financial analysis indicate that a developer would find it difficult to attain the required returns without public financial assistance.

The financial analysis is made for three cases: i) simultaneous development of stages I and II, ii) stage-wise development of stages I and II, and iii) independent development of stage I, by setting options of a combination of public financial assistance and annual lease rates. It is noted that the lease rates are found to be higher than the prevailing market rates in the neighboring countries such as Jordan.

In the case of the simultaneous development of stages I and II, only the option of a combination of higher annual lease rates and higher public financial assistance sustains the financial viability of the business scheme by a private developer. No option sustains financial viability of a private developer in the two other cases of the stage-wise development of stages I and II, and independent development of stage I.

This implicates the difficulty in finding a private developer and tenant enterprises for the Agro-industrial Park under a business scheme by private sector initiative.

However, the results of the financial analysis based on the business scheme by public sector initiative turn out to be better than those based on the business scheme by private sector initiative.

In the case of the simultaneous development of stages I and II, financial viability of a public developer turns out to be sustainable in some combinations of public financial assistance and lower annual lease rates. This implies that the business scheme by public sector initiative would be possible as indicated in Tables IV-4-18, IV-4-19 and IV-4-20.

(2) Conditions for the Agro-industrial Park Development by Public Sector Initiative

The conditions for the Agro-industrial Park development based on public sector initiative by a public developer are:

a) Public financial assistance for part of on-site infrastructure and facilities;
b) Equity funding from the PNA for 20 % of the initial investment cost;
c) Borrowing of soft loans from international financial institutions for 80 % of the initial investment

cost;

d) Institutional strengthening of PIEFZA as a public developer;
e) Investment promotion by the developer to fulfill the occupancy scenarios (30% in the 1st year, 50% in the 2nd year, 70 %in the 3rd year, and 90% in the 4th year) applied in the financial analysis; and
f) SME development to increase the number of firms which will qualify in the Park, in terms of operation scale, product quality, profitability, exports orientation, etc.

The PNA must take the necessary actions to satisfy the above conditions leading to the implementation of the Agro-industrial Park. The requirement of PNA's equity for 20% of the initial investment cost and soft loans for 80% of it is just one scenario so that the concerned stakeholders are requested to discuss the appropriate portion of equity and soft loans.

(3) Recommendations on Important Issues

Throughout all the chapters in this report, undertakings and important assumptions deemed necessary to be seriously considered by the PNA are specified. Recommendations on some of the important issues from the preparatory stage of the Agro-industrial Park development are stated below.

Steering Committee

The steering committee consisting of four sub-committees for the Agro-industrial Park development was proposed in the course of the Phase II Study. Provided that the business scheme by public sector initiative is accepted by the PNA, a steering committee meeting should be held immediately in order to discuss the following: i) implementation scheme, ii) technical issues, iii) investment promotion, and iv) industrial promotion. The priority issues to be discussed would be:

a) Organizational and financial arrangement for the Agro-industrial Park development
b) Investment promotion by public initiative
c) Institutional arrangements for construction and management of the off-site infrastructure; and
d) Establishment of the BDS Platform

The organizational and financial arrangement for implementation of the Agro-industrial Park development project will be the urgent subjects to be discussed among the principal members' organizations of the steering committee. MoNE and PIEFZA shall be responsible for implementation structure of the project while MoP and MoF shall be responsible for financial arrangement for (grant or soft loans) from donors or international financial institutions.

The PIEFZA Board of Directors has the responsibility to promote industrial estates locally and internationally. Investment promotion by public initiative implies institutional strengthening of the PIEFZA in this area. The PIEFZA shall be required to increase its staff for marketing who shall focus and facilitate the local and foreign target firms for the Agro-industrial Park. It should also to be requested to facilitate FDIs promotion in cooperation with the relevant organizations such as PIPA and PalTrade. These issues are to be discussed in the Sub-committee on Investment Promotion.

Construction and management of off-site infrastructures in the Agro-industrial Park development project necessitate discussions about role-sharing and demarcation in off-site infrastructures in terms of construction, operation and maintenance, and cost-bearing in operation and maintenance. These issues are to be discussed in the sub-committee on implementation scheme and technical issues.

The BDS Platform designed as an advisory committee under a public-private partnership will be the first step to realize the business support services to be implemented in the proposed BDS Center. The sub-committee on industry promotion should do the initial preparatory work for establishment of the BDS Platform.

Movement and Access

In connection with the simultaneous development of stages I and II, there would be a need for further coordination with Israel's security authorities as to the use of Access Road A-2, and the smooth passage of goods and people to and from the Agro-industrial Park. The PNA must hold a series of meetings to resolve the following issues:

a) Conversion of Area C to B in the land where Access Road A-2 is planned;

b) Facilitation of smooth passage of cargoes and people through the nearby checkpoint (Jericho DCL checkpoint), including inbound transportation for raw materials, and obtaining permission for outbound transportation from the Agro-industrial Park through the Jericho DCL checkpoint; and

c) Special treatment of commuting employees and inbound and outbound transportation vehicles for smooth passage through other checkpoints.

Investment Promotion

During the Study Part 3, the convention entitled "Investors and Business People Meeting to Promote the Agro-industrial Park in Jericho" was held in Ramallah-Palestine, Amman-Jordan and Dubai-UAE in November 2008 with the aim of inviting potential investors to the Agro-industrial Park. Throughout the course of the discussions at these seminars, the followings were identified as the urgent needs below:

a) The Ramallah meeting covered various inquiries and comments related to the Agro-industrial Park, while the discussions held in Amman and Dubai concentrated on the investment environment in Palestine. The investment promotion strategy for foreign enterprises would need provision of a comprehensive set of investment-related information.

b) The Ramallah meeting accommodated participants including those from 38 private enterprises. Successive investment promotion in Palestine should target these participants as potential investors.

c) The Amman meeting accommodated participants including those from 33 private enterprises, where most of them were in agribusiness trading fresh vegetables and fruits. Successive investment promotion in Jordan should attract the agribusiness sector.

d) The Dubai meeting was attended by seven participants from private business communities.

Successive investment promotion in Dubai would require needs assessment of investment in Palestine.

Based on the results of the three meetings, the sub-committee on investment promotion should discuss strategy focusing on target potential investors based on their information and profile. Investment promotion would need various supports from the concerned stakeholders such as Paltrade, PFIA and MoNE. In the meantime, the staff of PIEFZA should be trained under the internal training programs and technical assistance extended by donors.

Amendment of PIEFZA Law

It is not legally clear whether the Agro-industrial Park is interpreted as the industrial estate or the industrial free zone. Suppose that enterprises selling their products to domestic market are allowed to invest in the Agro-industrial Park, the Park is interpreted as the industrial estate. The current PIEFZA Law (PIEFZL) is legally ambiguous in the areas of industrial estates in terms of i) its objective, i.e. industrial promotion, ii) license and regulation applied to tenant industries, iii) income tax incentives according to the size of investment, and iv) exemption of customs for export industries. In particular, the current PIEFZL should make clear license, regulation and incentives for export industry in industrial estates. For instance, it is not clear whether they would be subject to the same regulations (i.e. export industry is allowed to sell 20 % of its total production to domestic market) and incentives (i.e. exemption of customs duties) that are applied to export industries in industrial free zone. Further the Law does not clarify income tax incentives which are presented in PIPA Law. PIEFZA is requested to coordinate with PIPA for amendment of the PIEFZL.

The PIEFZL stipulates PIEFZA as the regulatory and supervisory body for the development and management of industrial estates. Although PIEFZL refers the direct development of industrial estates by PIEFZA, the law should be reviewed regarding the mandate of PIEFZA as a public developer, and amended, if deemed necessary. The institutional strengthening of PIEFZA as a public developer would cover a wide range of issues such as its legislative status as a public developer, organizational arrangements for on-site management, investment promotion strategies and activities, and coordination with the relevant agencies regarding off-site operations and management.

(4) Proposed Undertakings by the PNA for the Agro-industrial Park Development

Based on the results of the feasibility study, the PNA is obliged to satisfy the following conditions for the success of the Agro-industrial Park development.

a) In order to ensure the occupancy scenarios, alternative measures have to be prepared to supplement insufficient number of local firms involved in the manufacture of food and beverages that would locate in the Park. The firms in other sectors must be approached and encouraged to locate in the Park.

b) The PNA must establish and implement strategic policies for trade facilitation and investment climate improvement.

c) Investment promotion regulatory framework must be reassessed and improved to be more investor-friendly and competitive.

d) Cooperation schemes must be established between PIPA and PIEFZA for more effective investment promotion.

e) The measures to strengthen the capacities of PIEFZA have to be identified and implemented.

f) The PNA has to secure grants from donors to finance off-site infrastructures, and a part of on-site infrastructures for stage I and II in the cases of both stage-wise and simultaneous development, and most part of on-site infrastructures for stage I in the case of independent development of stage I only.

g) In case of Scheme B, the PNA has to make available a portion of its own funds allocated as part of the initial investment costs for on-site construction.

h) Also in case of Scheme B, the PNA has to secure adequate soft loans from international financial institutions in order to cover the remaining investment costs for on-site construction.

i) The PNA needs to start discussing “movement and access” issues with Israeli security authorities at the earliest possible stage, considering the timeframe for the development of the Agro-industrial Park.

j) The urgent policy decision by PNA on solid waste treatment in Jericho is a pressing issue. Considering the construction of the Agro-industrial Park and rapid increase in the number of residents and visitors.

k) The measures to maintain transparency in the implementation and operation of the Agro-industrial Park have to be established.

l) PNA needs to materialize SME development and support policies to enhance the capacity of small and medium scale of enterprises.

m) The current income tax incentive is given to investors whose investment amount is more than USD 100,000 according to the “ Law No.10/1998 regarding Industrial Estates and Industrial Free Zones Law”. In the meantime, it is significant to attract SMEs which have not enjoyed current tax incentive in order to facilitate more investment in the Agro-industrial Park. Therefore the minimum investment ceiling currently provided to the enterprises with investment amount of USD 100,000 should be lowered.