

Fig. F.1 Detailed Rural Sociological Survey Sites in West Sumatra Province

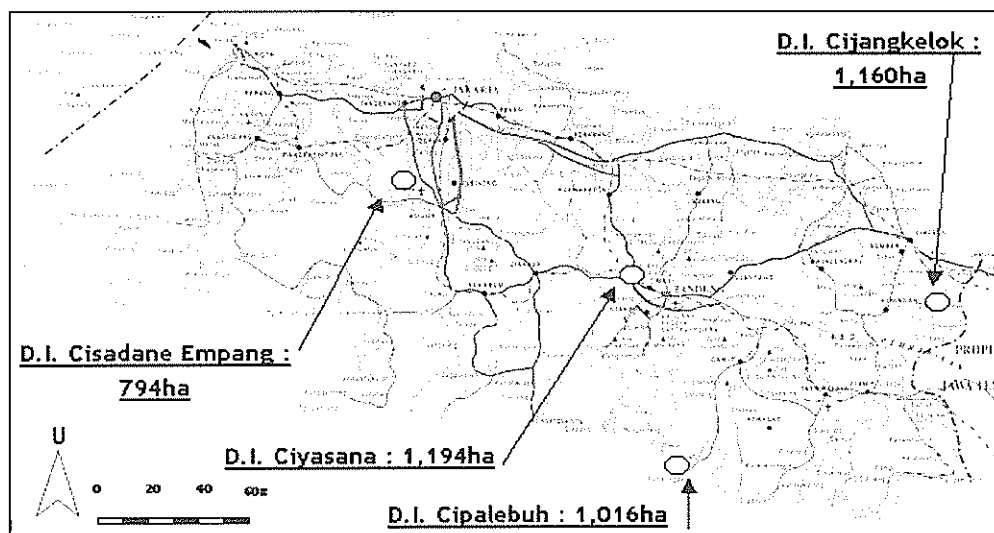


Fig F.2 Site of Detailed Rural Sociological Survey Sites in West Java Province

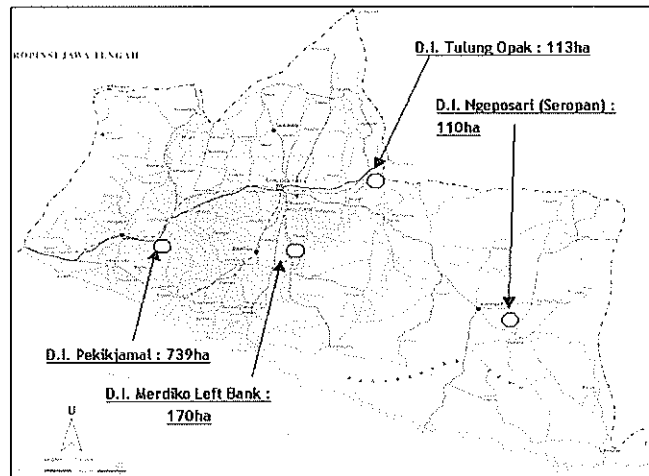


Fig F.3 Site of Detailed Rural Sociological Survey Sites in Yogyakarta Province

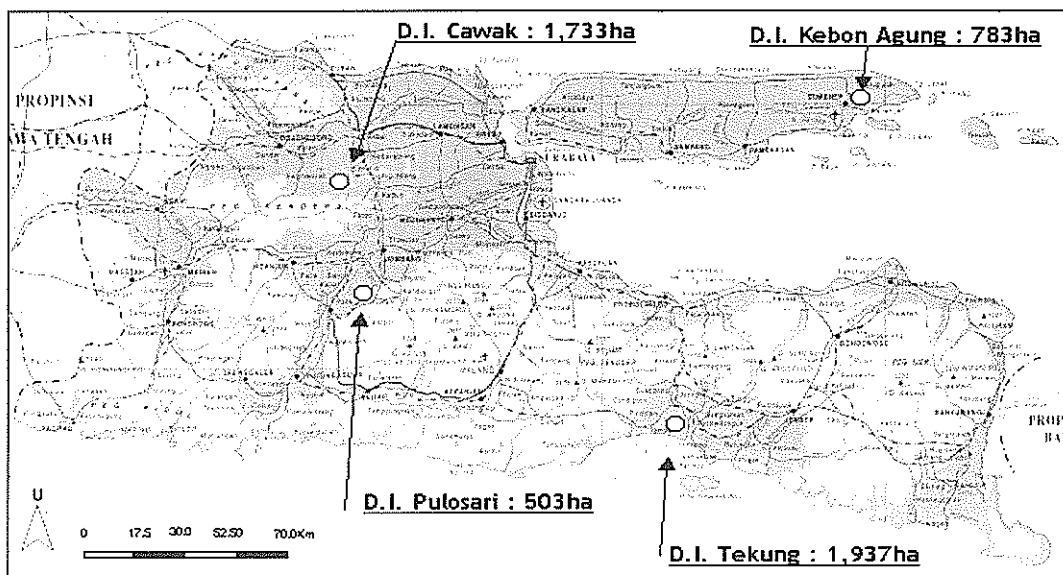


Fig. F.4 Site of Detailed Rural Sociological Survey Sites in East Java Province

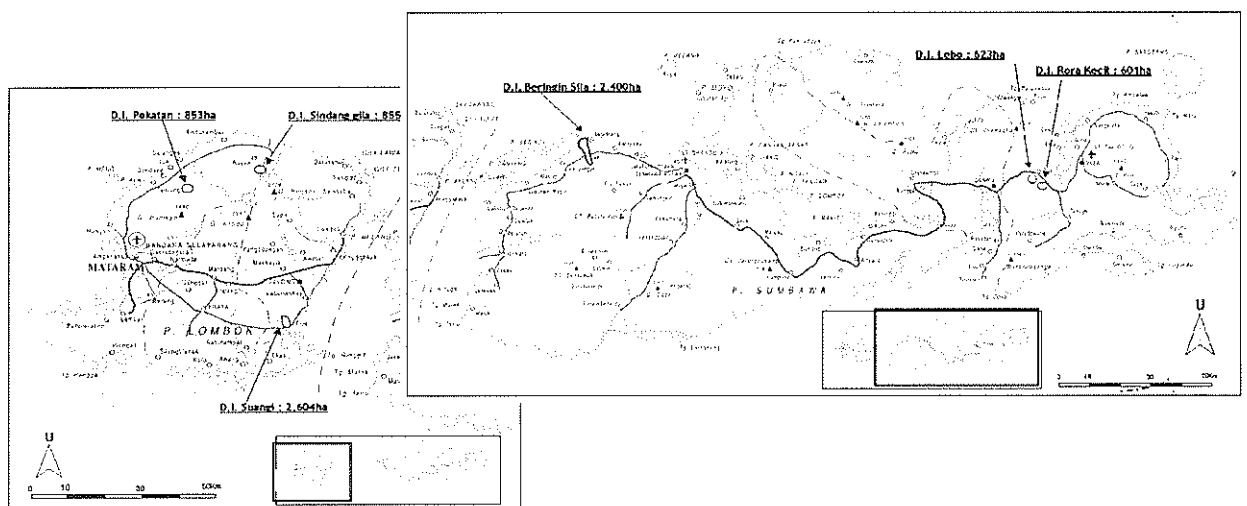


Fig. F.5 Site of Detailed Rural Sociological Survey Sites in NTB Province

ANNEX F:

FIELD SURVEY FOR VERIFICATION

COUNTERMEASURES

Table of Contents

PRA Survey Location Maps

F.1	The Selected Sites of West Sumatra -----	F - 1
F.1.1	General Conditions of the Province -----	F - 1
F.1.2	DI Batang Paku, Pasaman-----	F - 1
F.1.3	DI Sungai Janiah, Agam -----	F - 3
F.1.4	DI Batang Liki, Limapuluh Kota-----	F - 5
F.1.5	DI Anai Sasapan, Padang Pariaman -----	F - 6
F.1.6	DI Sungai Betung, Sawahlunto Sijunjung -----	F - 8
F.1.7	DI Lubuk Nyiur, Pasisir Selatan -----	F - 10
F.1.8	DI Koto Tuo, Kota Padang-----	F - 11
F.2	The Selected Sites Of West Java -----	F - 13
F.2.1	General Conditions of the Province -----	F - 13
F.2.2	DI Cijangkelok, Kuningan -----	F - 14
F.2.3	DI Ciyasana, Bandung-----	F - 15
F.2.4	DI Cipalebuh, Garut -----	F - 17
F.2.5	DI Cisadane Empang, Bogor -----	F - 18
F.3	The Selected Sites of Yogyakarta -----	F - 20
F.3.1	General Conditions of the Province -----	F - 20
F.3.2	DI Pekik Jamal, Kulon Progo-----	F - 22
F.3.3	DI Seropan, Gunung Kidul -----	F - 23
F.3.4	DI Merdiko, Bantul -----	F - 24
F.4	The Selected Sites of East Java -----	F - 26
F.4.1	DI Kebon Agung, Sumenep -----	F - 26
F.4.2	DI Cawak, Bojonegoro -----	F - 28
F.4.3	DI Pulosari, Kediri -----	F - 29
F.4.4	DI Tekung, Lumajang -----	F - 31
F.5	The Selected Sites of West Nusa Tenggara -----	F - 32
F.5.1	DI Pekatan, West Lombok -----	F - 33
F.5.2	DI Sindang Gila, West Lombok -----	F - 34
F.5.3	DI Swangi, East Lombok -----	F - 36
F.5.4	DI Beringin Sila, Sumbawa Besar -----	F - 37
F.5.5	DI Rora Kecil, Bima -----	F - 39
F.5.6	DI Lebo, Bima -----	F - 41

List of Tables

Table F.1.1.1	The Selected Sites in West Sumatera -----	F - 1
Table F.1.2.1	Physical Structural Conditions of DI. Batang Paku -----	F - 2
Table F.1.2.2	WUAs in DI Batang Paku -----	F - 2
Table F.1.4.1	Physical Structural Conditions of DI. Batang Liki -----	F - 5
Table F.1.4.2	Paddy Cost and Benefit Estimate in DI. Batang Liki -----	F - 6
Table F.1.5.1	Physical Structural Conditions of DI. Ani Sasapan -----	F - 7
Table F.1.5.2	Paddy Input and Output per Hectare in DI. Ani Sasapan -----	F - 7
Table F.1.7.1	Physical Structural Conditions of DI. Lubuk Nyiur -----	F - 10
Table F.1.8.1	Physical Structural Conditions of DI. Koto Tuo -----	F - 11
Table F.1.8.2	WUAs in DI. Koto Tuo -----	F - 11
Table F.1.8.3	Promoted Farming Technology in DI. Koto Tuo -----	F - 12
Table F.2.1.1	The Selected Sites in West Java -----	F - 13
Table F.2.4.1	Irrigated Areas in DI. Cipalebuh -----	F - 17
Table F.3.1.1	The Selected Sites in Yogyakarta -----	F - 20
Table F.3.1.2	Physical Irrigation Structural of DI. Lubuk Nyiur -----	F - 21
Table F.3.2.1	Physical Structural Conditions of DI. Pekik Jamal -----	F - 22
Table F.3.2.2	WUAs and WUAF in DI. Pekik Jamal -----	F - 22
Table F.3.4.1	WUAs in DI. Merdiko-Left -----	F - 25
Table F.4.1.1	The Selected Sites in East Java -----	F - 26
Table F.4.1.2	Main Products and their Prices in Sumenep -----	F - 27
Table F.4.4.1	WUAs and Villages in DI. Tekung -----	F - 31
Table F.5.1.1	The Selected Sites in West Nusa Tenggara -----	F - 33
Table F.5.4.1	Physical Structural Conditions of DI. Beringin Sila -----	F - 37
Table F.5.4.2	WUAs in DI. Beringin Sila -----	F - 37

List of Figures

Fig. F.4.4.1	WUA Organization -----	F - 31
--------------	------------------------	--------

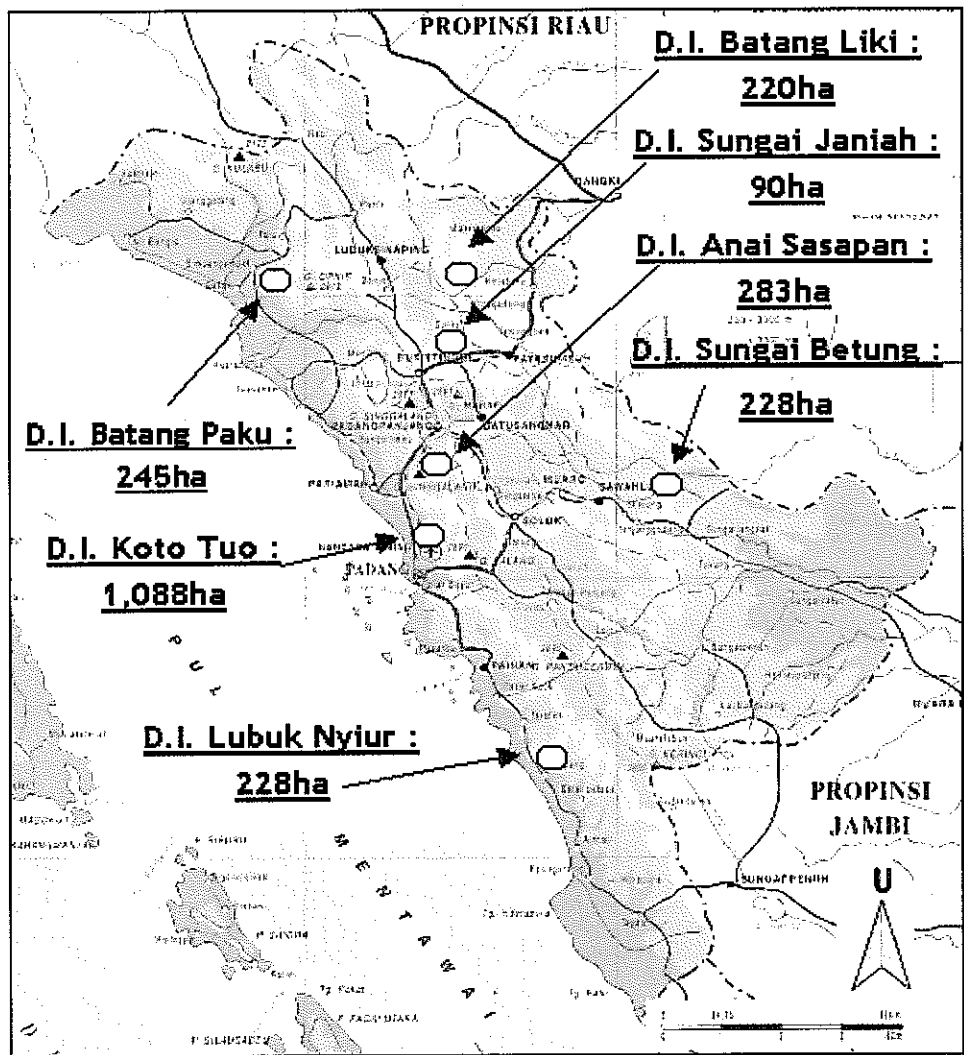


Fig. F.1 Site of Detailed Rural Sociological Survey And Locations in West Sumatra Province

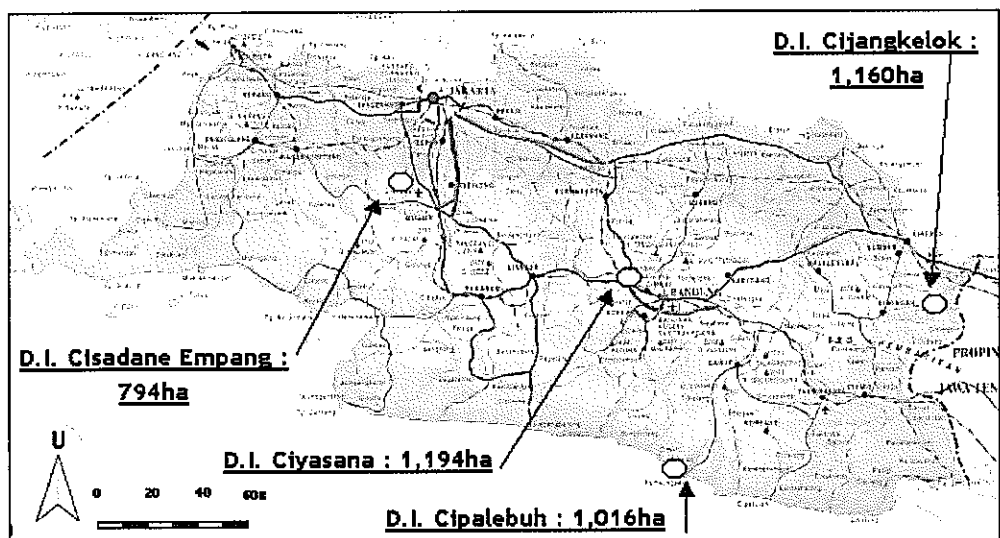


Fig F.2 Site of Detailed Rural Sociological Survey and Locations in West Java Province

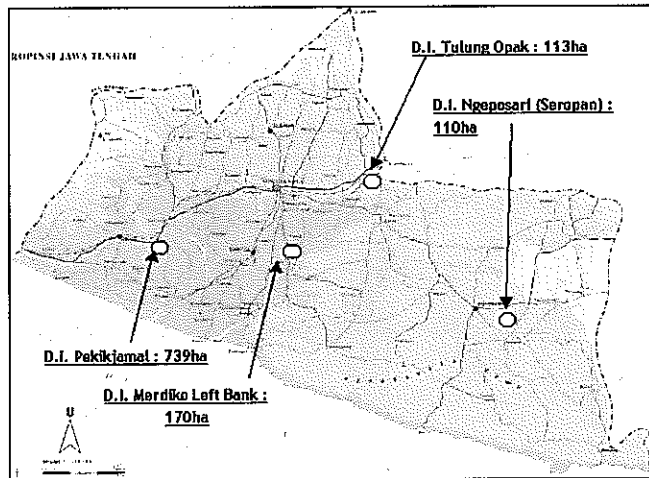


Fig F.3 Site of Detailed Rural Sociological Survey and Locations in Yogyakarta Province

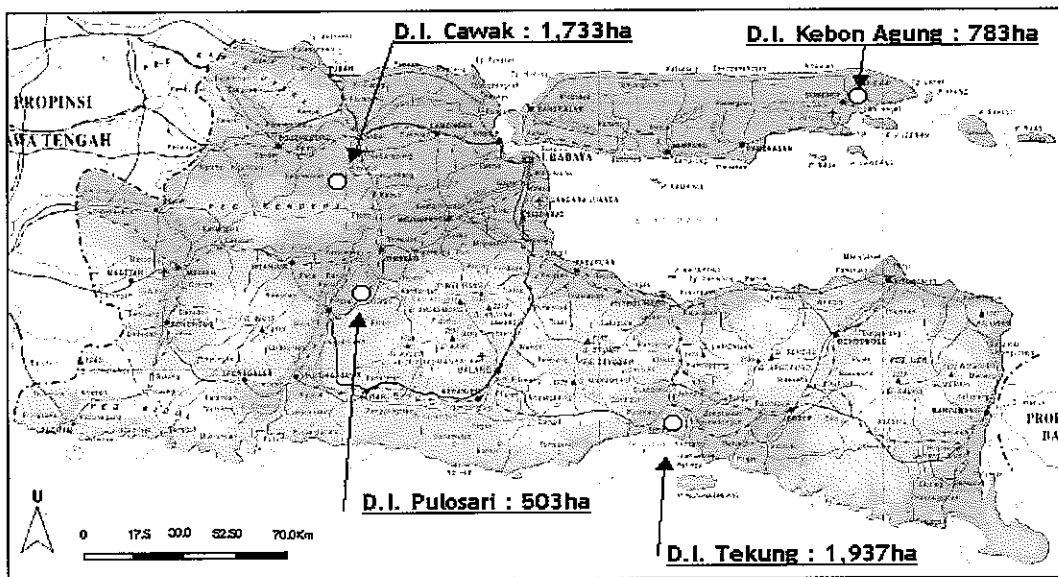


Fig. F.4 Site of Detailed Rural Sociological Survey and Locations in East Java Province

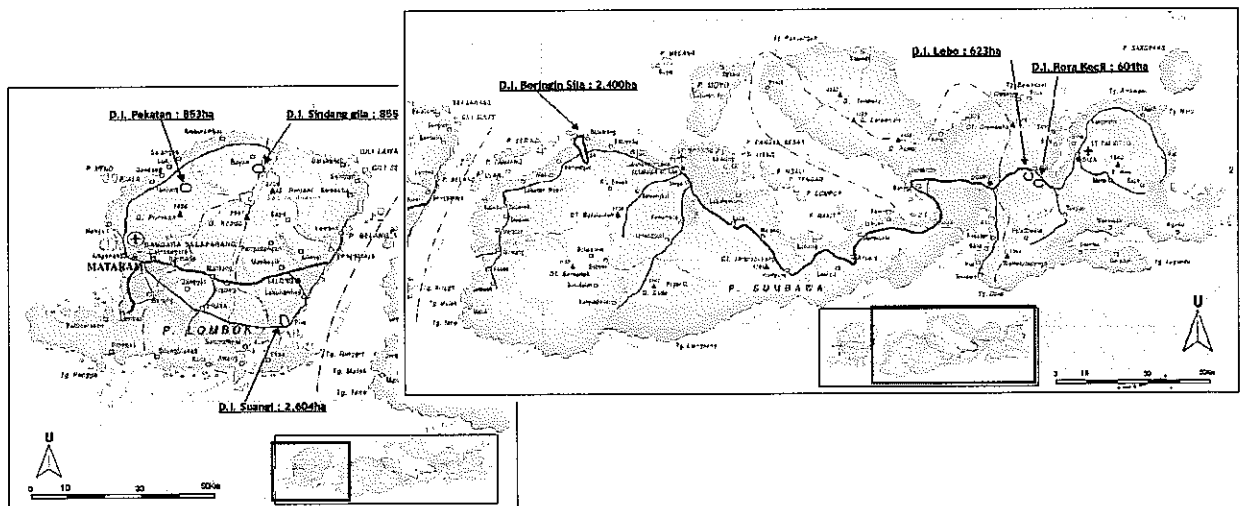


Fig. F.5 Site of Detailed Rural Sociological Survey and Locations in NTB Province

F.1 The Selected Sites of West Sumatera

F.1.1 General Conditions of the Province

Lays between 0.54'-3.30' Latitude and 98.36'-101.53' Longitude in the western central Sumatera island the Province of West Sumatera is predominated by Bukit Barisan mountains towered with volcanic peaks and scattered with broad valleys and spectacular highland lakes. From the air the region comprise of three distinctive characterizations i.e. a wide range of volcanic highland, a narrow but long coastal plain, and a series of off-shore jungle islands that altogether make a total of about 42,229.64 km².

In 1998 West Sumatera was inhabited by 4,473,250 people (994,056 households) at an average of about 106 people/km² population density and 0.50% growth¹. The *Minangkabau* ethnical group evidently represents the major population in the mainland whilst *Mentawai* in the off-shore islands. They live in 2,169 villages that administratively are organized into 114 sub-districts and 14 districts. *Nagari*, the past genealogical village community institution, in formal term is no longer appeared but traditionally still active.

Housing compound includes 3% of the area in approximate, *sawah*² 6%, dryland cultivation 2% and plantations 10%, whilst forest covers a total of about 65% area. The remaining 14% consists of other vegetation types and water bodies.

The Provincial Government Agency for Irrigation claims that 6 river basins are available in the Province, and that 963 irrigation schemes were established over the region for about 249,630 ha *sawah*. Currently more than 60% is being irrigated. The provincial figures show wetland paddy averaged at 4.5 ton/ha production whilst cassava 12.2 ton/ha, sweet potatoes 10.4 ton/ha, soybean 1.2 ton/ha and green pea 1.1 ha ton/ha. Accordingly food crops shared about 12% regional income; the other 88% mainly come from off-farm sectors i.e. trade (18%), manufacturing industries (13%), transportation (12%), finance (5%) and services (16%).

Table F.1.1.1 The Selected Sites of West Sumatera

No.	District	Di	ha	Category
1	Pasaman	Batang Paku	245	Non WUA 1
2	Agam	Sungai Jariah	90	Success WUA
3	Limapuluh Kota	Batang Liki	220	Single WUA 1
4	Padang Pariaman	Anai Sasapan	283	Single WUA 2
5	Sawahlunto Sijunjung	Sungai Betung	228	Several WUAs 1
6	Pesisir Selatan	Lubuk Nyuir	312	Non WUA 2
7	Kota Padang	Koto Tuo	1,088	Several WUAs 2

Following the site categorization the regional government proposed for a number of irrigation schemes of which 7 *DI*s³ were considered to represent the site categories as shown in table.

F.1.2 DI BATANG PAKU, PASAMAN

(1) General condition

Pasaman is a district of 7,835.40 km² area of which about 50% (3,930.80 km²) is available for utilization. The remaining 50% area is protected for land conservation.

The selected DI Batang Paku is a semi technical irrigation scheme of Government lays in the Subdistrict of Kinali at about 32 masl⁴. The DI was constructed in 1994 for about 245 ha sawah of Empat Koto and Sumber Agung villages; but currently the DI just allocates water for Empat Koto village only concerning about 115 (47%) ha sawah.

¹ Source: West Sumatera Province in Figures 1998, Central Bureau of Statistic of West Sumatera Province 1999

² *Sawah*, wetland paddy field

³ *DI, Daerah Irigasi*, irrigation schemes

⁴ masl, meter above sea level, usually used for altitude indicator.

Water is taken mainly from Batang Paku River that evidently decreases drastically in dry season. A supplemental water is therefore collected from the different DI Batang Pinagar. This additional water is available along years and could be used for the upstream and middle stream areas.

A transect walk during field survey identified the physical condition of the DI as summarized in Table F.1.2.1.

Table F.1.2.1 DI Batang Paku by Physical Structure Condition

Irrigation structure	Unit	Remark
Permanent weir	1	Low sedimentation
Primary canal	1,130m	100% covered with sediment
Secondary canal	1,170m	75% covered with sediment
Tertiary canal	1,038m	Low sedimentation
Culvert	2	Low sedimentation
Division structure	3	2 units are damaged
Control structure	3	3 units are damaged
Acqueduct	1	Good
Syphon	1	Good
Bridge	4	3 units are good, 1 damaged
Drop structure	2	2 units are damaged
Gate	22	7 damaged, 15 seriously damaged

Three WUAs were established accordingly for the mentioned 115 ha irrigated sawah concerning 127 members as described in Table 1.2.2 below. In the upstream of the DI WUA Budi Luhur was formed, whereas in the midstream WUA Rukun Santosa and in the downstream WUA Suka Maju.

Planting pattern is paddy-paddy-paddy with about 4.5 ton/ha production. Palawija is planted accordingly at planting season 1, 2 and 3. Using the prevailing price that averages at around Rp 1,000/kg a pessimistic scenario estimates that currently farmer earns rate of return at an average of nearly to Rp 2,000,000 only per ha per planting season.

Under this rough scenario cost of hand tractor is calculated for Rp 400,000/ha, planting Rp.240,000/ha, maintenance Rp260,000/ha, fertilizers Rp.419,000/ha, harvest Rp.630,000/ha and others Rp.84,000/ha which entirely represent a total of about Rp.2,033,000/ha production cost.

Table F.1.2.2 WUAs in the Selected DI Batang Paku

WUA	Village	Irrigated Sawah		Member		Progress
		Plan (ha)	Real (ha)	Plan (no)	Real (no)	
Budi Luhur	Empat Koto	95	60	120	60	Inactive
Rukun	Empat Koto	60	35	75	42	Inactive
Suka Maju	Empat Koto	90	20	115	25	Deceased
	Sb Agung		0		0	
TOTAL	2 villages	245	115	310	127	

(2) Irrigation

Whilst WUAs' leaders are inactive, the interviewed key informants reported that the upstream and midstream farmers, who mostly are native inhabitants, feel as they have rights for water more than the down stream farmers. Thus water is allocated mostly for the upstream and midstream and no sufficient water could be expected for the downstream as shown in the Table 1.2 above.

WUAs are fail to cooperate for and under one management at DI level, but this doesn't stand alone. The informal leaders are not concerned, and the formal leaders are partly responsible. Farmers are not included in the DI establishment and WUA formations. WUA leaders is selected by the Government, and the AD/ART⁵ that is formulated by the Government homogeneously for all WUAs in the country doesn't meet the local farmers' need. Thus no sense of belonging could be expected for the initiated DI and WUAs.

As a result many problems arise. The O&M fee is no longer collected by the WUAs of the downstream in particular, whereas the upstream and midstream farmers feel no need to pay O&M fee because in fact they always get water though they don't pay O&M fee. Thus the collected O&M fund is limited, and subsequently O&M activities are minimal.

⁵ AD/ART, *Anggaran Dasar/Anggaran Rumah Tangga*, internal regulation of an organization, articles, that is usually formulated and legalized at the first place by the members through General Assembly of the organization.

Whilst the water discharge is limited the DI facilities mostly are damaged and not functioning as shown in the Table 1.1. above, and not enough water could be distributed equally. While conflicts among farmers arise it is obvious that it is an urgent need for the DI to find new water resource. An option utilized as well is the unused water of DI Batang Pinagar that is apparently available along years.

(3) Agriculture

Because of low rate of return farmers tend to plant paddy for their own consumption rather than intensifying for optimal production. Wide range of off-farm works and opportunities and local plantations in particular on the other side also reduce the local farmers' motivation to farm.

High yield maize is the only non-paddy variety planted widely due to water availability and good marketing, but improper fertilizers utilized due to expensive for farmers to buy. As a result the maize production ranges at about 3-4 ton only per hectare. Farm diversification is something that is evidently far from farmers' reality because of their subsistence that makes them difficult to decide for such a risk and, subsequently, difficult to adopt new technology.

The interviewed key informants confirmed no planting pattern and calendar organized together among farmers within the DI nor within the same irrigated blocks so far that makes the problem of water scarcity and unequal allocation more difficult to resolve.

Supplies of production means and production inputs either farm production marketing are controlled by the private sector. While KUD and farm cooperatives are inactive, farmers work individually.

(4) Others

The farm production prices that in fact fluctuates in many ways are another factors that affect farmers tend to prefer for the economy of self-defense rather than trying for a potential cash crop upon such a risk.

Control of Government on paddy floor price and marketing on one side protects farmers from the possible lowest paddy price of free market, but on the other side represents a restriction to them to find chance for a profitable price.

F.1.3 DI Sungai Janiah, Agam

(1) General condition

Agam District, where the selected DI Sungai Janiah is located, represents one of the incredible three valleys with abundant rice fields so-called *luak nan tigo*⁶, the homeland of Minangkabau ancestors, laid to the north and west of Mt. Merapi and centring around the city of Bukittinggi. This highland region developed rapidly during the last two centuries as a result of the contact with Europeans. Recently about 423,600 people live in the district at an average of 190 people/km² density.

The district covers a total of about 2,232 km² area of which 1,502 km² (67%) is used for, among others, cultivation. By 1999 sawah paddy field includes around 49,410 ha land averaged at 4.7 ton/ha production. Palawija is dominated by maize 1,968 ha, sweet potatoes 1,114 ha, cassava 792 ha and peanuts 785 ha.

The DI Sungai Janiah (Sungai Jernih) is a people irrigation scheme lays in the Sub-district of Baso at about 900 masl high. The DI was formerly established in 1942 under traditional Nagari community institution by constructing a temporary weir at a point of Batang Lasi river.

⁶ The *luak nan tigo* or three valleys include Tanah Datar, Agam and Limapuluh Kota valleys crowned by Mt. Merapi at 2,891 meter above sea level (masl) high in the center and crater Lake Maninjau in the west.

Recently the DI has a permanent weir for about 89 ha sawah of 4 villages i.e. Sungai Janiah, Tabekpanjang, Salo and Kotobaru by using 6 permanent water gates and impermanent distribution canals and pipes. Water discharge varies at 150-180 m³/sec.. A WUA namely Karya Mandiri was initiated in 1993 and accordingly the previous local 8 person-group called *Banda* contracted by the Nagari to establish and manage the DI for 25-30 years was elected democratically by the farmers for their WUA leaders.

By the prevailing irrigation management system *Ninik Mamak*, the Head of traditional Nagari institution, is responsible for the entire Nagari communities. A *Panitia urang basawah* (sawah committee) established on sub-Nagari basis is in position to supervise the implemented irrigation management and responsible to the *Ninik Mamak*. The WUA leaders (the previous irrigation management contracted *Banda*) carry out the irrigation management and O&M. And the water user farmers pay 20% harvested production to the WUA leaders for irrigation investment and O&M fee.

(2) Irrigation

Like elsewhere in the country formally the WUA Karya Mandiri has *AD*⁷ that was legalized by the Bupati⁸. And correspondingly the WUA also has *ART*⁹ effectively regulating in details the operation of organization and activities in accordance with the prevailing *Nagari* arrangements on irrigation.

The operation of weir and gates and its maintenance is handled by a hired water gate keeper by about 600 kg paddy per harvest. Supervision of water allocation and cleaning of canals are undertaken by a member of WUA leaders (8-group) for twice a day. Whereas canal maintenance from sedimentations, garbage and grasses is conducted for the entire scheme by the whole WUA leaders for 3 times per planting season.

Currently it is also the job of WUA leaders to manage as well paddy and non-paddy planting pattern, provision of fertilizers, rental hand tractors (4 units), paddy marketing and rice milling (1 unit).

At upper level the Sawah Farmer Committee solves the problems of non-paddy water allocation fee, coordinate planting pattern and calendar and water allocation accordingly, and mobilize supplementary *gotong-royong*¹⁰ as required. The Village Government is responsible for village government administration only.

(3) Agriculture

Merantau, going abroad to seek for fortune, probably is the only tradition that may affect the agriculture and irrigation management in particular in the long run because of reducing numbers of farmer and farm laborer.

While water is relatively sufficient, mono-cropping represents the common picture of the practiced cultivation along years (paddy-paddy-paddy). Though paddy gives at no more than Rp 500,000/month earning to farmers due to low price and productivity but no serious diversification was applied for cash crops so far. The interviewed key informants confirmed that pests and insects are less controllable. Paddy production averages at 3.8 ton/ha only. Fertilizers are not used appropriately because expensive whilst labeled seed is not used due to the same reason. Arrangements which regard to planting pattern and calendar in fact are not properly implemented.

⁷ *AD, Anggaran Dasar*, basic regulations or articles formulated by the Government uniformly for WUAs over the country

⁸ *Bupati*, the Head of *Kabupaten* of District Government

⁹ *ART, Anggaran Rumah Tangga*, more detailed regulations of an organization

¹⁰ *Gotong-royong*, a traditional action of problem solving by organizing together the local people and the concerned parties

(4) Others

*KUD*¹¹ and other farm cooperatives do not work for the provision of farm credit, production means and production inputs, and so for farm production marketing. Both production input and output are controlled by the private sector.

Water leakage is too high because of the nature of local soil, whereas attention should be paid also for plastic distribution piping system that is evidently vulnerable from damage.

F.1.4 DI Batang Liki, Limapuluh Kota

(1) General Condition

Surrounded by a series of volcanic peaks of Bukit Barisan mountains, the district of Limapuluh Kota represents a broad and mostly fertile part of the homeland of Minangkabau ancestors so-called *luak nan tigo* (the three valleys) taking place in the northern east of Mt Merapi with Payakumbuh city in the center, about 33 km east of Bukittinggi.

The district covers around 3,354.53 km² area of which 1,655.70 km² (49%) is permittable for utilization. By 1999 the total population was 317,210 people (79,303 households) which average at about 95 people/km² density¹².

Table F.1.4.1 DI Batang Liki by Structure Condition

Structure	Unit	Condition
Weir	1 unit	Good
Primary canal	1,095 m	1,500 m damaged
Secondary canal	2,000 m	75% sedimentation
Tertiary canal	n.d.	>50% not functional
Culvert	2 unit	2 sedimentation
Division structure	3 unit	3 good
Division/offtake structure	2 unit	1 good, 1 damaged
Acqueduct	1 unit	Good
Syphon	1 unit	Good
Bridge	16 unit	5 good, 11 damaged
Culvert	2 unit	Good
Drop structure	2 unit	2 damaged
Gates	6 unit	2 good, 4 seriously damaged

The selected DI Batang Liki is Government's semi technical irrigation scheme in the Sub-district of Suliki Gunung Mas established in 1932 about 217 ha sawah. Currently the DI irrigates about 193,5 ha of 4 villages concerning about 390 farmers. A transect walk made during field survey indicated the DI condition is as summarized in Table F.1.4.1.

The DI has 1 WUA namely Batang Liki that is evidently not workable whereas 6 *Kelompok Tani* (Group of farmers) promoted under the Ministry of Agriculture are active.

(2) Irrigation

About 22 ha of upstream sawah that mostly located in the Suliki Timur village enjoys sufficient water along years, and so does the middle stream located in the Sei Rimbang Timur and Sei Rimbang Barat villages. On the contrary no water could be expected for Limbanang Koto nan Bunta village that is evidently in the downstream.

The interviewed key informants said that *PPA*¹³, the DI Government field officer responsible for water allocation works in the upstream and middle stream of the DI only. It is also the fact that WUA doesn't work at all. Job division between Government and WUA is unclear. While the Government's O&M fund is limited, no will of farmers of the upstream and middle stream to pay O&M fee because water is always available. Thus no O&M fee nor *gotong-royong* could be expected from the entire upstream, middle stream and downstream farmers.

¹¹ *KUD, Koperasi Unit Desa*, rural cooperative unit promoted by the New Order era on Sub-district boundary basis

¹² Source: District of Limapuluh Kota in Figures 1999, Central Bureau of Statistic of Limapuluh Kota

¹³ *PPA, Penjaga Pintu Air*, water gate keeper

As shown in Table 3.1 above sedimentation of main canals is obvious. Water leakage is too high. Damages happen in the most part of irrigation structure. And the mostly serious problem is that no longer tertiary irrigation structure functional. In many places water is allocated illegally from the main canals in the upstream and middle stream, and therefore no water could be allocated for the downstream.

Both local farmers and informal leaders (*Ninik mamak*) is not included in irrigation and WUA establishments. And no irrigation management nor O&M could be implemented by local WUA participation. Unavailable cropping pattern and planting calendar within the DI are another factor that makes difficult to arrange water allocation equally.

(3) Agriculture

In the upstream and middle stream farmers practice paddy-paddy-paddy cropping pattern due to abundant water along the year. *Palawija*¹⁴ is planted in parallel with the mentioned cropping pattern. Whereas in the downstream which is evidently lack of water farmers plant paddy-palawija-palawija.

Wetland paddy averages at 6 ton/ha production. This production probably is a effect of Farmer Groups that are evidently active. However the interviewed key informants said the production is not yet optimal. The uses of high yield variety seeds is still limited due to expensive to by. Fertilizers are not used appropriately due to the same reason. And because no cropping pattern nor planting calendar is organized, correspondingly, no pest control could be made effectively.

Like elsewhere in the country KUD is not functional to carry out efficiently the provisions of credit, production means, production inputs and production marketing for the benefit of farmers. Both supports and services for production input and output is undertaken and controlled by private. Subsequently production cost is high and production price is low resulting at low paddy production rate of return for farmers.

Table F.1.4.2 The DI Batang Liki by paddy cost and benefit estimate

A. Gross income per ha per season 6 ton @Rp.1,200/kg	7,200,000
B. Production cost per ha	2,945,000
- Land preparation, tractor	400,000
- Seed	500,000
- Planting	240,000
- Maintenance	260,000
- Fertilizers	545,000
- Harvest	900,000
- Others	100,000
C. Net income per ha per season	4,255,000
Net income per ha per month	1,063,750

Using current rate of selling price of Rp 1,200/kg an estimate indicates that farmers earn nearly to Rp 1,2 million net income per hectare per planting season, as shown in Table F.1.4.2.

(4) Others

The promoted WUA and it's *AD/ART* have never been disseminated to the farmers and traditional community institution.

The key informants confirmed that WUA was established by the *Kades* (the Head of Village Government Administration) and staff by using the copy of uniform *AD/ART* prepared by the Government. WUA leaders are pointed out by the *Kades*.

F.1.5 DI Anai Sasapan, Padang Pariaman

(1) General Condition

Padang Pariaman district covers about 7,413.50 km² and inhabited by 535,050 people (133,763 households) at an average of 72 people per km² density. By 1998 wetland paddy was harvested at 55,181 ha and 4.2 ton/ha production whilst maize at 1,040 ha and 2 ton/ha production. The remaining

¹⁴ *Palawija*, secondary food crops

secondary crops varied at <100 ha harvest areas¹⁵.

The DI Anai Sasapan selected for the second single WUA DIs in the Province is a Government's simple irrigation scheme located at about 50 km far from Padang city to north. The DI was established in 1974 in the Subdistrict of Kayu Taman for 307 ha sawah. Currently about 283 ha sawah of Padang Lapai is irrigated concerning 153 farmers.

The DI is managed by the Head of Sub-district Government Agency for Irrigation (*Pengamat*) who is assisted by 1 *Juru Pintu Bendung* (weir gate keeper), 1 *Juru Pengairan* (Irrigation field officer) and 1 *Penjaga Pintu Air* (water gate keeper).

The water is taken from Batang Anai and Batang Sasapan rivers that are relatively stable. Findings of transect walk along the irrigation scheme indicate the following condition (see Table F.1.5.1).

In correspondence with the irrigation scheme establishment, 1 WUA i.e. WUA Anai Sasapan was initiated in 1974 for the mentioned 283 ha sawah and 153 farmers. The WUA was legalized by the Bupati in 1994 under *SDB*¹⁶ category, but afterwards no report confirming the WUA leaders' activity. No O&M fee nor *gotong-royong* for irrigation maintenance were organized so far. Whereas 2 Farmer Groups (*Kelompok Tani*) are available for about 100 ha and 100 farmers only.

Table F.1.5.1 DI Anai Sasapan by Physical Condition

Irrigation Scheme	Unit	Condition
Weir	1	Impermanent, good
Feeder canals	7,080 m	54% good
Division/offtake structure	1 unit	Relatively good
Syphon	1 unit	Relatively good
Free offtake structure	1 unit	Relatively good
Acqueduct	3 units	Relatively good
Gates	No data	No data

Cropping pattern is paddy-paddy-paddy at 3.5 ton/ha production. Using the current Rp 1,100/kg selling price it is therefore apparent that gross income from paddy averages at about Rp 3,850,000 per hectare per planting season. A calculation made by the interviewed key informants regarding with production input and output is as summarized in Table 1.5.2.

(2) Irrigation

The weir is impermanent and locates in the forest that is evidently difficult to control. Several supplementary sources of water utilized along main canal are potential for sedimentation and garbage. While irrigation structures are partly damaged the WUA leaders are inactive. About 10-15% members only that could be organized for *gotong-royong*, and no O&M fee collected during the past 3 years. Afterwards only the WUA chairperson and several water user fishermen control the intake if water allocation is going wrong.

Table F.1.5.2 DI Anai Sasapan by Paddy Input and Output per ha

A. Production output: 3.5 ton/ha/season @Rp.1,100/kg	3,850,000
B. Production input/ha/season:	2,600,000
- Land preparation (cattle)	150,000
- Planting	225,000
- Maintenance	225,000
- Fertilizers	450,000
- Harvest	270,000
- Rental land	1,280,000
C. Farmer's income/ha/season	1,250,000
Farmer's income/ha/month	312,500

Whilst job divisions between Government and WUA are not clearly defined the local Sub-district Government Agency for Irrigation is also not workable due to lack of budget and uncertain position reasons. So far the *Juru Pengairan* and *Juru Pintu* are not registered yet to be a Government employee.

¹⁵ Source: District of Padang Pariaman in Figures 1998, Central Bureau of Statistic of Padang Pariaman District

¹⁶ *SDB*, *sedang berkembang*, developing category. The other two categories of Government's version on WUA categorization are *BB*, *belum berkembang* (not yet developed) and *SB*, *sudah berkembang* (developed)

(3) Agriculture

Traditionally the farmers have mutual-help groups for production inputs and other agricultural activities called *julo-julo karajo*. The groups are also active in mutual saving & credit activities and formalized by the Government to be 2 *Kelompok Tani* (farmer group) under the Ministry of Agriculture's program scheme.

However fertilizer availability and production marketing still represent serious problems to farmers. It is also the fact that farmers prefer to use local seeds rather than high yield varieties. Thus production is low, and because of low selling price no more than Rp 312,500/ha/month average income could be collected from paddy cultivation.

*Plakat turun ke sawah*¹⁷ is usually announced through the local mosques and markets prior to planting seasons. But currently most farmers and those of the down stream in particular do not care due to lack of water-related reasons.

(4) Others

Presently *Tuo Kampong* only, the lowest level of traditional *Ninik Mamak* leadership, that is usually still available in the villages. The mostly important *Ninik Mamak* at the upper levels of Minangkabau's traditional Nagari community institution i.e. *Penghulu Pucuk* and *Penghulu Panungkek* are in outside for *merantau* tradition and/or socio-political and economic reasons. Thus no sanction could be made and the prevailing traditional regulations are no longer workable.

Merantau is also a tradition of young generation which, at the local village level, resulting at farm laborer scarcity. Currently wage for farm laborer increases drastically up to 60-100%.

F.1.6 DI Sungai Betung, Sawahlunto Sijunjung

(1) General Condition

Sawahlunto Sijunjung District has 6,091.53 km² area populated by about 306,370 people (76,593 households). Thus, by it's about 50 people/km² average density Sawahlunto Sijunjung represents the mostly scarce density district in the Province¹⁸. The same source of data reveals that land allowable for utilization includes 4,169.42 km² (68%) district area, of which only about 23,647 ha (4%) district area was used for wetland rice cultivation at 3.8 ton/ha production. The secondary cropping was predominated by soybeans and cassava at 1,800 ha and 1,427 ha harvest area respectively.

The District Government Agency for Irrigation claims that about 99 governmental irrigation schemes are technical, semi technical and simple schemes; the village communities' irrigation schemes are 560 units. And accordingly a total of about 11,444 ha sawah is irrigated.

The selected DI Sungai Betung was established in 1986 for 228 ha wet paddy field of 2 villages of Koto Sungai Betung and Pasar Sungai Betung in the Sub-district of Kamang Baru. But only 200 ha sawah that currently is irrigated. Three WUAs were initiated for the mentioned irrigated land, i.e. WUA Sawah Liat (49 ha), WUA Sungai Tapung (78 ha), and WUA Payung Sekaki (73 ha).

The secondary data collected at Sub-district level confirm that Kamang Baru was inhabited by 30,202 people and 35 people/km² average density.

¹⁷ *Plakat turun ke sawah*, traditional arrangement regarding with cropping pattern and calendar i.e. to start going to paddy field for land preparation

¹⁸ Source: District of Sawahlunto Sijunjung in Figures 1999, Central Bureau of Statistic of Sawahlunto Sijunjung 2000.

(2) Irrigation

Formerly the DI is a traditional irrigation scheme established and managed independently by *gotong-royong* under *Nagari* institution. The operation and maintenance of irrigated blocks were undertaken by *Tuo Banda* respectively responsible to the Head of *Nagari* (*Penghulu Suku*). And an overall evaluation and planning was made at annual *Nagari* meeting called *bakaua*. No government nor village government involving in the irrigation and cultivation issues. But the irrigation was established by the Government in 1986 farmers and *Nagari* institution felt that the irrigation scheme was no longer belong to them, and therefore they minimized their involvement and responsibility.

To include farmers' involvement the Government initiated 3 WUAs in 1988 as mentioned above. The AD/ART prepared by the Government similarly for over the country was used and the WUA leaders were pointed out by the Village Government. Whilst the initiated WUAs were inactive farmers knew nothing about the WUA and WUA leaders.

The previous *Nagari* regulations on traditional irrigation management and O&M disappeared. The Sub-district Government Agency for Irrigation (*Pengamat, juru pengairan* and *juru pintu*) is in position to conduct the entire DI operation and maintenance activities. Within the prevailing scheme, farmers just need to use water and pay O&M fee. But no O&M fee could be collected so far. The irrigation O&M doesn't work due to budget and other shortages.

Farmers allocate water illegally but no sanction be applied. Most irrigation structures are damaged and not function due to lack of maintenances. And all in all water is sufficient for upstream and middle stream but no water could be expected for the down stream.

(3) Agriculture

Basically farmers practice mono-cropping system by paddy-paddy-paddy cropping pattern along the year; the secondary crops (soybean and cassava in particular) are planted accordingly.

The interviewed key informants confirmed that paddy production averages at 3.5 ton/ha only. Farmers do not use labeled paddy seeds, adequate fertilizers nor insecticides because of expensive to buy. PPL working minimally is partly responsible. Whereas low selling price and low income reduce farmers' willing and ability to adopt market orientation and appropriate technologies.

It is the fact that no rural cooperative nor rural bank effectively working for the benefit of farmers. The farmers' needs for farm capital, production inputs, marketing and other goods and services are completed and controlled by local private traders and collectors, toward whom farmers have no bargaining and claim making powers. Lacks of transportation and communications are another factors that partly sink farmers into difficult situation.

Post harvest practices may also cause low selling price since traditional drying techniques mostly depend on sun shine, and West Sumatra has longer rain season; hence farmers have no capacity to meet the prevailing standard quality (in term of paddy 14% wet rate at minimum).

(4) Others

Water of Sungai Betung river decreases about 45% in dry season due to deforestation of the upper water catchment area. Thus farmers established a traditional weir below the DI for additional water supply.

The mentioned initiative and capacity to solve problem by their own way represents a phenomenon that is interesting to observe since so far farmers are always reported as characterized by poverty: low human resource for development, low (formal) education background, low income, low organizational and managerial capabilities, etc.

F.1.7 DI Lubuk Nyiur, Pasisir Selatan

(1) General condition

Pasisir Selatan is a district of about 5,727.89 km² area and inhabited mostly by Minangkabau ethnical groups at a total of 426,400 people (106,600 households) and 74 people/km² density. Wetland paddy includes 40,335 ha that averages at 4.6 ton/ha production. The second crops are predominated by maize (2,633 ha), Soybeans (2,413 ha), peanut (1,235 ha) and cassava (1,011 ha)¹⁹.

The selected non-WUA DI Lubuk Nyiur is a Government's semi technical irrigation scheme situated in the Subdistrict of Batang Kapas. The DI was established in 1994 for 308 ha sawah in the two villages of Taratak Tompatih and Lubuk Nyiur, of which 218 ha (71%) is currently irrigated. In fact the two villages have a total of about 320 ha sawah and 1,027 farmers evidently at an average of about 0.32 ha/farmer landholding.

A transect walk during field survey reported that water is taken from the Sungai Batang Kapas river that is sufficient along the year. The DI has a permanent weir of 33 meter width and structures as specified in Table F.1.7.1.

Table F.1.7.1 DI Lubuk Nyiur by Structure Condition

Irrigation Scheme	Unit	Condition
Weir	1	33m width, permanent, small damaged
Main canal	200 m	
Feeding canals	7,671 m	8% damaged
Division/offtake structure	3	Small damaged
Offtake structure	2	Small damaged
Culvert	1	Good
Drop structure	6	Small damaged
Gates	30	20 good, 10 seriously damaged

A WUA was formed by the Government accordingly for 218 ha irrigated sawah and 230 farmers. But, as key-informants confirmed, the WUA leaders were pointed by the Village Government and has no AD/ART so far. Currently the WUA is inactive and unknown by farmers. It was also reported that about 10 *Kelompok Tani* are available in the included villages but one group only that is evidently active.

Cropping pattern is paddy-paddy-paddy (5 planting times per 2 years) at an average of 4 ton/ha production. Thus, the current Rp 1,000/kg selling price enable farmers earn around Rp 4,000,000 gross income, or Rp 1,268,000 net income after Rp 2,732,000 production cost per hectare per planting season.

(2) Irrigation

Formerly the village irrigation schemes of Taratak Tompatih and Lubuk Nyiur were managed respectively by the *Tuo Banda* responsible to the Head of *Nagari* Institution. The traditional irrigation management then ceased after the irrigation schemes were upgraded in 1994 by the Government and WUA were formed accordingly under the DI Lubuk Nyiur management. As the key informants reported, job division among Government and farmers is unclear.

The DI is managed by 1 *Juru Pengairan* living in Painan, about 27 km far from the DI, and visit the scheme for O&M activities 2 times per week. The *Juru Pintu*, 1 person, working since 1975 has remained a daily employee status. He is a local village inhabitant, getting old and sick, and receives no salary for the last 3 months because no O&M budget could be disbursed so far. O&M doesn't work and weir, main canals and gates are partly damaged due to sedimentation, garbage, illegal water allocations and floods.

Farmers are active in both farm and off-farm works²⁰, especially the young generation. However they mostly cultivate their own sawah, and about 15% only cultivated on share-cropping basis. Land preparation is undertaken by hand tractor; traditional plough is no longer adequate to meet the increasing planting intensities. The increase of hand tractor uses in turns increase the rental rate and

¹⁹ Source: District of Pasisir Selatan in Figures 1999, Central Bureau of Statistic of Pasisir Selatan

²⁰ Such as laborer of rubber plantations, laborer of logging companies, etc., from which they earn much bigger in-money income than farm.

hand tractor shortages.

Cropping pattern and planting calendar are discussed at village level and announced through the local mosques and markets. But it is often that currently it doesn't work because of increasing production cost and decreasing rate of return. As key informants reported, by using 4 ton/ha production, Rp.1,000/kg selling price, and Rp.2,732,00/ha/planting season production cost, farmers earn only about Rp.1,268,000/ha/planting season.

(3) Others

The previous genealogical community institution called *Nagari IV Koto Mudiak* to whom the traditional irrigation management *Tuo Banda* responsible disappeared when Law no 5/1979 on village government was taken into operation. Due to the prevailing Law, the mentioned Nagari was break down into 4 village-government administrations, i.e. Taratak Tompatih, Lubuk Nyiur, Sungai Nalo and Tuik. However the traditional village irrigation management of *Tuo Banda* remainingly worked on until the DI Lubuk Nyiur was established and managed by the Government in 1994.

Since then *Ninik mamak* and the other traditional Nagari leaders have changed to various positions and job opportunities inside and outside the Province for their individual family, and have no longer concerned with their communities.

F.1.8 DI Koto Tuo, Kota Padang

(1) General condition

Padang Municipal is the capital of West Sumatera Province covering an area of 695.03 km², of which about 62% is allowable for utilization. By 1999 the Province capital was inhabited by a total of about 786,040 people (196,510 households), hence represent an average of about 1,131 people/km² density²¹. The different source of data reported that Padang has 14,583 ha sawah at an average of about 5.1 ton/ha production²². The other food crops are dominated by maize, cassava and peanut.

The DI Koto Tuo is a Government's technical irrigation scheme situated in the Sub-district of Koto Tengah, Padang Municipal. The DI was constructed in 1975 for about 1,003.73 ha sawah. Currently about 713.06 ha (70%) is irrigated, concerning 10 villages and 646 farmers.

The DI was selected to represent the characterization of several WUA-DI in the Province. Water is taken from Batang Air Dingin river that is evidently insufficient in dry season. Field findings reveal a permanent weir established in 1976 is still in good condition. Main canal has 1,257 m-length, feeding canals 7,671 m whereas the buildings are as summarized in Table F.1.8.1.

Table F.1.8.1 DI Koto Tuo by it's Structure Condition

Irrigation Scheme	Unit	Condition
Weir, permanent	1	Good
Main canal	1,257 m	
Feeding canals	7,671 m	
Division/offtake structure	1	Not seriously damaged
Sedimentation trap	2	Good
Drainage structure	1	Good
Bridge	5	Good
Drop structure	3	2 good, 1 not seriously damaged
Gate	44	12 good, 11 not seriously damaged, 22 seriously damaged

²¹ Source: Padang Municipal in Figures 1999, Central Bureau of Statistic of Padang Municipal

²² Source: Provincial Government Agency for food cropping & Central Bureau of Statistic of West Sumatera 2000.

In corresponding to the irrigation scheme establishment 9 WUAs were formed in 1988 by the Government, but as the key informants reported only 2 WUAs that are currently active as specified in Table F.1.8.2. The 5 WUAs are inactive, dispersed or name only, whereas the remaining 2 WUA has no data available.

Table F.1.8.2 DI Koto Tuo by WUA Condition

WUA	Area (ha)	Member	Progress
1. Koto Tuo Sepakat, upstream	39	35	Name only
2. Ceno Pulai, mid/downstream	93	213	Dispersed
3. Saiyo, upstream	83.3	115	WUA leaders only, inactive
4. Kalawi Ganting, downstream	50	95	dna (data not available)
5. Empat Sekawan, downstream	70	70	WUA leaders only, active
6. Harapan Jaya, upstream	9.96	13	WUA leaders only, inactive
7. Setia Usaha	95	dha	dha
8. Paneh Bagamam, midstream	100.25	145	WUA leaders only, active
9. Cinpauik, downstream	103.1	123	WUA leaders only, inactive
Total	643.61	809	

The interviewed key informants on the other side reported, cropping pattern is paddy-paddy-paddy (5 planting seasons per 2 years) at an average of 4.2 ton/ha production. Using the current Rp 1,200/kg paddy price farmers earn from the paddy field gross income of about Rp 5,040,000 per hectare per planting season, that means Rp 2,683,000 net income after Rp 2,357,000 production cost per hectare per planting season.

(2) Irrigation

The DI was considered by the Government as a model of *IPAIR*²³ collection but it doesn't work. *Gotong-royong* for tertiary irrigation maintenance and regular meetings are also minimal. And above all, no WUA federation could be established so far, so no cropping pattern and planting calendar could be organized, and subsequently no adequate water allocation system could be made and operated for the entire WUAs of the DI. Field findings indicate the fact that job division between Government and WUAs is still unclear, whilst most farmers and WUA leaders do not know WUA goal, functions, activities nor benefits for them. WUAs were initiated by a limited number of local people for Government assistance.

Many offtake structures established by farmers in impermanent way are broken whilst no maintenance made for quaternary canals. The mostly serious problem concerns with gates; only about 12 (27%) of 44 units that are in good condition. The remaining 73% are broken (see Table 1.8.2 above).

Basically the DI water is used for agriculture (90%), fishery (5%) and others (car washing, domestic/clean water etc, 5%).

(3) Agriculture

A source of data reveals that land preparation is moderate due to hand tractor uses. But the other aspects of promoted farming technology are still low as clear from Table F.1.8.3.²⁴

*KUT*²⁵ distribution needs for 3 months that is too late from farmers' point of view, whereas on the contrary the distributed *KUT* mostly is not repaid.

Floor price considered by the Government by the moment is Rp.1,500/kg that is still low from the viewpoint of farmers; unfortunately farmers gain a lower rate, i.e. Rp.1,200/kg paddy.

Table F.1.8.3 DI Koto Tuo by the Promoted Farming Technology

No.	Farm Technology	% Applied
1	Arrangement of cropping pattern and planting calendar	53
2	Land preparation	79
3	Rotation of varieties	75
4	Use of high yield variety seeds	55
5	Planting population (200,000 stools/ha)	68
6	Pest control	69
7	Appropriate fertilizer	61
8	Improvement of on-farm water management	53
9	Harvest and post harvest treatments	63
10	ZPT/PPC uses	-

²³ *IPAIR*, iuran pemakai air, O&M water charge

²⁴ Source: Extension Program of *Balai Penyuluhan Pertanian* (Agricultural Extension Agency), Koto Tengah 2000

²⁵ *KUT*, kredit usaha tani, credit scheme promoted under the Ministry of Agriculture to ensure food production and paddy in particular

(4) Others

Sense of gotong-royong disappears mainly because of attitude change of people to compete each other rather than to cooperate. It is also the fact that traditional leaders are no longer concerned with their communities; they are active in various jobs and opportunities within and outside of the Province for their own social-politic-economic status offered widely in the development era.

It is interesting to note that farmers do not organize cropping pattern and planting calendar because belong to their experience same harvest season will automatically cause paddy price fall.

F.2 The Selected Sites of West Java

F.2.1 General Conditions of the Province

Roughly covering the western third of Java island, the Province of West Java is noticeably more mountainous than the rest of the island. The Province has volcanic peaks creating a fragmented series of narrow but fertile and well watered highland valleys and plateaus in the central and southern areas so-called *Priangan* or *Parahyangan*²⁶, the sacred homeland of Sundanese people. The northern areas that are evidently coastal low-land represents the homeland of Cirebon ethnical group in the east and Banten ethnical group in the west. Jakarta Province is excluded.

The Province of West Java is situated between 5,50' – 7,50 Latitude and 104,48' – 108,48' Longitude concerning about 43,240.09 km² area, of which wetland cultivation dominated at 27% area (1,129,019 ha).

The wetland cultivation consisted of technical irrigated 463,397 ha, semi technical irrigated 123,408 ha, simple irrigated 105,357 ha, non-governmental irrigated 203,582 ha, rain fed 231,220 ha and 2,055 ha others. It is interesting to note that however the wetland cultivation shared only 11% regional income (14% as combined with other agricultural sub-sectors), whereas manufacturing industries, on the other side, contributed about 31%²⁷.

Rainfall varied at 6-7 wet-month/annum (northern coast areas), 7-9 wet-month/annum (central and southern areas) and >9 wet-month/annum (Bogor and southern east coast)²⁸. And correspondingly 5 main rivers flow in terms of Ciujung, Cisadane, Citarum, Cimanuk and Cisanggarung. Populated by about 40,896,320 people (10,280,502 households) the Province averaged at 952 people/km² density. They were administratively organized into 26 districts, 529 sub-districts and 7,205 villages; but currently the figures should be reduced because of the formation of Banten Province.

Following the site categorization 4 sites were proposed by the regional government and selected to represent the existing success WUA, non-WUA, single WUA and federated WUA irrigation schemes in the Province as listed in Table F.2.1.1.

Table F.2.1.1 West Java by the Selected Sites

District	DI	ha	Category
1. Kuningan	Cijangkelok	1,160	Successful WUA
2. Bandung	Ciyasana	1,194	Non WUA
3. Garut	Cipalebuh	1,093	Single WUA
4. Cisadane Empang	Bogor	794	Federated WUAs

²⁶ *Priangan* or *Parahyangan*, the abode of gods, series of mountainous peaks and valleys stretching from Bogor in the west, Bandung in the midst, to Ciamis in the east.

²⁷ Source: The Province of West Java in Figures 1998, Central Bureau of Statistic of West Java.

²⁸ Source: Olderman, 1975

F.2.2 DI Cijangkelok, Kuningan

(1) General Condition

The District of Kuningan is located in the northern east part of West Java that is mostly mountainous, concerning about 76,041ha area of which irrigated sawah includes about 21,197 ha (28%) area and rainfed 8,344 ha (11%) area. The mentioned irrigated sawah consists of technical irrigation 19%, semi-technical irrigation 34% and simple irrigation 47%. The remaining land use types include about 61% area²⁹.

During 1998 the harvested paddy production of the prevailing planting seasons covered a total of about 63,799 ha at 4,8 ton/ha production. Shallot production dominated the secondary crops at 19,467 ton (11% of provincial production). The other main secondary crop productions were potato, cabbage, long-beans, bush-beans, chili, and tomato.

The DI Cijangkelok was proposed and selected to represent the existing successful WUA DIs of West Java. The DI was established by the Government in 1991/1992 in the Sub-district of Cibingbin, District of Kuningan, concerning 1,159 ha sawah, 33 tertiary blocks and 7 villages.

The DI, therefore, is a Government's irrigation scheme, and accordingly the Subdistrict Government Agency for Irrigation (Pengamat Office) is responsible to manage the irrigation O&M. Field survey focused on Sukarapih village found that WUA was formed on local *mitra cai* basis, a traditional water users association, to manage water distribution and maintenance of the local tertiary irrigation scheme. But currently the WUA doesn't function well as yet. The local tertiary irrigation scheme O&M is handled by *Ulu-ulu* and block leaders under the management of *Raksa Bumi*, a traditional village officer responsible for village development to the *Kuwu* (by the prevailing village government administration system the *Raksa Bumi* is officially called *Kaur Bangdes* or *Kepala Urusan Pembangunan Desa*, Head of Section for Village Development responsible to the *Kades* or *Kepala Desa*, the Head of Village Government.

It is however important to note that all farmers paid *IPAIR*³⁰ at 6 kg paddy/100 *bata*³¹ (0.14 ha) per harvest. The collected *IPAIR* was used for *Ulu-ulu* and block leaders' income (4 kg) and administration cost and maintenance (2 kg). Whilst for irrigation improvement and rehabilitation a special contribution was usually collected from the farmers and absentee landowners in accordance with decisions made in *musyawarah*³² among the local village communities.

At DI level water distribution was considered upon cropping pattern and planting calendar consented in a *musyawarah* among the Head of Section for Village Development of the included villages rather than among the initiated WUAs. WUA federation was not established so far.

(2) Irrigation

A walk through made during the field survey indicated that various damages occur at all levels of tertiary, secondary and primary schemes concerning gates, canals and weir because of lack of O&M budget and activities. This damaged condition of the irrigation structures in turns causes lack of distributed water, low farm production and income, and conflicts between upper, middle and downstream farmers.

The interviewed key informants confirmed that, in the most part, structures and canals are broken because of limited Government's O&M budget and *IPAIR* collected from the farmers. The irrigation structures that are evidently located in the hilly area also make maintenance difficult whereas canals were not all permanently established. It is therefore evident that in dry season water is insufficient;

²⁹ West Java in Figures 1998, CBS of West Java

³⁰ *IPAIR*, *iuran pemakai air*, water user charge

³¹ 100 *bata* = 0.14 ha

³² *Musyawarah*, a traditional problem solving and decision making that involves all elements of the local communities and the concerned parties

only in the upstream sawahs that planting could be made for 3 times annually, but no water could be expected for the down stream. It is also unfortunate that flood occurs in rain season. As the interviewed key informants reported, water catchment areas were deforested.

WUAs' leaders work inefficiently as obvious from lack of WUAs' resource of fund, whilst IPAIR collected from members are limited. WUAs have no O&M fund for the local secondary and primary irrigation schemes.

(3) Agriculture

But lack of the distributed water doesn't stand alone. Field findings indicated that farming practice is also responsible. Farmers still prefer to apply traditional farming rather than new technology, whereas *Kelompok Tani*³³ is inactive due to shortages of *PPL*³⁴ number and extension work facilities.

Landholding that averages at about 0.3 ha/household is another factor that, under the prevailing farming practice, may also causes low farm income. Whilst it is also a matter of fact that young generation is not interested to farm. They prefer to work in off-farm jobs and opportunities in term of factories, construction works, trades and estates. Thus farm laborer is sparse and expensive. And because production inputs (seeds, fertilizers, insecticides etc) are also expensive farmers tend to use traditional cultivation. Production is low. And input-output ratio is mostly negative.

(4) Others

It is also important to note that at village level farm production marketing doesn't develop; farmers sell their production individually to the traders and collectors due to lack of transportation infrastructures and facilities. And because of lack of bargaining power, the farm production marketing is mostly controlled by the private sector. Thus farm production price is low and, subsequently, farm income is low.

The problem of transportation, on the other side, also causes production inputs difficult to find and/or expensive to buy that in turns affect farmers' willing and ability to use appropriately labeled seeds, fertilizers and other promoted farm technologies. Whilst KUD doesn't work effectively, no farmer cooperative available in the DI that could be expected to organize both the provision of farm production inputs nor marketing.

F.2.3 DI Ciyasana, Bandung

(1) General Condition

Situated in the center of *Parahyangan* valleys, the District of Bandung includes about 217,749 ha area, of which about 46,745 ha (21%) and 11,595 ha (5%) area represent irrigated sawah and rainfed, respectively. The irrigated sawah consists of technical irrigation 42%, semi technical irrigation 26% and simple irrigation 32%. The remaining 74% district area is used for non-sawah landuse types³⁵.

Using the prevailing planting seasons, by 1998 the Bandung District covered about 109,125 ha harvested paddy field at an average of 4,9 ton/ha production. The secondary crops were mostly predominated by potato and cabbage productions at a total of about 282,177 ton and 204,988 ton respectively. The other secondary crops were long beans, carrots, chili, tomato, bush-beans and red/white onions.

³³ *Kelompok Tani*, group of farmers promoted under the Ministry of Agriculture's program scheme.

³⁴ *PPL, Penyuluh Pertanian Lapangan*, agricultural extension workers posted at village level under the Ministry of Agriculture's program scheme.

³⁵ West Java In Figures 1998, CBS of West Java

The DI Ciyasana was proposed and selected to represent the characteristic of non WUA DIs in the Province. The DI locates in 2 Sub-district administration boundaries of Cileunyi and Rancaekek, Bandung District, concerning a total of about 1,252 ha sawah and 9 villages³⁶.

Field survey focused on Cileunyi village found that a WUA was initiated by the local farmers. Unfortunately this good start doesn't make sense because the initiated WUA is not accepted nor legalized by the local Village Government so far. And as an effect, no farmer willing to pay *IPAIR*, no salary for the WUA leaders, and subsequently no activity could be made by the WUA leaders.

The field findings also reveal that DI water is uncontrollable. Flood occurs in rain season, among others, because of lack of irrigation maintenance. Culverts are closed with rubbish and canals are sedimented and broken. Whereas in dry season water is evidently insufficient due to the same reasons and off-farm water uses, and no water could be expected for down stream sawahs.

(2) Irrigation

The interviewed key informants confirmed that farmers have lack of sense of belonging. The fact is that the DI was established and owned by the Government. Thus it is their considered opinion that Government must be responsible for the irrigation O&M. In fact the irrigation O&M is handled by the local Sub-district Government Agency for Irrigation (Pengamat, Juru Pengairan and Water Gate Keeper). Unfortunately Government has no enough budget and facilities, whereas *IPAIR* collected from farmers doesn't work. As a result required maintenance, improvement or rehabilitation could not be undertaken properly.

Currently the DI is colored with damages and sedimentation. Inspection road is also broken, and drainage doesn't work well because of too small gate. A walk-through made during field survey revealed that canal banks were not established permanently and usually broken by flood. Rapid development of Bandung District is another factor that apparently increased the complexity of problem. The irrigated sawahs changed rapidly to settlement and industries. Many farmers changed to off-farm works and job opportunities. While increasing rubbish and polluted water affected the irrigation O&M and the distributed water, no serious attention nor motivation could be expected anymore for cultivation.

(3) Agriculture

Thus, as the interviewed key informants bear out, the following problems are evident in the DI, namely (a) low productivity, (b) small landholding, and (c) motivation change of farmers and young generation in particular to off-farm works. Farm productivity is low because of inadequate use of production inputs due to negative input-output ratio. Landholding is small because of increasing migrant-in and land use changes to settlement, trading and industrial centers. Whereas reducing motivation of farmers to cultivate is resulted from the fact that off-farm jobs give them better earning and social status as compared to farm.

It is a matter of fact that land price increased dramatically in correspondence with the increasing urbanization. Thus it is quite common to local farmers to sell their land and change to off-farm works.

(4) Others

The interviewed key informants reported that farmers get no benefit from the local KUD for capital, production inputs and marketing due to lack of capacity to compete against the private sector. Farmers usually seek for the needed seeds, fertilizers and insecticides and sell the productions individually to the local markets definitely controlled by the profit making traders and collectors. And after all they earn no adequate return from their farming due to lack of bargaining position.

³⁶ Source: Dinas PU Pengairan of Bandung District 1999

F.2.4 DI Cipalebuh, Garut

(1) General Condition

Bordered by Indian Ocean in the south the District has about 216,986 ha area, of which irrigated sawah covers about 41,695 ha (19%) and rain fed sawah 9,372 ha (4%) area³⁷. The irrigated sawah consists of technical irrigation 31%, semi-technical irrigation 34% and simple irrigation 35%. The remaining 77% area consists of non-sawah land use types.

Using the prevailing planting seasons by 1998 the harvested paddy concerned about 128,252 ha at an average of 4,3 ton/ha production, still lower than provincial figures that averaged at 4,5 ton/ha. The secondary crops were dominated by potatoes, cabbage, long beans, carrots, chili, tomato, bush beans and red/white onions.

The DI Cipalebuh located in the Sub-district of Pameungpeuk, Garut District, was proposed by the regional government to represent the specific conditions of single WUA DIs in the Province. The DI was established by the government in 1990 for 32 tertiary blocks of 5 villages in 2 Sub-districts of Pameungpeuk and Cikelet at a total of 1,093 ha. But currently only 1,016 ha sawah that is already irrigated as shown in the Table F.2.4.1.

Table F.2.4.1 DI Cipalebuh by the Irrigated Sawah

Pameungpeuk	Pameungpeuk	360.5
	Mandalakasih	279
	Mancagahar	149.5
	Jati	114
Cikelet	Pamalayan	113
2 Wubdistricts	5 Villages	1,016.0

The DI that consists of 1 permanent weir and 22 off-take structures, therefore, is a governmental irrigation scheme, and accordingly the *Kemantren*³⁸ Cikarak I and II are responsible for the DI management and O&M with local water users' participation.

The field survey concentrated in Mandalawangi village, Pameungpeuk, found the irrigated sawah represents about 51% village area. The village is headed by the *Kades*³⁹ elected by the village communities. Whilst village communities are represented by *BPD (Badan Perwakilan Desa)*⁴⁰

(2) Irrigation

A transect walk made during field study indicated that in general the DI Cipalebuh is still in good condition. Left side of weir and drainage gate are damaged because of flood. The damaged drainage gate, in some extent, causes entries of mud into the canal and sedimentation which, together with rubbish and *karamba*⁴¹, in turns affect the irrigated water flows and distribution especially for the down stream areas.

A WUA Mandala was established in the DI, but only the WUA leaders that are active. *IPAIR* doesn't work as yet. The *IPAIR* and the tertiary irrigation O&M, therefore, is handled by *Ulu-ulu* under the village management by hiring about 10 laborers for 7 days per month @ Rp 10,000/manday. The hard works are usually proposed to the District Government. When field survey was conducted, the Pameungpeuk Government Agency for Irrigation just dredged the Padengdeng canal sedimentation. However, because of no transparency farmers are reluctant to pay *IPAIR*..

On the other side the Government is also lack of O&M budget. Subsequently no adequate O&M could be conducted for the DI, and no sufficient water could be expected for planting season-3 (dry season)

³⁷ West Java in Figures 1998, CBS of West Java.

³⁸ *Kemantren*, equivalent to Subdistrict Government Agency for Irrigation (*Pengamat*)

³⁹ *Kades, Kepala Desa*, is the Head of Village under the prevailing government administration system. In the past villages are traditionally headed by *Kuwu* who was, among others, assisted by *Ulu-ulu* responsible for water management.

⁴⁰ *BPD, Badan Perwakilan Desa*, is a House of Representative at village level elected democratically by the local villages communities. Under the prevailing regional autonomy Law no 5/1999 the past village *LKMD* and *LMD* institutions are no longer applied.

⁴¹ *Karamba*, a net system made to catch fishes

of the down stream in particular. Sawah could not be cultivated, and this fallow land reduces production and income of farmers respectively.

It is however important to realize the fact that inadequate irrigation O&M may or may not stand-alone. Different findings reveal that water is taken from the Cipalebuh River. In dry season the water flow decreases. Thus the deforested water catchment areas in the upper lands may partly responsible.

(3) Agriculture

Production of planting season 1 of the year 2000/2001 pointed out that agriculture in the DI is, however, potential to develop. The main problem is production inputs and fertilizer in particular that is out of farmers' capacity to buy. As an effect, farmers use fertilizer inappropriately and production is low. The other problem concerns with farm production price that is evidently low as compared to production input, which in turns causes low farm income and low willing and ability of farmers to pay *IPAIR*.

Insufficient water in dry season (planting season 3) is another factor affecting farm production. Farmers prefer to keep their land fallow, whereas some hire outside sharecroppers for chili and water-melon.

(4) Others

So far no farm cooperative available in the DI organizing the provisions of production inputs and marketing for the farmers. Supplies of the required capital and production inputs on one side and marketing on the other side are controlled as well by the private sector (local traders, local collectors, rice mills etc.), resulting at a negative production input-output ratio.

The *KUD* at Sub-district level of Pameungpeuk focuses on electricity only. Farm production inputs, capital and marketing are not taken into their priority, whereas *Kelompok Tani* is also inactive.

F.2.5 DI Cisadane Empang, Bogor

(1) General Condition

The District of Bogor includes about 225,087 ha area of which about 39,727 ha (18%) and 7,928 ha (4%) are used for irrigated sawah and rainfed cultivation. The mentioned 39,727 ha irrigated sawah consists of technically irrigated 19%, semi-technically irrigated 28% and simply irrigated 53%⁴².

By 1998 the prevailing planting seasons recorded about 86,465 ha harvested wetland paddy field (4% provincial figure) at an average of 3,7 ton/ha production, much lower than provincial figures that averaged at 4,5 ton/ha. The secondary crops were dominated by potatoes, cabbages, long beans, carrots, chili, tomatoes and bush beans.

Administratively the selected DI locates in 3 district boundaries, namely Bogor District, Bogor Municipal and Depok. It includes 737 ha sawah and 16 villages.

Field survey focussing to Bantar Jaya village found the local village government consists of *Kades* (*Kepala Desa*, Head of Village) and *BPD* (*Badan Perwakilan Desa*, Village House of Representatives) elected by the village communities under the prevailing regional autonomy Law no 5/1999.

Field findings also reveal that registered WUAs are names only. There is no WUA leader, no member, no organization structure, no meeting, and no *gotong-royong* for irrigation maintenance. Thus in fact no WUA nor *mitra cai*⁴³ is available in the included villages of the DI. The irrigation O&M at tertiary

⁴² West Java in Figures 1998, CBS of West Java.

⁴³ *Mitra cai* is a traditional water users association usually available in the villages in West Java

blocks are undertaken by the *Ulu-ulu*, a traditional village leader responsible to *Kades* for local water supply and management.

(2) Irrigation

Field findings show that inadequate O&M takes place in the DI as evident from the damages of irrigation structures and facilities at tertiary, secondary and primary schemes. In general term the damages include intake water gate, canal structures and sedimentation mostly due to illegal water allocations and conflicts among farmers.

The interviewed key informants reported that no cropping pattern and planting calendar consented among farmers within and inter-villages in the DI. In a tertiary block farmers plant paddy, maize, vegetables etc in parallel with fish ponds. Thus no regulation made for appropriate water allocation within and among the tertiary blocks. Farmers seek and distribute water for their own farm individually, causing illegal water allocations and conflicts among farmers within and inter-villages.

Correspondingly farmers pay no IPAIR so far for *Ulu-ulu* and irrigation O&M, while no budget allocated from village government level. As an effect the *Ulu-ulu* doesn't work and no irrigation O&M activity could be made at village level. Under the prevailing regional autonomy law, actually *Cabang Dinas PU Pengairan Kabupaten* (District Government Agency for Irrigation) is in position to be responsible for the irrigation O&M. The required O&M could not be carried out adequately because of lack of O&M budget. However a DI improvement and rehabilitation could be made possible on village proposal basis.

(3) Agriculture

As evident in the village of Bantar Jaya cultivation is mostly undertaken by tenant farmers to whom cash crops are preferred rather than paddy. It is their experience that organized cropping pattern and planting calendar usually result at low price of harvested productions and low income. Thus no cropping pattern nor planting calendar could be organized together within and inter-tertiary blocks nor villages.

The mentioned land tenure also indicates that absentee lands are too high in number. The landowners living outside of the village on off-farm works mostly do not care on their land and irrigation. Whilst fast land use change from farming to settlements represent another factor causing smaller landholding, low farm income, and decreasing ability of farmers to pay IPAIR.

(4) Others

Supplies of production inputs and marketing of farm productions represent a feature that more or less similar with the previous sites. Farmers seek for the required capital, production inputs etc. from the local markets that are evidently controlled as well by the private sectors, and sell farm production to them accordingly. This system doesn't make them able to develop since no surplus could be expected in money term from production output beyond production cost.

The key-informants confirmed that farmers have been being absolutely controlled by the private sector. There is no room anymore for KUD to serve them, and that is why the KUD then concentrates differently to electricity and saving & credit services.

Kelompok Tani and PPL could not work effectively because, under the prevailing policy of the Ministry of Agriculture, the promoted activities do not meet with the farmers' aspiration and preference to cultivate. Lack of coordination between the District Governments of Bogor, Bogor Municipal and Depok is another factor that make the complicated problems of the DI management difficult to solve.

F.3 The Selected Sites of DI. Yogyakarta

F.3.1 General Conditions of the Province

The Province of *Daerah Istimewa*⁴⁴ Yogyakarta is situated in the southern central part of Java Island. Bordered by the Indian Ocean in the south and lays in the southern landscape of Merapi vulcano the Province's 3,186 km² area is populated by the Javanese heartland ethnical group at a total of about 3,237,628 people (698,787 households), making an average of 1,016 people/km² population density and 0.80% per annum growth⁴⁵. They are organized into 5 districts, 75 sub-districts and 438 villages.

A categorization by altitude shows the Province constitutes of 29% ha area of <100 masl⁴⁶ in the south. Gradually to north the area represents upland i.e. 64% ha of 100-500masl and the remaining 7% of >500masl.

By land use types settlement dominates about 86,725 ha (27% area). Sawah includes only about 59,792 ha (19%) whereas dry land 109,432 ha (34%), forest and people forest 38,060 ha (12%) and other vegetation types 8%.

Correspondingly food crops shared only about 16% regional income by 1998, whereas groups of trade, transportation, finance and services predominated at 56%. Manufacturing industries and construction shared 15% and 8% respectively.

Rivers flow from Mt. Merapi to south utilized for irrigated sawah 49,719 ha and other water uses. The remaining 10,073 ha sawah is rainfed.

Four irrigation schemes were considered to represent the conditions of the existing irrigation categorizations in the Province. The selected irrigation schemes are as presented in the Table F.3.1.1.

Table F.3.1.1 Yogyakarta by the Selected Site Categories

No.	District	Selected Site	ha	Category
1	Sleman	DI ^{*1} Tulung Opak, 1 WUA	113	Single WUA
2	Kulon Progo	DI Pekik Jamal, 13 WUAs	739	Success WUA
3	Gunung Kidul	DI Seropan	95	Non WUA
4	Bantul	DI Merdiko Kiri, 5 WUAs	170	Federated WUAs

^{*1} DI used here is Daerah Irigasi, irrigation scheme

(1) General Condition

The district of Sleman in the north covers about 574.82 km² land at 80-2,911 masl with 0.5-15.2 mm rainfall per day. Rivers flow from Mt Merapi through the district and constitute Progo and Opak watersheds.

About 832,406 people (208,102 households) of the Javanese heartland ethnical group currently represent the population of the district. They are organized into 17 Subdistricts and 86 villages. Some villages are evidently closed to Yogyakarta Municipal, thus quickly change to urban and suburban land uses such as shopping centers, settlements, governmental buildings and offices, university compounds, etc.

Paddy, however, predominates the 1999 district food production by 45,127 ha. The lower places were taken by maize (4,585 ha), peanut (3,679 ha), cassava (1,550 ha), soybean (890 ha), sweet potatoes (405 ha) and green pea (28 ha). Paddy production averages at 5.4 ton/ha⁴⁷. Different source of secondary data collected from the District Dinas of Irrigation reveals many irrigation schemes were established concerning above and below Mataram (Van der Wijk) irrigation scheme that mostly are small.

⁴⁴ *Daerah Istimewa*, Provincial Government with a special status given by the Central Government due to specific socio-cultural and socio-political backgrounds; the same special status was also given to Aceh. *Daerah Istimewa* usually abbreviated with DI.

⁴⁵ Source: Yogyakarta in Figures 1998, Central Bureau of Statistic DI Yogyakarta 1999

⁴⁶ masl, meter above sea level

⁴⁷ Source: District of Sleman in Figures 1998, Central Bureau of Statistic of Sleman District 1999

The selected DI Tulung Opak is a technical irrigation scheme formerly constructed in 1972 for 23 ha sawah of Tamanmartani village in the Kalasan Sub-district.

A WUA was initiated in the DI and legalized by the Bupati. Eventhough the DI management was not yet turned over by the Government, the irrigation O&M of about 50 meter below intake gate has been undertaken by farmers in liaison with local Village Government. The DI structure is as specified in the Table F.3.1.2.

Table F.3.1.2 DI Tulung Opak by Irrigation Structure

No.	Structure	Length (m)	Unit (Nos)
1	Main Canal	1,107	
2	Secondary canal	3,000	
3	Offtake culvert		1
4	Intake gate		2
5	Measurement structure		1
6	Flushing structure		2
7	Culvert		5
8	Animal washing point		2
9	Acquaduct		1
10	Avour		1

(2) Irrigation

Transect walk findings indicate that presently the DI is in good condition. It is however important to note that in dry season water is insufficient thus rotated in accordance with the planting patterns among the existing blocks that are evidently village and sub-village based. Peischal (measurement board) is not available. Tertiary structure is mostly impermanent and many banks are planted with annual and seasonal crops that may affect the irrigation structure. It is also a matter of fact that land ha/hh is too small hence the collected O&M fee is low. Farmers currently active mostly are old generation with low education and other required human resources. Young generation is not interested to farm.

The DI has one WUA namely Ngudi Rukun. The WUA was initiated in 1998 and legalized by the Bupati in 1999. Overshadowed by the past model of water users association called *OPPA*⁴⁸, WUA Ngudi Rukun organizes 9 irrigated blocks that are equivalent to the existing 9 *dusun* (sub-villages) of which the involvement of the Head of Sub-villages are taken into account. However regular meetings of WUA members are difficult to organize. Inadequate awareness of farmers on WUA is a problem to be taken into priority.

Whilst WUA manages the irrigation O&M about 50 meter below the weir as mentioned above, the weir management is handled by the Subdistrict Government Agency for Irrigation (*Pengamat*) of Kalasan who is assisted by 1 *Juru Pengairan* and 1 *Juru Pintu*. Block leaders are responsible for the local tertiary irrigation system.

(3) Agriculture

Basically the DI has paddy-paddy-palawija planting pattern with some extent of vegetables and tobacco prior to planting season 2. This land optimization doesn't mean that cultivation is the only source of income. Average landholding of about 0.10-0.25 ha/hh is too small to meet the increasing farm and living costs, and correspondingly farmers are also active on off-farm works.

Findings collected from the interviewed key informants indicate that farmers use fertilizers and insecticides inappropriately due to inadequate perception which regards to the promoted technologies. Paddy production averages at about 5.3 ton/ha, whilst maize 4.5 ton/ha, soybean 1.25 ton/ha and peanut 1.15 ton/ha.

(4) Others

Some farmers began to develop market oriented farming with additional capital and technology. By taking account the water availability vegetables represent the mostly preferable productions for the local and regional markets. Currently the district production of vegetables are dominated by chili, sawi (*Brassica rugosa*), and cabbage at 3,129 ton, 1,761 ton, and 1,662 ton productions respectively⁴⁹.

⁴⁸ *OPPA*, *organisasi petani pemakai air*, the past model of farmer water users organization working under Village Government administration

⁴⁹ Source: District Government Agency for Agriculture of Sleman 2000.

F.3.2 DI Pekik Jamal, Kulon Progo

(1) General condition

Kulon Progo in the west includes about 58,626 ha area. Overshadowed by the hills of Menoreh the district represents a divergent configuration of land that varies from <100masl (56% ha area), 100-500 masl (23% ha area) to >500 masl (11% ha area). Rainfall averages at about 293 mm per annum and makes the evidences of Progo and Serang watersheds in the district.

Agriculture represents the mostly important sector. About 27% of regional income of 1998 was predominated by this sector. Manufacturing industries and trade shared only about 17% and 12% respectively⁵⁰.

Paddy dominated food productions by 15,942 ha in 1999. The other main productions followed i.e. maize 5,291 ha, soybean 4,321 ha, cassava 2,988 ha, and peanut 2,623 ha. Vegetables on the other side were represented by chilli (1,737 ha), peanut (798 ha) and red onions (415 ha).

Kulon Progo consists of 12 Sub-districts and 88 villages. Using the study criteria the DI Pekik Jamal was considered to represent the success WUA irrigation schemes in the Province. The DI was not yet turned over but it has been managed by the WUA Federation since 3 years ago within supervision of the local Sub-district Government Agency for Irrigation (*Pengamat* who is assisted by 2 *Juru Pengairan* and 1 *Juru Pintu*).

The DI allocates water from the Serang River for about 729 ha sawah of 2 Sub-districts and 9 villages. The structure is as specified in the Table F.3.2.1.

Table F.3.2.1 DI Pekik Jamal by Irrigation Structure

Structure	Unit	Gate
Permanent weir	1	4
Intake structure	1	1
Control	2	4
Division	4	4
Offtake division	17	17
Offtake	38	38
Acqueduct	5	0
Syphon	4	0
Bridge	124	0
Culvert	25	0
Flushing gate	2	2
Avour	5	0
Drainage structure:		
Bridge	52	0
Gate	22	22

Correspondingly 2 WUA Federations was established i.e. WUAF Pekik Jamal East and WUAF Pekik Jamal West. The both WUAFs include 13 WUAs as summarized in Table F.3.2.2.

(2) Irrigation

The main problem of the DI is flood taking place annually in the lower cultivated land in particular. Farmers, therefore, practice what so-called *surjan*⁵¹ farming accordingly that often affect normal planting pattern-based water allocation.

Land holding is small, and subsequently the collected irrigation O&M is also small. It is also a general picture in the DI that young generation is not interested to farm. The active farmers mostly are old generation with lack of human resource for development.

Table F.3.2.2 DI Pekik Jamal by WUAs and WUAFs

No.	WUAF/WUA	Block	Area(ha)	Village	Subdistrict	Class**
Gabungan P3A Pekik Jamal Timur						
1	Kandegrejo	Kandeg	56	Pleret	Panjatan	SDB
2	Pusporejo	Cangkring	28	Garongan	Panjatan	SDB
3	Kontak Makmur	Tanjung	95	Bojong	Panjatan	SDB
4	Bangun Tirto	Praneman	38	Depok	Panjatan	SDB
5	Rumpun Karyo	Jarakan	63	Garongan	Panjatan	SB
6	Bulurejo	Bulu	50	Preret/Bugel	Panjatan	SDB
Gabungan P3A Pekik Jamal Barat						
7	Ngudi Makmur	Kebaran	50	Bojong	Panjatan	SDB
8	Karya Makmur	Salut	25	Bojong	Panjatan	SDB
9	Suka Maju	Kalicawang	35	Karangwuni	Wates	SDB
10	Suka Makmur	Karangrejo	95	Karangwuni	Wates	SDB
11	Ngesti Utomol	Kulwaru	75	Kulwaru	Wates	SB
12	Ngestu Bawono	Ngestiharjo	57	Ngestiharjo	Wates	SDB
13	Tri Mulyo	Jetis	62	Sogan	Wates	SDB
Jumlah:			729			

** BB-belum berkembang (not yet developing), SDB-sedang berkembang (developing) and SB-sudah berkembang (developed), are the prevailing Government version of WUA classification by a set of progress indicators.

⁵⁰ Source: District of Kulon Progo in Figures 1998, Central Bureau of Statistic 1999

⁵¹ *Surjan* farming is a practice of up-lifted dryland and wetland cultivation systems parallelly in an irrigated block. The up-lifted land called *marengan* is planted with palawija along years (chilli, peanut, water melon etc), and the low land is planted with paddy twice a year.

Whilst a part of the leaders of WUAs and WUAFs doesn't understand their jobs as yet, it is difficult to the DI to find potential farmers willing to be a WUA leader. Thus no change could be expected for WUA progress and development. In some extent farmers face their lack of capacities to pay the considered O&M fee due to fail harvests, high production inputs and low rate of return.

Transect walk conducted during the field survey indicated regular torrent occurs in rain season and that inadequate drainage canals are partly responsible.

(3) Agriculture

The DI farmers use hand tractor, hand-sprayer and other production means, whilst thresher, rice mill and other facilities are used for post harvest treatments. Farmers usually sell paddy and *palawija* productions individually to the local markets, traders or collectors.

Transportation and communication facilities are not bad, but no organized marketing as yet to enhance their bargaining position. KUD has no financial and managerial capacity to do so. As an effect farm production prices usually fluctuate in such a way, and in the harvest in particular its fall down to a level below production cost.

Eventually this non-benefitable situation causes the evidence of negative rate of return, lack of willing and capacity to pay irrigation O&M adequately, and in some extent weakening interest to farm and encouraging the desire to change to off-farm jobs and off-farm landuse.

F.3.3 DI Seropan, Gunung Kidul

(1) General Condition

The Gunung Kidul district mostly consists of hilly areas. About 90% ha area is at 100-500 masl. Low land (<100masl) covers only about 8% area, while the remaining 2% is at >500masl. The area is administratively organized into 15 Sub-districts and 144 villages and populated by about 591,344 people (147,836 households).

By taking bio-physical condition into account the government classifies the district into 3 development zones, i.e. (1) Batur Agung development zone in the north at 200-700 masl with many sources of water and rivers, (2) Ledok Wonosari development zone at 150-200 masl in the centre within which rivers flow but no water in dry season. And (3) Gunung Seribu development zone 100-300 masl in the south with no surface river but rich with ground rivers.

Accordingly 2 planting patterns prevail concerning paddy-*palawija-palawija* and paddy-*bera-bera*⁵². Maize dominated food production of the district in 2000 by 51,914 ha harvest. The remaining places were taken by cassava (48,848 ha), soybean (44,818 ha) and peanut (42,888 ha). Dryland paddy concerned about 37,501 ha and wetland paddy 10,070 ha only. Vegetables were represented by spinach (1,749 ha), chilli (1,694 ha) and long beans (1,256 ha)⁵³.

The Javanese heartland population of the district live from both farm and off-farm works due to hard condition for cultivation. The WUAs mostly promoted for pump irrigation schemes are identical to *Kelompok Tani* responsible for the scheme.

The selected DI Seropan is a ground water pump irrigation system designed in the Semanu Subdistrict for 1,000 ha with 800-1,000 m³/sec. water discharge. For the first stage construction was made in 2000 by the Provincial Irrigation Project of Yogyakarta concerning about 60 m³/sec. discharge for 110 ha (90 ha actual) irrigation scheme.

⁵² *Bera* = uncultivated

⁵³ Source: Government Agency for Food Production of Gunung Kidul 2001.

(2) Irrigation

Farmers expect the irrigation scheme could be operated for this dry season 2001. Accordingly a WUA was established in the village of Ngeposari past April 2001, but no water distribution structure as yet available to allocate water from the established water distribution tanks to the target blocks and individual lands.

It is also evident that no analysis was made as yet for potentially profitable irrigated croppings and sustainable irrigation operation and maintenance. However a trial was made by the local District Government for a mix farming system of cotton plantations and soybean. An estimate shows that O&M cost may average at about Rp 600/m³.

(3) Agriculture

The Semanu Subdistrict lays in the hilly areas of 100-300 masl Gunung Seribu development zone. The interviewed key informants confirmed that Semanu recently has 7,457.41 ha dryland and 4.7 ha sawah that constitute a total of about 7,461.11 ha area. Landholding ranges at <0.5 ha/house hold concerning about 6,556 households and >0.5 ha/hh about 5,788 households. Planting pattern is paddy-*bero-bero* and in some extent paddy-*palawija-bera*.

Due to the local scarcity farmers and young generation in particular are active on off-farm works within and outside the region. By the coming operation of the DI Seropan it is expected that planting pattern will change to paddy-*palawija-palawija* and farm works and opportunities increase accordingly.

Farm productions are usually sold to the local traders and collectors in the field called *tebasan* system, to the local markets, and to KUD. But no selling made for paddy so far. Paddy is planted only for their own consumption.

F.3.4 DI Merdiko, Bantul

(1) General Condition

Bantul in the south and bordered by the Indian ocean is the district of which the 4th site selected for irrigation schemes of Yogyakarta is embedded. Bantul is the only district of the province that in the most part is lowland. Nearly to 80% ha area of the district is situated at <100masl height. The remaining area lays at 100-300 masl.

Rainfall averages at 1,769 mm per annum and blesses the total of about 323,562 ha of district area with Progo, Opak and Oya watersheds. The watersheds are utilized mainly for sawah irrigation and other water uses.

By 2,830 people/km² the districts is most densely populated. Farmers' land holding is too small. And subsequently farm is no longer to be the main source of income of the local Javanese heartland people. Only about 40% people are active on farm works, whereas the remaining 60% are active on various off-fam jobs and opportunities.

The selected DI Merdiko allocates water from Winongo river for about 577 ha sawah that, belongs to government administration boundary, is included into 4 villages i.e. Pendowoharjo, Panggungharjo, Timbulharjo, and Tirtomolo. Sectorially the DI is managed under the Sub-district Government Agency for Irrigation (*Pengamat*) of Kasihan for the right side, and the *Pengamat* of Cepoko and Plered for the left side.

Focusing on the left side field survey addressed to the included villages that are administratively covered into Sewon Subdistrict. A WUA Federation was established upon 4 WUAs, namely WUA

Titomulyo, Subur I, Subur II and Nototirto as summarized in Table F.3.4.1.

(2) Irrigation

The common feature of small land holding of the DI in turn affect the farmers capacity to pay O&M fee. Young generation is not interested to farm, whereas potential farmers willing to be WUA leaders are difficult to find. Farmers mostly are old and traditional generations that are hard to change. They do not know that they are the members of WUA. They think that the WUA members are the WUA leaders only. Above all, WUA is not popular in the local communities. Regular meetings include the WUA leaders only due to big number of members.

Table F.3.4.1 DI Merdiko-Left by WUAs

WUA	Village	Area(ha)	Class	Pengamat
Tirto Mulyo	Timbulharjo	36.06	BB	Cepoko
Subur II	Pendowoharjo	12.14	B	Pleret
Subur I	Panggungharj	66.86	SD	Pleret
Nototirto	Timbulharjo	53.00	SD	Cepoko

Sugar factory is different problem realized by the DI due to conflicts that usually arise between the mentioned off-farm water user and the farmers. Transect walk found the fact that water of the DI Merdiko Left comes from syphon of the DI Merdiko Right. Thus, due to lack of water in dry season, coordination of both left and right sides of the DI is needed under one management.

Most tertiary off-take gates are damaged or disappeared, whilst rubbish closes the gates. Taking account that upholding by *gotong-royong* is regularly carried out, public awareness of the local communities for adequate rubbish management is likely needed.

High sedimentation takes place in some points and so do leakages in some tertiary schemes due to impermanent construction.

(3) Agriculture

The DI farmers mostly practice multi-cropping in conjunction with cattle breeding; mono-cropping is sparsely applied. Planting pattern is paddy-paddy-*palawija* of which paddy, soybean and maize represent the main productions with 7.6 ton/ha, 1.7 ton/ha, 4.9 ton/ha production respectively.

Fisheries are potential; the only handicap is waste water coming out from Madukismo sugar factory. Capital was supplied by *KUD*⁵⁴ with *KUT*⁵⁵ scheme, whilst the problems of production inputs and production means were resolved by partnership with *Kelompok Tani*⁵⁶, cooperatives, and private. It is however important to note that farmers have low capacities for adequate farming management and technology practices. This causes low productions and then, because of lack of marketing capability, low income, and finally low irrigation O&M fee.

(4) Others

Farmers sell productions individually rather than organizing together against the local traders and/or local markets. Whereas an estimate indicates hand tractor shortage of about 832 units for about 16,640 ha sawah, land use quickly changes from agriculture to settlement and other urban/suburban land use types. PPL is available in each villages and functional for WUA empowerment. The problem is that mostly they are getting old and will be retired while WUAs still need for their assistance. Cooperatives are also introduced to the WUAs, but only one WUA so far establishing a saving and credit cooperative for the members.

⁵⁴ *KUD*, *Koperasi Unit Desa*, a multipurpose cooperative promoted by the New Order Government in rural areas on subdistrict boundary basis.

⁵⁵ *KUT*, *Kredit Usaha Tani*, a credit scheme initiated by the New Order Government for farmers in order to enhance national food and paddy production in particular.

⁵⁶ *Kelompok Tani*, *Group of Farmers* promoted by the New Order Government and Ministry of Agriculture in particular for the optimization of agricultural extension works.

F.4 The Selected Sites in East Java Province

The Province of East Java is situated between 7°-12' and 8°-48' latitude and 111°-0' and 114°-4' longitude and covers land area and Madura Island at a total of about 46,709.60 km².

Bio-physically East Java is marked by a procession of volcanic cones and well watered valleys cultivated for centuries. It constitutes of several regions with its own flavor. First is the fertile Brantas River valleys around the Arjuna-Butak-Kelud mountains that represent an extension of the Central Java heartland culture. Second is the Bromo-Tengger highland north of Mt. Semeru that is predominated by a pre-Islamic Hindu traditions. And third is another huge volcanic complex around Mt. Ijen in the east.

By landuse types wetland cropping (*sawah*) includes about 881,159 ha (19%) provincial area of which about 671,494 ha is technically irrigated. Dry land farming represents about 1,164,202 ha (25%) provincial area, while plantations and forest are about 963,513 ha (21%) and 1,356,929 ha (29%) respectively. The remaining 6% area is settlement, grassland and other landuse types⁵⁷.

East Java is populated by Javanese, Maduranese, Blambangan and Tengger ethnical groups at a total of about 33,170,001 people (7,371,111 households), and at 710 people/km² density and 0.70% population growth. They live mostly from industrial sector (29% people) and trade-hotel-restaurant (22% people) at an average of about 3 million rupiah regional income per capita per annum by 1998.

People living from agriculture concern only about 14,560,321 (16%) inhabitants constituted of food cropping 8,712,078 (10%), plantations 2,923,127 (3%), livestock 1,718,561 (2%), and the remaining people of forestry and fishery.

Administratively East Java comprises of 37 districts, 615 sub-districts and 8,413 villages, of which 4 districts were proposed by the Provincial Government for the Study concerning 1 irrigation scheme each. A summary of East Java by district and the selected site categories is as presented in Table F.4.1.1.

Table F.4.1.1 East Java by District and the Selected Sites

	District	Selected Site	Area(ha)	Category
1	Lumajang	DI Tekung, 9 WUAs	1,937	Success WUA
2	Sumenep	DI Kebon Agung, 8 WUAs	783	Non WUA
3	Kediri	DI Pulosari, 4 WUAs	503	Single WUA
4	Bojonegoro	DI Cawak, 16 WUAs	1,733	Federated WUAs

F.4.1 DI Kebon Agung, Sumenep

(1) General Condition

The Sumenep district locates in Madura island at <150 m asl⁵⁸ with 565mm/month rainfall. The district is populated by Maduranese who keeps strongly the tradition.

Plantations (coconut, tobacco) and small industries are the mostly important sub-sectors for the people. Paddy field covers about 22,660 ha at an average of about 3.7 ton/ha production. Forest covers about 16,483 ha. The other landuse types includes about 160,172 ha.

The district has a number of watersheds mainly Kalinjuk, Kali Matren and Kali Masjid. The selected DI Kebon Agung is situated in the watershed of Kalinjuk, Kebon Agung village, for approximately 783 ha of 26 tertiary block sawah of 9 villages at a range of 50-800 m³/sec. discharge. The following planting patterns and calendars are applied due to water availability and local potential, i.e. paddy-tobacco-maize/soybean.

⁵⁷ East Java in Figures, the Provincial Bureau of Statistic, 1999

⁵⁸ asl, meter above sea level

This technical irrigation scheme has 1 permanent weir, 2 intake gates, 2.37 km primary canal, 4,157 m secondary canal, 3 drop structures, 1 flushing structure, 10 bridges, 1 control structure, and 4 animal washing structures.

The DI management is handled by the Government and Sub-district Government Agency for Irrigation (*Pengamat* of Kebon Agung) in particular by assistances of *Juru Pengairan* and *Juru Pintu*. In dry season water is rotated as consented with the included the villages.

(2) Irrigation

The main issues of the DI are characterized by limited water availability, limited land ha per household, low awareness of people, inadequate government policy and less developing WUA so-called HIPPA⁵⁹.

The interviewed farmers and key-informant confirmed the rotating water is sufficient for planting season 1 but not so for planting season 2 and 3. Transect walk made during field survey indicated the evidence of sedimentation. Canals are also damaged in many places as caused by illegal water allocation of farmers while many others illegally allocate water by using pumps.

Farmers are not familiar yet with organization. WUAs and WUAF leaders do not know their jobs and proposed for a simple system of organization and legalization. The initiated 8 WUAs in the DI have no AD/ART⁶⁰, and propose for financial injection from Government. Contribution fee for WUA as well as for irrigation O&M was considered by the *Juru Pengairan* and the Head of Village, and no collection could be made from the farmers.

(3) Agriculture

Land averages at about 0.13 to 0.50 ha per household and mostly represents absentee lands. Thus the existing farmer mostly are tenant. The interviewed key informant farmers said that tractor was too expensive to hire. Thus land was usually prepared by using cow.

Under irrigation system the practiced land preparation may represent inappropriate solution because planting was usually late. And the situation in turns caused inappropriateness of water allocation schedule, insufficient allocated water, decrease of production in quantity and quality, and after all KUD⁶¹ was not interested to buy, by saying that KUT⁶² is not repaid and so no financial capacity of KUD to buy.

Farmers, therefore, sold paddy to the private sector at Rp.1,230/kg by the year of 1999.

The condition above leads farmer to base income on tobacco of planting season 2 of which farmers earned money income at a range of about Rp.23,000-25,000/kg.

(4) Others

The other problem issued by the farmers and key-informants was production inputs that are evidently expensive and difficult to find, concerning labeled

Table F.4.1.2 Sumenep District by Main Production and On-Farm Prices

Main Production	Apr (Rp/100kg)	Aug (Rp/100kg)	Dec (Rp/100kg)
Paddy IR 36	123	123	-
Maize	97.5	279.575	112.475
Cassava	43	127.917	44.083
Peanut	704.167	573	634
Soybean	249	211.25	206.25
Green pea	341.667	381.25	326
Long bean	150	175	160
Green chili	1.000.000	158.333	75
Small chili	1.060.000	627.5	192
Red chili	1.500.000	283.333	237.5

Source: Badan Pusat Statistik Kabupaten Sumenep 1999

⁵⁹ HIPPA, *Himpunan Petani Pemakai Air*, Water Users Association (WUA)

⁶⁰ AD/ART, *Anggaran Dasar/Anggaran Rumah Tangga*, internal regulation of organization, statuta, articles usually formulated by the respective organization founding team and legalized by their General Assembly

⁶¹ KUD, *Koperasi Unit Desa*, Rural Cooperative promoted under New Order era on subdistrict area basis and contracted by Government to collect paddy from the farmers at floor price level considered by the Government.

⁶² KUT, *Kredit Usaha Tani*, a credit scheme for farmers provided by the Government through KUD to enhance national food security in the New Order era

seeds, fertilizers and insecticides, whereas the return is low. A secondary data collected from district level show the following figures (see Table F.4.1.2).

F.4.2 DI Cawak, Bojonegoro

(1) General Condition

Bojonegoro represent a wide range district by altitude categorization. The district covering a total of about 833.53 km² territory constitutes of <25 masl 18.7%, 25-100 masl 52.5%, 100-500masl 28.6% and >500masl 0.2% with 203 mm rainfall per annum. About 17 rivers flow along 5-66 km in the region within Bengawan Solo watershed⁶³.

The weir of Cawak is located at the administration border of Bojonegoro and Lamongan districts. Rehabilitation was made in 1987 to widen the irrigated land. But by the prevailing autonomy law no 22, 1999, anxiety is evident as to whether the water discharge could be maintained because Lamongan farmers also need water and many water pumps operate in the upper level of the weir.

The DI Cawak technically irrigates water for about 15 tertiary blocks of 1,733 ha *sawah* in 2 Subdistricts, i.e. Baureno 2 villages and Kepoh Baru 16 villages. The DI has 1 permanent weir with 2 intake gates, 5,106.5 m primary canal, 6,201 m secondary canal, 20,467m tertiary canal, 24,235m quarterly canal, 2 tap structures, 5 division structures, and 30.480m drainage canal, under the management of the Sub-district Government Agency for Irrigation (*Pengamat*) of Baureno.

Like elsewhere in East Java, WUA is initiated in the DI on village admin boundary basis so-called HIPPA rather than on tertiary irrigation unit.

Accordingly dry land farming dominates at 155,116 ha, forest 98,275 ha, wetland 75,590 ha and other vegetation types 5,857 ha, of which plantations and tobacco in particular represent the most important source of income. Processing of farming and forest productions is at the second place, and at the third place food cropping is represented mainly by paddy, maize, soybean and peanut.

(2) Irrigation

Transect walk observed water was illegally allocated by farmers directly from the primary and secondary canals. This illegal causing many places of secondary canal are in broken condition whereas tertiary canals are left out and full with sedimentation, and lack of water in planting season 2 and 3. It is interesting that however, as the interviewed farmers confirmed, HIPPA system makes them easier to get water as compared with the past irrigation management system traditionally handled by *Jagatirta*⁶⁴.

The findings indicate that after all the main issue of the DI currently is dependency on different district Government Administration of Lamongan. It is also apparent that actions are also needed to encounter small land ha/household, inadequate government policy, WUAs' ineffectiveness, and lack of irrigation management and O&M financing system.

The interviewed key-informant confirmed that HIPPA are not autonomous as its was initiated and work under Village Government system. Though HIPPA and Federation (*Gabungan HIPPA*) have *AD/ART*⁶⁵, but no sanction could be made so far for the illegal water allocations directly from the primary and secondary canals. *IPAIR*⁶⁶ is difficult to apply because of no sense of belonging nor

⁶³ Source: Kabupaten Bojonegoro in Figures, Central Bureau of Statistic 1998

⁶⁴ *Jagatirta*, similarly to *Ulu-Ulu* or *Ili-ili*, a Village Head's staff responsible for water supply prevailing for Javanese ethnical group rural areas in particular under traditional village government system; in Bali *Pekasih*, and in West Nusa Tenggara *Panggawa*.

⁶⁵ *AD/ART*, *Anggaran Dasar/Anggaran Rumah Tangga*, internal regulation of organization, statute or articles usually formulated by the Founding Team and legalized by the General Assembly of the respective organization

⁶⁶ *IPAIR*, the previous version of O&M fee collected from farmers and managed by the Government

awareness of farmers concerning the irrigation scheme that is evidently state-owned. Lacks of water and farm income are another factor partly responsible.

(3) Agriculture

Land tenure varies at a range of 0.25 to 0.3 ha/household. Under other production conditions unbenefiting to farmers, no much return could be expected. As reported above, water is evidently insufficient. Moreover land preparation is too expensive and so are high yielding variety seeds, fertilizers, insecticides and other required production inputs.

Basically planting pattern in the DI is paddy-paddy-*palawija*. Prior to planting season-1 farmers usually plant maize, of which they change soon to paddy when rain comes. It is also interesting that they prefer to minimize risk by using mono-cropping rather diversified cropping system. By the system paddy is the main production for planting season 1, whereas tobacco is the mostly preferred commodity for the planting season 2 and 3.

(4) Others

Response towards the Government's idea to place a community organizer (CO) at DI level for WUA empowerment varies in wide range. A part of both farmers and key-informants agreed likely the other Government programs and projects addressed to them.

The other part disagreed by thinking better to allocate financial budget for the WUAs and FWUA leaders, *Jagatirta*, *Juru Pengairan* and *Juru Pintu* as they are familiar already with the local irrigation problems and conditions, rather than for CO that is University background, lack of required field experience, come from outside, financed and managed by institution outside of local water user communities.

In fact WUAs and WUAF leaders expect for salary respectively for their jobs and activities, whereas *Juru Pengairan* and *Juru Pintu* expect for operational budget and facilities adequately and permanent status as Government employee.

WUAs and WUAF also need for injection fund that can be used for enabling them to start-up working on their own capital formation.

F.4.3 DI Pulosari, Kediri

(1) General Condition

Kediri district, the site of the most powerfull Hindhu Javanese heartland kingdom during 11th and 13th centuries, lays at 25-2,300 masl of the Brantas valley and covering 23 Sub-districts and 344 villages at a total of about 1.386,05 km² area.

By elevation a categorization shows about 32% area lays at <100 masl, 54% area at 100-500masl, 10% at 500-1000masl, and 4% at >1000masl. During 1995-1999 rainfall ranges between 1,500-2,500 mm per annum with December to March of rain season.

About 7 rivers flow from Mt Kelud in the east while another 6 rivers from Mt Liman in the West, and the local people use them mainly for irrigation before associate with the Brantas River. Agriculture contributed about 44% regional income by 1999, whereas manufacturing 11% and trade-hotel-restaurant 20%.

Entirely the district has 51 irrigation schemes, of which the Government is currently still responsible to manage. Using the study criteria the DI Pulosari was selected to represent the single WUA irrigation schemes in the province. The DI locates in the Sub-districts of Pare and Plemahan and technically irrigates water at 95-325 m³/sec. discharge for about 503,00 ha sawah of 8 villages.

(2) Irrigation

Transect walk during field study indicated the DI has about 9.15 km length canals, 70% of which are currently in good condition. The remaining 30% mostly concerning with division structures and improper design need for improvement, while floods damaged some banks and canals are not cleaned from the grasses. Garbage is another problems that need for local people awareness to manage garbage worthily. Normalization is also needed for the Pulosari Rever (500 m length), Kamboja culverts, and Singgahan upstream (300m in approximate).

Irrigation management is handled by the Government which in the field is acted by the *Pengamat, Juru Pengairan* and *Juru Pintu* by using the district government's financial budget that is limited. IPAIR does not work so far. Farmers think that irrigation is state owned hence it is the position of Government to responsible by them selves.

Above all, HIPPA is not popular for farmers because of unprofitable irrigated cultivation and more interesting off-farm works. HIPPA's, in fact, are less functioning, and farmers do not know as yet what is the benefit of WUA for them. Hence no participation could be expected from farmers for irrigation O&M.

(3) Agriculture

The interviewed key informant said, although agricultural sector includes 44.4% labor force it is a matter of fact that farmers are no longer interested to cultivate because of low rate of return. Landholding averages at about 0.3 ha per household. For land preparation tractor is expensive while farm laborer must be paid Rp.9,000 to 10,000/man-day, much more expensive than buffalo or cow averaging at Rp.45,000/day by 0.5 ha capacity.

While production and selling price are low, Large scale industrial development in the district on the other side requiring thousands laborers. This developing off-farm works seems also responsible.

Planting pattern in the DI currently is considered by the farmers. By taking account the water availability, 3 planting patterns therefore prevail. The first is planting pattern prevailing for area where water is sufficiently irrigated, i.e. paddy-paddy-*palawija*. The second is planting pattern for less sufficient water allocation, i.e. paddy-*palawija-palawija*. And the third is *palawija-palawija-palawija* for those of western side of Brantas river that is scarce with water.

In the meantime field findings face the fact of some groups of farmers installing ground water pumps to overcome water scarcity for their sawahs, rather than improving the existing irrigation management.

(4) Others

INPRES No.3/1999 on irrigation policy reform are not yet socialized to farmers because of limited budget and human resource at Kabupaten level. Irrigation related District Government's staff is minimum in number and much more trainings are needed for dissemination and empowerment purposes. Adequate and practicable regulations, manuals and instruments as required for irrigation policy reform implementation are also not available as yet.

Coordination among the sectorial Government Agencies is space as from the Central level each sectors take actions merely for their own sectorial program and project prioritizations. By the regional autonomy the district expects that program and project can be considered and implemented incorporated by the district level.

Efforts made by the District Bappeda and District Secretary to simplify WUA legalization are disagreed by the District Judicial Agency because laws must be equally implemented for all and no special treatment could be given for a certain groups of people.

F.4.4 DiITekung, Lumajang

(1) General condition

Lumajang covers about 179,090 ha area used for sawah 23%, dryland farming 28%, forest 30% and others 19%. The area lays at 0-3,676masl in the eastern side of Tengger-Semeru volcanic complex. A trial made to classify the area by elevation shows <25masl includes 11%, 25-100 masl 22%, 100-500 masl 35%, 500-1,000 masl 17%, 1,000-2,000 masl 11% and >2,000masl 4%⁶⁷.

Population is dominated by Javanese and Madurese at a total of about 934,094 people (233,524 households) living mostly from agricultural sector. About 31 rivers flows in the area mainly used for the mentioned agriculture sector that approximately contributes 40% regional income of the district. Recently 20 technical irrigation schemes operate in the district for about 33,661 ha sawah and 357 WUAs.

The weir of the selected DI Tekung is laid in the Sub-district of Tekung, about 13 km far from Lumajang city, for 1,964 ha sawah of 9 villages in the Subdistrict of Yosowilangun. The weir was established by the Dutch Government in 1937-1939 at a point of Bondoyudo river. Currently the DI has 1 permanent weir, 3,320 m primary canal, 12,930 m secondary canal, 31,110 m tertiary canal, 12,750 drainage canal, 14 tap structures, 1 division structure, 1 intake gate, 1 flushing structure, 2 aqueducts and 5 culverts.

Table F.4.4.1 DI Tekung by WUA and Villages

No.	WUA	Area(ha)	Village	Remark
1	Tirta Sari	61	Nogosari	Aktif
2	Tunas	215	Kalipepe	Aktif
3	Dewa Ruci	403	Yosowilangun	Aktif
4	Karya	451	Yosowilangun	Aktif
5	Tirta Utama	35	Kebonsari	Aktif
6	Karya Bakti	317	Tunjung Rej	Aktif
7	Karya Tirta	226	Munder	Aktif
8	Margo Rukun	182	Wotgalih	Tidak aktif
9	Tirta Asri	92	Krai	Aktif

Likely elsewhere in East Java WUA was established on village administration basis. Thus the DI has 9 WUAs that were federated into one WUA Federation. A summary of the DI by WUA and villages is as shown in the Table F.4.4.1.

(2) Irrigation

Basically the DI is in good condition and well functioning. Some inadequacies evident concern with low weir, unavailable water level recording board (peischal), sedimentation in primary canal, incomplete division structure to secondary canal, unfinished lining construction, and unavailable drainage structure at a certain place.

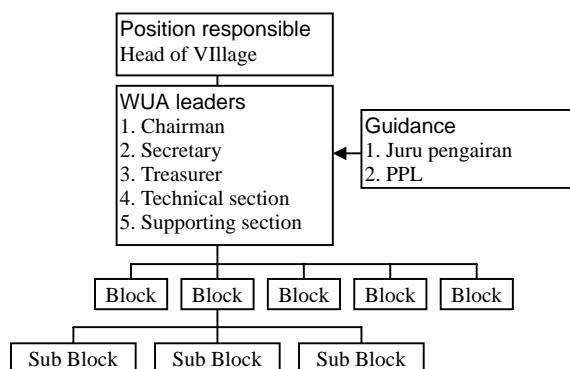


Fig. F.4.4.1 WUA Organizational

It is also evident that fluctuating water discharge of the DI to be encountered by optimizing irrigation management to distribute water sufficiently at all irrigation blocks. O&M fund is also limited, whereas both District Government and WUA/WUAF are not ready yet with preparation to put the irrigation policy reform into operation.

The key informants confirmed, WUAs were set and responsible to the Village Government as evident from the organizational structure as shown in Fig. F.4.4.1.

WUAs have AD/ART respectively that is uniformly formulated by Government. WUAs also have WUA leaders' work plan and regular meetings respectively of which responsibility must be made to

⁶⁷ Source: Kabupaten Lumajang Dalam Angka 1998, Biro Pusat Statistik Kabupaten Lumajang 1999.

the Head of Village (Kades, Kepala Desa) rather than to the WUA members. As apparent from the figure, no General Assembly in the WUA nor WUAF so far. Farmers feel that the members of WUA are the WUA leaders, not farmers.

However farmers prefer to the promoted WUA, which in the Province of East Java is called HIPPA, rather than the traditional irrigation management system called *tuwowo* due to the following reasons: (1) water distribution is more effective, (2) WUA reduces conflicts among farmers and villages for water, and (3) WUA is more organized.

Legalization of WUAs and WUAF must be given by Bupati, rather than by the respective WUA and WUAF's General Assembly, of which registration by the government could be made.

WUA Federation of the DI was established from the previous Sub-district Irrigation Committee rather than from by and for the included WUAs. And no O&M fee (IPAIR) could be collected by WUAF up to the moment. The IPAIR is still being collected and managed by the District Government for the district revenue, and no IPAIR could be collected from farmers.

(3) Agriculture

Field findings indicate land tenure in the DI is about 0.3 ha per household that, under the prevailing technology, is too small for a profitable food cropping. Rental tractor averages at about Rp 200,000/ha, much cheaper than in the other selected sites.

Production input, however, is higher as compared with production output. The key informant calculated that in money term the production input of paddy averages at about Rp.900/kg, while production output Rp.800/kg.

(4) Others

Local farmers are characterized by still high sense of *gotong royong*, transparent, hard workers. However it is important to note that, due to the past development approaches (top-down, centralized, project oriented, etc) less initiative of farmers to change by themselves and waiting for Government instructions, programs and projects, whereas local government is remaining to regulate rather than liberating people to develop by themselves.

The WUAF leaders said, they need for stimulant capital and O&M fee (IPAIR) collection and management to enable them manage as well the local Tekung irrigation scheme.

F. 5 The Selected Sites of West Nusa Tenggara Province

The Province of West Nusa Tenggara consists of Lombok and Sumbawa islands and another 237 small islands constituting a total of about 20,150 km² provincial area. These islands are situated in the east of Bali, and take place at western part of a long northern curve of Nusa Tenggara islands –Lombok, Sumbawa, Komodo, Flores, Lembata- that is volcanic in origin.

The islands, therefore, are potential fertile, lacking only reliable rain in the east. The remaining Nusa Tenggara islands –Sumba, Savu, Roti, Timor- are the shorter southern arc formed of raised coral reef limestone and sedimentary rock..

Mount Rinjani and Tambora respectively crown groups of mountains that dominate Lombok and Sumbawa islands with 18 sub-river basins and divergent configurations of bio-physical condition of the Province. The

islands however are different in flora and fauna and less populated as compared to Java and Bali, and correspondingly the villages and cultivated lands are widely dispersed.

Administratively the Province comprise of 7 districts, 61 sub-districts, and 582 villages. The region is populated mainly by Sasak, Sumbawa and Bima/Dompu ethnical groups at a total of about 3,795,654 people, 188 people/km² density, and 2.15% growth. Like elsewhere in Indonesia they live mostly on agriculture and irrigated paddy cultivation in particular.

Government established some irrigation systems and many others were constructed by the local people. Presently the Province has 6 dams, 126 small dams, 288 weirs, 235 ground water pumps, 1,719 local people dams, and 1,395 local people weirs.

Six irrigation schemes were selected in the study Province of West Nusa Tenggara to represent specific conditions of the irrigation schemes by WUA classifications. The selected irrigation schemes by district and site category are as listed in Table F.5.1.1.

Table F.5.1.1 West Nusa Tenggara by the Selected Site Categories

	District	Irrigation scheme	Area(ha)	Site category
1	Lombok Barat	Pekatan	821	Success WUA
		Sindang Gila	496	Single WUA1
2	Lombok Timur	Suangi	2,356	Non WUA1
3	Sumbawa Besar	Beringin Sila	2,400	Several WUAs
4	Bima	Rora Kecil	331	Non WUA2
		Lebo	330	Single WUA2

F.5.1 DI Pekatan, West Lombok

(1) General Condition

The DI Pekatan is situated in 2 Subdistricts of Gangga and Tanjung, West Lombok, and allocates water for about 831 ha sawah of 4 villages, namely Gondang, Bentek, Tanjung and Jenggala.

Accordingly the DI has 2 sub-schemes called DI Pekatan left and DI Pekatan right. A weir was established permanently with 3 intake gates and about 8 km-length primary canal and 10 km-length secondary canal. In the feeder canal the following buildings are evident, namely 1 sediment trap, 5 division structures, 1 siphon, 33 bridges, 91 culverts, 19 drop structures, and 2 flushing gates; whereas offtake canal has 1 bridge, 1 culvert, 1 off-take gate, and 1 drop structure.

Focusing on Gondang village field survey reported village territory at an extent of about 861.400 ha populated by about 9,834 people (1,922 households). They use village land mainly for food cropping at about 433.050 ha, plantations 405.050 ha, and settlement and other land use types 23.300 ha. Above all, people are also partly active in fisheries.

The previous village government's organizational structure still remains thus a reformation is needed for the sake of Law no 22, 1999. WUA Pelopor is actively developing and represented the best WUA at provincial level in 1999, but some shortages are evident by the moment. PPL is also active resulting at good *Kelompok Tani* of the village.

(2) Irrigation

Field findings indicate that water discharge is decreasing because of deforestation in the upper level of the DI, and the local communities of Buntak and Monggal forests are mostly responsible. As an effect water is insufficient especially for planting season-3 of August to December.

It is also evident that tertiary canal was partly not permanently constructed, division structure is damaged, sedimentation trap is not available, whereas garbage of the local communities is partly responsible. Flood therefore usually occurs in rain season and lack of water occurs in dry season.

The farmers said that WUA financial management, however, is less transparent. IPAIR⁶⁸ is not yet orderly managed. The IPAIR is still funded partly from village land so-called tanah bengkok, and be used for improvements of tertiary and secondary canal. WUA is not yet financially independent.

It was also realized by the farmers that potential young farmers are not interested to be WUA leaders. Regeneration, so far, doesn't work, and no significant change of WUA occurs. Federation of the WUAs for DI management is also not available as yet. So far the WUAs involve differently in the DI management and no initiative from them to work together within one management.

(3) Agriculture

As a result planting patterns and calendars by villages are not organized and affect the appropriateness of water allocation and uncontrollable pests and insects. Paddy production decreases at a range of 3-4 ton/ha even for the planting season 1. But unorganized planting patterns and calendars may not stand alone.

The interviewed key-informant reported that farm laborers are limited and this situation causes inadequate maintenance. It is also apparent that KCL fertilizer is not yet used because of no power of farmers to buy.

(4) Others

Production inputs are too expensive as compared with the selling price resulting at low level of income from farming. The on-farm price of paddy ranges at Rp.800 to 900/kg because of low quality of paddy, but the key-informant reported differently.

KUD has no more capacity to collect paddy from the farmers. Farmers sell the paddy with no bargaining power to the traders who collect paddy from the farmers even before harvest.

F.5.2 DI sindang Gila, West Lombok

(1) General Condition

The selected DI Sindang Gila is situated in the upstream of Mount Rinjani for about 496 ha *sawah* of Senaru village, Subdistrict of Bayan, West Lombok. Afterwards the irrigated water is allocated to the different DI Sopak and Loloan in the downstream.

The DI has about 440-552 m³ per second discharge with 1 permanent weir, 13,629 meter length primary canal, 3 intake structures, 3 feeder canals, 5 aqueducts, 1 siphon, 5 bridges, 13 drop structures, 5 off-take structures, and 3 keeper houses.

A statistical source of data indicates, the only benefited village of Senaru covers a territory of about 4,400 ha. By land use type, the village land is dominated by forest at an estimate of about 2,782 ha land. Plantations is at the second place covering about 963 ha land. Wet land paddy includes about 635 ha, hence about 139 ha sawah is excluded from the irrigation scheme.

The village is populated by about 6,758 people (1,664 households) of Sasak Bayan ethnical group, about 80% of whom live mostly from farming. The remaining 20% people are active in various off-farm works such as handicraft, trading, hotel-home stay-and restaurant, mount climbing guide and other tourism-related activities.

(2) Irrigation

The Sub-district Government Dinas of Irrigation (*Pengamat, Juru Pengairan, Penjaga Pintu*) is in position to responsible for the operation and maintenance of the weir, primary canals and secondary canals. Whereas the operation and maintenance of tertiary and quarterly canals are undertaken by WUA and *Pekasih*, the traditional village officer responsible for water.

⁶⁸ IPAIR, *uran pemakai air*, the previous version of irrigation management or O&M fee

Two WUAs were initiated within the irrigation scheme, namely WUA Pade Angin which includes about 220 ha irrigated land and WUA Beriuk Maju responsible for the remaining 276 ha, but no Federation was established so far. It is also evident from the visit that WUA leaders have inadequate technical know-how on irrigation O&M and WUA management while coordination with the related sectors' programs and projects was low. The implemented trainings and extension services were not effective, and the sectorial programs and projects worked individually, overlapped and tended to compete each others.

A transect walk made during field survey realized the fact of decreasing discharge of the DI due to deforestation in the surrounding water catchment areas and increasing non-farming water uses. It was also evident from the walk-through that 40% irrigation facilities were broken in many places. Improper construction and inadequate O&M is partly responsible, while garbage of the local communities and sedimentation is high.

On the other side WUA members highlighted their need for transparent financial WUA management. The collection and usage of irrigation O&M fee called *swineh* were not undertaken in accordance with the prevailing regulations, and this reduces the members' trust to their WUA. Members do not know about *IPAIR*⁶⁹ promoted by Government, hence no *IPAIR* collection so far.

(3) Agriculture

*Kelompok Tani*⁷⁰ is available in the village and sub-villages in the DI but less develop independently because of set for agricultural sector's programs and projects such as extension program purpose, distribution of KUT, fertilizer, production inputs etc rather than for the local farmers' self reliance.

Improper fertilizer uses represent the mostly significant issues in the moment. Farmers use Urea fertilizer inadequately whereas TSP and KCL have never been used because expensive to buy and make land difficult to prepare. Subsequently production ranges at about 1-3 ton/ha, and this low production in turns causes farmers reluctant to use production inputs properly. Uncontrollable pests and diseases are another problems partly responsible.

Water availability is another issue of importance because of decreasing discharge, water must be allocated on rotation basis. This often doesn't meet with planting schedule that, because plant growth is affected, may arrive at the similar effect i.e. low production. Overall farm income is low, farmers have no financial capacity for the next planting nor for *KUT* repayment, and may seek for local private credit scheme (*rentenir*), or change part-timely for off-farm jobs, etc.

It is interesting that findings collected from key-informant farmers indicate inactive *PPL*. They said that most farmers do not know the *PPL* posted in their village. Different source of data reported that often the posted *PPL* mostly have non-food agricultural background, very short job assignment period, etc and the extension doesn't work.

The findings also indicate that land is usually prepared improperly, labeled seeds are not used, and no post harvest practices effective for profitable marketing, while market is absolutely controlled by private and local traders in particular. And at the end farmers earn only at about Rp 750-800/kg paddy.

(4) Others

Cooperative and the promoted KUD has no competing power against private in timely serving the farmers with the required production inputs, credit scheme, and various goods and services, as well as in providing the collection of productions efficiently.

⁶⁹ *IPAIR, Iuran Penggunaan Air*, the old version of irrigation management fee collected from water users and managed by the District Government

⁷⁰ *Kelompok Tani*, Group of Farmers promoted by the Ministry of Agriculture in the New Order decades in particular

Although these private activists are ethically unaccepted and cynically called *pengijon*⁷¹, *tengkulak*⁷², and *rentenir* but they come when the farmers need them likely a true friend.

F.5.3 DI Swangi, East Lombok

(1) General Condition

The DI Swangi was established for about 2,604 ha sawah of 7 villages in the Sub-district Sakra, East Lombok. The upstream villages consist of Swangi, Sukarare, Gunung Rajak. Buntiang village is in the middle stream. And the downstream villages are Pengkelak Mas, Pijot and Selebung. Currently 14 WUAs were initiated in the villages ranging at about 82-358 ha and 214-545 members.

A secondary source of data reported the DI has 1 permanent weir, 60.159 km feeding canals, 22 control structures, 12 gates, 2 division structures with 4 gates, and 19 tap structures with 16 gates.

Field survey was focused on Gunung Rajak village covering a total of about 611,379 ha territory that is mostly used for food cropping. Local statistical data reveal the irrigated paddy field includes about 534,126.8 ha, while dry land cultivation 100 ha and settlement and other land use types 3,250 ha.

The same source of data shows about 9,834 people are inhabited the village (3,375 households) and live mostly from irrigated land cropping.

(2) Irrigation

Transect walk made during field survey found no gate at division structures, impermanent canal and sedimentation. These conditions may cause flood in rain season, and insufficient water and conflicts of water users in dry season. The interviewed key-informant said the problem is lack of fund collected from farmers to build the required gates and to clean the sediment.

It is also evident from the findings that irrigation structures are not functional in many places and division box gates in particular due to old and no reparation was made.

Planting patterns and calendars were discussed and consented among villages, and water is allocated accordingly. However water is insufficient and late, and conflicting water distribution occurs due to the operation of DI Terara in the upper stream. There is no federation of WUAs in the DI Swangi so far to make coordination with the upper DI possible.

The WUAs are active but many shortages are realized. The WUAs are lack of communication with their members due to big number of membership and no regular meeting could be made with them, whereas WUAs' leaders have low managerial capacity and O&M technical know-how. Hence WUAs have no work plan so far established on member basis. The WUAs active mostly when any project from the Government. Similarly, the *Kelompok Tani* in the local villages mostly active when required for *KUT*⁷³ distribution.

Key-informant told that, subsequently, *IPAIR*⁷⁴ doesn't work. Farmers feel that too many contribution they need to pay. They pay 50 kg paddy *suweneh*⁷⁵ for the local *Panggawa* (50%), village (25%) and WUA (25%) every harvest, and they need also to pay for additional water from the upper DI, etc.

(3) Agriculture

The main issues of the local agriculture regard with the practice of planting pattern and calendar

⁷¹ *Pengijon* is usual term for some body who serves farmers by buying farm productions prior to harvest at lower price.

⁷² *Tengkulak* is traders active as local production collector.

⁷³ *KUT, Kredit Usaha Tani*, a credit scheme provided by the Government for the enhancement of food production

⁷⁴ *IPAIR, iuran pemakai air*, a previous version of O&M fee collected from water users and managed by the Government

⁷⁵ *Suweneh* is traditional water fee, usually paid in paddy term, for *Panggawa*, the traditional village officer elected by farmers and responsible for water management in the village.

(paddy-paddy-*palawija*) that were mostly not orderly followed by the farmers, and no sanction so far could be applied. Production inputs are expensive and difficult to find due to marketing distribution system. KUD has no power to operate directly to farmers. And subsequently farmers do not use labeled seeds and fertilizer is used improperly.

Rental tractor ranges at Rp 350,000-400,000/ha while farm labourer is about Rp 10,000-15,000/manday that, above all, make production cost is too high for <0.5 ha/household landholding as compared with the output. Paddy price ranges at about Rp 800-900/kg only.

(4) Others

Again the key-informants feel KUD is partly responsible due to the same reason above. KUD was trusted by the Government to be the contractor of food collection from the farmers for national food security program. Belong to the contract KUD got money from the Government through the channeling bank. And accordingly food productions must be supplied to local Government storage (DOLOG) at floor-price level considered by the Government. The KUD completed the contract but by using the private. Private controls both supplies of production inputs and other goods and services for farmers as well as collection of food productions.

F.5.4 DiBeringin Sila, Sumbawa Besar

(1) General Conditions

The DI Beringin Sila is situated in the Subdistrict of Utan Rhee, District of Sumbawa Besar. It was established in 1998/1999 by using UECF fund for about 2,400 ha irrigated cultivation, fishery and tourism purposes. Water is taken from the Utan river by a weir and allocated by 3 primary canals and 8 secondary canals as specified in the Table F.5.4.1.

Administratively the DI includes 6 villages, namely Stowe Brang, Orong Bawah, Tengah, Motong, Jorok and Pukat. A visit to Stowe Brang

village reported that about 940 ha land are included into the village by the following landuse types. Irrigated sawah covers about 27%, settlement 5%, plantations 34%, protection forest 6%, people forest 18% and others 10%.

The village population is about 3,095 people (775 households). Farmers include about 60% people by < 0,5 ha *sawah* per household. They consist of landowners 60%, tenant farmers 26%, farm laborers 14%, and a number of cattle breeders. In parallel with irrigation construction works 4 WUAs were established in the DI, namely WUA Batu Gong, WUA Bumi Muncar, WUA Plongka Suar and

Table F.5.4.1. DI BERINGIN SILA, NTB

A. WEIR		Cross section (m)	0.7x0.7	Sec. Canal K. Padak (m)	2,323
Water catchment area (km2)	61	Man hole	0.9x1	Sec. Canal Penyorong (m)	2,356
Wide of weir (m)	47	D. FEEDER CANAL		Sec. Canal Pukat (m)	2,972
Height (m)	2	Beringin Sila (m)	1,751	Sec. Canal Jengko (m)	3,004
El crest (m)	67	Beringin Sila Left (m)	1,219	Sec. Canal Penyegar (m)	-
El. Upron (m)	65	Beringin Sila Right (m)	1,299	H. BUILDINGS	
El. Stilling basin (m)	59	E. TOTAL AREA (ha)	2,400	Division/offtake (unit)	45
Flood design (m3/second)	385	Constructed (ha)	1,935	Drop structure, vertical	120
Discharge(m3/second)	3.4	Extension (ha)	465	Drop structure (unit)	4
Intake gate (m)	2	F. PLANTING PATTERN		Culvert (unit)	22
Flushing gate (m)	2	Wet season	paddy	Drainage culvert (unit)	40
B. DESILTING BASIN & FLUSHING STRUCTURE		Dry season I	palawija	Acqueduct (unit)	4
Length (m)	95	Dry season II	palawija	Syphon (unit)	4
Wide (m)	9	Max requirement (m3/sc)	3.36	Bridge (unit)	48
Flushing gate (m)	2	Rotation block	4	Intake (unit)	2
Upstream depth (m)	2	G. CANALS		Inspection road (m)	29,611
Downstream depth (m)	3	Primary canal, right (m)	1.022	Tertier block (unit)	56
Invert slope (no)	43	Sec. canal Motong (m)	4,702	Offtake (unit)	2
C. SYPHON		Sec. canal Sekokok (m)	4,033	Keeper House (unit)	7
Length (m)	110	Primary canal, left (m)	4,008		
		Sec. Canal Rapang (m)	1,925		

Table F.5.4.2. WUAs in the DI Beringin Sila

WUA	Village	Land (ha)	Member (No)	Initiation	Category
WUA Beringin Sila	Stowe Barang, Orong Bawah, Tengah, Motong	1,086	971	Nov 7, '97	B
WUA Plongka	Jorok, Motong	423	296	Nov 24, '97	B
WUA Batu Gong	Orong Bawah, Motong, Pukat	609	425	Sep 9, '97	B
WUA Bumi Muncar	Orong Bawah, Pukat	304	267	Sep 24, '97	B

Source: Field Survey Report of DI Beringin Sila, NTB, JICA Study Team 2001.

B = berkembang, developed

WUA Beringin Sila as shown in the Table F.5.4.2.

(2) Irrigation

Both sides of local Government and WUAs are responsible for the operation and maintenance of Beringin Sila irrigation scheme. Accordingly at sub-district level, the Sub-district Head of Irrigation (*Pengamat Pengairan*) need to work in close coordination with the Sub-district Head of Agriculture. The problem is inactive Sub-district Head of Agriculture, so coordination doesn't work.

The government side of DI management is the Sub-district Head of Irrigation (*Pengamat*) also responsible for the other two irrigation schemes⁷⁶. The *Pengamat* has 2 *Juru Pengairan* for upstream and downstream respectively and 6 *Juru Pintu*. The *Juru Pengairan* is responsible to ensure the irrigation function by undertaking operation and maintenance as scheduled. Whereas *Juru Pintu* is responsible for maintenance of water gates on regular basis. Weir maintenance is conducted differently by *Juru Bendung* responsible to operate intake and flushing gates for minimal sedimentation and sufficient water allocation.

WUAs are responsible for irrigation operation and maintenance at village level that are tertiary and quaternary irrigations. Management is handled by the local WUA leaders and *Malar*. The problem is insufficient water in dry season in particular. Thus water is allocated on rotation basis, whereas maintenance is carried out by *gotong-royong* prior to planting season. The irrigation management fee is 7 *kaleng*⁷⁷ paddy (and 4 *gantang*⁷⁸ *palawija*) per hectare. The collected fee is used for *Malar* 60%, Village Head 10%, WUA leaders 20% and WUA 10%.

The WUA and O&M practices, however, reduce trust of members due to some reasons. Firstly, WUA leaders were not elected democratically by the members. Secondly, water is not distributed fairly among farmers. And thirdly, high percentage fee of *Malar* was considered by the included villages' leaders and not by the members.

(3) Agriculture

Paddy is the main crop of the DI. Soybean and green pea are the secondary crops. The cultivation covers a total of about 1,086 ha land that is mostly technically irrigated. The previous paddy-*palawija-palawija* planting pattern is still remaining due to water insufficiency. Only a small part of farmers definitely changes to paddy-paddy-*palawija*

Pests and insects are uncontrollable. High yielding seed varieties are less be used. They prefer to use their own seed rather than going to local Government seedling centers. Lack of *PPL*⁷⁹ extension work is partly responsible. Fertilizer is used inappropriately because of expensive to buy. It is also a fact that imitative fertilizers are marketed in the area and difficult to farmers to distinguish.

Rental tractor ranges at Rp 450,000-500,000 per hectare that is expensive to farmers. Thus farmers prefer the past uses of buffalo, cow, or horse like in with improper result of land preparation. Presently the DI water decreases especially in dry season. Although *Malar* rotates appropriately unsatisfied water distribution remains, resulting at late planting and in turn low production. Paddy averages at a range of about 3 to 4 ton/ha production and *palawija* 1 ton/ha.

While Government seriously accelerate agricultural production change by various programs and projects, it is difficult to farmers to adopt new technology. They need guidance on-farm works, but rottenly find no PPL when needed. Extension, therefore, is undertaken by the local *Juru* obviously inappropriate due to poor on agricultural technologies. It is also evident that Government concerns

⁷⁶ Namely DI Tarusan (195 ha) and DI Air Putik (347 ha)

⁷⁷ 7 *kaleng* paddy is equivalent to about 80 kg

⁷⁸ 4 *gantang* second crop is equivalent to 24 kg

⁷⁹ *PPL*, *Penyuluh Pertanian Lapangan*, agricultural extension worker of Government posted at village level

more on production for national food security rather than human development and social welfare of the farmers.

A rural cooperative called *KUD*⁸⁰ is available in the DI, and so are the *BRI*⁸¹ units. But these economic and financial organizations are lacks of program scheme and management suitable to farmers. Fertilizer distributed by Government through KUD doesn't work due to low competing power against private. Similarly collection of food productions carried out by *Dolog*⁸² through KUD is inefficiently implemented due to lack of KUD's capacity to operate.

Thus private sector plays an important role in the DI. They control the required production means and inputs, credit, goods and services, and collect farm productions by using local retailers and collectors. Post harvest practice is another factor of the unprofitable cultivation, as it doesn't enable farmers to store production for good price. Whereas no marketing channel strongly encouraging them for farm diversification.

(4) Others

Up to 1998 the farmers of Beringin Sila used water of the Utan River for their cultivation. Temporary weir and canals were established by *gotong-royong*⁸³. *Malar* was appointed to manage the irrigation systems, and they enjoyed sufficient water allocation. As told by a local key-informant, the only problem was irrigation structures that were frequently broken. The problem has no longer been evident since the Government built the irrigation system permanently in 1998.

Nevertheless different problem rises afterward. Water is allocated insufficiently. The irrigation was not well constructed and after one year damages could be find in some places. No water could be allocated for the mostly fertile lands. Field findings also indicate that local irrigation Government Agency is lack of field work facilities, whereas field officers' salary paid irregularly. Inspection is made by walking or bicycle along 30 km-length canals for irrigation O&M.

F.5.5 DI Rora Kecil, Bima

(1) General Condition

The DI Rora Kecil was established in 1975 for about 531 ha sawah of Rora village, Sub-district Donggo, Bima District. This semi-technical irrigation scheme has 18 m wide permanent weir with 2 intake gates and 9.44 km length feeding canal.

The primary canal is about 22.6 km length, secondary canal 7.23 km and inspection road 1.32 km. The DI was designed for about 678 m³/sec. discharge but only 380 m³/sec. that currently could be achieved. Traditional dams in the upper level i.e. Dam Waduk Tuti and Dam Ruhu Tumpi are partly responsible. The same source of data also reveals the evidence of 212 m closed canal, 17 culverts, 2 off-take structures, 2 aqueducts, 3 sedimentation traps, 11 drop structures, 2,100 m semi drop culverts, and 7 division structures. About 9 km length tertiary canals are not yet established.

Field survey, therefore, was undertaken in the Rora village and WUA Sama Ne'e in particular. Presently, the village was populated by about 3,978 people and 741 households of Bima/Dompu ethnical groups mostly living from cultivation. By land uses, a total of about 2,748 ha territory comprised of irrigated sawah 640 ha, dry land cultivation 1,500 ha, plantations 141 ha, grass land 379 ha and settlement 88 ha.

⁸⁰ *KUD, Koperasi Unit Desa*, is a multipurpose cooperative promoted by Government for rural areas and based at *Kecamatan* (Sub-district) level

⁸¹ *BRI, Bank Rakyat Indonesia*, a state-owned bank addressing saving and credit programs for ordinary people

⁸² *Dolog*, a non departemental Government storage organizations set up over the country for collection and distribution of food productions under national food security.

⁸³ *Gotong royong*, a traditional manner of problem solving by the concerned people

(2) Irrigation

Long time before WUA was established water was traditionally managed by the *Panggawa*, a village officer responsible for operation and maintenance of local irrigation system. Report was given to the Head of Village for any kind of rehabilitation as required. As a follow up observation on the spot and meeting involving the concerned parties so-called *musyawarah* were usually undertaken by the Village Government before decision could be made. Accordingly fund was raised from the harvest by *gotong-royong* and so was construction works. A *Panggawa* was elected by the farmers from the local figure and given with *tanah bengkok*⁸⁴.

In 1997 a number of WUAs were formed under INPRES No.2, 1984, Tutarora (Samakai), Ndanu Samaila, Sabua Ade, Sama Ne'e, Waduk Tunti, and Ruhu Tumpi. Within this organization setting *Panggawa* was included to be an O&M implementer at WUA level called *Ulu-Ulu* under the prevailing irrigation management of Subdistrict Government of Irrigation (*Pengamat*) of Sila. Under the irrigation management system the WUAs and *Panggawa* have never been active.

The WUAs' leaders were included into training programs, but they have no working plan so far, no clear understanding on their job, and so how to manage the *Panggawa*. Thus in practice the irrigation O&M depends mostly on *Pengamat's* staff, the *Juru Pengairan*. By the help of *Juru Pintu*, the *Juru Pengairan* records water discharge, control and maintains irrigation scheme, formulate with PPL planting pattern and calendar, calculate the required water, and operate water allocation accordingly. Unfortunately the works couldn't be carried out adequately. While the location is mountainous and difficult to achieve no work facilities available to cover the DI scheme and no budget could be disbursed up to the moment. The *Juru Pintu*, Mr Umar, working on honorarium basis for the position since 1980 said that water decreases drastically in dry season and rotating system of water allocation, however, often could not prevent illegal distribution, water gate damages and conflicts among farmers. There is no water regulation nor sanction so far consented with farmers.

Farmers have no sense of belonging on the DI nor interest to manage because of state-owned irrigation scheme. When reparation or other special maintenance is needed the *Pengamat* usually approaches the Head of Village and irrigated blocks' leaders for *musyawarah* purpose. Actions then be made accordingly by *gotong-royong* for material, manpower, and fund mobilizations as required. *Gotong-royong* for canal cleaning is usually done prior planting season.

Presently the weir is closed with stones due to floods in rain seasons causing lack of water discharge for planting season 1 and 2 in particular. About 4.22 km length secondary canal was not permanently established, and so was about 8.59 km tertiary canal, and cause high water leakage.

(3) Agriculture

Irrigated paddy cultivation contributes the mostly important income of farmers. The works in terms of land preparation, planting, maintenance and harvesting are undertaken by men and women. Share cropping is not popular. Tenant farmers are small in number. After production cost that is evidently provided by tenant, harvest is usually divided for landowner and tenant farmer on fifty-fifty basis. Plantations represent the second of importance especially coffee, *kemiri* and clove.

Tractor is not so popular because sawah is characterized by stoned land. Land preparation, therefore, is done by using buffalo which is evidently getting space, making land preparation is technically improper and financially inefficient since 1 ha needs for 10 to 15 days @Rp.50,000/day that is equivalent to Rp 500,000-750,000/ha.

Labeled seeds are not used because of its availability and expensive to buy. By the same reasons fertilizers are used improperly. This situation is getting worse in planting season 1 and 2 that are

⁸⁴ *Tanah bengkok* is village land of which land use right was traditionally given by the village community to Village Officers for living due to the given position and responsibility in the village.

ultimately dry and water is allocated insufficiently and not timely. As a result paddy production is low at a range of about 3-3.5 ton/ha.

Planting pattern are not consented with farmers so planting calendar is practiced individually, not organized, and this makes rotating water allocation in planting season 1 and 2 difficult and insufficient. In the upstream paddy-paddy-*palawija* is possible while in the downstream paddy-*palawija-bero*⁸⁵.

(4) Others

Inadequate road and transportation facilities are another problems of farmers to provide production inputs and to sell harvested productions. Transportation cost from farm to the house may vary at a range of Rp 3,000-3,500 per 100 kg paddy.

KUD has no financial and management capacity so far to provide appropriately production means, capital and consumption goods and services either marketing of farm production for the sake of farmers. Market is absolutely controlled by the private, and as an effect farmers are impoverished from both sides i.e. when buying and when selling. By the moment farmers sell paddy at Rp 800-900/kg.

F.5.6 DiILebo, Bima

(1) General Condition

The DI Lebo is situated in the Sub-district Mada Pangga, Bima, and intended to supply water for about 350 ha sawah in the Dena and Rade villages. The DI is semi technical with 0.129 km primary canal and 4.73 km secondary canal, 1 control structure, 1 division structure, 7 tap structures, 12 aqueducts, 3 bridges, and 2 flushing culverts.

The irrigation scheme was permanently established unless 1.44 km of 4.73 km secondary canal and 6.63 km of 7.33 km tertiary canal.

Field survey focused on Dena village which includes about 3,413.19 km² territory. The village is populated by about 3,688 people (880 households) that are mostly active in farming. About 39 shops, 2 kiosks and 2 KUDs are available for various production inputs, goods and services. Dena is really characterized with fertile land. About 357.19 ha sawah is technically irrigated, the other 350 ha is semi technical sawah, and the remaining 102 ha is irrigated under simple system and rainfed, whereas cattle breeding contribute another main source of income.

The local irrigation system was formerly managed by *Panggawa*, a traditional village officer elected by the people for water and responsible to the Village Leader. Under this irrigation management system a required irrigation improvement or rehabilitation was discussed in a *musyawarah* at village community level with the village government. And the actions were taken accordingly for financial, manpower and materials as required by *gotong-royong*.

WUAs were initiated in 1997 under INPRES No. 2, 1984. These WUAs have no *AD/ART*⁸⁶ nor registered so far. WUAs' leaders were appointed by the Head of Village just to meet formal requirement, and they are inactive up to the moment. Irrigation management is undertaken by the *Pengamat's* staff (*Juru Pengairan* and *Juru Pintu*) for the government side, and the *Panggawa* posted voluntarily as tertiary irrigation block leader for the farmer side.

(2) Irrigation

The DI Lebo is under the management of *Pengamat* Office of Sila. To manage the DI *Pengamat* is assisted by 1 *Juru Pengairan* and 1 *Juru Pintu*. By a help of *Juru Pintu* the *Juru Pengairan* is

⁸⁵ *Bero*, uncultivated at all

⁸⁶ *AD/ART*, *Anggaran Dasar / Anggaran Rumah Tangga*, internal organization's rules, statute, or articles.

responsible to record the water discharge, control and maintain the physical condition of irrigation scheme, calculate the need of water and allocate water accordingly from the weir up to tertiary level. The job is however hard to achieve due to limited number of staff as mentioned above as compared to the scope of works, unavailable work facilities, inadequate annual budget and irregular disbursement. The secondary canal is partly closed by grasses and sedimentation.

As reported above the initiated WUAs are not workable. Thus at farmer level, the operation and management of irrigation is handled by *Kelompok Tani*⁸⁷ and Village Government. Maintenance of weir, primary canal and secondary canal is carried out by *gotong-royong* of both Desda and Rade villages. Whereas the tertiary systems belong to *Panggawa* and the *Kelompok Tani* of the respective village to manage.

The interviewed key-informant said that WUAs' leaders expect that a Bupati Decree and salary could be issued for the legal basis of their job and activities as WUA leaders.

(3) Agriculture

Paddy and *palawija* represent the main production in the DI. Labeled seeds are used by more than 30 farmers and so are proper fertilizer practices. The remaining >70% farmers use their own seed and fertilizer inadequately. Young generation is not interested to be farmer, and farm laborer is limited in number and must be hired from outside at about Rp 15,000/manday. As a result paddy production averages at a range of 3 to 4.2 ton/ha.

It is however important to note that most farmers use hand tractors for land preparation, and post harvest practices are relatively better for efficiency and marketing purposes.

Due to water availability three types of planting pattern are evident in the DI, concerning paddy-paddy-*palawija* in the upstream, paddy-*palawija-palawija* in the middle stream, and paddy-*palawija-bero* in the downstream.

(4) Others

Harvest mostly is sold to the local traders with relatively low price. KUD has no power to compete against the private unless the provision of *sembako* (basic needs) and production inputs.

Similarly to the WUA leaders above, it seems WUA needs legalization first before any kind of activity. This misperception may rise from the fact that, belong to the past Government policy, WUA is established on government instruction basis with AD/ART that is evidently issued legalized by the Government rather than by the General Assembly of the respective WUA.

Hence, farmers are not familiar with their WUA, they do not know their WUA leaders, no WUA work plan is prepared, no O&M fee collected regularly from farmers, no WUA regulation is formulated, and subsequently no sanction could be made effective for an orderly irrigation management.

F.5.7 DI Rora Kecil, Bima

(1) General Condition

The DI Rora Kecil was established in 1975 for about 531 ha sawah of Rora village, Sub-district Donggo, Bima District. This semi-technical irrigation scheme has 18 m wide permanent weir with 2 intake gates and 9.44 km length feeding canal.

The primary canal is about 22.6 km length, secondary canal 7.23 km and inspection road 1.32 km. The DI was designed for about 678 m³/sec. discharge but only 380 m³/sec. that currently could be achieved.

⁸⁷ Kelompok Tani, Group of Farmers, promoted by the Ministry of Agriculture

Traditional dams in the upper level i.e Dam Waduk Tuti and Dam Ruhu Tumpi are partly responsible. The same source of data also reveals the evidence of 212 m closed canal, 17 culverts, 2 offtake structures, 2 aqueducts, 3 sedimentation traps, 11 drop structures, 2,100 m semi drop culverts, and 7 division structures. About 9 km length tertiary canals are not yet established.

Field survey, therefore, was undertaken in the Rora village and WUA Sama Ne'e in particular. Presently, the village was populated by about 3,978 people and 741 households of Bima / Dompu ethnical groups mostly living from cultivation. By landuse, a total of about 2,748 ha territory comprised of irrigated sawah 640 ha, dryland cultivation 1,500 ha, plantations 141 ha, grass land 379 ha and settlement 88 ha.

(2) Irrigation

Long time before WUA was established water was traditionally managed by the *Panggawa*, a village officer responsible for operation and maintenance of local irrigation system. Report was given to the Head of Village for any kind of rehabilitation as required. As a follow up observation on the spot and meeting involving the concerned parties so-called *musyawarah* were usually undertaken by the Village Government before decision could be made. Accordingly fund was raised from the harvest by *gotong-royong* and so was construction works. A *Panggawa* was elected by the farmers from the local figure and given with *tanah bengkok*⁸⁸.

In 1997 a number of WUAs were formed under INPRES No.2, 1984, Tutarora (Samakai), Ndanu Samaila, Sabua Ade, Sama Ne'e, Waduk Tunti, and Ruhu Tumpi. Within this organization setting *Panggawa* was included to be an O&M implementor at WUA level called *Ulu-Ulu* under the prevailing irrigation management of Subdistrict Government of Irrigation (*Pengamat*) of Sila. Under the irrigation management system the WUAs and *Panggawa* have never been active.

The WUAs' leaders were included into training programs, but they have no working plan so far, no clear understanding on their job, and so how to manage the *Panggawa*. Thus in practice the irrigation O&M depends mostly on *Pengamat's* staff, the *Juru Pengairan*. By the help of *Juru Pintu*, the *Juru Pengairan* records water discharge, control and maintains irrigation scheme, formulate with PPL planting pattern and calendar, calculate the required water, and operate water allocation accordingly. Unfortunately the works couldn't be carried out adequately. While the location is mountainous and difficult to achieve no work facilities available to cover the DI scheme and no budget could be disbursed up to the moment. The *Juru Pintu*, Mr Umar, working on honorarium basis for the position since 1980 said that water decreases drastically in dry season and rotating system of water allocation, however, usually could not prevent illegal distribution, water gate damages and conflicts among farmers. There is no water regulation nor sanction so far consented with farmers.

Farmers have no sense of belonging on the DI nor interest to manage because of state-owned irrigation scheme. When reparation or other special maintenance is needed the *Pengamat* usually approaches the Head of Village and irrigated blocks' leaders for *musyawarah* purpose. Actions then be made accordingly by *gotong-royong* for material, manpower, and fund mobilizations as required. *Gotong-royong* for canal cleaning is usually done prior planting season.

Presently the weir is closed with stones due to floods in rain seasons causing lack of water discharge for planting season 1 and 2 in particular. About 4.22 km length secondary canal was not permanently established, and so was about 8.59 km tertiary canal, and cause high water leakage.

(3) Agriculture

Irrigated paddy cultivation contributes the mostly important income of farmers. The works in terms of land preparation, planting, maintenance and harvesting are undertaken by men and women. Share

⁸⁸ *Tanah bengkok* is village land of which land use right was traditionally given by the village community to Village Officers for living due to the given position and responsibility in the village.

cropping is not popular. Tenant farmers are small in number. After production cost that is evidently provided by tenant, harvest is usually divided for landowner and tenant farmer on fifty-fifty basis. Plantations represent the second of importance especially coffee, *kemiri* and clove.

Tractor is not so popular because sawah is characterized by stoned land. Land preparation, therefore, is done by using buffalo which is evidently getting scarce, making land preparation is technically improper and financially inefficient since 1 ha needs for 10 and 15 days @ Rp.50,000/day that is equivalent to Rp.500,000 and 750,000/ha.

Labeled seeds are not used because of its availability and expensive to buy. By the same reasons fertilizers are used improperly. This situation is getting worse in planting season 1 and 2 that are ultimately dry and water is allocated insufficiently and not timely. As a result paddy production is low at a range of about 3 to 3.5 ton/ha.

Planting pattern are not consented with farmers so planting calendar is practiced individually, not organized, and this makes rotating water allocation in planting season 1 and 2 difficult and insufficient. In the upstream paddy-paddy-*palawija* is possible while in the downstream paddy-*palawija-bero*⁸⁹.

(4) Others

Inadequate road and transportation facilities are another problems of farmers to provide production inputs and to sell harvested productions. Transportation cost from farm to the house may vary at a range of Rp.3,000 to 3,500 per 100 kg paddy.

KUD has no financial and management capacity so far to provide appropriately production means, capital and consumption goods and services either marketing of farm production for the sake of farmers. Market is absolutely controlled by the private, and as an effect farmers are impoverished from both sides i.e. when buying and when selling. By the moment farmers sell paddy at Rp.800 to 900/kg.

F.5.8 DI Lebo, Bima

(1) General Condition

The DI Lebo is situated in the Sub-district Mada Pangga, Bima, and intended to supply water for about 350 ha sawah in the Dena and Rade villages. The DI is semi technical with 0.129 km primary canal and 4.73 km secondary canal, 1 control structure, 1 division structure, 7 tap structures, 12 aqueducts, 3 bridges, and 2 flushing culverts.

The irrigation scheme was permanently established unless 1.44 km of 4.73 km secondary canal and 6.63 km of 7.33 km tertiary canal.

Field survey focused on Dena village which includes about 3,413.19 km² territory. The village is populated by about 3,688 people (880 households) that are mostly active in farming. About 39 shops, 2 kiosks and 2 KUDs are available for various production inputs, goods and services. Dena is really characterized with fertile land. About 357.19 ha sawah is technically irrigated, the other 350 ha is semi technical sawah, and the remaining 102 ha is irrigated under simple system and rainfed, whereas cattle breeding contribute another main source of income.

The local irrigation system was formerly managed by *Panggawa*, a traditional village officer elected by the people for water and responsible to the Village Leader. Under this irrigation management system a required irrigation improvement or rehabilitation was discussed in a *musyawarah* at village community level with the village government. And the actions were taken accordingly for financial, manpower and materials as required by *gotong-royong*.

⁸⁹ *Bero*, uncultivated at all

WUAs were initiated in 1997 under INPRES No.2/1984. These WUAs have no *AD/ART*⁹⁰ nor registered so far. WUAs' leaders were appointed by the Head of Village just to meet formal requirement, and they are inactive up to the moment. Irrigation management is undertaken by the *Pengamat's* staff (*Juru Pengairan and Juru Pintu*) for the government side, and the *Panggawa* posted voluntarily as tertiary irrigation block leader for the farmer side.

(2) Irrigation

The DI Lebo is under the management of *Pengamat* Office of Sila. To manage the DI *Pengamat* is assisted by 1 *Juru Pengairan* and 1 *Juru Pintu*. By a help of *Juru Pintu* the *Juru Pengairan* is responsible to record the water discharge, control and maintain the physical condition of irrigation scheme, calculate the need of water and allocate water accordingly from the weir up to tertiary level.

The job is however hard to achieve due to limited number of staff as mentioned above as compared to the scope of works, unavailable work facilities, inadequate annual budget and irregular disbursement. The secondary canal is partly closed by grasses and sedimentation.

As reported above the initiated WUAs are not workable. Thus at farmer level, the operation and management of irrigation is handled by *Kelompok Tani*⁹¹ and Village Government. Maintenance of weir, primary canal and secondary canal is carried out by *gotong-royong* of both *Desda* and *Rade* villages. Whereas the tertiary systems belong to *Panggawa* and the *Kelompok Tani* of the respective village to manage.

The interviewed key-informant said that WUAs' leaders expect that a *Bupati Decree* and salary could be issued for the legal basis of their job and activities as WUA leaders.

(3) Agriculture

Paddy and palawija represent the main production in the DI. Labeled seeds are used by more than 30% of farmers and so are proper fertilizer practices. The remaining less than 70% of farmers use their own seed and fertilizer inadequately. Young generation is not interested to be farmer, and farm laborer is limited in number and must be hired from outside at about Rp.15,000/manday. As a result paddy production averages at a range of 3 to 4.2 ton/ha.

It is however important to note that most farmers use hand tractors for land preparation, and post harvest practices are relatively better for efficiency and marketing purposes.

Due to water availability three types of planting pattern are evident in the DI, concerning paddy-paddy-palawija in the upstream, paddy-palawija-palawija in the middle stream, and paddy-palawija-bero in the downstream.

(4) Others

Harvest mostly is sold to the local traders with relatively low price. KUD has no power to compete against the private unless the provision of *sembako* (basic needs) and production inputs. Similarly to the WUA leaders above, it seems WUA needs legalization first before any kind of activity. This misperception may rise from the fact that, belong to the past Government policy, WUA is established on government instruction basis with *AD/ART* that is evidently issued legalized by the Government rather than by the General Assembly of the respective WUA. Hence, farmers are not familiar with their WUA, they do not know their WUA leaders, no WUA work plan is prepared, no O&M fee collected regularly from farmers, no WUA regulation is formulated, and subsequently no sanction could be made effective for an orderly irrigation management.

⁹⁰ *AD/ART, Anggaran Dasar / Anggaran Rumah Tangga*, internal organization's rules, statuta, or articles.

⁹¹ *Kelompok Tani*, Group of Farmers, promoted by the Ministry of Agriculture