Within the above potential area of 845 ha, there exist the areas of protected lands for development, i.e., the Public Forest and National Park, and already developed area for intensive use such as wet paddy fields. The actual potential lands to be converted to vegetables are limited in the A&D lands and the area is estimated at about 600 ha in the Study area.

4.5 Future Land Use Plan

As a conclusion of the land resources assessment, future land use in the Study area are proposed as shown in Main Text. The agricultural land use plan is summarized as shown in the following table.

Present and Future Agricultural Land Use

(Unit: ha)

Agricultural Land Use	Present	Future
Vegetable (Net area)	720	1,320
Irrigated	0	320
Rainfed	720	1,000
Tree crops	1,220	620
Other land use	1,060	1,060

Source: The JICA Study Team

As the Project aims to horticulture development with irrigation, the coconut lands shall be transformed to vegetable lands. The land in the Public Forest and National Park shall not be used for vegetable cropping. The only A&D lands, which are suitable for vegetable and not used for intensive use yet, shall be transformed to vegetable cropped lands.

5 Conclusion

1) Soil survey was carried out by a local contractor under supervision by the JICA Study Team during Phase 1. The survey consisted of soil profile survey and laboratory tests.

2) Soils were categorized three soil series of Abo, Alipit and Bukal. Those soils were generally classified into moderately fertile, but major constraint for agriculture was a steep slope.

3) The land suitability for vegetable cropping was assessed based on the survey results. The moderately and marginally suitable areas were estimated at 905 ha and 660 ha in the total Study area of 3,000 ha.

4) Taking the present land use and land status into account, potential area for vegetable extension was estimated at 600 ha. In future, the area of 1,320 ha were expected to be used for vegetable production, while 720 ha in present.

Table III.1.1 Land Slope by Municipality and Elevation

(Unit: ha)

Municipality	Elevation (m)	Land Slope Class						Total
		3 - 8 %	8 - 15 %	15 - 18 %	18 - 25 %	> 25 %	Others	
Nagcarlan	<300	38					12	50
	300-400	87	69	10		19	73	258
	400-500	25	56	15	19	46	59	220
	500-600	13	97	47	70	43	52	322
	600-700	23	87	32	52	35	24	253
	700-800		9	9	27	20	11	76
	800-900				2	1		3
	>900							
	Total	186	318	113	170	164	231	1,182
Liliw	<300							
	300-400		56	2	3		44	105
	400-500		84	55	4		91	234
	500-600		37	89		2	77	205
	600-700			42	16	19	26	103
	700-800		1	9	22	48	26	106
	800-900				3	15	1	19
	>900							
	Total		178	197	48	84	265	772
Majayjay	<300							
	300-400		1				9	10
	400-500		100				45	145
	500-600		56		2		22	80
	600-700		7		1		7	15
	700-800							
	800-900							
	>900							
	Total		164		3		83	250
National Park	<300							
	300-400							
	400-500							
	500-600							
	600-700	4	2		1	91	1	99
	700-800		29	8	34	48	21	140
	800-900		24	20	32	164	5	245
	>900			12	22	274	4	312
	Total	4	55	40	89	577	31	796
Total	<300	38					12	50
	300-400	87	126	12	3	19	126	373
	400-500	25	240	70	23	46	195	599
	500-600	13	190	136	72	45	151	607
	600-700	27	96	74	70	145	58	470
	700-800		39	26	83	116	58	322
	800-900		24	20	37	180	6	267
	>900			12	22	274	4	312
	Total	190	715	350	310	825	610	3,000

Source: Topographic Map (1/4,000) prepared by the JICA

Table III.2.1 General Description of Soil Test Pits

Pit No.	Barangay	Municipality	Elevation (m)	Vegetation	Slope
1	Abo	Nagcarlan	325	Paddy	B 5%
2	Abo	Nagcarlan	348	Coconut, Banana, Lanzones	B 4%
3	Abo	Nagcarlan	375	Coconut, Banana, Lanzones	C 12%
4	San Francisco	Nagcarlan	530	Coconut, Banana, Lanzones	E 30%
5	San Francisco	Nagcarlan	515	Coconut, Banana, Lanzones	D 18%
6	San Francisco	Nagcarlan	595	Vegetables	B 6%
7	San Francisco	Nagcarlan	610	Vegetables	D 16%
8	Sil. Napapatid	Nagcarlan	320	Coconut, Banana	E 18%
9	Balimbing	Nagcarlan	345	Coconut, Banana, Lanzones	B 6%
10	Abo	Nagcarlan	430	Coconut, Banana, Lanzones	B 8%
11	Abo	Nagcarlan	440	Coconut, Banana, Lanzones	D 16%
12	Abo	Nagcarlan	500	Coconut, Banana, Lanzones	E >18%
13	Bukal	Nagcarlan	680	Shrubs	E 20%
14	Abo	Nagcarlan	525	Coconut, Banana, Lanzones	C 14%
15	Abo	Nagcarlan	570	Coconut, Banana, Lanzones	E 60%
16	Abo	Nagcarlan	445	Coconut, Banana, Lanzones	B 5%
17	Bukal	Nagcarlan	640	Vegetables	B 6%
18	Bukal	Nagcarlan	665	Banana	C 8%
19	Sil. Lazaan	Nagcarlan	504	Coconut, Banana, Lanzones	C 14%
20	Malinao	Nagcarlan	400	Coconut, Banana	C 15%
21	San Francisco	Nagcarlan	810	Vegetables	E >18%
22	Kan. Lazaan	Nagcarlan	485	Vegetables, Coconut, Banana	C 14%
23	Kan. Lazaan	Nagcarlan	545	Vegetables, Coconut, Banana	C 12%
24	Kan. Lazaan	Nagcarlan	655	Vegetables, Coconut, Banana	C 10%
25	Balibarin	Liliw	380	Coconut, Banana, Lanzones	C 9%
26	Il. San Roque	Liliw	424	Paddy	C 13%
27	Novaliches	Liliw	452	Coconut, Banana, Lanzones	C 11%
28	Il. San Roque	Liliw	517	Vegetables, Coconut, Banana	C 12%
29	Novaliches	Liliw	570	Tomato, Coconut, Banana	D 16%
30	Luquin	Liliw	445	Coconut, Lanzones, Banana	D 16%
31	Iba. Sungi	Liliw	400	Coconut,Banana	C 10%
32	Il. Sungi	Liliw	520	Coconut, Lanzones, Tomato	C 12%
33	Novaliches	Liliw	625	Tomato	D 16%
34	Luquin	Liliw	770	Tomato	E 18%
35	Luquin	Liliw	665	Coconut, Tomato	D 14%
36	Luquin	Liliw	530	Coconut, Tomato	D 16%
37	Il. Sungi	Liliw	650	Coconut, Banana, Tomato	D 17%
38	San Roque	Majayjay	415	Upland rice	C 15%
39	Bukal	Majayjay	545	Tomato, Coconut	C 15%
40	Malinao	Majayjay	415	Tomato, Upland rice, Coconut	C 9%

Source: Soil Survey Carried out by the JICA Study Team

Table III.2.2 Soil Series/Types/Mapping Units of the Study area

Physiographic Landscape	Soil Mapping Unit	Soil Series/Type	USDA Taxonomic Subgroup Level	Area (ha)	Percentage (%)
Volcanic Footslope	AbB	Abo loam, 3-8 % slope; nearly level to gently sloping	Typic Eutropepts	135	4.5%
	AbC1	Abo loam, 8-15 % slope; gently sloping to sloping; slightly eroded		105	3.5%
	AbD1	Abo loam, 15-18 % slope; gently sloping to moderately steep, slightly eroded		80	2.7%
	AbE1	Abo loam, 18-25 % slope; moderately steep to steep; slightly eroded		65	2.2%
	AbF1	Abo loam, >25 % slope; steep to very steep; slightly eroded		320	10.7%
	AtB	Alipit clay loam, 3-8 % slope; nearly level to gently sloping	Typic Hapludalfs	15	0.5%
	AtC1	Alipit clay loam, 8-15 % slope; gently sloping to moderately steep; slightly eroded		395	13.2%
	AtD1	Alipit clay loam, 15-18 % slope; sloping to moderately steep; slightly eroded		170	5.7%
	AtE1	Alipit clay loam, 18-25 % slope; moderately steep to steep; slightly eroded		50	1.7%
	AtF1	Alipit clay loam, >25 % slope; steep to very steep; slightly eroded		80	2.7%
	BuB	Bukal loam, 3-8 % slope; nearly level to gently sloping	Typic Udorthents	40	1.3%
	BuC1	Bukal loam, 8-15 % slope; gently sloping to moderately steep; slightly eroded		215	7.2%
	BuD1	Bukal loam, 15-18 % slope; sloping to moderately steep; slightly eroded		100	3.3%
	BuE2	Bukal loam, 18-25 % slope; moderately steep to steep; moderately eroded		195	6.5%
	BuF2	Bukal loam, >25 % slope; steep to very steep; moderately eroded		425	14.2%
Miscellaneous	M	Residential/Built-up area		45	1.5%
	RTE	River Terrace Escarpment		565	18.8%
Total				3,000	100.0%

Source: Soil Survey Carried out by the JICA Study Team

Table III.2.3 Soil Type by Municipality and Elevation

(Unit: ha)

Municipality	Elevation (m)	Soil Type																	Total
		AbB	AbC1	AbD1	AbE1	AbF1	AtB	AtC1	AtD1	AtE1	AtF1	BuB	BuC1	BuD1	BuE2	BuF2	M	RTE	
Nagcarlan																			
	<300	38															10	2	50
	300-400	72	44	10		18	15	25								1	16	57	258
	400-500	25	22	7		18		23					11	8	19	28	13	46	220
	500-600		8	6	6	11		6				13	83	41	64	32	2	50	322
	600-700		25	14	27	13						23	62	18	25	22	1	23	253
	700-800		5	9	13	17							4		14	3		11	76
	800-900				1	1									1				3
	>900																		
	Total	135	104	46	47	78	15	54				36	160	67	123	86	42	189	1,182
Liliw																			
	<300																		
	300-400							56	2	3								44	105
	400-500							84	55	4							1	90	234
	500-600			6		1		37	83		1						2	75	205
	600-700			12		1			30	16	18							26	103
	700-800		1	9	7	21				15	27							26	106
	800-900				2	13				1	2							1	19
	>900																		
	Total		1	27	9	36		177	170	39	48						3	262	772
Majayjay																			
	<300																		
	300-400							1										9	10
	400-500							100										45	145
	500-600							56		2								22	80
	600-700							7		1								7	15
	700-800																		
	800-900																		
	>900																		
	Total							164		3								83	250
National Park																			
	<300																		
	300-400																		
	400-500																		
	500-600																		
	600-700											4	2		1	91		1	99
	700-800					26				2	20		29	8	32	2		21	140
	800-900				3	52				4	10		24	20	25	102		5	245
	>900			7	6	128				2	2			5	14	144		4	312
	Total			7	9	206				8	32	4	55	33	72	339		31	796
Total																			
	<300	38															10	2	50
	300-400	72	44	10		18	15	82	2	3						1	16	110	373
	400-500	25	22	7		18		207	55	4			11	8	19	28	14	181	599
	500-600		8	12	6	12		99	83	2	1	13	83	41	64	32	4	147	607
	600-700		25	26	27	14		7	30	17	18	27	64	18	26	113	1	57	470
	700-800		6	18	20	64				17	47		33	8	46	5		58	322
	800-900				6	66				5	12		24	20	26	102		6	267
	>900			7	6	128				2	2			5	14	144		4	312
	Total	135	105	80	65	320	15	395	170	50	80	40	215	100	195	425	45	565	3,000

Source: Soil Survey carried out by the JICA Study Team.

Note: M: Residential/Built-up Area

RTE: River Terrace Escarpment

Table III.2.4 Physical and Chemical Characteristics of Soils in the Project Area

Soil Pit No.	Soil Series/ Land Type	Texture	Slope	Soil Drainage	Soil Thickness (A & B)	Coarse Fragments/ Rock Outcrop (%)	Underlying Materials	Flooding	Erosion	pH (H2O) Surface	CEC (meq/100g) Surface	Ex. K (meq/100g)	Available Phosphorous (ppm)	Total N (%)	Organic Matter (%)
20	Alipit	Clay loam	8_15	Well draind	50_100	15_25	Volcanic	None	1	5.9	17.8	2.8	9.0	0.21	3.22
06	Bukal	Loam	3_8	Well draind	50_100	15_26	Volcanic	None	1	5.6	13.0	0.9	43.4	0.24	-
18	Bukal	Sandy loam	8_15	Well draind	50_100	15_27	Volcanic	None	1	5.7	1.2	1.8	33.0	0.24	3.11
17	Bukal	Loam	3_8	Well draind	50_100	15_28	Volcanic	None	1	5.5	14.2	0.2	8.8	0.48	4.24
04	Bukal	Loam	>25	Well draind	50_100	25_50	Volcanic	None	2	5.9	11.3	0.4	11.0	0.29	4.04
15	Bukal	Loam	>25	Well draind	50_100	25_50	Volcanic	None	2	5.9	20.4	-	132.0	0.58	4.51
21	Bukal	Loam	18_25	Well draind	50_100	25_50	Volcanic	None	2	5.0	14.5	0.1	49.8	0.42	4.09
13	Bukal	Loam	>25	Well draind	50_100	25_50	Volcanic	None	2	5.8	24.8	0.3	6.6	0.67	4.84
01	Abo	Loam	3_8	Well draind	50_100	None	Volcanic	None	None	6.5	24.7	1.4	57.2	0.15	2.32
24	Abo	Clay loam	8_15	Well draind	50_100	None	Volcanic	None	1	5.8	16.1	0.2	7.8	0.46	3.97
22	Abo	Loam	15_18	Well draind	50_100	None	Volcanic	None	1	5.9	16.4	1.0	42.0	0.28	4.32
16	Abo	Loam	3_8	Well draind	50_100	None	Volcanic	None	1	6.0	14.7	1.2	37.5	0.20	3.29
02	Abo	Loam	3_8	Well draind	50_100	None	Volcanic	None	None	5.7	13.1	1.1	116.2	0.19	3.34
34	Alipit	Clay loam	18_25	Well draind	50_100	None	Volcanic	None	1	5.8	15.3	0.5	13.8	0.46	4.66
36	Alipit	Silt loam	15_18	Well draind	50_100	None	Volcanic	None	1	5.6	11.1	0.9	14.7	0.30	3.69
39	Alipit	Loam	8_15	Well draind	50_100	None	Volcanic	None	1	5.1	24.1	1.5	24.0	0.41	4.32
27	Alipit	Clay loam	3_8	Well draind	50_100	None	Volcanic	None	1	5.9	15.6	2.2	41.1	0.24	3.30
40	Alipit	Clay loam	8_15	Well draind	50_100	None	Volcanic	None	1	5.9	23.5	3.0	5.8	0.23	3.22
09	Alipit	Loam	3_8	Well draind	50_100	None	Volcanic	None	None	6.2	15.8	1.3	42.0	0.15	2.56
19	Alipit	Clay loam	8_15	Well draind	50_100	None	Volcanic	None	1	5.9	20.6	0.3	36.0	0.26	3.74
26	Alipit	Clay loam	8_15	Well draind	50_100	None	Volcanic	None	1	5.7	18.2	2.5	16.0	0.21	3.34
29	Alipit	Loam	15_18	Well draind	50_100	None	Volcanic	None	1	5.0	11.2	1.3	49.0	0.25	3.95
32	Alipit	Loam	15_18	Well draind	50_100	None	Volcanic	None	1	5.1	18.6	0.6	43.0	0.42	4.24
35	Alipit	Loam	15_18	Well draind	50_100	None	Volcanic	None	1	4.8	12.7	0.4	32.0	0.37	4.22
37	Alipit	Loam	15_18	Well draind	50_100	None	Volcanic	None	1	5.4	19.5	1.5	16.2	0.51	4.29

Source: Soil Survey Carried out by the JICA Study Team
Remarks: Weighted average between 0 - 50 cm soil depth.

Table III.3.1 Land Suitability Criteria for Each Land Utilization Type

Land Use Type/ Limitation	Highly Suitable (S1)	Moderately Suitable (S2)	Marginally Suitable (S3)	Not Suitbale (N)
Drainage				
Diversified Crops	Well	Not used	Imperfect drained	Poor/excessive
Tree Crops	Well	Not used	Imperfect drained	Poor/excessive
Upland Rice	Poor to well	Not used	Not used	Execcive
Soil Depth (cm)				
Diversified Crops	More than 75	75 to 50	50 to 25	Less than 25
Tree Crops	More than 150	150 to 100	100 to 50	Less than 50
Upland Rice	More than 60	51 to 60	20 to 50	Less than 20
Soil Texture				
Diversified Crops	Fine to medium	Nort used	Coarse	Very coarse
Tree Crops	Fine to medium	Nort used	Coarse	Very coarse
Upland Rice	Fine	Medium	Moderately coarse	Coarse
Slope (%)				
Diversified Crops	0 to 5	5 to 15	15 to 20	More than 20
Tree Crops	0 to 8	8 to 15	15 to 25	More than 25
Upland Rice	0 to 5	5 to 15	15 to 24	More than 24
CEC (me/100g)				
Diversified Crops	More than 24	16 to 24	Less than 16	Not used
Tree Crops	More than 24	16 to 24	Less than 16	Not used
Upland Rice	More than 24	16 to 24	Less than 16	Not used

Source: Soil Survey Carried out by the JICA Study Team

Table III.3.2 Land Suitability Classes/Subclasses by Municipality

Suitability Group	Soil Unit	Suitability Class/Subclass by Land Use Type			Area (ha)
		Upland Rice	Diversified Crops	Tree Crops	
Nagcarlan					
A	AbB/AbC1	S2tx	S2tx	S2kx	240
	AtB	S2tx	S2tx	S2kx	15
	AtC1	S2tx	S2tx	S2tk	65
	BuB/BuC1	S2st	S2tx	S2tx	255
B	AbD1/BuD1	S3t	S3t	S3t	145
C	AbE/BuE2	N	S3t	S3t	240
N	AbF1/BuF2	N	N	N	590
Miscellaneous Land Type	RTE	River terrace escarpment			185
	M	Residential/built-up area			45
Sub-Total					1,780
Liliw					
A	AtC1	S2tx	S2tx	S2kx	160
B	AbD1/AtD1	S3t	S3t	S3t	205
C	AbE1/AtE1	N	S3t	S3t	65
N	AbF1/AtF1	N	N	N	235
Miscellaneous Land Type	RTE	River terrace escarpment			305
Sub-Total					970
Majayjay					
A	AtC1	S2tx	S2tx	S2tk	170
C	AbE/BuE2	N	S3t	S3t	5
Miscellaneous Land Type	RTE	River terrace escarpment			75
Sub-Total					250

Source: Soil Survey carried out by the JICA Study Team
Remarks: Subscripted letters mean; t: Slope; x: Soil fertility; k: Soil depth.

Table III.3.3 Land Suitablity for Vegetable by Municipality and Elevation

(Unit: ha)

Municipality	Elevation (m)	Land Suitability Class: Moderately Suitable	Marginally Suitable	Not Suitable	Other Land Use	Total
Nagcarlan	<300	38			12	50
	300-400	156	10	19	73	258
	400-500	81	34	46	59	220
	500-600	110	117	43	52	322
	600-700	110	84	35	24	253
	700-800	9	36	20	11	76
	800-900		2	1		3
	>900					
	Total	504	283	164	231	1,182
Liliw	<300					
	300-400	56	5		44	105
	400-500	84	59		91	234
	500-600	37	89	2	77	205
	600-700		58	19	26	103
	700-800	1	31	48	26	106
	800-900		3	15	1	19
	>900					
	Total	178	245	84	265	772
Majayjay	<300					
	300-400	1			9	10
	400-500	100			45	145
	500-600	56	2		22	80
	600-700	7	1		7	15
	700-800					
	800-900					
	>900					
	Total	164	3		83	250
National Park	<300					
	300-400					
	400-500					
	500-600					
	600-700	6	1	91	1	99
	700-800	29	42	48	21	140
	800-900	24	52	164	5	245
	>900		34	274	4	312
	Total	59	129	577	31	796
Total	<300	38			12	50
	300-400	213	15	19	126	373
	400-500	265	93	46	195	599
	500-600	203	208	45	151	607
	600-700	123	144	145	58	470
	700-800	39	109	116	58	322
	800-900	24	57	180	6	267
	>900		34	274	4	312
	Total	905	660	825	610	3,000

Source: Soil Survey Carried out by the JICA Study Team

Table III.4.1 Land Potential for Vegetable Cropping Extension by Municipality and Elevation

(Unit: ha)

Municipality	Elevation (m)	Total Area	Potential Area	Vegetable Cropping Area			Paddy Field	Potential - Vegetable - Paddy
				Total Area	Irrigation Plan Area	No Irrigation Area		
Nagcarlan	<300	50	38	2		2		36
	300-400	258	166	35		35	5	126
	400-500	220	115	25		25		90
	500-600	322	227	87	63	24		140
	600-700	253	194	76	67	9		118
	700-800	76	45	29	24	5		16
	800-900	3	2	1	1			1
	>900							
	Total	1,182	787	255	155	100		527
Liliw	<300							
	300-400	105	61	15	14	1	1	45
	400-500	234	143	59	58	1	8	76
	500-600	205	126	103	93	10	1	22
	600-700	103	78	78		78		
	700-800	106	44	44		44		
	800-900	19	11	11		11		
	>900							
	Total	772	463	310	165	145		143
Majayjay	<300							
	300-400	10	1					1
	400-500	145	100	40		40	22	38
	500-600	80	58	19		19	3	36
	600-700	15	8	1		1		7
	700-800							
	800-900							
	>900							
	Total	250	167	60		60	25	82
National Park	<300							
	300-400							
	400-500							
	500-600							
	600-700	99	7	3		3		4
	700-800	140	71	22		22		49
	800-900	245	76	31		31		45
	>900	312	34	22		22		12
	Total	796	188	78		78		110
Total	<300	50	38	2		2		36
	300-400	373	228	50	14	36		178
	400-500	599	358	124	58	66		234
	500-600	607	411	209	156	53		202
	600-700	470	287	158	67	91		129
	700-800	322	160	95	24	71		65
	800-900	267	89	43	1	42		46
	>900	312	34	22		22		12
	Total	3,000	1,605	703	320	383		902

Source: Soil Survey Carried out by the JICA Study Team

Remarks: The last colum shows the physically potential areas only, not concerned land status.

Attachment III.1 Soil Profile Description

Profile No.	:	**1**				
Location	:	San Francisco, Nagcarlan				
Soil series	:	Abo				
Subgroup lebel	:	Typic Eutropeputs				
Land Form	:	Volcanic Footslope				
Surrounding landform	:	Nearly level to undulating				
Land Use or Vegetation	:	Upland Rice				
Parent Material	:	Clay Prordum from Physiographic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	None				
Slope	:	B4%				
Elevation (m)	:	325				
Rock outcrops / stoniness	:	None				

			I	II	III	IV
Horizon Symbol			AP	B	B	BC
Depth			0-18	18-63	63-72	72-100
Boundary			abrupt	gradual	gradual	
Form of Boundary			smooth	wavy	wavy	
Color	Wet		10YR 3/2	10YR 3/3	10YR 3/3	10YR 3/4
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	CL	CL	SCL
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	weak	weak
	Type		subangular blocky	subangular blocky	subangular blocky	subangular blocky
	Size		medium	medium	fine, medium	medium, coarse
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	slightly sticky
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	slightly plasticity
	Moist		friable	friable	friable	slightly firm
	Dry					
Others	Cutans					
	Cementation					
	Pores		Many fine tubular	many fine tubular	Many fine tubular	
	Pans					
	Root		many fine medium	many fine	few fine medium	few fine medium
	Efflorescene					
	pH		5.8	6.0	6.0	6.0
	Others					

Profile No.	:	**2**				
Location	:	San Francisco, Nagcarlan				
Soil series	:	Abo				
Subgroup lebel	:	Typic Eutropepts				
Land Form	:	Volcanic Footsope				
Surrounding landform	:	Gently sloping				
Land Use or Vegetation	:	Coconut/Lanzones/Banana				
Parent Material	:	Residual, Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	moist				
Erosion class	:	none				
Slope	:	B8%				
Elevation (m)	:	348				
Rock outcrops / stoniness	:	none				

			I	II	III	IV
Horizon Symbol			A	B	B	
Depth			0-19	19-55	55-100	
Boundary			clear	gradual		
Form of Boundary			smooth	irregular		
Color	Wet		10YR 3/2	10YR 3/3	10YR 5/3	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	L	SCL	
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	weak	
	Type		granular	granular	angular blocky, subangular blocky	
	Size		fine	fine		
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	
	Moist		friable	friable	friable	
	Dry					
Others	Cutans					
	Cementation					
	Pores		common fine tubu.	common fine tubu.		
	Pans					
	Root		common fine, medium	very few fine, few medium coarse		
	Efflorescene					
	pH		6.0	5.9	5.9	
	Others					

Attachment III.1 Soil Profile Description

Profile No.	:	**3**				
Location	:	San Francisco, Nagcarlan				
Soil series	:	Abo				
Subgroup lebel	:	Typic Eutropepts				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Undulating to rolling				
Land Use or Vegetation	:	Coconut/Lanzones/Banana				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	None				
Slope	:	C12%				
Elevation (m)	:	375				
Rock outcrops / stoniness	:	none				
			I	II	III	IV
Horizon Symbol			A	B	B	B
Depth			0-18	18-52	52-75	75-100
Boundary			abrupt	gradual	diffuse	
Form of Boundary			smooth	wavy	irregular	
Color	Wet		10YR 3/2	10YR 3/3	2.5Y 4/2	10YR 4/3
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	SCL	SCL	SCL
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	weak	weak
	Type		granular	subangular blocky	subangular blocky	subangular blocky
	Size		medium	fine	fine	medium
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	slightly sticky
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	slightly plasticity
	Moist		friable	friable	friable	friable
	Dry					
Others	Cutans					
	Cementation					
	Pores		common fine tubular	common fine tubular	common fine, medium tubu.	common fine tubular
	Pans					
	Root		common fine common medium		very few fine and medium	very few fine medium
	Efflorescene					
	pH		5.7	5.8	5.9	6.0
	Others		very few irregular gravels	very few medium irregular gravels with pyroclastic materials	pre. of ant house	

Profile No.	:	**4**				
Location	:	San Francisco, Nagcarlan				
Soil series	:	Bukal				
Subgroup lebel	:	Typic Udorthents				
Land Form	:	Volcanic footslopes				
Surrounding landform	:	Hilly				
Land Use or Vegetation	:	Coconut/Lanzones/Banana				
Parent Material	:	Basalt lorasit				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Moderately				
Slope	:	F30%				
Elevation (m)	:	530				
Rock outcrops / stoniness	:	25-50%				
			I	II	III	IV
Horizon Symbol			A	B	BC	
Depth			0-18	18-65	65-100	
Boundary			clear	diffuse		
Form of Boundary			wavy	wavy		
Color	Wet		10YR 2/2	10YR 3/3	10YR 4/3	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	SCL	SCL	
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	weak	
	Type		granular	subangular blocky	subangular blocky	
	Size		fine	fine, medium	medium	
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	
	Moist		friable	friable	friable	
	Dry					
Others	Cutans					
	Cementation					
	Pores			common fine tubular	few fine tubular	
	Pans					
	Root		many fine common medium very few coarse	few fine medium very few coarse	very few very fine	
	Efflorescene					
	pH					
	Others		common small irrigular gravels	very few partially wethered volcanic tuff		

Attachment III.1 Soil Profile Description

Profile No.	:	5				
Location	:	San Francisco, Nagcarlan				
Soil series	:	Bukal				
Subgroup lebel	:	Typic Udorthents				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Hilly				
Land Use or Vegetation	:	Coconut/Banana/Lanzones				
Parent Material	:	Basalt/orde (Pyrocloshic)				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	D18%				
Elevation (m)	:	515				
Rock outcrops / stoniness	:	2 - 10%				
			I	II	III	IV
Horizon Symbol			A	B	C	
Depth			0-15	15-71	71-100	
Boundary			clear	clear		
Form of Boundary			wavy	wavy		
Color	Wet		10YR 2/2	10YR 3/2	10YR 3/3	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	SCL	CoS	
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	structureless	
	Type		granular	subangular blocky		
	Size		fine	medium		
Consistence	Wet	Stickness	slightly sticky	slightly sticky	non-sticky	
		Plasticity	slightly plasticity	slightly plasticity	non-plasticity	
	Moist		friable	friable	loose	
	Dry					
Others	Cutans					
	Cementation					
	Pores			common fine tubu.		
	Pans					
	Root		many fine medium coarse	common fine medium few coarse		
	Efflorescene					
	pH		5.6	5.5	5.8	
	Others		few small, medium irreegular glavels	very few boulders	many medium, coarse irregular gravels / stones	very few partially wethered pyro-clastic materials

Profile No.	:	6				
Location	:	San Francisco, Nagcarlan				
Soil series	:	Bukal				
Subgroup lebel	:	Typic Udorthents				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Gently undulating				
Land Use or Vegetation	:	Vegetable (cabbage, raddish, sayote), Coconut/Banana				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	none				
Slope	:	B6%				
Elevation (m)	:	595				
Rock outcrops / stoniness	:	2 - 10%				
			I	II	III	IV
Horizon Symbol			A	BC	C	
Depth			0-18	18-76	76-150	
Boundary			clear	gradual		
Form of Boundary			wavy	irregular		
Color	Wet		10YR 3/2	10YR 3/3	2.5Y N4	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	SL	CoS	
	Large Particle	Size				
		%				
Structure	Grade		weak		Structureless	
	Type		granular	single grain		
	Size		fine			
Consistence	Wet	Stickness	slightly sticky	non-sticky	non-sticky	
		Plasticity	slightly plasticity	non-plasticity	non-plasticity	
	Moist		friable	loose		
	Dry					
Others	Cutans					
	Cementation					
	Pores					
	Pans					
	Root		few fine	very few fine common medium very few coarse	very few fine	
	Efflorescene					
	pH		5.6			
	Others			presence of small irregular gravels	many medium, coarse irregular gravels	

Attachment III.1 Soil Profile Description

Profile No.	:	7				
Location	:	San Francisco, Nagcarlan				
Soil series	:	Bukal				
Subgroup lebel	:	Typic Udorthents				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Hilly to mountainous				
Land Use or Vegetation	:	Raddish, Tomato, Coconut				
Parent Material	:	Basalt, audecite				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	D16%				
Elevation (m)	:	610				
Rock outcrops / stoniness	:	2 - 10%				

			I	II	III	IV
Horizon Symbol			A	C	C	R
Depth			0-16	16-39	39-80	80-
Boundary			clear	clear		
Form of Boundary			wavy	smooth		
Color	Wet		10RY 2/2	10RY 3/2	2.5Y 4/4	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	SL	LS	
	Large Particle	Size				
		%				
Structure	Grade		weak			
	Type		granular	single grain	single grain	
	Size		fine			
Consistence	Wet	Stickness	slightly sticky	non-sticky	non-sticky	
		Plasticity	slightly plasticity	non-plasticity	non-plasticity	
	Moist		friable	loose	loose	
	Dry					
Others	Cutans					
	Cementation					
	Pores		many fine tubu.	many finetubu.		
	Pans					
	Root		many fine medium	common fine medium		
	Efflorescene					
	pH					
	Others			few irregular gravels		loose sandy materials /bedrock

Profile No.	:	8				
Location	:	Silangan Napapatid, Nagcarlan				
Soil series	:	Abo				
Subgroup lebel	:	Typic Eutropepts				
Land Form	:	Vlcanic footslope				
Surrounding landform	:	Mountainous				
Land Use or Vegetation	:	Coconut/Banana				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	C15%				
Elevation (m)	:	380				
Rock outcrops / stoniness	:	none				

			I	II	III	IV
Horizon Symbol						
Depth			0-12	12-52	52-100	
Boundary			clear	diffuse		
Form of Boundary			wavy	irregular		
Color	Wet		10YR 2/2	10YR 3/2	10YR 3/3	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	CL	CL	
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	weak	
	Type		granular	subangular blocky	subangular blocky	
	Size		fine	fine	fine / medium	
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	
	Moist			friable	slightly firm	
	Dry					
Others	Cutans					
	Cementation					
	Pores		common medium tubu.	common medium tubu.		
	Pans					
	Root		many fine medium	common fine medium		
	Efflorescene					
	pH		6.1	6.2		
	Others					

Attachment III.1 Soil Profile Description

Profile No.	:	9				
Location	:	Balimbing, Nagcarlan				
Soil series	:	Alipit				
Subgroup lebel	:	Typic Hapludalfs				
Land Form	:	Vicanic footslope				
Surrounding landform	:	Gently undulating				
Land Use or Vegetation	:	Coconut/Banana/Lanzones				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	none				
Slope	:	B8%				
Elevation (m)	:	345				
Rock outcrops / stoniness	:	none				
			I	II	III	IV
Horizon Symbol						
Depth			0-22	22-71	71-100	
Boundary			clear	diffuse		
Form of Boundary			smooth	wavy		
Color	Wet		10YR 2/2	10YR 3/3	10YR 3/2	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	CL	C	
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	weak	
	Type		subangular blocky	subangular blocky	subangular blocky	
	Size		fine	fine	fine	
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	
	Moist		slightly firm	slightly firm	slightly firm	
	Dry					
Others	Cutans			few thin patchy clay	common thin patchy clay	
	Cementation					
	Pores		few fine tubu.		common tubu.	
	Pans					
	root		many fine many medium	common fine medi	few fine	
	Efflorescene					
	pH					
	Others					

Profile No.	:	10				
Location	:	Abo, Nagcarlan				
Soil series	:	Abo				
Subgroup lebel	:	Typic Eutropets				
Land Form	:	Volvanic footsloope				
Surrounding landform	:	Undulating to rolling				
Land Use or Vegetation	:	Coconut/Banana/Lanzones				
Parent Material	:	Residual				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	none				
Slope	:	B8%				
Elevation (m)	:	430				
Rock outcrops / stoniness	:	none				
			I	II	III	IV
Horizon Symbol			A	B	Bw	
Depth			0 -13	13-48	48 - 100	
Boundary			clear	gradual		
Form of Boundary			wavy	wavy		
Color	Wet		10YR 2/2	10YR 3/2	10YR 4/3	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	CL	SCL	
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	weak	
	Type		granular	subangular blocky	subangular blocky	
	Size		fine	fine, medium	medium	
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	
	Moist		friable	slightly firm	friable	
	Dry					
Others	Cutans					
	Cementation					
	Pores		few fine tubu.	common fine tubu.	few fine tubu.	
	Pans					
	Root		common fine medium	very few fine medium	very few fine	
	Efflorescene					
	pH					
	Others				presence of krotoviness (ants house)	

Attachment III.1 Soil Profile Description

Profile No.	:	11				
Location	:	Abo, Nagcarlan				
Soil series	:	Abo				
Subgroup lebel	:	Typic Eutropepts				
Land Form	:	Volcanic footsloope				
Surrounding landform	:	Sloaping to undulating				
Land Use or Vegetation	:	Lanzones/Coconut/Banana				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	D16%				
Elevation (m)	:	440				
Rock outcrops / stoniness	:	none				

			I	II	III	IV
Horizon Symbol			A	BA	B	R
Depth			0-13	13-33	33-85	85-
Boundary			clear	diffuse		
Form of Boundary			wavy	irregular		
Color	Wet		10YR 3/3	10YR 5/3	10YR 3/4	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	L	CL	
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	weak	
	Type		granular	granular	subangular blocky	
	Size		fine	fine	fine, medium	
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	
	Moist		friable	friable	friable	
	Dry					
Others	Cutans					
	Cementation					
	Pores			common fine tubu.		
	Pans					
	Root		many fine many medium	few fine common medium common coarse	very few fine common medium few coarse	
	Efflorescene					
	pH					
	Others			common medium coarse irregular gravels, stones presence of boulders embedded below the surface		Embeded volcanic materoals possibly basalt /andesite

Profile No.	:	12				
Location	:	Abo, Nagcarlan				
Soil series	:	Bukal				
Subgroup lebel	:	Typic Udrorthents				
Land Form	:	Volcanic footsloope				
Surrounding landform	:	HIlly to mountainous				
Land Use or Vegetation	:	Coconut/Lanzones/Banana				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	E19%				
Elevation (m)	:	500				
Rock outcrops / stoniness	:	25-50%				

			I	II	III	IV
Horizon Symbol			A	AC	C	
Depth			0-9	9-31	31-100	
Boundary			clear	diffuse		
Form of Boundary			irregular	irregular		
Color	Wet		10YR 2/2	10YR 3/2	10YR 3/3	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	L	FSL / SiL	
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	weak	
	Type		granular	granular	granular	
	Size		fine	fine	fine	
Consistence	Wet	Stickness	slightly sticky	slightly sticky	non-sticky	
		Plasticity	slightly plasticity	slightly plasticity	non-plasticity	
	Moist		friable	friable	friable	
	Dry					
Others	Cutans					
	Cementation					
	Pores			many fine tubu.		
	Pans					
	Root		many fine medium coarse	few fine medium coarse		
	Efflorescene					
	pH		5.8	5.6	5.7	
	Others		pre. of partially wethered pyroclastic materials possibly volcanic tuff		few medium coarse partially wethered volcanic rock fragments and boulders	

Attachment III.1 Soil Profile Description

Profile No.	:	**13**				
Location	:	Bukal, Nagcarlan				
Soil series	:	Bukal				
Subgroup lebel	:	Typic Udorthents				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Rolling to hilly				
Land Use or Vegetation	:	Shrubs/Sushes				
Parent Material	:	Basalt/Andesite				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Moderately				
Slope	:	F>25%				
Elevation (m)	:	680				
Rock outcrops / stoniness	:	25-50%				
			I	II	III	IV
Horizon Symbol			A	BC	C	
Depth			0-12	12-43	43-100	
Boundary			abrupt	gradual		
Form of Boundary			smooth	irregular		
Color	Wet		10YR 2/1	10YR 3/3	10YR 5/4	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	FSL	FSL	
	Large Particle	Size				
		%				
Structure	Grade					
	Type			single grain	single grain	
	Size					
Consistence	Wet	Stickness	slightly sticky	non-sticky	non-sticky	
		Plasticity	slightly plasticity	non-plasticity	non-plasticity	
	Moist		friable	friable	very friable	
	Dry					
Others	Cutans					
	Cementation					
	Pores		many fineoblique tubu. open pore	few medium tubu.	many fineoblique tubu.	
	Pans					
	Root		many fine - medium	few fine		
				medium	many medium	
				coarse	few coarse	
	Efflorescene					
	pH		5.7	5.6	5.8	
	Others			termite / ants house very few boulders imbeded	common medium and coarse hard irregular unwethered rocks	

Profile No.	:	**14**				
Location	:	Abo, Nagcarlan				
Soil series	:	Abo				
Subgroup lebel	:	Typic Eutropepts				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Undulating				
Land Use or Vegetation	:	Coconut/Lanzones/Banana				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	C14%				
Elevation (m)	:	525				
Rock outcrops / stoniness	:	none				
			I	II	III	IV
Horizon Symbol			A	B1	B2	
Depth			0-11	11-42	42-100	
Boundary			clear	gradual		
Form of Boundary			smooth	irregular		
Color	Wet		10YR 3/2	10YR 3/3	10YR 4/3	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	L to CL	SL	
	Large Particle	Size				
		%				
Structure	Grade		weak	weak		
	Type		granular	subangular blocky	single grain	
	Size		fine	medium		
Consistence	Wet	Stickness	slightly sticky	slightly sticky	non-sticky	
		Plasticity	slightly plasticity	slightly plasticity	non-plasticity	
	Moist		friable	friable	loose	
	Dry					
Others	Cutans					
	Cementation					
	Pores		few fine tubu.	many fine tubu.		
	Pans					
	Root		many fine	common fine	common fine	
			medium	medium	medium	
				few coarse		
	Efflorescene					
	pH					
	Others		few partially wethered rock fragments	few to common sto boulders (20%) pyroclastic materials	stones, boulders (15%) pyroclastic materials	

Attachment III.1 Soil Profile Description

Profile No.	:	**15**				
Location	:	Abo, Nagcarlan				
Soil series	:	Bukal				
Subgroup lebel	:	Typic Udorthents				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Hilly to mountainous				
Land Use or Vegetation	:	Coconut/Lanzones/Banana				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Moderately				
Slope	:	F60%				
Elevation (m)	:	570				
Rock outcrops / stoniness	:	25-50%				

			I	II	III	IV
Horizon Symbol			A			
Depth			0-9	9-32	32-80	80-
Boundary			clear			
Form of Boundary			wavy			
Color	Wet		10YR 2/1	10YR 2/2	10YR 5/3	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	CL	FSL	
	Large Particle	Size %				
Structure	Grade		weak			
	Type		granular		single grain	
	Size		fine			
Consistence	Wet	Stickness	slightly sticky	slightly sticky	non-sticky	
		Plasticity	slightly plasticity	slightly plasticity	non-plasticity	
	Moist		friable	slightly firm	loose	
	Dry					
Others	Cutans					
	Cementation					
	Pores		few fine tubu.			
	Pans					
	Root		many fine medium common coarse			
	Efflorescene					
	pH		5.7			
	Others					Layers of stones boulders

Profile No.	:	**16**				
Location	:	Abo, Nagcarlan				
Soil series	:	Abo				
Subgroup lebel	:	Typic Eutropepts				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Sloping to slightly undulating				
Land Use or Vegetation	:	Coconut/Lanzones/Banana				
Parent Material	:	Volcanic tuff				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	None				
Slope	:	B5%				
Elevation (m)	:	445				
Rock outcrops / stoniness	:	none				

			I	II	III	IV
Horizon Symbol			A	B	C	
Depth			0-10	10-47	47-100	
Boundary			clear	gradual		
Form of Boundary			smooth	wavy		
Color	Wet		10YR 2/2	10YR 3/2	10YR 3/4	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	CL	Coarse S	
	Large Particle	Size %				
Structure	Grade		weak	weak		
	Type		subangular blocky	subangular blocky	single grain	
	Size		medium	medium		
Consistence	Wet	Stickness	slightly sticky	slightly sticky	non-sticky	
		Plasticity	slightly plasticity	slightly plasticity	non-plasticity	
	Moist		friable	friable	loose	
	Dry					
Others	Cutans					
	Cementation					
	Pores		many fine tubu.	many fine open tubu.	many fine tubu. open pores	
	Pans					
	Root		many fine medium	common fine medium	common fine medium coarse	
	Efflorescene					
	pH					
	Others				wethered volcanic tuff and pyroplastic materials	

Attachment III.1 Soil Profile Description

Profile No.	:	**17**				
Location	:	Bukal, Nagcarlan				
Soil series	:	Bukal				
Subgroup lebel	:	Typic Udorthents				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Undulating				
Land Use or Vegetation	:	Vegetable (Cabbage, Sayote)				
Parent Material	:	Volcanic tuff				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	None				
Slope	:	B6%				
Elevation (m)	:	640				
Rock outcrops / stoniness	:	2 - 10 %				
			I	II	III	IV
Horizon Symbol						
Depth			0-18	18-39	39-66	66-100
Boundary			gradual	diffuse	diffuse	
Form of Boundary			wavy	wavy	irregular	
Color	Wet		10YR 3/2	10YR 3/3	10YR 3/3	10YR 3/4
	Dry					
Mottling	Abundance					common
	Size					medium
	Contrast					distinct
	Color					10YR4/1
Texture	Fine Earth		L	L	L	FSL
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	weak	weak
	Type		subangular blocky	subangular blocky	subangular blocky	subangular blocky
	Size		fine	medium	medium	medium
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	slightly sticky
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	slightly plasticity
	Moist		very friable	very friable	friable	friable
	Dry					
Others	Cutans					
	Cementation					
	Pores		common	common		
	Pans					
	Root		many fine	few fine	very few fine	very few fine
	Efflorescene					
	pH		5.5	5.5	5.8	
	Others				very few boulders	very few boulders volcanic tuff

Profile No.	:	**18**				
Location	:	Bukal, Nagcarlan				
Soil series	:	Bukal				
Subgroup lebel	:	Typic Udorthents				
Land Form	:	Volcanic footslope				
Surrounding landform	:	nearly level to undulating				
Land Use or Vegetation	:	Banana/Coconut/Papaya				
Parent Material	:	Lesnet/anhzitie				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	C10%				
Elevation (m)	:	665				
Rock outcrops / stoniness	:	2 - 10 %				
			I	II	III	IV
Horizon Symbol			A1	A2	B1	B3
Depth			0-17	17-35	35-76	76-100
Boundary			abrupt	clear	diffuse	
Form of Boundary			smooth	smooth	smooth	
Color	Wet		10YR 2/2	10YR 3/3	10YR 3/2	10YR 4/3
	Dry					
Mottling	Abundance					common
	Size					medium
	Contrast					distinct
	Color					10YR 4/1
Texture	Fine Earth		FSL	FSL	SiL	SiL
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	weak	weak
	Type		crumb	single grain	crumb	crumb
	Size		fine		medium	medium
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	slightly sticky
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	slightly plasticity
	Moist		very friable.	very friable.	very friable.	very friable
	Dry					
Others	Cutans					
	Cementation					
	Pores		many	many	many	many
	Pans					
	Root		many fine medium	common fine medium	few medium	few coarse
	Efflorescene					
	pH		6.3	5.0	5.9	5.0
	Others			few stones many gravels (40%)		

Attachment III.1 Soil Profile Description

Profile No.	:	**19**				
Location	:	Silangan Lazaan, Nagcarlan				
Soil series	:	Alipit				
Subgroup lebel	:	Typic Hapludalfs				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Undulating to Rolling				
Land Use or Vegetation	:	Banana/Coconut/Lanzones				
Parent Material	:	Residual				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	C14%				
Elevation (m)	:	504				
Rock outcrops / stoniness	:	None				
			I	II	III	IV
Horizon Symbol			A	BT	B	
Depth			0-18	18-46	46-81	81-100
Boundary			clear	diffuse	diffuse	
Form of Boundary			smooth	wavy	smooth	
Color	Wet		10YR 3/2	10YR 3/3	10YR 4/3	10YR 3/4
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		CL	CL	CL	CL
	Large Particle	Size				
		%				
Structure	Grade		moderately weak	moderately weak	moderately strong	weak
	Type		subangular blocky	subangular blocky	subangular blocky	subangular blocky
	Size		medium	medium	coarse	medium
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	slightly sticky
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	slightly plasticity
	Moist		friable	friable	firm	friable
	Dry					
Others	Cutans			thin patchy clay	thin patchy clay	
	Cementation					
	Pores		common fine medi	common fine medi	many fine medium	few fine tubu.
			oblique tubu.	oblique tubu.	tubu.	open pores
			open pores			
	Pans					
	Root		many fine	common fine	common fine	few fine
			medium	medium	medium	
	Efflorescene					
	pH			5.8	5.8	5.5
	Others			termite /ants house		many medium partially wethered rock fragments

Profile No.	:	**20**				
Location	:	Malinao, Nagcarlan				
Soil series	:	Alipit				
Subgroup lebel	:	Tyoic Hapludalfs				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Undulating				
Land Use or Vegetation	:	Coconut/Banana				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	C15%				
Elevation (m)	:	400				
Rock outcrops / stoniness	:	None				
			I	II	III	IV
Horizon Symbol			A			
Depth			0-19	19-76	76-100	
Boundary			gradual	clear		
Form of Boundary			wavy	wavy		
Color	Wet		10YR 2/2	10YR 3/3	10YR 3/3	
	Dry				10YR 5/6	
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		CL	CL	CL	
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	weak	
	Type		angular blocky, sub	angular blocky, sub	subangular blocky	
	Size		fine, medium	fine	fine, medium	
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	
	Moist		friable	friable	friable	
	Dry					
Others	Cutans					
	Cementation					
	Pores		few fine tubu.	common fine tubu.	many fine tubu.	
	Pans					
	Root		many fine	common fine	few fine	
			medium	medium	medium	
	Efflorescene					
	pH					
	Others			few irregular gravels	many medium coarse irregular gravels	

Attachment III.1 Soil Profile Description

Profile No.	:	**21**				
Location	:	San Francisco, Nagcarlan				
Soil series	:	Bukal				
Subgroup lebel	:	Typic Udorthents				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Hilly to mountainous				
Land Use or Vegetation	:	Pechay, Cabbage, Raddish				
Parent Material	:	Basalt, Andisite, Pyrodestic Materials				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Moderately				
Slope	:	E19%				
Elevation (m)	:	810				
Rock outcrops / stoniness	:	25 - 50 %				
			I	II	III	IV
Horizon Symbol			A	B	C	
Depth			0-14	14-45	45-100	
Boundary			clear	gradual		
Form of Boundary			wavy	irregular		
Color	Wet		10YR 2/2	7.5YR 3/4	10YR 4/2	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	CL	FiS	
	Large Particle	Size				
		%				
Structure	Grade		weak	moderate		
	Type		subangular blocky	angular blocky, sub	single grain	
	Size		fine, medium	medium		
Consistence	Wet	Stickness	slightly sticky	slightly sticky	non-sticky	
		Plasticity	slightly plasticity	slightly plasticity	non-plasticity	
	Moist		friable	firm	loose	
	Dry					
Others	Cutans					
	Cementation					
	Pores		many fine tubu.	common fine tubu.		
	Pans					
	Root		many fine	few fine medium		
	Efflorescene					
	pH					
	Others			very few stones		

Profile No.	:	**22**				
Location	:	Kanluran Lazaan, Nagcarlan				
Soil series	:	Abo				
Subgroup lebel	:	Typic Eutropepts				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Undulating				
Land Use or Vegetation	:	Vegetable/Coconut/Banana/Lanzones				
Parent Material	:	Basalt/andesite				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	C14%				
Elevation (m)	:	485				
Rock outcrops / stoniness	:	None				
			I	II	III	IV
Horizon Symbol						
Depth			0-16	16-56	56-100	
Boundary			clear	gradual		
Form of Boundary			smooth	smooth		
Color	Wet		10YR 3/3	10YR 5/3	2.5YR N2	
	Dry				2.5Y 4/2	
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	SiCL	CoS	
	Large Particle	Size				
		%				
Structure	Grade		weak	weak		
	Type		granular	subangular blocky		
	Size		medium			
Consistence	Wet	Stickness	slightly sticky	slightly sticky	non-sticky	
		Plasticity	slightly plasticity	slightly plasticity	non-plasticity	
	Moist		friable	friable	loose	
	Dry					
Others	Cutans					
	Cementation					
	Pores		few fine medium tubu.	common fine medium tubu.		
	Pans					
	Root		many fine medium	common fine mediu	very few very fine	
	Efflorescene					
	pH					
	Others					

Attachment III.1 Soil Profile Description

Profile No.	:	**23**				
Location	:	Kanluran Lazaan, Nagcarlan				
Soil series	:	Abo				
Subgroup lebel	:	Typic Eutropepts				
Land Form	:	Middle Slope undulating				
Surrounding landform	:	Undulating				
Land Use or Vegetation	:	Vegetable/Coconut/Banana/Lanzones				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	C12%				
Elevation (m)	:	545				
Rock outcrops / stoniness	:	None				
			I	II	III	IV
Horizon Symbol						
Depth			0-2	20-43	43-74	74-100
Boundary			clear	diffuse	abrupt	
Form of Boundary			smooth	smooth	wavy	
Color	Wet		10YR 3/2	10YR 5/3	10YR 6/3	10YR 5/6
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	SiCL	FiSL	SiCL
	Large Particle	Size				
		%				
Structure	Grade		weak	weak		weak
	Type		granular	subangular blocky	single grain	subangular blocky
	Size		fine	medium		medium
Consistence	Wet	Stickness	slightly sticky	slightly sticky	non-sticky	slightly sticky
		Plasticity	slightly plasticity	slightly plasticity	non-plasticity	slightly plasticity
	Moist		friable	friable	loose	friable
	Dry					
Others	Cutans					
	Cementation					
	Pores		many fine medium tubu.	common fine medi tubu.	very few tubu.	
	Pans					
	Root		many fine medium	common fine medi	few medium	very few medium
	Efflorescene					
	pH		5.4	5.6	5.8	5.9
	Others				many wethered volcainc tuff	

Profile No.	:	**24**				
Location	:	Kanluran Lazaan, Nagcarlan				
Soil series	:	Abo				
Subgroup lebel	:	Typic Eutropepts				
Land Form	:	Middle Slope undulating				
Surrounding landform	:	Gently undulating				
Land Use or Vegetation	:	Vegetable/Banana/Coconut/Lanzones				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	C10%				
Elevation (m)	:	655				
Rock outcrops / stoniness	:	None				
			I	II	III	IV
Horizon Symbol						
Depth			0-16	16-59	59-82	82-100
Boundary			clear	clear	abrupt	
Form of Boundary			wavy	irregular	irregular	
Color	Wet		10YR 3/3	10YR 4/3	10YR 4/3	10YR 5/3
	Dry					
Mottling	Abundance		common			
	Size		fine			
	Contrast		distinct			
	Color		10YR 5/6			
Texture	Fine Earth		CL	CL	SCL	SCL
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	weak	weak
	Type		subangular blocky	subangular blocky	subangular blocky	subangular blocky
	Size		fine	medium	medium	fine
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	slightly sticky
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	slightly plasticity
	Moist		friable	friable	friable	friable
	Dry					
Others	Cutans		pre.thin patchy clay cutans	pre.thin patchy clay cutans		few thin patchy clay cutans
	Cementation					
	Pores		common fine tubu.	common fine tubu.		
	Pans					
	Root			few fine		
	Efflorescene					
	pH					
	Others		few highly wethered rock fraguments		many medium partially wethered dark red (10R 3/6) possibly iron concretion	many medium partially wethered black (2.5Y N2) rock fragments

Attachment III.1 Soil Profile Description

Profile No.	:	**25**				
Location	:	Balibarin, Liliw				
Soil series	:	Alipit				
Subgroup lebel	:	Typic Hapludalfs				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Slightly undulating				
Land Use or Vegetation	:	Coconut/Banana				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	C9%				
Elevation (m)	:	380				
Rock outcrops / stoniness	:	None				
			I	II	III	IV
Horizon Symbol			A	B	B	
Depth			0-15	15-53	53-100	
Boundary			clear	gradual		
Form of Boundary			wavy	wavy		
Color	Wet		10YR 2/2	10YR 3/2	10YR 3/3	
	Dry					
Mottling	Abundance				few	
	Size				fine	
	Contrast				faint	
	Color				10YR6/4	
Texture	Fine Earth		CL	CL	CL	
	Large Particle	Size				
		%				
Structure	Grade		moderately strong	moderately strong	moderately strong	
	Type		subangular blocky	subangular blocky	subangular blocky	
	Size		fine, medium	fine, medium	fine, medium	
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	
	Moist		friable	firm	firm	
	Dry					
Others	Cutans					
	Cementation					
	Pores		many fine oblique tubu. open pores	many fine oblique tubu. open pores	common fine oblique tubu. open pores	
	Pans					
	Root		many fine medium coarse	few fine medium coarse	very few fine medium	
	Efflorescene					
	pH		6.4	6.3	6.2	
	Others				few highly wethered rock fraguments	

Profile No.	:	**26**				
Location	:	Ilayang San Roque, Liliw				
Soil series	:	Alipit				
Subgroup lebel	:	Typic Hapludalfs				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Upland terrace to gently undulating				
Land Use or Vegetation	:	Upland Rice - Irrigated				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	C13%				
Elevation (m)	:	424				
Rock outcrops / stoniness	:	None				
			I	II	III	IV
Horizon Symbol			A			
Depth			0-14	14-59	59-100	
Boundary			clear	gradual		
Form of Boundary			smooth	wavy		
Color	Wet		10YR 4/3	10YR 3/3	10YR 3/3	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		CL	C	C	
	Large Particle	Size				
		%				
Structure	Grade		moderately weak	moderately strong	moderately strong	
	Type		subangular blocky	subangular blocky	subangular blocky	
	Size		fine, medium	medium, coarse	medium, coarse	
Consistence	Wet	Stickness	slightly sticky	sticky	sticky	
		Plasticity	slightly plasticity	plasticity	plasticity	
	Moist		friable	firm	firm	
	Dry					
Others	Cutans			few patchy thin clay cutans	few patchy thin clay cutans	
	Cementation					
	Pores		many fine oblique tubu. open pores	few fine oblique tubu. open pores	few fine tubu. open pores	
	Pans					
	Root		commonfine medium	common fine medi	very few fine	
	Efflorescene					
	pH		5.8	5.9	6.0	
	Others				very few boulders	

Attachment III.1 Soil Profile Description

Profile No.	:	**27**				
Location	:	Novaliches, Liliw				
Soil series	:	Alipit				
Subgroup lebel	:	Typic Hapludalfs				
Land Form	:	Middle Slope undulating				
Surrounding landform	:	Undulating				
Land Use or Vegetation	:	Coconut/Banana/Lanzones				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	C11%				
Elevation (m)	:	452				
Rock outcrops / stoniness	:	None				
			I	II	III	IV
Horizon Symbol			A	B		
Depth			0-19	19-45	45-68	68-100
Boundary			clear	diffuse	diffuse	
Form of Boundary			smooth	smooth	smooth	
Color	Wet		10YR 3/3	10YR 4/3	10YR 5/4	10YR 4/4
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		CL	CL	CL	CL
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	weak	weak
	Type		subangular blocky	subangular blocky	subangular blocky	subangular blocky
	Size		fine, medium	medium	medium	medium
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	slightly sticky
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	slightly plasticity
	Moist		friable	friable	friable	firm
	Dry					
Others	Cutans			pre. patchy thin clay cutans		
	Cementation					
	Pores		many fine tubu. open pores	many fine tubu. open pores	common fine tubu. open pores	
	Pans					
	Root		common fine medi	common fine medi	very few very fine	very few very fine
	Efflorescene					
	pH		5.7	5.8	6.0	5.8
	Others				common medium partially wethered rock frugments possibly tufaceous materials	

Profile No.	:	**28**				
Location	:	Ilayang San Roque, Liliw				
Soil series	:	Alipit				
Subgroup lebel	:	Typic Hapludalfs				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Undulating				
Land Use or Vegetation	:	Vegetable/Coconut/Banana				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	C12%				
Elevation (m)	:	517				
Rock outcrops / stoniness	:					
			I	II	III	IV
Horizon Symbol			A	BT	BT	BC
Depth			0-14	14-35	35-65	65-100
Boundary			clear	clear	gradual	
Form of Boundary			smooth	irregular	irregular	
Color	Wet		10YR 3/3	10YR 4/3	10YR 3/3	10YR 4/2
	Dry					10YR 5/3
Mottling	Abundance		common		common	
	Size		fine		medium	
	Contrast		distinct		distinct	
	Color		2.5Y 5/2		10YR 6/6	
Texture	Fine Earth		CL	C	C	C
	Large Particle	Size				
		%				
Structure	Grade		weak	moderately strong	moderately strong	moderately strong
	Type		subangular blocky	subangular blocky	subangular blocky	subangular blocky
	Size		fine,medium	medium	medium	medium,coarse
Consistence	Wet	Stickness	slightly sticky	sticky	sticky	sticky
		Plasticity	slightly plasticity	plasticity	plasticity	plasticity
	Moist		friable	firm	firm	firm
	Dry					
Others	Cutans			common thin patch clay cutans	common thin patch clay cutans	few thin patchy clay cutans
	Cementation					
	Pores		many fine tubu.	common medium fi tubu.	many medium tubu.	commonfineto med tubu.
	Pans					
	Root		few fine	very few fine		
	Efflorescene					
	pH					
	Others				few medium wethered rock fragments	few medium partially wethered rock fragments

Attachment III.1 Soil Profile Description

Profile No.	:	29				
Location	:	Novalichs, Liliw				
Soil series	:	Alipit				
Subgroup lebel	:	Typic Hapludalfs				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Undulating to roling				
Land Use or Vegetation	:	Tomato/Coconut/Banana				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist All				
Erosion class	:	Slightly				
Slope	:	D16%				
Elevation (m)	:	570				
Rock outcrops / stoniness	:	None				
			I	II	III	IV
Horizon Symbol						
Depth			0-16	16-48	48-79	79-100
Boundary			clear	gradual	abrupt	
Form of Boundary			wavy	wavy	broken	
Color	Wet		10YR 3/4	10YR 3/3	10YR 5/4	2.5Y N/2
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	CL	SiCL	SL
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	weak	
	Type		subangular blocky,	subangular blocky	subangular blocky	single grain
	Size		fine	medium	medium	
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	non-sticky
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	non-plasticity
	Moist		friable	friable	slightly firm	loose
	Dry					
Others	Cutans					
	Cementation					
	Pores		many fine tubu.	common fine medi	few fine tubu	
				tubu.	open pore	
	Pans					
	Root		common fine medi	few fine	very few fine	very few medium
	Efflorescene					
	pH		5.4	5.6	5.7	5.8
	Others				common mdi. partially wethered iron concretion	many medium irregular gravels of volcanic materials possibly tuff

Profile No.	:	30				
Location	:	Luquin, Liliw				
Soil series	:	Alipit				
Subgroup lebel	:	Typic Hapludalfs				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Rolling				
Land Use or Vegetation	:	Coconut/Lanzones/Banana				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist throughout				
Erosion class	:	Slightly				
Slope	:	D16%				
Elevation (m)	:	445				
Rock outcrops / stoniness	:	None				
			I	II	III	IV
Horizon Symbol						
Depth			0-15	15-38	38-54	54-100
Boundary			clear	clear	gradual	clear
Form of Boundary			smooth	smooth	wavy	smooth
Color	Wet		10YR 3/2	10YR 3/3	7.5YR 2/2	10YR 3/4
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		CL	CL	Coarse S	SiCL
	Large Particle	Size				
		%				
Structure	Grade		moderately weak	moderately weak		moderately weak
	Type		subangular blocky	subangular blocky	single grain	subangular blocky
	Size		medium	coarse		medium
Consistence	Wet	Stickness	slightly sticky	slightly sticky	non-sticky	slightly sticky
		Plasticity	slightly plasticity	slightly plasticity	non-plasticity	slightly plasticity
	Moist		friable	firm	loose	friable
	Dry					
Others	Cutans					
	Cementation					
	Pores		many fine tubu.	common fine tubu.	common fine tubu.	common fine tubu.
			open pores	open pores	open pores	open pores
	Pans					
	Root		many fine medium coarse	few fine	few fine	few fine
	Efflorescene					
	pH					
	Others					

Attachment III.1 Soil Profile Description

Profile No.	:	**31**
Location	:	Ibabang Sungi, Liliw
Soil series	:	Alipit
Subgroup lebel	:	Typic Hapludalfs
Land Form	:	Volcanic footslope
Surrounding landform	:	Undulating
Land Use or Vegetation	:	Coconut/Banana
Parent Material	:	Volcanic Material
Drainage	:	Well-drained
Moisture Condition	:	Moist
Erosion class	:	Slightly
Slope	:	C10%
Elevation (m)	:	400
Rock outcrops / stoniness	:	None

			I	II	III	IV
Horizon Symbol			A	B	B	
Depth			0-15	15-54	54-100	
Boundary			clear	gradual		
Form of Boundary			smooth	wavy		
Color	Wet		10YR 2/3	10YR 3/2	10YR 2/3	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	CL	CL	
	Large Particle	Size %				
Structure	Grade		weak	weak	moderate	
	Type		subangular blocky	subangular blocky	subangular blocky	
	Size		fine , medium	medium	medium	
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	
	Moist		friable	friable	firm	
	Dry					
Others	Cutans					
	Cementation					
	Pores		many fine oblique tubu.	many fine oblique tubu.	common fine medium tubu.	
	Pans					
	Root		many, fine medium	common fine medi	few fine medium	
	Efflorescene					
	pH		5.6	5.7	5.8	
	Others				few fine red hard and soft iron concretions	

Profile No.	:	**32**
Location	:	Ilayang Sungi, Liliw
Soil series	:	Alipit
Subgroup lebel	:	Typic Hapludalfs
Land Form	:	Volcanic footslope
Surrounding landform	:	Gently undulating
Land Use or Vegetation	:	Coconut/Lanzones/Tomato
Parent Material	:	Volcanic Material
Drainage	:	Well-drained
Moisture Condition	:	Moist
Erosion class	:	Slightly
Slope	:	C12%
Elevation (m)	:	520
Rock outcrops / stoniness	:	None

			I	II	III	IV
Horizon Symbol						
Depth			0-15	15-65	65-100	
Boundary			clear	gradual		
Form of Boundary			smooth	irregular		
Color	Wet		10YR 2/3	10YR 3/3	10YR 3/4	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	SiL	SiCL to CL	
	Large Particle	Size %				
Structure	Grade		moderately weak	weak	moderately weak	
	Type		subangular blocky	subangular blocky	subangular blocky	
	Size		medium to coarse	medium	medium	
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	
	Moist		friable	friable	friable	
	Dry					
Others	Cutans					
	Cementation					
	Pores		many fine oblique tubu.	common fine obliq tubu.	common fine oblique tubu.	
	Pans					
	Root		many fine medium	common fine medi	few medium	
	Efflorescene					
	pH					
	Others					

Attachment III.1 Soil Profile Description

Profile No.	:	**33**				
Location	:	Novaliches, Liliw				
Soil series	:	Alipit				
Subgroup lebel	:	Typic Hapludalfs				
Land Form	:	Volcanic footslope				
Surrounding landform	:	undulating				
Land Use or Vegetation	:	Tomato				
Parent Material	:	Basalt/andesite				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	D16%				
Elevation (m)	:	625				
Rock outcrops / stoniness	:	None				
			I	II	III	IV
Horizon Symbol						
Depth			0-19	19-66	66-100	
Boundary			clear	gradual		
Form of Boundary			wavy	wavy		
Color	Wet		10YR 3/4	10YR 4/4	10YR 5/4	
	Dry					
Mottling	Abundance			few	few	
	Size			fine	fine	
	Contrast			distinct	distinct	
	Color			10YR 5/4	5YR 5/3	
Texture	Fine Earth		CL	CL	CL	
	Large Particle	Size				
		%				
Structure	Grade		moderate	weak	weak	
	Type		angular blocky to si	subangular blocky	subangular blocky	
	Size		fine	fine	fine	
Consistence	Wet	Stickness	slightly sticky	slightly sticky		
		Plasticity	slightly plasticity	slightly plasticity		
	Moist		firm	friable		
	Dry					
Others	Cutans					
	Cementation					
	Pores					
	Pans					
	Root		common fine	few fine		
	Efflorescene					
	pH		5.6	5.7	5.9	
	Others				very few fine rocks	

Profile No.	:	**34**				
Location	:	Luquin, Liliw				
Soil series	:	Alipit				
Subgroup lebel	:	Typic Hapludalfs				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Undulating to rolling				
Land Use or Vegetation	:	Tomato				
Parent Material	:	Basalt/Andisite				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	E18%				
Elevation (m)	:	770				
Rock outcrops / stoniness	:	None				
			I	II	III	IV
Horizon Symbol						
Depth			0-13	13-36	36-85	85-100
Boundary			clear	abrupt	gradual	
Form of Boundary			wavy	wavy	irregular	
Color	Wet		10YR 3/3	10YR 4/3	7.5YR 5/6	10YR 6/4
	Dry					
Mottling	Abundance			fwe	fwe	
	Size			fine	fine	
	Contrast			distinct	distinct	
	Color			10YR 5/6	10YR 6/4	
Texture	Fine Earth		CL	CL	SiCL	CL
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	weak	weak
	Type		subangular blocky	subangular blocky	subangular blocky	subangular blocky
	Size		fine	fine	fine	fine
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	slightly sticky
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	slightly plasticity
	Moist		friable	firm	firm	firm
	Dry					
Others	Cutans					
	Cementation					
	Pores		few fine tubu.	few fine tubu.	very few fine tubu.	few fine tubu.
	Pans					
	Root		many fine	common fine	few fine	
	Efflorescene					
	pH		5.6	5.7		
	Others		few partially wethered rock fragments	few irregular gravels	few small medium irregular gravels many medium fine partially wethered dark red(10YR 5/8)	common partially wethere Volcanic tube.7.5YR N2

Attachment III.1 Soil Profile Description

Profile No.	:	35				
Location	:	Luquin, Liliw				
Soil series	:	Alipit				
Subgroup lebel	:	Typic Hapludalfs				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Undulating				
Land Use or Vegetation	:	Coconut/Tomato				
Parent Material	:	Basalt - Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	D16%				
Elevation (m)	:	655				
Rock outcrops / stoniness	:	None				
			I	II	III	IV
Horizon Symbol						
Depth			0-16	16-67	67-100	
Boundary			clear	gradual		
Form of Boundary			wavy	smooth		
Color	Wet		10YR 3/2	10YR 3/4	10YR 3/6	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	SiCL to CL	SCL	
	Large Particle	Size				
		%				
Structure	Grade		weak	moderate	weak	
	Type		crumb to subangula	subangular blocky	subangular blocky	
	Size		medium	medium	medium	
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	
	Moist		friable	firm	friable	
	Dry					
Others	Cutans					
	Cementation					
	Pores		many fine oblique tubu.	common fine obliq tubu. open pore	common fine oblique tubu. open pore	
	Pans					
	Root		many fine medium	few fine	very few fine	
	Efflorescene					
	pH					
	Others			few small soft red iron concretion	few hard irregular stones very few small soft red iron concretions	

Profile No.	:	36				
Location	:	Luquin, Liliw				
Soil series	:	Alipit				
Subgroup lebel	:	Typic Hapludalfs				
Land Form	:	Middle Footslopes Erosion: 2				
Surrounding landform	:	Undulating				
Land Use or Vegetation	:	Coconut/ Tomato				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	16%D				
Elevation (m)	:	530				
Rock outcrops / stoniness	:	None				
			I	II	III	IV
Horizon Symbol			A	B	B	B
Depth			0-9	9-55	55-80	80-100
Boundary			clear	gradual	clear	
Form of Boundary			smooth	wavy	wavy	
Color	Wet		10YR 2/3	10YR 3/3	10YR 4/4	10YR 4/4
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		SiL	CL	L to CL	L to CL
	Large Particle	Size				
		%				
Structure	Grade		weak	moderately strong	weak to moderate	weak
	Type		subangular blocky	subangular blocky	subangular blocky	subangular blocky
	Size		medium	medium to coarse	medium	medium
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	slightly sticky
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	slightly plasticity
	Moist		friable	friable to firm	friable	friable
	Dry					
Others	Cutans					
	Cementation					
	Pores		many fine open tubu.	many fine tubu.	common fine tubu.	
	Pans					
	Root		many fine	common fine medi	few fine	no roots
	Efflorescene					
	pH					
	Others			few small soft red iron concretions		wethered and hard pyroclastic materials

Attachment III.1 Soil Profile Description

Profile No.	:	**37**				
Location	:	Ilayang Sungi, Liliw				
Soil series	:	Abo				
Subgroup lebel	:	Typic Eutropepts				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Undulating				
Land Use or Vegetation	:	Coconut/Banana/Tomato				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	D17%				
Elevation (m)	:	650				
Rock outcrops / stoniness	:	None				

			I	II	III	IV
Horizon Symbol			A	AB	Bw	Bw
Depth			0-11	11-38	38-85	85-100
Boundary			clear	gradual	clear	
Form of Boundary			wavy	wavy	smooth	
Color	Wet		10YR 3/2	10YR 3/3	10YR 4/3	10YR 4/4
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	L	SiCL	SCL
	Large Particle	Size				
		%				
Structure	Grade		weak	weak	moderately weak	weak
	Type		subangular blocky	subangular blocky	subangular blocky	subangular blocky
	Size		fine to medium	medium	medium	medium
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	slightly sticky
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	slightly plasticity
	Moist		friable	friable	friable	friable
	Dry					
Others	Cutans					
	Cementation					
	Pores		many fine tubu. open pore	many fine tubu. open pores	common fine mediu tubu. open pore	few fine tubu. open pore
	Pans					
	Root		many fine medium	common fine medium	few fine medium	
	Efflorescene					
	pH					
	Others					many soft and wethered red iron concretion

Profile No.	:	**38**				
Location	:	San Roque, Majayjay				
Soil series	:	Alipit				
Subgroup lebel	:	Typic Hapludalfs				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Undulating to rolling				
Land Use or Vegetation	:	Rice (irrigated)				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	C15%				
Elevation (m)	:	415				
Rock outcrops / stoniness	:	None				

			I	II	III	IV
Horizon Symbol						
Depth			0-18	18-42	42-100	
Boundary			clear	diffuse		
Form of Boundary			smooth	irregular		
Color	Wet		10YR 3/3	10YR 4/4	7.5YR 3/3	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		CL	CL	CL to C	
	Large Particle	Size				
		%				
Structure	Grade		weak	moderately strong	moderately strong	
	Type		subangular blocky	subangular blocky	subangular blocky	
	Size		medium, coarse	medium, coarse	coarse	
Consistence	Wet	Stickness	slightly sticky	slightly sticky	sticky	
		Plasticity	slightly plasticity	slightly plasticity	plasticity	
	Moist		firm	firm	firm	
	Dry					
Others	Cutans					
	Cementation					
	Pores		many fine tubu. open pore	many fine tubu. open pore	few fine tubu. open pores	
	Pans					
	Root		many fine to mediu	few fine medium	few fine	
	Efflorescene					
	pH					
	Others			few small soft red possibly iron concretion		

Attachment III.1 Soil Profile Description

Profile No.	:	**39**				
Location	:	Bukal, Majayjay				
Soil series	:	Alipit				
Subgroup lebel	:	Typic Hapludalfs				
Land Form	:	Volcanic footslope				
Surrounding landform	:	Undulating				
Land Use or Vegetation	:	Tomato/Coconut/Coffee/Lanzones/Vegetable				
Parent Material	:	Volcanic Material				
Drainage	:	Well-drained				
Moisture Condition	:	Moist throughout				
Erosion class	:	Slightly				
Slope	:	15%C				
Elevation (m)	:	545				
Rock outcrops / stoniness	:	None				
			I	II	III	IV
Horizon Symbol			A	AC	C	
Depth			0-18	18-45	45-100	
Boundary			clear	diffuse		
Form of Boundary			wavy	wavy		
Color	Wet		10YR 3/2	10YR 3/4	10YR 4/4	
	Dry					
Mottling	Abundance					
	Size					
	Contrast					
	Color					
Texture	Fine Earth		L	L to CL	SiL	
	Large Particle	Size				
		%				
Structure	Grade		moderately weak	weak	weak	
	Type		subangular blocky	subangular blocky	subangular blocky	
	Size		medium	medium	fine	
Consistence	Wet	Stickness	slightly sticky	slightly sticky	slightly sticky	
		Plasticity	slightly plasticity	slightly plasticity	slightly plasticity	
	Moist		friable	friable	friable	
	Dry					
Others	Cutans					
	Cementation					
	Pores		common fine medi tubu. open pores	common fine medi tubu. open pores	common fine medium tubu. open pores	
	Pans					
	Root		many fine medium	few fine medium	few fine medium	
	Efflorescene					
	pH					
	Others					

Profile No.	:	**40**				
Location	:	Malinao, Majayjay				
Soil series	:	Alipit				
Subgroup lebel	:	Typic Hapludalfs				
Land Form	:	Volcnaic footslope				
Surrounding landform	:	Undulating				
Land Use or Vegetation	:	Tomato/Upland Rice/Surrounding Coconut/Lanzones				
Parent Material	:	Volcanic Material - Basaltic				
Drainage	:	Well-drained				
Moisture Condition	:	Moist				
Erosion class	:	Slightly				
Slope	:	C9%				
Elevation (m)	:	475				
Rock outcrops / stoniness	:	None				
			I	II	III	IV
Horizon Symbol						
Depth			0-12	12-58	58-100	
Boundary			clear	gradual		
Form of Boundary			smooth	irregular		
Color	Wet		7.5YR 3/4	5YR 3/2	7.5YR 3/3	
	Dry					
Mottling	Abundance		few			
	Size		medium			
	Contrast		distinct			
	Color		5Y 4/1			
Texture	Fine Earth		C	C	C	
	Large Particle	Size				
		%				
Structure	Grade		moderately strong	moderately strong	strong	
	Type		subangular blocky	subangular blocky	subangular blocky	
	Size		medium	coarse	coarse	
Consistence	Wet	Stickness	sticky	sticky	sticky	
		Plasticity	plasticity	plasticity	plasticity	
	Moist		firm	firm	firm	
	Dry					
Others	Cutans					
	Cementation					
	Pores		many fine tubu. open pores	common fine tubu. open pores	common fine tubu. open pores	
	Pans					
	Root			few fine medium	few fine medium	
	Efflorescene					
	pH					
	Others		very few red soft possibly iron concretion very few small hard gravels	few small soft and hard red and black possibly iron and manganese concretion		

Attachment III.2 Analytical Data of Soil Laboratory Test

Pedon No.	Horizon	Depth (cm)	pH H2O	pH KCl	Av. P (ppm)	Organic C (%)	O. M. (%)	EC (mS/cm)	Exchangeable Cation (me/100g) Ca	Mg	Na	K	CEC (me/100g)	Total N (%)	Base Sat. (%)	Texture (%) Sand	Silt	Clay	Textural Class
1		0 - 18	6.5	4.7	57.2	1.35	2.32	0.05	4.3	3.8	0.1	1.4	13.9	0.15	69	48.2	42.0	9.8	L
		18 - 63	6.8	4.8	49.8	0.62	1.07	0.03	4.1	3.9	0.1	1.2	12.3	0.08	76	54.2	30.0	15.8	SL
		63 - 72	6.7	4.6	41.6	0.61	1.05	0.03	4.8	5.8	0.2	1.1	14.5	0.07	82	46.2	35.0	18.8	L
		72 - 100														52.2	33.0	14.8	SL
2		0 - 19	5.7	4.5	116.2	1.94	3.34	0.05	4.3	2.4	0.1	1.1	13.1	0.19	60	51.2	38.0	10.8	L
		19 - 55														47.2	38.0	14.8	L
		55 - 100														40.2	42.0	17.8	L
3		0 - 18														56.2	32.4	11.4	SL
		18 - 52														54.2	30.4	15.4	SL
		52 - 75														61.2	25.4	13.4	SL
		75 - 100														40.2	40.4	19.4	L
4		0 - 18	5.9	4.7	11.0	2.35	4.04	0.03	2.8	1.4	0.1	0.4	11.3	0.29	42	56.2	35.4	8.4	SL
		18 - 65														62.2	28.4	9.4	SL
		65 - 100														61.2	31.4	7.4	SL
15		0 - 9	5.9	5.0	132.0	4.97	8.54	0.09	14.4	3.8	0.1	0.5	24.3	0.58	77	58.2	33.4	8.4	SL
		9 - 32														59.2	33.4	7.4	SL
		32 - 80														56.2	36.4	7.4	SL
16		0 - 10	6.0	4.6	37.5	1.91	3.29	0.05	7.0	3.2	0.1	1.2	14.7	0.20	78	44.2	45.0	10.8	L
		10 - 47														41.2	45.0	13.8	L
		47 - 100														75.2	15.0	9.8	SL
17		0 - 18	5.5	5.0	8.8	3.89	6.68	0.03	2.1	0.5	0.1	0.2	14.2	0.48	20	50.2	42.0	7.8	L
		18 - 39														48.2	46.0	5.8	SL
		39 - 66														47.2	46.0	6.8	SL
		66 - 100														50.2	43.0	6.8	SL
18		0 - 17	5.7	4.5	33.0	1.98	3.41	0.03	1.2	0.4	0.1	0.1	7.2	0.24	25	68.2	25.0	6.8	SL
		17 - 35	6.6	4.8	11.0	0.94	1.61	0.03	0.5	0.2	Trace	0.1	7.3	0.23	27	61.2	33.0	5.8	SL
		35 - 76	5.9	5.1	8.8	1.54	2.65	0.03	1.6	0.4	0.1	0.1	7.4	0.14	30	47.2	48.0	4.8	SL
		76 - 100	6.0	5.1	7.3	0.86	1.48	0.02	1.5	0.4	0.1	0.1	7.0	0.10	30	54.2	41.0	4.8	SL

Attachment III.2 Analytical Data of Soil Laboratory Test

Pedon No.	Horizon	Depth (cm)	pH		Av. P	Organic C	O. M.	EC	Exchangeable Cation (me/100g)				CEC	Total N	Base Sat.	Texture (%)			Textural
			H2O	KCl	(ppm)	(%)	(%)	(mS/cm)	Ca	Mg	Na	K	(me/100g)	(%)	(%)	Sand	Silt	Clay	Class
19		0 - 18	5.9	4.5	36.0	2.32	3.98	0.03	9.4	3.0	0.4	0.3	20.6	0.26	64	40.2	44.0	15.8	L
		18 - 46														39.2	45.0	15.8	L
		46 - 81														42.2	41.0	16.8	L
		81 - 100														49.6	35.6	14.8	L
20		0 - 19	5.9	4.2	9.0	1.87	3.22	0.03	4.2	2.9	0.2	2.8	17.8	0.21	57	36.2	44.4	19.4	L
		19 - 76														32.2	36.4	21.4	CL
		76 - 100														48.2	25.4	26.4	SCL
21		0 - 14	5.0	4.1	49.8	3.78	6.50	0.06	1.5	0.3	0.1	2.0	14.5	0.42	14	52.6	37.6	9.8	SL
		14 - 45	5.2	4.6	6.7	1.69	2.91	0.09	1.6	0.3	0.1	2.1	7.8	0.23	27	60.6	33.6	5.8	SL
		45 - 100	6.0	4.9	8.1	0.24	0.41	0.03	2.2	0.7	Trace	3.0	41.0	0.03	73	77.6	13.6	8.8	SL
24		0 - 16	5.8	4.8	7.8	3.37	5.80	0.03	2.9	1.7	0.1	0.2	16.1	0.46	30	50.6	43.6	5.8	SL
		16 - 59	6.0	5.2	7.3	1.60	2.75	0.04	1.2	2.6	0.1	0.4	12.6	0.22	34	79.6	17.6	2.8	LS
		59 - 82	6.4	5.3	7.0	0.60	1.03	0.01	0.8	0.6	Trace	0.3	9.9	0.08	17	81.6	12.6	5.8	LS
		82 - 100	6.4	5.2	6.8	0.59	1.01	0.01	0.9	0.5	Trace	0.4	8.1	0.06	22	76.6	17.6	5.8	LS
26		0 - 14	5.7	4.4	16.0	1.94	3.34	0.06	5.0	5.2	0.1	2.5	18.2	0.21	70	44.6	40.6	14.8	L
		14 - 59														35.6	40.6	23.8	L
		59 - 100														30.6	41.6	27.8	CL
27		0 - 19	5.9	4.9	41.1	2.27	3.90	0.04	4.4	2.8	0.1	2.2	15.6	0.24	61	46.6	41.6	11.8	L
		19 - 45	6.2	4.9	18.8	1.02	1.75	0.02	3.3	1.4	0.1	0.6	11.0	0.13	49	44.6	43.6	11.8	L
		45 - 68	6.2	4.8	29.6	0.93	1.60	0.03	5.0	1.9	0.4	0.6	16.7	0.13	47	16.6	41.6	11.8	L
		68 - 100	6.3	4.8	17.2	1.27	2.18	0.03	7.0	3.6	0.6	0.6	24.2	0.17	52	56.6	33.6	9.8	SL
29		0 - 16	5.0	4.4	49.0	2.61	4.49	0.05	2.3	1.2	0.1	1.3	11.2	0.25	44	39.6	44.6	15.8	L
		16 - 48														40.6	41.6	17.8	L
		48 - 79														60.6	30.6	8.8	SL
		79 - 100														83.6	7.6	8.8	SL
32		0 - 15	5.1	4.3	43.0	4.04	6.95	0.05	2.5	1.0	0.1	0.6	18.6	0.42	23	50.6	39.6	9.8	L
		15 - 65														54.6	35.6	9.8	SL
		65 - 100														68.6	26.6	4.8	SL

Attachment III.2 Analytical Data of Soil Laboratory Test

Pedon No.	Horizon	Depth (cm)	pH		Av. P	Organic C	O. M.	EC	Exchangeable Cation (me/100g)				CEC	Total N	Base Sat.	Texture (%)			Textural Class
			H2O	KCl	(ppm)	(%)	(%)	(mS/cm)	Ca	Mg	Na	K	(me/100g)	(%)	(%)	Sand	Silt	Clay	
34		0 - 13	5.8	4.9	13.8	3.88	6.67	0.04	1.7	2.6	0.1	0.5	15.3	0.46	32	44.6	45.6	9.8	L
		13 - 36	5.8	4.7	7.6	2.56	4.40	0.03	1.3	0.8	0.1	0.4	15.3	0.43	17	50.6	41.6	7.8	L
		36 - 85	6.0	5.2	2.6	1.42	3.30	0.03	2.1	1.3	0.1	0.5	10.3	0.26	39	82.6	14.6	2.8	LS
		85 - 100	6.0	5.4	2.2	1.30	2.23	0.03	1.9	1.0	0.1	0.7	10.7	0.14	35	74.6	20.6	4.8	SL
35		0 - 16	4.8	4.4	32.0	2.98	5.13	0.06	0.6	0.2	0.1	0.4	12.7	0.37	10	50.2	41.4	8.4	L
		16 - 67														68.2	24.4	7.4	SL
		67 - 100														59.2	32.4	8.4	SL
36		0 - 9	5.6	4.6	14.7	2.14	3.69	0.04	0.8	0.5	0.1	0.9	11.1	0.30	21	50.6	40.6	8.8	L
		9 - 55	5.9	5.0	5.5	1.93	3.32	0.03	2.8	1.3	Trace	1.2	17.0	0.25	31	81.6	14.6	3.8	LS
		55 - 80	5.7	5.0	4.9	0.67	1.16	0.06	1.9	0.7	0.2	0.2	12.3	0.15	24	72.6	20.6	6.8	SL
		80 - 100	5.8	5.1	4.1	1.24	2.13	0.06	2.2	1.2	0.1	0.8	15.8	0.16	27				
37		0 - 11	5.4	4.8	16.2	2.50	4.29	0.16	7.3	2.3	Trace	1.5	19.5	0.51	57	42.2	46.4	11.4	L
		11 - 38														68.2	28.4	3.4	SL
		38 - 85														82.2	15.4	2.4	LS
		85 - 100														68.2	26.4	5.4	SL
39		0 - 18	5.1	4.3	24.0	2.50	4.31	0.08	3.5	1.7	0.1	1.5	24.3	0.41	28	44.2	44.4	13.4	L
		18 - 45	5.6	4.6	6.9	2.07	3.55	0.03	4.0	2.4	0.2	0.6	18.6	0.26	39	38.2	47.4	14.4	L
		45 - 100	5.9	4.7	7.9	1.78	3.06	0.02	3.3	2.0	0.3	0.9	17.5	0.21	37	30.2	52.4	17.4	SL
40		0 - 12	5.9	4.3	5.8	1.87	3.22	0.03	5.7	5.0	0.3	3.0	23.5	0.23	60	40.2	34.4	25.4	L
		12 - 58	6.1	3.9	4.0	0.43	0.74	0.03	12.2	7.0	0.4	3.0	30.7	0.06	74	18.2	36.4	45.4	C
		58 - 100	6.1	3.9	3.8	0.31	0.53	0.02	10.5	5.9	0.5	2.9	27.5	0.05	72	13.2	29.4	57.4	C

Source: Soil Survey Carried out by the JICA Study Team

FEASIBILITY STUDY ON
THE UPLAND IRRIGATION AND
RURAL DEVELOPMENT PROJECT
IN SOUTHERN LUZON

APPENDIX-IV

AGRICULTURE AND AGRICULTURAL ECONOMY

FEASIBILITY STUDY
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APPENDIX-IV

AGRICULTURE AND AGRICULTURAL ECONOMY

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APPENDIX-IV AGRICULTURE AND AGRICULTURAL ECONOMY

1 Land Use and Cropping Pattern

1.1 Present Land Use

Laguna Province has a total land of about 176 thousand hectares that consist of about 127 thousand hectares of lowland including agricultural, industrial and residential lands, and about 49 thousand hectares of forest land including forest reserves, national parks, timber license areas. Agricultural land accounts for about 86 thousand hectares equivalent in 49% of the total land.

Total land area of the concerned three (3) Municipalities are 26,300 ha, out of which agricultural land occupies the largest share of 21,000 ha or 80%. In the Study area having 3,000 ha in total, agricultural land is limited to 2,060 ha or 69% of the total area. The Study area is still having a larger area of grassland and forest (29%). Most of the forest extends in higher elevation on the mountain slopes of Mt. Banahaw. Grassland is mostly observed in Municipality of Nagcarlan at the higher slopes of Mt. San Cristobal. The forest and grassland above around 800m in elevation of these mountain slopes belong to the National park, and some groups of farmers illegally occupy a part of this grassland and forest for vegetable production. Such illegal squatters are likely to increase due to favorable climate for vegetable production in highland. The present land use in the concerned Municipalities and the Study area is summarized as follows.

Present Land Use

(Unit: ha)

Land use/Municipalities	Nagcarlan	Liliw	Majayjay	Total	%
Whole Municipalities					
Agricultural Land	10,020	4,340	5,930	20,290	77.1
Open grassland	260	0	0	260	1.0
Forest	880	1,110	2,630	4,620	17.6
Towns / villages	280	180	120	580	2.2
Others	50	50	450	550	2.1
Total	11,490	5,680	9,130	26,300	100.0
Study Area					
Agricultural Land	1,160	680	220	2,060	68.7
Open grassland	200	0	0	200	6.7
Forest	340	210	0	550	18.3
Towns / villages	40	10	5	55	1.8
Others	40	70	25	135	4.5
Total	1,780	970	250	3,000	100.0

Source: Municipality offices of Nagcarlan, Liliw and Majayjay
Present land use survey and farmer's household survey carried out under by JICA Study Team.

The following table shows the present conditions of agricultural land use both in the concerned whole Municipalities and the Study area.

Agricultural Land Use

(Unit: ha)

Land use/Municipalities	Nagcarlan	Liliw	Majayjay	Total	%
Whole Municipalities					
Coconuts / Tree crops	8,910	3,500	4,480	16,890	83.2
Vegetables	390	370	290	1,050	5.2
Rice	620	410	1,010	2,040	10.1
Others	100	60	150	310	1.5
Total	10,020	4,340	5,930	20,290	100.0
Study Area					
Coconuts / Tree crops	790	300	130	1,220	59.2
Vegetables	340	360	60	760	36.9
Rice	5	10	25	40	1.9
Others	25	10	5	40	1.9
Total	1,160	680	223	2,060	100.0

Source: Municipality offices of Nagcarlan, Liliw and Majayjay
Present land use survey and farmer's household survey carried out by JICA Study Team.
Remark: The net hectares of "Vegetables" by column in the Study area are 320, 340,60 and 720 respectively.

As seen from the table, coconuts plantation is dominant, occupying 83% of the total agricultural land in the whole concerned Municipalities and 59% in the Study area. Coconut plantation mainly extends in lower areas of the mountain slopes. In most cases, coconut trees are very old (mostly more than 50 years). The farmers have seldom renewed the coconuts plantation due its low productivity, and rather accelerated inter-cropping with other crops such as vegetables, lanzones, banana, coffee and citrus instead of planting new young coconuts. Such farming pattern of inter-cropping under coconut trees is referred to "multi-storied cropping".

Vegetables are cultivated on a total area of 1,050 ha in the whole concerned Municipalities and 760 ha (net 720 ha) in the Study area; namely, the vegetable cultivation areas are concentrated in the Study area having 72% of the total areas that are put under vegetable cultivation in the concerned Municipalities. In recent years, vegetable cultivation under coconuts plantation (multi-storied cropping) is expanding in the Study area.

The farmers generally prefer to plant vegetables in mountain side, looking for cooler climate. In the Study area, vegetables are mostly planted on the mountain slopes between 500 m and 800 m in elevation as shown below.

Vegetable Cultivation by Altitude in the Study Area

(Unit: ha)

Elevation	Nagcarlan	Liliw	Majayjay	Total	%
less than 300 m	2	0	0	2	0.3
300 m - 400 m	34	13	0	47	6.5
400 m - 500 m	20	43	40	103	14.3
500 m - 600 m	84	112	19	215	29.9
600 m - 700 m	94	90	1	185	25.7
700 m - 800 m	62	46	0	108	15.0
800 m - 900 m	22	23	0	45	6.3
more than 900 m	2	13	0	15	2.0
Total	320	340	60	720	100.0

Source: Present land use survey carried out by JICA Study Team
Remark: Area is shown by net hectare which is ordinarily used for the cropped area of vegetables in tables hereinafter

The paddy field is very few in the Study area though its percentage is a little higher in Majayjay depending upon abundant water source.

The upper portion of the Study area is included in the public forest area and the National park area and about 11% of the vegetable planted area is located inside the National park area, and about 18% is also located inside the public forest area excluding the National park area.

1.2 Land Tenure and Holding Size

Three thousands (3,000) hectare of the Study area is divided to three categories of the land, that are the A&D land, the Public Forest and the National Park shown in Table IV 1.1.

The results of farmers' household survey reported that about 60% of the respondents have owned the farm land. However according to the further investigation, it was revealed that almost of the land in the Study area are still owned by the government, that is Public land, and are currently covered by patent applications under the Public Lands Act. At the local level, ownership right of the present users has been recognized by virtue of tax declaration and length of residency and individual land plots and applicants have already been identified by the government, so that the lands would be re-distributed to the patent applicants.

Agricultural land in the Study area is estimated at 2,020 ha in total. Total number of the farm household is 1,340 as of March 1994. Average farm size in the Study area is calculated to be 1.5 ha. It is assumed that average size farmer cultivates 1.5 ha in total comprising 0.9 ha of coconuts, 0.5 ha vegetables and 0.1 ha other crops as shown below:

Average Farm Size in the Study Area

(Unit: ha)

Items	Nagcarlan	Liliw	Majayjay	Total
Agricultural land (ha)	1,140	660	220	2,020
- Coconuts plantation	790	300	130	1,220
- Vegetables *	320	340	60	720
Nos. of farm household	812	401	127	1,340
Average farm size (ha)	1.4	1.6	1.7	1.5
- Coconuts plantation	1.0	0.7	1.0	0.9
- Vegetables	0.4	0.8	0.5	0.5
- Others	0.0	0.1	0.2	0.1

Source: Present land use survey and farmers' household survey carried out by JICA Study Team.

Distribution of land holding size in the Study area was investigated through the farmers' household survey. The result indicates that landless farmers are scarce and 70% of the farmers belong to the clusters of 0.5 - 2.0 ha as shown below:

Distribution of Land Holding Size in the Study area

(Unit: %)

Farm Size (ha)	Nagcarlan	Liliw	Majayjay	Total
> 0.49	8	15	8	9
0.5 - 0.99	31	30	28	30
1.0 - 1.49	36	27	33	33
1.5 - 1.99	8	17	10	10
2.0 - 2.49	9	6	9	9
2.5 - 2.99	1	2	2	2
< 3.0	7	4	10	7
Total	100	100	100	100

Source: Farmers' household survey carried out by JICA Study Team

1.3 Present Cropping Pattern

Recent estimated area and production of main crops in the Philippines and Laguna Province are shown in Table IV.1.2 and IV.1.3.

According to the farmers' household survey, the total cropping intensity of the respondents in the Study area is estimated as shown in Table IV.1.4. The cropping pattern for whole of the Study area is roughly illustrated in Fig.IV.1.1. Coconut is dominant crop in the Study area especially in lower-elevation areas. Vegetables are relatively new crops. The share of vegetables is not yet so large, but it is being increased recently because of the relative profitability of the vegetables. Historically vegetables were first introduced in Majayjay where has comparatively favored with physical conditions like water source and soil texture. In 1990s, the vegetable cultivation was expanded gradually to the eastern areas, especially to the mountain slopes in the Liliw and Nagcarlan.

The major kinds of vegetables in the Study area are tomato, cabbage, radish, beans (snap beans, string beans, etc.), sweet potato, out of which tomato and cabbage are dominant crops in the dry season. Rainy season lasts from May to December with continuous rains. In this season, farmers generally limit the cultivation of vegetables except sweet potatoes and cabbage because both quantity and quality of ordinary vegetables are adversely affected by excessive rainfall. Therefore, considerable extents of fallow lands are observed in the rainy season and as the result cropping intensity through the year is kept as low as 130% on an average.

For tomato cropping, most of the seedlings are transplanted from January to March, especially in February, and most of the fruits are harvested from April to May, with a few cases harvested in June. Most of cabbages are also transplanted from January to March, and harvested from April to May, however some of them are planted in July and harvested in September.

Cropping pattern of the vegetables in the Study area is generalized as illustrated in Fig. IV.1.2. In the Municipalities of Majayjay and Liliw, tomatoes are planted in a larger area compared to Nagcarlan, while in

Nagcarlan Municipality the farmers plant more cabbages and less tomatoes compared to other Municipalities. Radish is planted especially in the upper foot of Mt. San Cristobal. Cultivation area by crops is estimated as follows:

Cultivation Area by Crops

(Unit: ha)

Crops	Dry season	Rainy season	Total
Coconuts / tree crops	-	-	1,220
Vegetables	720	215	935
- Tomatoes	435	-	435
- Cabbages	145	70	215
- Radish	70		70
- Sweet potatoes	-	145	145
- Others*	70	-	70
Cropping Intensity of vegetable farm (%)	100	30	130

Source: Based on the farmers' household survey carried out by JICA Study Team and information from MAOs.
Remarks*: Beans, Pechay, etc.

1.4 Future Land Use

The implementation of this proposed Project will follow considerable changes on the land use in the Study Area. At present, the agricultural land distributes to 3 land categories as mentioned before. Out of the total area of 3,000 ha, 760 ha is upland vegetable field and 1,220 ha is coconut farm. Some parts of these areas are included in the national park and some parts in the public forest area.

To protect the environment of the National Park, agricultural land use in the National Park should not be expanded in future. Accordingly the agricultural land, which is estimated to be 100 ha (80 ha of vegetable field and 20 ha of coconut farm), was excluded from its beneficial area of the proposed Project area so as not to make the agricultural land in the National Park increase any more. The agricultural lands in the public Forest area has been accepted by concerning agencies as the beneficial area of this proposed project, though they won't allow more expansion of the agricultural lands in future.

Apart from the National Park, there are 680 ha of existing vegetable farms to be going to enjoy the benefits of the proposed project. With project, the agricultural productivity and marketing situation of these farms will be considerably improved in order that all of these farms will be improved in marketing facilities, and out of these 680 ha, 340 ha will be irrigated. (Out of irrigated 340 ha, 270ha is located in A&D area, and rest of 70 ha in Public forest area.) Moreover in future the coconut farms with low productivity existing around the current upland fields will be turned more and more to vegetable farms that are estimated as 630ha in the A&D land up to 10 years after the project implementation. Finally, total beneficial area with the Project will extend to gross 1,310 ha.

These changes in land use in the Study area by the project are shown as following table and in Table IV 1.6 and Fig. IV.1.3 in detail.

Summary of Land Use Changes by the Project

(Unit : ha)

Land Use	without Project	with Project	Difference
Vegetable farm	760	1,390	+630
- Rainfed	760	1,050	+290
- Irrigated	0	340	+340
Coconuts	1,220	590	-630
Forest/scrub	750	750	0
Others	270	270	0
Total	3,000	3,000	0

Remark: 1) "Others" includes river beds, residential areas, rice land, etc.
2) The acreage of vegetable farm is shown as gross hectares.
3) The rainfed vegetable farm in the National Park.

1.5 Proposed Cropping Pattern

More or less the Study Area is a newly developed vegetable production area, and the kinds of vegetables mainly planted are limited. According to the farmers' household survey conducted by JICA Study Team, respondents desire to expand the cropping area especially for tomato and cabbage in the dry season and for cabbage, beans, sweet potato in wet season if irrigation water would be available. This mostly reflects the present cropping situation. However considerable numbers of the farmers expect recommendable new vegetables with higher profit.

Most of subtropical vegetables have a large possibility to be planted under the natural conditions in this area. Provided that the land productivity and marketing condition are improved by the project and the results of the training at the proposed Upland Horticulture and Irrigation Technology Center are transferred to most of beneficiaries, the cropping intensity will be increased extremely and various high profitable vegetables will be introduced.

Accordingly proposed cropping pattern is prepared first taking into account of the improvement of existing vegetable farming and then the introduction of high profitable and suitable vegetables to achieve the high cropping intensity. On the basis of this concept, 25 vegetables common in current vegetable markets, including existing main vegetables in the Study area, were picked up to compare their profitability, marketability, and area suitability as shown in Table IV.1.7 that was provided based on Table IV 1.8 and IV.1.9. On the basis of the over all rank of these vegetables, following 12 vegetables were finally selected and combined into some types of the cropping pattern as shown in Fig. IV.1.4 and IV.1.5.

Tomato, Cabbage (dry and wet season), Radish, Sweet potato, Beans (Baguio beans and Sitao), Carrots, Chinese cabbage, Celery, Lettuce and Cauliflower (However, in the Rainfed area Chines cabbage, Celery and Cauliflower are not proposed due to lack of irrigation water.)

The following consideration was taken into account for preparing proposed cropping pattern:

(1) Generally in advanced vegetable production area such as Baguio in Benguet province and Second Laguna Irrigation Project area in Cavite province, annual cropping intensity is about 300% or more due to the intensive use of farm land. In the Study area it will be possible to raise the cropping intensity up to 300% under the irrigation with improved marketing conditions. Therefore, the proposed cropping intensity in the irrigated area was settled on this level. Each cropping pattern is composed of two crops in dry season and one crop in wet season. To grow crops introduced in wet season it should be required to use some vegetable protection facilities from heavy rain.

(2) Even in the rest of the upland area excluding the area to be irrigated, farmers' intention to increase vegetable production will be enhanced with the project and it will raise cropping intensity up to 200% that means growing one crop in every season.

(3) At present the proportion of tomato planting is so high that it may accelerate the soil deterioration, soil sickness and may increase crop diseases resulted from the continuous cropping. To reduce such anxiety on the crop farming, the maximum proportion of a crop in each cropping pattern should be 50% at most, and the continuous cropping of the same kind or family of crops in a particular field should be avoided as far as possible.

(4) Generally the more it is high profitable vegetable, the more it may require high techniques and much labor for cropping, so that such vegetable shouldn't be introduced too much regardless farmers' ability.

(5) Legume crops should be introduced in crop rotation as much as possible since they can improve the soil fertility. (In proposed cropping pattern, the legume newly increased is represented by sitao that is more profitable than Baguio beans represented existing legume on the cost and return analysis.)

2 Crop Yield and Production

2.1 Present Crop Yield and Production

Because of newly developed area of the vegetable production, there are no available statistic data for crop yield and production in the Study area. The result of the farmers' household survey shows that the unit yield of vegetables per ha fluctuates considerably from farm to farm because of different farm conditions and cultivation

techniques. Unit yields and production of major vegetables in the Study area are estimated on the basis of the farmers' household survey as well as the information given by MAOs as follows:

Vegetable Production in the Study Area

Crops	Cultivated Area (ha)	Unit Yield (tons/ha)	Production (tons)
Tomato	435	10	4,350
Cabbage			
- dry season	145	7	1,020
- rainy season	70	5	350
Radish	70	9	630
Sweet Potato	145	10	1,450
Others (Beans)	70	6	420
Total	935	-	8,220

Source: Based on the farmers' household survey carried out by JICA Study Team
Remark: " Area(ha)" means net hectares.

Crop unit yields are generally low mainly due to (1) lack of irrigation facilities, (2) low level of fertilizer use, (3) inadequate control of pest and diseases, and (4) use of poor quality seeds (self produced seeds). However, according to the farmers' household survey, some farmers already attained higher unit yields, for example, twenty 20 tons/ha for tomatoes and twelve 12 tons/ha for cabbages. This fact indicates a large potential for high level of vegetable production in the Study area.

2.2 Farming Practices

(1) Present farming practices

As mentioned in section 1.3, the kind of crops cultivated in the Study area are limited, and the crop productivity is very low. The outlines of the current farming practice in the Study area are shown in Appendix V (Farmers' households survey). Generally the Study area is the newly developing vegetable production area, and crop intensity is very low due to the inadequate farm conditions as mentioned before, so that the present farming practices for vegetables seems to be still humble and to be quite uneven from farm to farm.

(2) Proposed farming practices

All of the vegetables in the proposed cropping pattern are common in upland fields and markets of this country, and ordinary farming practices are already established by agricultural research institutes of DA, agricultural universities and colleges, extension offices, etc. However taking into account of the local characteristics of the area is required to produce vegetables with high quality. In the Study area following items should be taken into consideration for farming practices of vegetables.

1) Land preparation

The mechanization of farming will be very difficult as the upland fields of the Study area are highly undulated and scattered. Land preparation with man and animal power will be common even in future. With high cropping intensity, acceptable period for land preparation will be tightened. However, thorough land preparation should be essential for all kind of vegetables, so that two of three times of plowing followed by harrowing should be carried out. The ridging for counter cropping should be practiced as much as possible in order to protect upland from soil erosion.

2) Seeds

High quality seeds must just promise the good products and high profit to the farmers. The seeds currently used in the Study area don't necessarily have good genius, so that high quality seeds should be introduced instead of traditional ones. In case of existing vegetables such as tomato more than half of the farmers in the Study area are using their own seeds, while for cabbage and radish imported seeds have been popular. Some new varieties, such as "Tempest" of Chinese cabbage, "Kuroda-GT" of carrot, "White Baron" of cauliflower, have already been examined at the demonstration farm of MAO in Nagcarlan. Anyway recommendable varieties for proposed crops should be determined and diffused by MAOs as soon as possible.

3) Seedbed and transplanting

Seedbed should be prepared with fertile and well-drained soil, then organic manure should be apply thoroughly to grow the strong and healthy seedlings. Seedling should be transplanted at a best opportune time in its growing stage. Generally the seed beds prepared in the Study area seem to be so narrow and poor to get good seedlings, that more investment should be taken for the seed bed preparation. Further more, it should be promoted to uniform the planting varieties, and to arrange the scheduled transplanting periods, collectively.

4) Fertilizer application

According to the soil survey the soil of the Study area is relatively fertile and suitable for vegetable production. Generally it will be unnecessary to take any particular measures for soil improvement. However to rise up of the unit yield and cropping intensity of vegetables, thorough fertilizer application should be necessary. On the other hand, with cropping of three times a year total amount of fertilizer applied must be so great that the effect of fertilizer applied to previous crop should be taken into consideration. At present application of chicken manure is very popular in the Study area, and the application of not only chicken manure but also various kinds of organic fertilizers should be still more promoted because they work mildly to crops and improve better the physical and chemical characteristics of the upland soil.

5) Crop protection

As the Study area is located at the upstream in the watershed of Laguna Province, over-application of agro-chemicals may cause the pollution to the water resource for down stream. Though it will be inevitable that agro-chemical application increases with the expansion of cropping intensity, the greatest care should be required for the amount used and the periods applied of agro-chemicals, and other approaches to reduce plant pests and diseases, such as thorough application of organic fertilizer, mulching, weeding of the plants that serve as host, avoidance of susceptible vegetables in succession, plant protection against the heavy rain, etc., should be practiced at the same time. Furthermore plant pest clinic, forecasting of occurrence and training of farmers on crop protection should be promoted for proper pest and disease control. (Refer to Table IV. 2. 4)

6) Harvesting

Depending on the improvement of the barangay road and the construction of new trading post with project marketing condition in the Study area will be improved, and marketing activity will be encouraged. Accordingly harvesting should be carried out under consideration of marketability, that is, the quality of the products to be harvested should be best for sale and the quantity to be harvested should be based on the information from markets at that time. Scheduled planting and harvesting should be promoted at the stage of an individual and a local.

7) Post-harvesting

To make the most of the improved marketing conditions with project, it is very important to keep the quality of the harvested products as freshly and beautifully as possible. Therefore careful handling of the products from the picking up on the field to the selling at the trading post should be required. Transporting, sorting, grading and packing of the products should be improved to enhance the economic value of the products at the market. Depending upon the marketing research, marketing cooperatives should be prepared the proper post-harvesting manuals for the farmers.

In spite of the serious efforts put in by related agencies, many problems and constraints are still lying comprehensively on the country's vegetable industry. Some of them are unavailability of superior varieties, unavailability and high cost of inputs, ineffective and inadequate research, training and extension effort, limited post-harvest technology, lack of financing and low credit availability, etc., which must be affect to the improvement of farming practices in the Study area. However those nationwide problems and constraints will not be resolved only by a few local governments but the orchestrated activities of national and regional government agencies will be expected.

The proposed "Upland Horticulture and Irrigation Technology Center" must greatly contribute to improve the present farming practices for proposed vegetable production.

(3) Labor requirement

For the proposed farming practice, the labor requirement of each vegetable per hectare is estimated as shown in Table IV.2.5 and IV.2.6. These estimations are used to calculate the production cost with project in Appendix IV.3.3. For the financial analysis of the farm income with project mentioned in Appendix IV 3.4, labor requirements of the typical farms in the irrigated area and the rainfed area were estimated as shown in Table IV.2.7 and IV.2.8. Mathematically, farming of each typical farm is able to be practiced only by assumed family labor. However considering the short term labor concentration resulted from unreliable climate, it may be necessary on actual farming to introduce some extent of hired labor in case of the farm of irrigated area,.

2.3 Anticipated Unit Yield of Crops

According to the trend of recent vegetable production in Laguna Province shown in Table 3.9.1 of Main Report, the average unit yield per hectare of whole vegetables in recent is as follows:

Average Unit Yield of Whole Vegetables

(Unit: ton/ha)

Year	1991	1992	1993
Unit Yield	10.7	10.6	10.5

The unit yield of vegetable has remained on the same level as a whole. Unless any special measurement is enforced, Provincewide unit yield of vegetables will not be raised any more in future. Paticularly, in the Study area, it is expected that unit yield of vegetable will be rather reduced in future because of soil erosion, unless any soil conservation measure like the proposed plan is conducted. Hoever to estimate the rate of declining is so difficult that in the proposed plan of crop production, the unit yield of vegetable without project is put as same as the present one, assuming that the unit yield of vegetable in future under the condition without the proposed project will not at least exceed the current unit yield.

The unit yield of vegetables in the Study area is under the very low level as mentioned before, but it doesn't mean that the potential of land productivity in the Study area must be low. By means of the project implementation and improved farming practices accompanied with project, the unit yield of the Study area will be raised remarkably. Especially the unit yield of the area with irrigation facilities will be able to achieve the level in advanced area such as La Trinidad (Benguet) and Second Laguna Irrigation Project area (Cavite) shown in Table IV.2.1 and IV.2 2. From the view point of this, in the irrigated area anticipated unit yields of each vegetable with project were estimated as equivalent to or 80% of either unit yield of these advanced areas.

The unit yield of vegetable in the non-irrigated area with project will be also increased to some extent on the assumption that farm inputs must be increased and farming practices must be rationalize. Consequently

the level of unit yield of the crops in this area was estimated about 20% up to the unit yield of existing crops or about 80 % of the anticipated unit yield of the crops in the irrigated area.

The anticipated unit yield of each proposed vegetable is summarized in following table, detailed in Table IV.2.3.

Anticipated Unit Yield of Crops

	Irrigated area	Rainfed area
Tomato	14.7	12.0
Cabbage (Dry)	17.6	8.4
(Wet)	10.6	8.4
Radish	15.3	10.8
Sweet Potato	15.4	12.0
Baguio beans	6.7	6.3
Carrots	12.6	10.1
Cauliflower	9.4	-
Celery	12.6	-
Chinese cabbage	13.9	-
Lettuce	11.9	9.5
Sitao	10.3	8.2

2.4 Agricultural Production under Future Condition with Project

On the basis of the future land use mentioned in 1.4, proposed cropping pattern in 1.5, proposed farming practices in 2.2, and the anticipated unit yield of crops in 2.3, the amount of the vegetable production in future with project was estimated as following table. These targets will be achieved by five (5) years in the area with irrigation, and by ten (10) years in the area without irrigation under the improvement of marketing facilities and supporting services provided by the Project.

Agricultural production under future condition with Project

	Irrigated Area			Rainfed Area			Total
	Area (ha)	Unit yields (kg)	Production (tons)	Area (ha)	Unit yields (kg)	Production (tons)	Production (tons)
Tomato	160	14.7	2,352	465	12.0	5,580	7,932
Cabbage							
dry	96	17.6	1,689	186	8.4	1,562	3,251
wet	64	10.6	678	186	8.4	1,562	2,240
Radish	64	15.3	979	186	10.8	2,009	2,988
Sweet potato	96	15.4	1,267	279	12.0	3,348	4,615
Baguio beans	32	6.7	214	93	6.3	586	800
Carrot	96	12.6	1,210	93	10.1	939	2,149
Chines cabbage	96	13.9	1,335				1,335
Celery	32	12.6	403				403
Lettuce	32	11.9	381	93	9.5	884	1,265
Cauliflower	32	9.4	301				301
Sitao	160	10.3	1,648	279	8.2	2,288	3,936

Remark: " Area" means net hectares.

The propotion of the total vegetable products mentioned above to the demand of vegetables in Metro Manila in future was estimated as follows.

On the basis of "Year Book 1993", the population in Metro Manila which was about 8,120 thousand as of 1990 is estimated at about 10,350 thousands in 2000, about 11,400 thousands in 2005 and about 12,290 thousands in 2010 respectively. According to those estimations , the annual population growth rate during 2000-2005 and 2005-2010 is averagely to be 1.6% and 1.3% respectively. Supporsed that the Project implementation will be completed in 1997, at the fifth and the tenth year after the completion of the Project, that is at 2002 and 2007, the estimated population in Metro Manila will be about 10,680 thousands and 11,700 thousands respectively derived from above population growth rate. While, according to said Year Book, average amount of vegetable consumption per head per day in 1990 was about 84.4 g. Assumed that this consumption level will be kept in future, annual consumption of vegetables in Metro Manila is estimated at 329,000 tons in 2002, and 360,000 tons in 2007 respectively by means of multiplying yearly consumption per head (84.4 g * 365 days) and estimated population together. The total amount of vegetable products in the Project area is estimated at 21,000 tons and 30,000 tons which is only equvalent to 5% and 7% to the demand in Metro Manila at the said respective year, and even if 80% of these vegetable products are shipped to the markets in Metro Manila, they will not occur any over supplying problem.

Furthermore, following estimation will strengthen the above opinion. The population of Laguna Province in 1990 was about 1,370,000, and assumed that the population growth rate of Laguna Province is same as that of Region IV in said Year Book, it is estimated at 1,890,000 in 2000. Applying the average population growth rate of 2000-2005 and 2005-2010 which is 2.3% and 2.0% respectively, the estimated population is 1,980,000 and 2,200,000 in 2002 and 2007 respectively. By means of the same estimation method, the demand of vegetables in Lagna Province will be about 61,000 tons in 2002 and 68,000 tons in 2007. According to Table 3.9.1 (2/2), the amount of vegetable products in Laguna Province is about 22,000 tons at present, this Province will unable to self-supply its vegetable demand, unless any considerable development measures for increase of vegetable production are executed. From this point of view, the increase of vegetable production in the Project area will be desirable to expand of self-supply of this Province.

3 Crop Production Cost and Farm Budget Analysis

3.1 Present Crop Production Cost

According to the farmers' household survey, average production costs of the major vegetables are estimated as follows, Table IV.3.1 in detail.

Production Costs of Major Vegetable in the Study Area

(Unit: ₱ /ha)

Crops	Tomato	Cabbage	Radish	Sweet Potato	Beans
Farm Inputs	12,095	8,603	3,845	5,100	10,779
- Seeds	800	800	960	3,300	2,000
- Fertilizers	5,318	4,830	2,016	1,800	1,440
- Agro-chemicals	3,207	2,973	869	-	1,069
- Other farm materials	2,770	-	-	-	6,270
Labor	10,270	9,820	7,750	8,740	9,820
- Hired labor	2,410	2,070	1,530	2,070	2,520
- Family labor	7,860	7,750	6,220	6,670	7,300
Transportation	3,250	2,250	2,750	3,250	2,000
Others	1,000	1,000	1,000	1,000	1,000
Total	26,615	21,673	15,345	18,090	23,599
less family labor	18,755	13,923	9,125	11,420	16,299

Source: Based on the farmers' household survey carried out by JICA Study Team

Crop production costs comprise (1) farm input costs and (2) labor costs. Farm input costs largely fluctuate by kind of crops ranging from ₱3,845/ha for radish to ₱12,095/ha for tomato. Fertilizer ranks first followed with agro-chemicals in the farm inputs, but in case of sweet potato the largest is seedling cost, and agro-chemicals are hardly used. In addition, in case of tomato and beans, some stalks and strings are used for supporting and training plants. Most of the vegetable farmers employ casual laborers occasionally during the planting and harvesting seasons. Labor cost is the largest item of the vegetable production costs. Transportation cost is estimated as the labor cost of man and horse carrying products from farm to trading point.

3.2 Present Agricultural Production Values and Farm Income

Net production values and farm income of vegetables in the Study area are estimated on the basis of gross production values and total production costs as shown below:

Gross Production Values

Crops	Production (tons) (A)	Average Price (₱ / kg) (B)	Gross Value (₱ million) (A) x (B)
Tomato	4,350	4.2	18.3
Cabbage			
- dry season	1,010	7.9	8.0
- rainy season	350	9.9	3.5
Radish	630	4.9	3.1
Sweet Potato	1,450	4.8	7.0
Others(Baguio beans)	420	8.4	3.5
Total	8,220		43.4

Source: Based on the farmers' household survey carried out by JICA Study Team

Total Production Costs

Crops	Harvested Area (ha) (A)	Unit Production cost (₱ / ha) (B)	Total Production cost (₱ million) (A) x (B)
Tomato	435	26,615	11.6
Cabbage			
- dry season	145	21,673	3.1
- rainy season	70	23,245*	1.6
Radish	70	15,354	1.1
Sweet Potato	145	18,090	2.6
Others	70	23,599	1.7
Total	935		21.7

Source: Based on the farmers' household survey carried out by JICA Study Team under Phase 1

Net Production Values and Farm Income

Crops	Gross Production Value (₱ million) (A)	Total Production cost (₱ million) (B)	Net Production Value (₱ million) (A) - (B)	Farm Income (₱ million)
Tomato	18.3	11.6 (8.2)*	6.7	10.1
Cabbage				
- dry season	8.0	3.1 (2.0)	4.9	6.0
- rainy season	3.5	1.6 (1.1)	1.9	2.4
Radish	3.1	1.1 (0.6)	2.0	2.5
Sweet Potato	7.0	2.6 (1.7)	4.4	5.3
Others(Baguio beans)	3.5	1.7 (1.1)	1.8	2.4
Total	43.4	21.7 (14.7)	21.7	28.7

Source: Based on the farmers' household survey carried out by JICA Study Team
Remark*: Less family labor

Gross production values, production costs and net production values of major vegetables are estimated to be about ₱43.4 million, ₱21.7 million and ₱21.7 million on financial price basis, respectively. Since there are 1,340 farm household in the Study area, these values are equivalent to ₱32,390, ₱16,190 and ₱16,190, per farm respectively. The average farm income, which is indicated as the value reduced the production cost without family labor from the gross production value, is equivalent to ₱21,420 per farm.

According to the farmers' household survey, the average family income is estimated at about ₱50,000 per annum as follows:

Average Family Income

Source of Income	Average Income per Family (₱)	(%)
Vegetables	21,420	43
Coconuts / Tree crops	6,100	12
Livestock / Poultry	1,500	3
Off-farm income	20,980	42
Total	50,000	100

Source: Based on the farmers' household survey carried out by JICA Study Team

Taking the estimated family income and average family size (4.65 persons/family) in the Study area, per capita net income is calculated at ₱10,700 per annum.

3.3 Estimated Production Cost with Project

(1) Financial and Economic Production Cost

In section IV.1.5, to compare the marketability of several vegetables, the production cost of each vegetable was roughly estimated. However the financial production costs of the proposed vegetables in the Study area were reestimated more precisely on the basis of the collected data and information from related municipalities, advanced vegetable production areas and some agricultural agencies. After that economic production costs was calculated from these financial costs multiplied by various coversion factors (see Table IV 3.2 - IV.3.3).

(2) Detailed Production Cost of Some Materials

To estimate the production costs of the proposed vegetables, the cost of terminal irrigation facilities and rain protection materials were estimated as follows.

1) Terminal Irrigation Facilities

• Assumption

- Average size of an terminal watering block : 1.8 ha.
- Average farm size in a block : 0.3 ha.
- The number of farms in one block : 6 farms.
- Materials required :
  Water supply pipe (Polyethylene , ø 1.5)
  L = 120m × 84 pesos/m = 10,080 pesos
  Watering hose (Polyethylene , ø 1.0)
  L = 360m × 35 pesos/m = 12,600 pesos
  Total 22,680 pesos
- Life of materials : 5 years

(see Fig. IV.3.1)

• Annual cost per hectare

22,680 / 1.8 / 5 = 2,520 pesos

• Annual cost per crop (two crops in a dry season)

2,520 / 2 = 1,250 pesos

2) Rain Protection Materials

• Assumption

- Vegetable farm is covered by simple trellis with vinyl film
- Unit of the trellis

Pole:	$\pi /4 \times 0.15 \times 2.5m =$	$0.0442m^3$
Beam:	$0.0075 \times 0.15 \times 5.0m =$	$0.1125m^3$
Cramp:	$0.05 \times 0.01 \times 1.0m \times 2 =$	$0.0100m^3$
Total	$0.1667m^3$	

• Set up cost per hectare

	Quantity	Unit price	Value(pesos/ha)
- Timber (Parm)	66.68m^3	2,500pesos/m^3	166,700
- Vinyl film	10,000m^2	3.5pesos/m^3	35,000

• Life of materials

- Timber: 15years
- Vinyl: 6years

• Annual cost of materials per hectare

Timber	166,700 / 15	=	11,113 pesos
Vinyl	35,000 / 6	=	5,833
Labor (30%)		=	5,084
Total		=	22,030 pesos

(see Fig. IV.3.1)

3.4 Farm Budget Analysis

Farm budget analysis was made to assess the impact of the project on future farm income. The analysis was made under with and without project conditions for two types of farmers: whose vegetable farms are subject to irrigation development and whose farms are not subject to irrigation development but located influence area of the proposed road improvement. Assumptions used for the analysis were as follows:

(1) Farm size

Typical farm size of irrigated farmers and rainfed farmers are estimated at 0.46 ha and 0.62 ha respectively on the basis of the following:

Items	Project area		
	Irrigated area	Rainfed area	Total
Area (ha)	320	400	720
No of farm households	693	647	1,340
Average farm size (ha)	0.46	0.62	-

(2) Hired labor

It is assumed that 20% of the total labor requirement will be relied on hired labors considering possible labor shortage in the peak period.

(3) Off-farm income

It is assumed that typical irrigated farmers do not earn off-farm income, while rainfed farmers earn a half of the average off-farm income at present.

(4) Household expenditure

It is estimated based on linear correlation between present household incomes and expenditures with some adjustment.

(5) Other necessary expenditure (O&M costs)

After completion of the project, farmers will be required to pay irrigation fee to cover the O&M costs of irrigation facilities and marketing cooperative fee. They were estimated as follows:

Irrigation fee: Annual O&M costs for irrigation facility ÷ No. of beneficiary farm household
= 920,000 pesos ÷ 693 farm household
= 1,330 pesos

Marketing cooperative fee: 2% of the gross income from vegetable production
Irrigated farmers: 184,000 × 2% = 3,700 pesos
Rainfed farmers: 96,000 × 2% = 1,900 pesos

The results of the analysis are given in Table IV.3.4 and summarized as follows:

Farm Budget Analysis for Typical Farmers

(Unit: pesos)

Items	Without Project	With Project	
		Irrigated area	Rainfed area
Average vegetable farm size	-	0.46 ha	0.62 ha
1. Household Income (A)	50,000	146,200	88,600
- Vegetables	21,400	140,100	70,500
- Other Agricultural Products	7,600	6,100	7,600
- Non-farm incomes	21,000	0	10,500
2. Expenses (B)	43,100	85,700	62,900
3. Payment Capacity (C = A - B)	6,900	60,500	25,700
4. Payment to be required (D)	200	5,100	1,900
- O&M costs for irrigation facilities	0	1,400	0
- Cooperative fee	200	3,700	1,900
5. Surplus (C - D)	6,700	55,400	23,800

The result of the analysis indicates that the financial condition of the farmers could be improved considerably after the project implementation. Farm income will show threefold increase for the typical farm income in irrigated area , from ₱50,000 to ₱146,200, while the typical farm income in rainfed area will increase to ₱ 88,600. Necessary expenses in the future, operation and maintenance costs of the project facilities as well as the marketing cooperative fee being proposed in the project, are slight comparing with the payment capacity in both farm categories. It is concluded, therefore, that the improvement in farmers' income will enable farmers to bear the necessary expenses and create a large surplus.

4 Marketing and Prices

4.1 Marketing

Domestic marketing system of the vegetables produced in the Study area is illustrated on Fig. IV.4.1. The vegetable farms are scattered over the area and road network connecting between farms and main roads is lacking. The harvested vegetables are therefore transported by using horse from farm to main road where trading post exists. There are several trading posts in the Study area. None of weighing, washing, bagging and storage facilities is available at the trading post. It is merely a simple wooden structure with shade.

Domestic marketing system is characterized by a wide range of intermediaries performing different functions. During the harvesting season, more than 100 buyers show up at the trading posts to buy and collect the vegetables. They are generally classified into (1) primary wholesalers who sell the products to other wholesalers in Manila and elsewhere, (2) local wholesalers-retailers who sell to other traders and/or directly to the end-consumers at major towns in Laguna, and (3) local retailers who buy in smaller quantities and sell to the end-consumers locally. The primary wholesalers from Manila handle 70-80% of the total products, local wholesalers-retailers 15-20%, and local retailers 5-10%.

In general, there may be 1-4 middlemen operating between the farmers and the retailers. At the trading post, the existence of local brokers, who act as an intermediary between the farmers and buyers for a commission, is common. The buyers from Manila are not only primary wholesalers, but also include assemblers who collect purchases and assemble for shipment to distant markets, wholesalers-retailers and simple collecting agents (truckers) for the primary wholesalers.

The Bureau of Standards under the Department of Trade and Industry (DTI) has formulated a number of grading standards for fruit and vegetables; however, these have not been accepted or used by the traders. In the Study area, an informal quality grading, which is usually on purely visual ground, is practiced and provides the basis of pricing on the spot. The products are usually graded into three (3) classes; "A" (first class), "B" (second class) and "C" (third class). About 60% of the prices paid to "A" class products is generally paid to "B" class products, 40% prices to "C" class products.

Vegetables purchased by the dealers from Manila are transported, using unrefrigerated trucks, directly to Divisoria market, Manila. More than 200 wholesalers are carrying on vegetable business at Divisoria. The wholesalers at Divisoria do business generally with regular partners (secondary wholesalers, wholesalers-retailers and retailers). There is no auction market at Divisoria. Prices are determined on the spot through negotiations, making reference to the purchasing prices in the vegetable producing areas.

The existing marketing system is not entirely inappropriate, and the fact that similar marketing systems continue to operate elsewhere suggests that it may be the most efficient domestic marketing system.

4.2 Prices

The lowland vegetable production pattern, which is highly seasonal, is reflected in the wholesale prices of the vegetables in Metro Manila. Table IV.1 gives the monthly wholesale prices of major vegetables for the years 1989 - 1994 at Divisoria market, Manila. Fig. IV.4.2 shows the seasonal pattern of wholesale prices at Divisoria market for tomato and cabbage which is derived from the monthly average wholesale prices for the years 1988 - 1994. These data clearly shows that vegetable prices rise from June/July to reach a peak in November/December and then fall again during January to May when lowland production become available. The vegetable production pattern in the Study area is similar to those in lowland. Almost no vegetables, except sweet potato, are produced in the Study area during the high price period of June/July - November/December mainly due to low technologies applicable to the wet season cultivation and poor accessibility to the market.

The wholesale prices at Divisoria market and ex-trading post prices at La Trinidad (Benguet) were compared in order to check the margins between two different data series of prices. Margins are around 75 - 85%, depending upon the kinds and quality grades of vegetables which affects the selling prices as well as the product shelf life and transportation / storage losses (see Table IV.4.2 and Fig. IV.4.3). In the Study area, the prices at the trading posts are much lower than 75% of the wholesale prices at Divisoria mainly because, compared to Baguio, the Study area has such disadvantages as (1) poor quality of production, (2) higher risk of post-harvest losses during transportation due to poor road condition, and (3) low bargaining power of the farmers during the negotiation with the dealers.

Such disadvantageous situations will be gradually improved under the proposed Project through the irrigation development, proper training of the vegetable farmers, improvement of the existing farm-to-market roads, construction of well-equipped trading posts and organization of market cooperatives, etc. It is therefore anticipated that the prospective prices at the trading posts in the Study area will be much improved, being not less than 75% of the wholesale prices at Divisoria. The anticipated ex-trading post prices of vegetables in the Study area are shown in Table IV.4.3.

No price reporting service is available in the Study area. The farmers have no idea about the wholesale price in Manila; therefore the farmers are rather in a disadvantageous position during the price negotiations with the dealers at the trading posts. In Baguio, the prices agreed between producers and wholesalers and those reported to the price collection officers become the fixed prices for all transactions in Baguio market on that day. If this kind of price information services will become available in the Study area, the farmers will be able to avoid unfair price offer by the dealers.

5 Agricultural Support Services and Cooperative Movement

5.1 Agricultural Research

As the dominant crops in the Philippines are rice, corn, sugar and coconut, the agricultural research in the Philippines has been a strong emphasis on these crops, while it has poorly supported on fruit and vegetables. The major constraints to horticultural research activities are the limited research station resources, insufficient training for the staff, too low staff rewards, delay of project formulation, evaluation and approval, lack of funds for experimental work, etc. Despite these constraints, numbers of staff have made their efforts to agricultural research and development.

The Philippine Council for Agricultural Resource Research and Development (PCARRD) in the Department of Science and Technology (DOST) has the overall sectoral planning role for agricultural research, and is responsible for evaluating research proposals, monitoring research progress and allocating government fund. It has established the National Research and Development Network (NRDN) which is comprised by twelve (12) National research centers, eighty-three (83) cooperating stations and fifteen (15) specialized agencies. As the Regional research centers, eight (8) institutions are designated. National and Regional research centers involved in vegetables are as follows.

National research center

- University of the Philippines (UPLB)	:	Los Baños, Laguna
- Central Luzon State University (CLSU)	:	Munoz, Nueva Ecija
- Visayas State College (Vis CA)	:	Baybay, Leyte

Regional research center

- Isabela State University (ISU)	:	Echague, Isabela
- Palawan National Agriculture College (PNAC)	:	Arbolan, Palawan
- Camarines Sur State Agricultural College (CSSAC)	:	Pili, Camarines Sur
- Bureau of Plant Industry (BPI)	:	La Carlota City, Negros
- Mountain State Agricultural College (MSAC)	:	La Trinidad, Benguet

Bureau of Agricultural Research (BAR) in DA has a responsibility for all agricultural research of the Department and is establishing close cooperation with PCARRD, the State Colleges and Universities and non-government organizations. It has four (4) National Crop Research Development Centers and there are one or more research stations by each Region. Generally it is said that the DA focuses its research on technology verification and demonstration, while state colleges and universities (SCU) focuses their research in technology generation. However, in practice the distinction between both research activities is not so clear.

The University of the Philippines at Los Baños (UPLB) is well known as one of horticulture research centers and has the Institute of Plant Breeding, Institute of Biotechnology and Post-harvest Horticulture Training and Research Center.

From 1988 to 1992 in the Study area, a pilot demonstration farm for high land vegetable cropping had been experimented by University of the Philippines, and several kinds of vegetables were tried to grow under irrigation. As a result of the experiment it was confirmed that almost all kind of subtropical vegetables can grow in this area. At present the demonstration farm has been taken over to the Laguna Poly-technical College and used as the agricultural training farm for the students. At the next site of this farm, NIA and the Municipality of Nagcarlan are, in close cooperation, going to start the new irrigation farm for vegetables assisted by JICA and supervised by University of the Philippines.

"The Economic Garden National Crop Research and Development Center of Department of Agriculture (DA)" is also located at Los Baños. In this Economic Garden several new varieties and strains of legumes and other vegetables have been evaluated and selected for the development of improved varieties and seed production. Some new varieties have been sent to the Study area to check their suitability for middle highland.

5.2 Agricultural Extension Services

The reorganization of DA in 1987 brought about significant structural and policy changes on the agricultural extension and training. As the result of structural changes, the former line bureaus performing specialized line functions changed to staff bureaus where program and project implementation are undertaken, and their field staffs were absorbed by Regional offices. In addition, the Philippine Training Center for Rural Development, the Philippine Agricultural Training Council and the Bureau of Agricultural Extension was merged into Agricultural Training Institutes (ATI) as a training section of DA.

In each administrative region, there is a Regional office of DA headed by a Regional Director who is assisted by three Assistant Directors for operations, research and support services. Under the Assistant Director for Operations, there are the Provincial Agricultural Officers (PAOs).

Region IV office of DA in Quezon City is charged with implementing extension at the regional and provincial levels. The office of Laguna Provincial Agricultural Officer has a PAO, who implements policies, plans, laws, regulations of DA, etc.

However, based on the new policy of the extension that agricultural extension should be location specific, the former Municipal Agricultural Office of DA in each Municipality was transferred to the Municipal Government as the Office of the Municipal Agriculturist headed by Municipal Agricultural Officer (MAO) assisted by Agricultural Technologists (ATs). Therefore, each Municipality is now the base of agricultural extension. MAO has the responsibility for agricultural extension in the Municipality and each AT, who is assigned for agricultural extension in each territory including some Barangays, is most directly in contact with

the farmers. Generally an AT visits farmers weekly and holds monthly meeting for extension. The number of AT is about 7 - 9 persons in each Municipality. (see figure IV 5.1)

In Nagcarlan eight (8) demonstration farm sized in maximum 5,000 sq.m. have been provided at the advanced farms that are managed by farmers with seeds sent from MAO to confirm the adaptability of new varieties of vegetables and to extend them to the neighborhood. In Liliw the government has established the "Plant Pest Clinic in Liliw" project to empower the extension workers and farmers on matters related to crop protection.

However the finances for agricultural extension in the municipalities are very limited to conduct the proper extension service, and despite the technical support to MAO provided by the Regional office and PAO, a number of limiting factors has hampered the effectiveness of the service.

5.3 Farm Input Supplies

Major farm inputs for growing vegetables are seeds, fertilizers and agrochemicals. Member farmers of the agricultural cooperatives usually procure their farm inputs through the cooperatives, and other farmers buy these materials from the agricultural supplies dealers whose shops are three (3) in Nagcarlan and three (3) in Liliw.

Most of farmers use home rising seeds in case of tomato seed, but generally they purchase seeds for growing cabbage, radish, etc. As the chemical fertilizer, compound fertilizer such as 14-14-14 (figures are percentage of N, P and K included), urea and ammonium sulfate are commonly used, and the application of chicken manure is most popular. Insecticides like Decis or Sumicidine, and Fungicides like Dithane are commonly used, but the application frequency and volume may be not so much. Besides stalks, nylon lope, tying materials are used for tomato and beans.

In the Study area, because of the bad road condition, and strongly undulating and small plots of the upland fields, farmers hardly use agricultural machinery. Horses are used for transportation of farm inputs and products.

Due to the small scale of farming, most of the farming labor depends on family labor, but some hired labor mainly for land preparation and transplanting are applied. Generally average hired labor cost for farming is about one hundred (100) pesos for a man a day and two hundred and fifty (250) pesos for a set of man and horse a day. These hired labors are supplied smoothly on the whole.