

APPENDIX K

Environmental and Social Considerations

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Appendix K-1: Environmental Standards in Armenia

1. Surface Water Standards in Armenia

Indicator of quality	Unit	Class of quality					Back concentration (BC)	
		I Excellent	II Good	III Moderate	IV Poor	V Bad	Hrazdan River	Kasakh River
Dissolved oxygen (DO)	mg O ₂ /l	>7 or BC*	>6	>5	>4	<4	>7	>7
Biochemical oxygen demand (BOD ₅)	mg O ₂ /l	3	5	9	18	>18	3	3
Chemical oxygen demand (COD _{Cr})	mg O ₂ /l	10	25	40	80	>80	10	10
Ammonium ion	mg N/l	0.2 or BC	0.4	1.2	2.4	> 2.4	0.172	0.033
Nitrite ion (NO ₂ -N)	mg N/l	0.01 or BC	0.06	0.12	0.3	>0.3	0,003	0,011
Nitrate ion (NO ₃ -N)	mg N/l	1 or BC	2.5	5.6	11.3	>11.3	0.086	0.272
Phosphate ion	mg/l	0.05 or BC	0.1	0.2	0.4	>0.4	0,007	0,060
Total zinc	µg/l	BC	100	200	500	>500	2.7	5.0
Total copper	µg/l	BC	BC+20	50	100	>100	1.5	3.0
Total chrome	µg/l	BC	BC+10 (50)	100	250	>250	1.1	2.0
Total arsenic	µg/l	BC	20	50	100	>100	6.6	0.65
Total cadmium	µg/l	BC	BC+1	BC+2	BC+4	>BC+4	0.03	0.02
Total lead	µg/l	BC	BC+10	25	50	>50	0.17	0.5
Total nickel	µg/l	BC	BC+10 (20)	50	100	>100	2.2	2.1
Total molybdenum	µg/l	BC	2xBC or 10	4xBC or 25	8xBC or 50	>8xBC	5.5	1.19
Total manganese	µg/l	BC	2xBC or 100	4xBC or 200	8xBC or 500	>8xBC	2.3	23
Total vanadium	µg/l	BC	2xBC+5 or 10	4xBC	8xBC or 100	>8xBC	5.2	4
Total cobalt	µg/l	BC	2xBC or 20	4xBC or 50	8xBC or 100	>8xBC	0.15	0.43
Total Iron	mg/l	BC	2xBC or 0.5	0.5	1	>1	0.04	0.61
Calcium	mg/l	BC	100	200	300	>300	26.6	18.5
Magnesium	mg/l	BC	50	100	200	>200	56.5	3.3
Barium	µg/l	BC	2xBC or 100	4xBC or 250	1000	>1000	25	23
Beryllium	µg/l	BC	2xBC	4xBC	100	>100	0.02	0.04
Potassium	mg/l	BC	2xBC	4xBC	8xBC	>8xBC	20.19	3.46
Sodium	mg/l	BC	2xBC	4xBC	8xBC	>8xBC	77.56	3.34
Lithium	µg/l	BC	BC	-	2500	>2500	36.7	1
Boron	µg/l	BC	450	700	1000	>2000	412	11
Aluminum	µg/l	BC	2xBC	4xBC	5000	>5000	12.4	266
Total selenium	µg/l	BC or 10	20	40	80	>80	2.5	0.5
Total antimony	µg/l	BC	2xBC	4xBC	8xBC	>8xBC	1.6	0.5

Indicator of quality	Unit	Class of quality					Back concentration (BC)	
		I Excellent	II Good	III Moderate	IV Poor	V Bad	Hrazdan River	Kasakh River
Total tin	µg/l	BC	2xBC	4xBC	8xBC	>8xBC	0.04	0.04
Chemical oxygen demand (CODMn)	mg O ₂ /l	5 or BC	10	15	20	>20	3.78	3.314
Total inorganic nitrogen	mg N/l	1.5 or BC	4	8	16	>16	0.266	0.433
Total phosphorus	mg/l	0.1 or BC	0.2	0.4	1	>1	0,05	0.083
Chloride ion	mg/l	BC	2xBC	150	200	> 200	75.3	3.5
Sulfate ion	mg/l	BC	2xBC	150	250	> 250	32.78	15.3
Silicate ion	mg Si/l	BC	2xBC or 10	4xBC or 20	8xBC	>8xBC	2.22	11.34
Total mineralization	mg/l	BC	2xBC	1000	1500**	>1500	544	95.8
Electrical conductivity	µS/cm	BC	2xBC	1000	1500**	>1500	858	148.4
Rigidity	mg equal/l	2.8	10	20	40	<40	6.7	1.07
Suspended Solids (SS)	mg/l	BC	1.2xBC	2xBC (30)	4xBC	>4xBC	3.4	8.1
Odor (20°C & 60°C)	points	<2 (natural)	2 (natural)	2	4	>4	<2 (natural)	<2 (natural)
Color	degree	(natural)	>5 (natural)	20	30	>200	(natural)	(natural)

*BC) Background Concentration (BC for water parameters is fixed by river) **for irrigation 1000

Remarks) In case of BOD, a water sample which shows 0-3 mg/l is categorized into "Class I Excellent"

Source: "Protocol of government RA, 27.01.2011 27 N 75-N"; downloaded from HP of Environmental Impact Monitoring Center, MNP

2. Guidelines for Interpretations of Water Quality of Irrigation (FAO)¹

Potential Irrigation Problem				Units	Degree of Restriction on Use		
					None	Slight to Moderate	Severe
Salinity(affects crop water availability) ²							
	EC _w			dS/m	< 0.7	0.7 – 3.0	> 3.0
	(or)						
	TDS			mg/l	< 450	450 – 2000	> 2000
Infiltration (affects infiltration rate of water into the soil. Evaluate using EC _w and SAR together) ³							
SAR	= 0 – 3		and EC _w =		> 0.7	0.7 – 0.2	< 0.2
	= 3 – 6		=		> 1.2	1.2 – 0.3	< 0.3
	= 6 – 12		=		> 1.9	1.9 – 0.5	< 0.5
	= 12 – 20		=		> 2.9	2.9 – 1.3	< 1.3
	= 20 – 40		=		> 5.0	5.0 – 2.9	< 2.9
Specific Ion Toxicity (affects sensitive crops)							
	Sodium (Na) ⁴						
	surface irrigation			SAR	< 3	3 – 9	> 9
	sprinkler irrigation			me/l	< 3	> 3	
	Chloride (Cl) ⁴						
	surface irrigation			me/l	< 4	4 – 10	> 10
	sprinkler irrigation			me/l	< 3	> 3	

¹ The table is attached as "Table-1 Guidelines for Interpretations of Water Quality of Irrigation" in "Water quality for agriculture" (FAO,1994)

Potential Irrigation Problem		Units	Degree of Restriction on Use		
			None	Slight to Moderate	Severe
	Boron (B)	mg/l	< 0.7	0.7 – 3.0	> 3.0
	Trace Elements (see Table 21)				
Miscellaneous Effects (<i>affects susceptible crops</i>)					
	Nitrogen (NO ₃ - N) ⁵⁶	mg/l	< 5	5 – 30	> 30
	Bicarbonate (HCO ₃)				
	(<i>overhead sprinkling only</i>)	me/l	< 1.5	1.5 – 8.5	> 8.5
	pH		Normal Range 6.5 – 8.4		

1) Adapted from University of California Committee of Consultants 1974.

2) ECw means electrical conductivity, a measure of the water salinity, reported in deci-Siemens per metre at 25°C (dS/m) or in units millimhos per centimetre (mmho/cm). Both are equivalent. TDS means total dissolved solids, reported in milligrams per litre (mg/l).

3) SAR means sodium adsorption ratio. SAR is sometimes reported by the symbol RNA. See Figure 1 for the SAR calculation procedure. At a given SAR, infiltration rate increases as water salinity increases. Evaluate the potential infiltration problem by SAR as modified by ECw. Adapted from Rhoades 1977, and Oster and Schroer 1979.

4) For surface irrigation, most tree crops and woody plants are sensitive to sodium and chloride; use the values shown. Most annual crops are not sensitive; use the salinity tolerance tables (Tables 4 and 5). For chloride tolerance of selected fruit crops, see Table 14. With overhead sprinkler irrigation and low humidity (< 30 percent), sodium and chloride may be absorbed through the leaves of sensitive crops. For crop sensitivity to absorption, see Tables 18, 19 and 20.

5) For boron tolerances, see Tables 16 and 17.

6) NO₃ -N means nitrate nitrogen reported in terms of elemental nitrogen (NH₄ -N and Organic-N should be included when wastewater is being tested).

Source: Guidelines for Interpretations of Water Quality for Irrigation (Water Quality for Agriculture, FAO, 1994)

3. Environmental Quality Standards for priority Substances and Certain Other Pollutants

Part A: Environmental Quality Standards (EQs)

AA: Annual Average; Mac: Maximum Allowable Concentration.

Unit: [µg/l]						
No	Name of substance	CAS number ⁽¹⁾	AA-EQS ⁽²⁾ Inland surface waters ⁽³⁾	AA-EQS ⁽²⁾ Other surface waters	MAC-EQS ⁽⁴⁾ Inland surface waters ⁽³⁾	MAC-EQS ⁽⁴⁾ Other surface waters
(1)	Alachlor	15972-60-8	0.3	0.3	0.7	0.7
(2)	Anthracene	120-12-7	0.1	0.1	0.4	0.4
(3)	Atrazine	1912-24-9	0.6	0.6	2.0	2.0
(4)	Benzene	71-43-2	10	8	50	50
(5)	Brominated diphenylether ⁽⁵⁾	32534-81-9	0.0005	0.0002	NA	NA
(6)	Cadmium and its compounds (depending on water hardness classes) ⁽⁶⁾	7440-43-9	≤ 0.08 (Class 1) 0.08 (Class 2) 0.09 (Class 3) 0.15 (Class 4) 0.25 (Class 5)	0.2	≤ 0.45 (Class 1) 0.45 (Class 2) 0.6 (Class 3) 0.9 (Class 4) 1.5 (Class 5)	≤ 0.45 (Class 1) 0.45 (Class 2) 0.6 (Class 3) 0.9 (Class 4) 1.5 (Class 5)
(6a)	Carbon-tetrachloride ⁽⁷⁾	56-23-5	12	12	NA	NA
(7)	C10-13 Chloroalkanes	85535-84-8	0.4	0.4	1.4	1.4
(8)	Chlorfenvinphos	470-90-6	0.1	0.1	0.3	0.3
(9)	Chlorpyrifos (Chlorpyrifos-ethyl)	2921-88-2	0.03	0.03	0.1	0.1
(9a)	Cyclodiene pesticides: Aldrin ⁽⁷⁾ Dieldrin ⁽⁷⁾ Endrin ⁽⁷⁾ Isodrin ⁽⁷⁾	309-00-2 60-57-1 72-20-8 465-73-6	Σ = 0.01	Σ = 0.005	NA	NA
(9b)	DDT total ^{(7) (8)}	NA	0.025	0.025	NA	NA

No	Name of substance	CAS number (¹)	AA-EQS (²) Inland surface waters (³)	AA-EQS (²) Other surface waters	MAC-EQS (⁴) Inland surface waters (³)	MAC-EQS (⁴) Other surface waters
	para-para-DDT (⁷)	50-29-3	0.01	0.01	NA	NA
(10)	1,2-Dichloroethane	107-06-2	10	10	NA	NA
(11)	Dichloromethane	75-09-2	20	20	NA	NA
(12)	Di(2-ethylhexyl)-phthalate (DEHP)	117-81-7	1.3	1.3	NA	NA
(13)	Diuron	330-54-1	0.2	0.2	1.8	1.8
(14)	Endosulfan	115-29-7	0.005	0.0005	0.01	0.004
(15)	Fluoranthene	206-44-0	0.1	0.1	1	1
(16)	Hexachloro-benzene	118-74-1	0.01 (⁸)	0.01 (⁸)	0.05	0.05
(17)	Hexachloro-butadiene	87-68-3	0.1 (⁸)	0.1 (⁸)	0.6	0.6
(18)	Hexachloro-cyclohexane	608-73-1	0.02	0.002	0.04	0.02
(19)	Isoproturon	34123-59-6	0.3	0.3	1.0	1.0
(20)	Lead and its compounds	7439-92-1	7.2	7.2	NA	NA
(21)	Mercury and its compounds	7439-97-6	0.05 (⁸)	0.05 (⁸)	0.07	0.07
(22)	Naphthalene	91-20-3	2.4	1.2	NA	NA
(23)	Nickel and its compounds	7440-02-0	20	20	NA	NA
(24)	Nonylphenol (4-Nonylphenol)	104-40-5	0.3	0.3	2.0	2.0
(25)	Octylphenol (4-(1,1',3,3'-tetramethylbutyl)phenol))	140-66-9	0.1	0.01	NA	NA
(26)	Pentachloro-benzene	608-93-5	0.007	0.0007	NA	NA
(27)	Pentachloro-phenol	87-86-5	0.4	0.4	1	1
(28)	Polyaromatic hydrocarbons (PAH) (¹⁰)	NA	NA	NA	NA	NA
	Benzo(a)pyrene	50-32-8	0.05	0.05	0.1	0.1
	Benzo(b)fluor-anthene	205-99-2	$\Sigma = 0.03$	$\Sigma = 0.03$	NA	NA
	Benzo(k)fluor-anthene	207-08-9				
	Benzo(g,h,i)-perylene	191-24-2	$\Sigma = 0.002$	$\Sigma = 0.002$	NA	NA
	Indeno(1,2,3-cd)-pyrene	193-39-5				
(29)	Simazine	122-34-9	1	1	4	4
(29a)	Tetrachloro-ethylene (⁷)	127-18-4	10	10	NA	NA
(29b)	Trichloro-ethylene (⁷)	79-01-6	10	10	NA	NA
(30)	Tributyltin compounds (Tributyltin-cation)	36643-28-4	0.0002	0.0002	0.0015	0.0015
(31)	Trichloro-benzenes	12002-48-1	0.4	0.4	NA	NA
(32)	Trichloro-methane	67-66-3	2.5	2.5	NA	NA
(33)	Trifluralin	1582-09-8	0.03	0.03	NA	NA

NA: Not applicable

(1) CAS: Chemical Abstracts Service.

(2) This parameter is the EQS expressed as an annual average value (AA-EQS). Unless otherwise specified, it applies to the total concentration of all isomers.

(3) Inland surface waters encompass rivers and lakes and related artificial or heavily modified water bodies.

(4) This parameter is the EQS expressed as a maximum allowable concentration (MAC-EQS). Where the MAC-EQS are marked as 'not applicable', the AA-EQS values are considered protective against short-term pollution peaks in continuous discharges since they are significantly lower than the values derived on the basis of acute toxicity.

(5) For the group of priority substances covered by brominated diphenylethers (No 5) listed in Decision No 2455/2001/EC, an EQS is established only for congener numbers 28, 47, 99, 100, 153 and 154.

- (6) For cadmium and its compounds (No 6) the EQS values vary depending on the hardness of the water as specified in five class categories (Class 1: < 40 mg CaCO₃/l, Class 2: 40 to < 50 mg CaCO₃/l, Class 3: 50 to < 100 mg CaCO₃/l, Class 4: 100 to < 200 mg CaCO₃/l and Class 5: ≥ 200 mg CaCO₃/l).
- (7) This substance is not a priority substance but one of the other pollutants for which the EQS are identical to those laid down in the legislation that applied prior to 13 January 2009.
- (8) DDT total comprises the sum of the isomers 1,1,1-trichloro-2,2 bis (p-chlorophenyl) ethane (CAS number 50-29-3; EU number 200-024-3); 1,1,1-trichloro-2 (o-chlorophenyl)-2-(p-chlorophenyl) ethane (CAS number 789-02-6; EU number 212-332-5); 1,1-dichloro-2,2 bis (p-chlorophenyl) ethylene (CAS number 72-55-9; EU number 200-784-6); and 1,1-dichloro-2,2 bis (p-chlorophenyl) ethane (CAS number 72-54-8; EU number 200-783-0).
- (9) If Member States do not apply EQS for biota they shall introduce stricter EQS for water in order to achieve the same level of protection as the EQS for biota set out in Article 3(2) of this Directive. They shall notify the Commission and other Member States, through the Committee referred to in Article 21 of Directive 2000/60/EC, of the reasons and basis for using this approach, the alternative EQS for water established, including the data and the methodology by which the alternative EQS were derived, and the categories of surface water to which they would apply.
- (10) For the group of priority substances of polyaromatic hydrocarbons (PAH) (No 28), each individual EQS is applicable, i.e. the EQS for Benzo(a)pyrene, the EQS for the sum of Benzo(b) fluoranthene and Benzo(k) fluoranthene and the EQS for the sum of Benzo(g,h,i) perylene and Indeno (1,2,3-cd)pyrene must be met.

Source: Official Journal of the European Union (24.12.2008)

Appendix K-2: Results of Chemical Analysis of Soil Samples

1. Results of Chemical Analysis of Soil Samples (1/3)

Compounds	Detection limit, (mg/kg)	No.1 Aratashen <Tomato>						No.2 Taronik <Green pepper>						No.3 Taronik <Non-cultivated>					
		2 weeks before soil sampling						2 months before soil sampling						None					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1 Alachlor	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2 Atrazine	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3 Chlorfenvinphos	0.04	D	D	D	ND	D	D	ND	D	D	D	D	D	ND	D	D	ND	ND	ND
4 Chlorpyrifos	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5 Fluoranthene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6 Hexachlorobenzene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7 Nonylphenols (4-Nonylphenol)	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8 Pentachlorobenzene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9 Pentachlorophenol	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10 Benzene	0.0005	0.00184	0.0017	0.0019	0.0017	0.0018	0.0018	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
11 Simazine	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
12 Trichlorobenzenes	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
13 Trichloromethane	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
14 Trifluralin	0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
15 Aldrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
16 Dieldrin	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
17 Isodrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
18 Endrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
19 para-para-DDT	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
20 Hexachlorocyclohexane (α,β,δ and γ (lindan) isomers)	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
21 Endosulfan I	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
22 Endosulfan II	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
23 Naphthalene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24 Anthracene	0.01	D	D	D	D	D	D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Source: JICA Survey Team (2016)

Remarks: Quantitative analysis for Benzen, Aldrin, Endrin, para-para-DDT, Hexachlorocyclohexane (α,β,δ and γ (lindan) isomers), Endosulfan I, Endosulfan II, Naphthalene and Anthracene, while qualitative analysis for other compounds

2. Results of Chemical Analysis of Soil Samples (2/3)

Compounds	Detection limit, (mg/kg)	No.4						No.5						No.6						No.7					
		Aghavnatun <Apricot>						Aragats <Cabbage>						Baghramyan <Grape>						Tzitzan <Potato>					
		7 months before soil sampling						3 months before soil sampling						3 months before soil sampling						3 months before soil sampling					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
1 Alachlor	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2 Atrazine	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3 Chlorfenvinphos	0.04	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
4 Chlorpyrifos	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5 Fluoranthene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6 Hexachlorobenzene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7 Nonylphenols (4-Nonylphenol)	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
8 Pentachlorobenzene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9 Pentachlorophenol	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10 Benzene	0.0005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00296	0.00221	0.0027	0.003	0.0025	0.003	ND	ND	ND	ND	ND	ND
11 Simazine	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
12 Trichlorobenzenes	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
13 Trichloromethane	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
14 Trifluralin	0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
15 Aldrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
16 Dieldrin	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
17 Isodrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
18 Endrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
19 para-para-DDT	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
20 Hexachlorocyclohexane (α, β, δ and γ (lindan) isomers)	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
21 Endosulfan I	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
22 Endosulfan II	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
23 Naphthalene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
24 Anthracene	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

3. Results of Chemical Analysis of Soil Samples (3/3)

Compounds		Detection limit, (mg/kg)	No.8						No.9						No.10					
			Tzaghtkalanj <Grape>						Hovtamech <Tomato in greenhouse>						Mrgastan <Onion>					
			4 months before soil sampling						3 months before soil sampling						3 months before soil sampling					
		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	
1	Alachlor	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
2	Atrazine	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
3	Chlorfenvinphos	0.04	ND	D	ND	D	ND	D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
4	Chlorpyrifos	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
5	Fluoranthene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
6	Hexachlorobenzene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
7	Nonylphenols (4-Nonylphenol)	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
8	Pentachlorobenzene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
9	Pentachlorophenol	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
10	Benzene	0.0005	0.0017	0.0015	0.0016	0.0018	0.0017	0.0015	0.0008	0.00070	0.00060	0.0008	0.0009	0.0009	ND	ND	ND	ND	ND	
11	Simazine	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
12	Trichlorobenzenes	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
13	Trichloromethane	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
14	Trifluralin	0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
15	Aldrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
16	Dieldrin	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
17	Isodrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
18	Endrin	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
19	para-para-DDT	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
20	Hexachlorocyclohexane (α,β,δ and γ (lindan) isomers)	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
21	Endosulfan I	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
22	Endosulfan II	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
23	Naphthalene	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
24	Anthracene	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	

Appendix K-3: Results of Chemical Analysis of Ground Water Samples

Sampling place	Unit	Aratashen 1	Aratashen 2	Aratashen 3	Artimet 1	Artimet 2	Griboyedov 1	Griboyedov 2	Khoronk 1	Khoronk 2	Khoronk 3	Detection limits
		①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	
Depth of groundwater level		6m	25m	10m	4m	8m	2m	6m	8m	1m	10m	
Well depth		9m	30m	80-100m	6m	11m	4.5m	7m	17m	6m	80-100m	
Components of fertilizer												
1	Nitrates (NO ₃ -N)	mgN/l	11.51	0.90	2.15	5.91	7.91	4.85	9.34	31.74	14.10	0.01
2	Nitrites (NO ₂ -N)	mgN/l	0.0585	0.0014	ND	0.0045	0.0476	0.0095	0.0041	0.0009	0.0005	0.0023
Components of pesticide/insecticide												
1	Alachlor	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.07
2	Atrazine	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.060
3	Chlorfenvinphos	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.025
4	Chlorpyrifos	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.002
5	Fluoranthene	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0
6	Hexachlorobenzene	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
7	Nonylphenols	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.20
8	Pentachlorobenzene	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
9	Pentachlorophenol	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.10
10	Benzene	µg/l	0.40	0.20	1.40	0.30	0.60	0.50	0.10	0.20	0.30	0.05
11	Simazine	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.5
12	Trichlorobenzenes	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
13	Trichloromethane	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
14	Trifluralin	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05
15	Aldrin	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02
16	Dieldrin	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
17	Isodrin	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.015
18	Endrin	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.012
19	para-para-DDT	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0025
20	Hexa-chlorocyclohexane	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
21	Endosulfan I	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02
22	Endosulfan II	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.02
23	Naphthalene	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.20
24	Anthracene	µg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01

Source: JICA Survey Team (2016)

ND: Not Detected

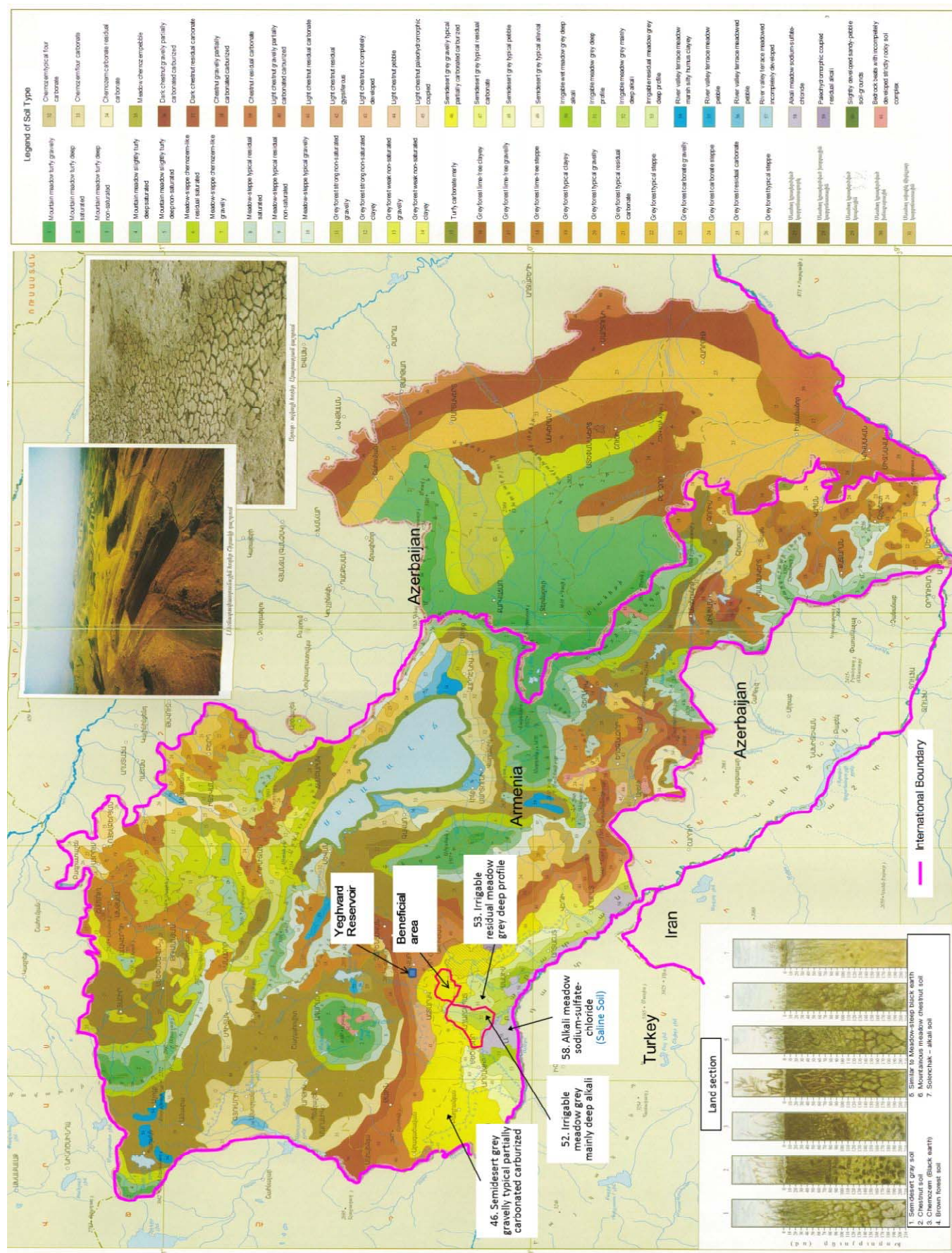
Methodology: Ion chromatography for Nitrate, Spectrometer for Nitrite, Gas Chromatography flame ionization detector for Benzene, Gas Chromatography/Mass Spectrometer for other pesticides/insecticides

Groundwater depth is based on interview to the users.

Khoronk 3 and Aratashen 3 were taken from pump stations, while others were taken from individual wells.

Highlighted cells show high nitrate concentration.

Appendix K-4: Soil Distribution Map in Armenia



Source: NATIONAL ATLAS OF ARMENIA Volume A "Center of Geodesy and Cartography" SNCO

Appendix K-5: Main Ecological Characteristics of Identified Fish in the Hrazdan River and Kasakh River

Fish species	Migratory	Size of the fish	Main habitat	Spawning conditions	Capture point
1.Angora loach (<i>Oxynoemacheilus angorae</i>) ^{1,2}	Not migratory	L: 5-8 cm, H:1.5-2 cm, max:11x2.5cm	Widespread from downstream to middle upstream of Hrazdan River. In the shallow water of rivers and channels	Spawning season is from April to July. Favorite places for spawning is on the sand or water plants at coastal parts of rivers at 0.1-0.7 m depth	Middle & down stream
2.Armenian roach (<i>Rutilus rutilus schelkovnikov</i>) ^{1,2,3}	Not migratory	L:12-15 cm, H:3-5 cm, max:25x7.5cm	In the In the shallow water of rivers and channels	Spawning season is from January to March. Favorite places for spawning are and channels on the water plants at the coastal parts of rivers at the depth of 0.2-0.5 m	Down stream
3.Asp (<i>Aspius aspius</i>) ^{1,2,3}	From upstream to downstream at middle autumn and from downstream to upstream at middle spring	L:40-60 cm, H:8-12 cm, max:80x18.5cm	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. Rivers, lakes, channels and reservoirs	Spawning season is from March to April. Favorite places for spawning is on the sand or gravel bottom of rivers and reservoirs at the depth of 0.5-2.0 m	Down stream
4.Blackbrow bleak (<i>Acanthalburnus microlepis</i>)	Not migratory ²	L:12-15 cm, H:4-6 cm, max:25x9cm ^{1,2}	Widespread in downstream of the Hrazdan River. In the shallow water of rivers, reservoirs, channels and ponds ²	Spawning season is from late April to the end of July. Favorite places for spawning is on the water plants at the coastal parts of rivers and reservoirs at the depth of 0.5-1.5 m ¹	Down stream
5.Brown trout (<i>Salmo trutta fario</i>) ^{1,2,3}	From upstream to downstream at late winter and from downstream to upstream at middle autumn	L:25-30 cm, H:5-6 cm, max:50x10cm	Widespread in upstream of the Hrazdan River and in small rivers in its basin. Mountain stream, sometime in the shallow water of rivers	Spawning season is from October to December. Favorite places for spawning is on the sand or gravel at the upstream of rivers at the depth of 0.1-0.4 m	Up stream
6.Bulatmai barbell (<i>Luciobarbus capito</i>)	Not migratory ^{1,2,3}	L:35-50 cm, H:8.5-12 cm, max:90x19cm ^{1,2,3}	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. Rivers, also channels and reservoirs ^{1,2,3}	The males spawn in June. Favorite places for spawning is on the rocks or gravel bottom of river at the depth of 0.2-0.5 m ^{1,2}	Down stream
7.Chub (<i>Squalius orientalis</i>) ^{1,2,3}	Partially, from upstream to downstream at autumn or from downstream to upstream at middle spring	L:15-25 cm, H:4-7.5 cm, max:40x10cm	Widespread from downstream to middle stream of Hrazdan River. In the shallow water of rivers, channels, ponds, lakes and reservoirs	Spawning season is from May to August. Favorite places for spawning are at the coastal parts of the small rivers at the depth of 0.3-0.7 m. The eggs are pelagic (the eggs are laid in the midwaters)	Up & down stream
8.Common bream <i>Abramis brama</i>	From upstream to downstream at early autumn and from downstream to upstream at middle spring ²	L:25-35cm, H:10-15cm, max:50x22cm ²	Widespread in downstream of the Hrazdan River, channels, ponds, and sometime reservoirs ^{1,4}	Spawning season is from April to June. Favorite places for spawning is on the water plants at the coastal parts of rivers/channels at the depth of 0.2-0.7 m ²	Down stream
9.Common carp (<i>Cyprinus carpio</i>)	From upstream to downstream at early autumn and from downstream to upstream at	L:35-45cm, H:8.5-14cm, max:70x23cm ^{1,2,3}	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. Rivers, lakes, also channels, reservoirs and ponds ^{1,2,3}	Spawning season is from April to June. Favorite places for spawning are at the coastal parts of rivers, ponds, channels, reservoirs at the depth of 0.2-0.5 m on the	Down stream

Fish species	Migratory	Size of the fish	Main habitat	Spawning conditions	Capture point
	middle spring. This species does not make the migration in the lakes, reservoirs and ponds ^{1,3}			water plants ^{1,2,3}	
10. Eastern mosquitofish (<i>Gambusia holbrooki</i>)	Not migratory ²	L: 2-4 cm, H: 0.4-0.8 cm, max: 6x1.2 cm ^{1,2}	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. In the shallow water and ponds, reservoirs ^{1,2}	Spawning season is from March to November. Favorite places for spawning in the water plants on the surface water ^{1,2}	Down stream
11. European bitterling (<i>Rhodeus amarus</i>) ²	Not migratory	L: 4-6 cm, H: 1.5-2.5 cm, max: 9x3.5 cm	Widespread downstream of Hrazdan River. In the shallow water of rivers, channels and ponds	Spawning season is from late March and to September. Favorite place for spawning is in the shell of Anadonta sp. (freshwater mussels) at the depth of 0.1-1.0 m	Down stream
12. Gudgeon (<i>Gobio gobio</i>) ⁵	Not migratory	L: 6-10 cm, H: 2-2.5 cm, max: 15x3.5 cm	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. In the shallow water of rivers, channels and ponds	Spawning season is from April to June. Favorite places for spawning is on the sand, small rocks, gravel ground, water plants at the coastal parts of the rivers, channels and ponds at the depth of 0.1-0.5 m	Down stream
13. Kura barbell (<i>Barbus lacerata cyri</i>)	Yes (partially). From upstream to downstream at late autumn and from downstream to upstream at early spring ^{1,3}	L: 12-18 cm, H: 3.5-5.5 cm, max: 25x7 cm ^{1,2,3}	Widespread from downstream to upstream of Hrazdan River. In the shallow water of rivers, mountain stream and channels ^{1,2,3}	Spawning season is from April to August. Favorite places for spawning is on the sand and gravel ground at the coastal parts of rivers and channels at the depth of 0.2-1.0 m ¹	Up, mid and down stream
14. Kura bleak (<i>Alburnus filippii</i>) ^{1,2}	Not migratory	L: 7-12 cm, H: 2.5-3.5 cm, max: 15x4 cm	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. In the shallow water of rivers and channels	Spawning season is from late April to the end of June. Favorite places for spawning is on the water plants or bottom gravel of the coastal parts of rivers and channels at the depth of 0.3-1.0 m	Down stream
15. Kura khramulya (<i>Capoeta capoeta</i>)	From upstream to downstream at middle autumn and from downstream to upstream at early spring ¹	L: 30-40 cm, H: 7-10 cm, max: 70x18 cm ^{1,2}	Widespread from downstream to middle stream of Hrazdan River. In the shallow water of rivers, channels and reservoirs ^{1,2}	Spawning season is from early June to July. Favorite places for spawning is on the sand or gravel ground at the coastal parts of rivers at the depth of 0.3-1.0 m. The biology of Kura khramulya in reservoirs of Armenia is unknown ²	Down stream
16. Kura loach (<i>Oxynoemacheilus brandtii</i>)	Not migratory ²	L: 4-7 cm, H: 1.2-1.8 cm, max: 10x2 cm ^{1,2}	Widespread from downstream to middle upstream of Hrazdan River. In the shallow water of rivers and channels ²	The biology of Kura loach in Armenia is unknown ²	Mid & down stream
17. Kura nase (<i>Chondrostoma cyr</i>)	From upstream to downstream at autumn and from downstream to upstream at middle spring ^{1,3}	L: 12-15 cm, H: 2.5-4.0 cm, max: 25x5.0 cm ^{1,2}	Widespread from downstream to middle stream of Hrazdan River. In the shallow water of rivers, channels and reservoirs ^{1,2,3}	Spawning season is from late March to June. Favorite places for spawning is on the sand and gravel ground at the coastal parts of the upstream rivers at the depth of 0.3-0.5 m ^{1,2}	Up & down stream
18. Monkey goby	Not migratory	L: 6-12 cm,	Widespread in downstream of the Hrazdan	Spawning season is from February to June. Favorite	Down

Fish species	Migratory	Size of the fish	Main habitat	Spawning conditions	Capture point
<i>(Neogobius fluviatilis)</i> ²		H:1.2-2.5 cm, max:20x4 cm	River from Araks River to Yerevan. In the shallow water of rivers, channels, reservoirs and ponds	places for spawning are under the stones at the coastal parts of rivers, channels, reservoirs at the depth of 0.4-1.5 m	stream
19.Mursa <i>(Luciobarbus mursa)</i>	Not migratory ^{1,3}	L:30-40 cm, H:6-8 cm, max:50x10cm ^{1,2,3}	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. Rivers, also in the channels ^{1,2,3}	Spawning season is from April to June. The biology of Mursa in reservoirs of Armenia is unknown ^{1,2,3}	Down stream
20. North Caucasian bleak <i>(Alburnus hohenackeri)</i> ²	Not migratory	L:6-10 cm, H:2-3 cm, max:14x4.5 cm	Widespread in downstream of the Hrazdan River. In the shallow water of rivers, channels and ponds	Spawning season is from late April to the end of May. Favorite places for spawning is on the water plants or bottom gravel at the coastal parts of rivers and channels at the depth of 0.1-0.5 m	Down stream
21.Prussian carp <i>(Carassius gibelio)</i> ²	From upstream to downstream at middle autumn and from downstream to upstream at middle spring. This species does not make the migration in the lakes, reservoirs and ponds	L:12-18 cm, H:4-6.5 cm, max:35x9.5cm	Widespread from downstream to upstream of Hrazdan River. In the shallow water of rivers, channels, reservoirs and ponds	Spawning season is from March to July. Favorite places for spawning is on the water plants at the coastal parts of rivers, ponds, channels, reservoirs at the depth of 0.1-1.5 m	Up, mid and down stream
22.Rainbow trout <i>(Oncorhynchus mykiss)</i> ²	It is not observed regularly. The Rainbow trout is identified throughout of the Hrazdan River, where penetrates from the fish farms	L:20-30cm, H:4.5-6.5cm, max:60x14cm	Rivers, ponds, however, it has no main habitat in Armenia	Spawning of rainbow trout in the rivers of Armenia is unknown	Up, mid and down stream
23.Sevan khramulya (Capoeta capoeta sevangi) ^{1,2,3}	From upstream to downstream at late autumn and from downstream to upstream at early spring	L: 20-30 cm, H:5-7.5 cm, max:50x12 cm	Widespread from downstream to upstream of Hrazdan River. Lakes and in the shallow water of rivers, channels and reservoirs	Spawning season is from April to August. Favorite places for spawning is on the sand or gravel ground at the coastal parts of rivers, lakes, ponds and reservoirs at the depth of 0.1-0.6 m	Up, mid and down stream
24.South Caspian sprilin <i>(Alburnoides eichwaldi)</i> ^{1,2,3}	Partially migratory. From upstream to downstream at late autumn and from downstream to upstream at early spring	L:6-8 cm, H:2-3 cm, max:12x3.5 cm	Widespread from downstream to upstream of Hrazdan River. In the shallow water of rivers and mountain stream, channels and reservoirs	Spawning season is from April to July. The fish can spawn 2-3 times per year. Favorite places for spawning is on the rocky bottom of the coastal parts of rivers at the depth of 0.1-0.5 m	Up, mid and down stream
25.Sunbleak <i>(Leucaspis deloneatus)</i> ²	Not migratory	L:4-6 cm, H:1-1.3 cm, max:8x1.8 cm	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. In the shallow water of rivers and ponds	Spawning season is from April to May. Favorite places for spawning is on the water plants at the coastal parts of rivers, ponds at the depth of 0.5-1.5 m	Down stream
26.Topmouth gudgeon <i>(Pseudorasbora parva)</i> ²	Not migratory	L:3.5-6 cm, H:1-1.5 cm,	Widespread in downstream of the Hrazdan River from Araks River to Yerevan. In the	Spawning season is from April to July. Favorite places for spawning is on the water plants or rocky ground at the	Up, mid and down

Fish species	Migratory	Size of the fish	Main habitat	Spawning conditions	Capture point
27. Wels catfish (<i>Silurus glanis</i>) ^{1,2,3}	Not migratory	max:9x2 cm L:80-120 cm, H:15-20 cm, max:300x48 cm	shallow water of rivers and channels, reservoirs and ponds Widespread in downstream of the Hrazdan River, generally in the deep rivers and channels	coastal parts of rivers, ponds, channels, reservoirs at the depth of 0.2-0.8 m Favorite places for spawning is on the water plants and muddy bottom at the coastal parts or average depth of rivers, channels at the depth of 0.5-3.0 m	stream Down stream
28. White bream (<i>Blicca bjoerkna transcaucasica</i>)	Not migratory ¹	L:10-12 cm, H:3.5-5 cm, max:18x7 cm ^{1,2,3}	Widespread in downstream of the Hrazdan River from Araks River to Yerevan, in the shallow water of rivers, channels and ponds ^{1,2,3}	Spawning season is from April to end of May. Favorite places for spawning is on the water plants at the coastal parts of rivers and channels at the depth of 0.1-0.5 m ^{1,2}	Down stream

*Identified location is categorized into upstream, mid-stream and downstream of the Hrazdan River as shown in Figure-1.

L: the medium length of the body, H: the medium height of the body, max: the maximum body size

Source 1: Dadikyan, 1986, Fishes of Armenia. Yerevan, Academy of Sciences of the Armenian SSR

2: Pipoyan, 2012, The Ichthyofauna of Armenia: Stages of Formation and Present State, Publishing-ISBN 978-3-8473-9977-3

3: Barach, 1940, Fishes of Armenia// Proceedings of the Sevan Hydro biological Station. 1940 - Volume 6

4: Pipoyan, 1998a, Reconstruction of fish fauna under the influence of anthropogenic factors // Environmental issues. Abstracts of scientific conference in Yerevan

5: Pipoyan, 1998b, The new species for the fauna of Armenia - gudgeon Gobio gobio (Cyprinidae) // Journal of Ichthyology

Appendix K-6: Checklist

Category	Environmental Item	Main Check Items	Yes (Y) No (N)	Confirmation of Environmental Considerations
1 Permits and Explanation	(1) ESIA and Environmental Permits	(a) Has ESIA report been officially completed? (b) Has ESIA report been approved by authorities of the host country's government? (c) Has ESIA report been unconditionally approved? If conditions are imposed on the approval of ESIA report, are the conditions satisfied? (d) In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	(a) Y (b) N (c) N (d) N	(a) It has been completed. (b) (c) SCWE will submit the ESIA Report to MNP for approval. It takes several months for ESIA report approval by MNP in general. (d) No other permit is needed.
	(2) Explanation to the Public	(a) Are contents of the project and the potential impacts adequately explained to the public based on appropriate procedures, including information disclosure? Is understanding obtained from the public? b) Are proper responses made to comments from the public and regulatory authorities?	(a) Y (b) Y	a) Based on the law, the Draft ESIA Report and F/S Report were uploaded at homepage of the SCWE. The series of stakeholder meetings to explain the Draft ESIA Report under the name of SCWE have been organized, and there was no objection by the participants. b) The PIU members responded to the questions at the stakeholder meetings properly
	(3) Examination of alternatives	(a) Have alternative plans of the project been examined with social and environmental considerations?	(a) Y	In terms of 1) water resource, 2) reservoir site, 3) reservoir area, and 4) anti-filtration works, alternatives are examined, in order. The route of canal is proposed to avoid the physical relocation and to minimize land acquisition.
2 Mitigation measures	(1) Water Quality	(a) Does water quality of dam pond/reservoir comply with the country's ambient water quality standards? Is there a possibility that proliferation of phytoplankton and zooplankton will occur? (b) Does the quality of water discharged from the dam pond/reservoir comply with the country's ambient water quality standards? (c) Are adequate measures, such as clearance of woody vegetation from the inundation zone prior to flooding planned to prevent water quality degradation in the dam pond/reservoir? (d) Is there a possibility that reduced the river flow downstream will cause water quality degradation resulting in areas that do not comply with the country's ambient water quality standards? (e) Is the discharge of water from the lower portion of the dam pond/reservoir (the water temperature of the lower portion is generally lower than the water temperature of the upper portion) planned by considering the impacts to downstream areas?	(a) Y (b) Y (c) Y (d) N (e) N	(a) Quality of the planned water source, namely, water of Hrazdan River is suitable as irrigation water in accordance with the FAO and Armenian Standards. In the Reservoir, water course will be generated since the stored water will be diverted. Thus, no eutrophication of the Reservoir is expected and no such case has been reported in Armenia. (b) As mentioned before, Hrazdan River water is proper for irrigation, and no eutrophication is expected. (c) There are fruit trees to be inundated, and clearance will be done. (d) Water deterioration in the downstream is not expected. (e) The target crops of irrigation by the Reservoir are upland crops, and water temperature will not be a big issue.

Category	Environmental Item	Main Check Items	Yes (Y) No (N)	Confirmation of Environmental Considerations
	(2) Waste	(a) In the case of that large volume of excavated/dredged materials are generated, are the excavated/dredged materials properly treated and disposed of in accordance with the country's standards?	(a) Y	The generated waste by the construction will be reused for other purposes. Waste not to be recycles will be disposed at specified place by MNP. It is needed to get "waste passport" for waste disposal in accordance with the Law on Waste.
3 Natural Environment	(1) Protected Areas	(a) Is the project site located in protected areas designated by the country's laws or international treaties and conventions? Is there a possibility that the project will affect the protected areas?	(a) N	Protected areas are far away from the construction sites and no damage is expected to such protected areas.
	(2) Ecosystem	(a) Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats (e.g., coral reefs, mangroves, or tidal flats)? (b) Does the project site encompass the protected habitats of endangered species designated by the country's laws or international treaties and conventions? (c) Is there a possibility that the project will adversely affect downstream aquatic organisms, animals, plants, and ecosystems? Are adequate protection measures taken to reduce the impacts on the ecosystem? (d) Is there a possibility that installation of structures, such as dams will block the movement of the migratory fish species (such as salmon, trout and eel that move between rivers and sea for spawning)? Are adequate measures taken to reduce the impacts on these species?	(a) N (b) N (c) N (d) N	(c) Due to the Project, hydrological conditions in the Hrazdan River will be changed to some extent, however, enough water depth and discharge peak in spring season for spawning will be secured.
	(3) Hydrology	(a) Is there a possibility that hydrologic changes due to the project will adversely affect surface water and groundwater flows?	(a) N	Since ecological minimum discharge will be discharged as present. Moreover, no significant change of hydrological conditions will be caused, since current discharge peak in spring season will be secured.
	(4) Topography and Geology	(a) Is there a possibility that reductions in sediment loads downstream due to settling of suspended particles in the reservoir will cause impacts, such as scouring of the downstream riverbeds and soil erosion? Is there a possibility that sedimentation of the reservoir will cause loss of storage capacity, water logging upstream, and formation of sediment deposits at the reservoir entrance? Are the possibilities of the impacts studied, and adequate prevention measures taken?	(a) N	Proposed burrow pit will be submerged in the Reservoir. No big-scale geological change is expected. Slope protection works through rock rip up will be done to prevent from soil erosion.
4 Social Environment	(1) Resettlement and Land expropriation	(a) Is involuntary resettlement/land expropriation caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? (b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement? (c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socio-economic studies on resettlement?	(a) Y (b) Y (c) Y (d) Y (e) Y (f) Y (g) N/Y (h) Y (i) Y (j) Y/N	(a) No physical relocation will be caused while land acquisition will be done. It was examined to minimize the land to be expropriated and to avoid relocation. (b) Public Seminar and Hearings to explain basic compensation package for the affected persons have been done. (c) Compensation cost for land and

Category	Environmental Item	Main Check Items	Yes (Y) No (N)	Confirmation of Environmental Considerations
		(d) Is the compensations going to be paid prior to the resettlement and land expropriation? (e) Is the compensation policies prepared in document? (f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? (g) Are agreements with the affected people obtained prior to resettlement? (h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? (i) Are any plans developed to monitor the impacts of resettlement? (j) Is the grievance redress mechanism established?		standing crops is estimated following the governmental regulations, which considers market price. In addition, support for livelihood recovery for farmers who cultivated in the Reservoir with no legal status is proposed. (d) Prior to land expropriation, compensation shall be paid. (e) The proposed compensation policy is included in the report. (f) Consideration to the vulnerable persons will be paid by payment of allowance of minimum monthly salary for 6 months in Armenia. They will be hired as labors for the construction works with high priority. (g) It is F/S stage of the project, therefore, after the loan agreement between the both government, final census and asset survey will be done. After that, final agreement on the compensation will be exchanged. (h) The PAPs can lodge their complaints in three way, namely 1) through community municipalities, 2) through PIU/SCWE and 3) court directly. PAPs will choose their most convenient and accessible way for grievance redress. (i) A proposed monitoring plan is documented in the report. (j) No new committee will be established, however, existing organizations will handle the grievance. As mentioned in (h) above, three patterns of grievance redress system using existing grievance lodging system are proposed, and the PAPs can choose the most convenient way for them.
	(2) Living and Livelihood	(a) Is there a possibility that the project will adversely affect the living conditions of inhabitants? Are adequate measures considered to reduce the impacts, if necessary? (b) Is there a possibility that the project will adversely affect the downstream land uses? In particular, is there a possibility that reductions in the supply of fertile soils to downstream areas will adversely affect agricultural production? (c) Is sufficient infrastructure (e.g., hospitals, schools, roads) available for project implementation? If existing infrastructure is insufficient, is a plan developed to	(a) Y (b) Y (c) Y (d) N (e) N (f) Y (g) N (h) N	(a) It was examined to minimize the land to be expropriated and to avoid relocation. (b) The proposed Reservoir is not located on the natural river, thus, no land users in the downstream. (c) The project site is located on near Yeghvard City, enough infrastructures have been established. (d) No cases that infectious diseases by any construction works

Category	Environmental Item	Main Check Items	Yes (Y) No (N)	Confirmation of Environmental Considerations
		construct new infrastructure or improve existing infrastructure? (d) Is there a possibility that diseases, including communicable diseases, such as HIV will be introduced due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? (e) Is there a possibility that the existence of the dam will cause impacts on water navigation, such as limitations of vessel traffic and water area uses by local inhabitants? (f) Is the minimum flow required for maintaining downstream water uses secured? (g) Is there a possibility that reductions in water flow downstream or seawater intrusion will cause impacts on downstream water uses and land uses? (h) Is there a possibility that water-borne or water-related diseases (e.g., schistosomiasis, malaria, filariasis) will be introduced?		were caused has been reported in Armenia. Malaria is not common disease. (e) There is no navigation in and around the site. (f) Ecological minimum discharge shall be secured in accordance with the regulation. (g) There is no sea in the country. (h) The Reservoir will have enough depth, it is difficult for mosquito to survive.
	(3) Heritage	(a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	(a)N	There is no heritage in and around the site.
	(4) Land scape	(a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	(a)N	There is no special and esthetic land scape in and around the site.
	(5) Ethnic Minorities and Indigenous Peoples	(a) Does the project comply with the country's laws for rights of ethnic minorities and indigenous peoples? (b) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?	(a) N (b) N	There are no minority people in the affected area.
5. Others	(1) Impacts during Construction	(a) Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? (b) If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (c) If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? (d) In the case of the projects including borrow sites, if construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? (e) If necessary, is health and safety education (e.g., traffic safety, public health) provided for project personnel, including workers?	(a) Y (b) Y (c) Y (d) – (e) Y	(a) Some mitigation measures such as water spray to reduce dust are proposed. (b) During construction stage, sequential works will be done, which will enable the wildlife in the Reservoir to evacuate themselves. (c) Due to land expropriation, some damages to social environment are expected, however, supports to restore their living standard are proposed. (d) The project site has been already developed for farming. There is no primordial nature. (e) It is planned to provide as needed.
	(2) Accident	(a) Are adequate contingency plans and mitigation measures developed to cover both the soft and hard aspects of the project, such as accident prevention programs, installation of prevention facilities and equipment, and safety education for workers? Are adequate measures for emergency response to accidental events considered?	(a) Y (b) N	(a) It is planned to present safety instruction and practice regular maintenance of equipment and vehicles. In case of emergency, warning system will function. (b) The Project proposes to establish warning system to inform

Category	Environmental Item	Main Check Items	Yes (Y) No (N)	Confirmation of Environmental Considerations
		(b) Is a warning system established to alert the inhabitants to water discharge from the dam?		the surrounding community people in case of emergency such as large scale earthquake.
	(3) Monitoring	(a) Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? (b) Are the items, methods and frequencies of the monitoring program adequate? (c) Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? (d) Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	(a) Y (b) Y (c) Y (d) Y	(a) Monitoring parameters are proposed. (b) Practical methods are proposed. (c) It is included in the report. (d) Draft monitoring format is attached in the report.
6. Note	Note on Using Environmental Checklist	(a) If necessary, the impacts to trans-boundary or global issues should be confirmed (e.g., the project includes factors that may cause problems, such as trans-boundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	(a)N	(a) Hrazdan River is not international river, and it is completed within only the territory of Armenia.

Appendix K-7: Letter from Yeghvard City to Chairman of SCWE

1. Original



ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԿՈՏԱՅՔԻ ՄԱՐԶԻ ԵՂՎԱՐԴԻ ՔԱՂԱՔԱՊԵՏ

Հայաստանի Հանրապետության Կոտայքի մարզի Եղվարդ համայնք,
ք. Եղվարդ, Երևանյան 1, Հեռ. (0224) 21110, info@yeghvard.am

N 370
03 նոյեմբեր 2015թ.

ՀՀ ԶՐԱՅԻՆ ՏՆՏԵՍՈՒԹՅԱՆ ՊԵՏԱԿԱՆ
ԿՈՄԻՏԵԻ ՆԱԽԱԳԱՀ
ՊԱՐՈՆ Ա. ՀԱՐՈՒԹՅՈՒՆՅԱՆԻՆ

Հարգելի պարոն Հարությունյան.

Ի կատարումն "Շրջակա միջավայրի վրա ազդեցության գնահատման և փորձաքննության մասին" ՀՀ օրենքի 16-րդ հոդվածի՝ նախնական համաձայնություն եմ տալիս Եղվարդ քաղաքային համայնքի վարչական տարածքում "Եղվարդի ոռոգման համակարգի բարելավման նախագծի" իրականացմանը:

Հարգանքներով՝

ՀԱՄԱՅՆՔԻ ՂԵԿԱՎԱՐ՝

ՆՈՐԱՅՐ ՍԱՐԳՍՅԱՆ

Կապ.՝ Կ. Հարությունյան

Հեռ. 0224-2-11-58

2. English (translated)

N370

03.11.2015

To: Chairman of State Committee of Water Economy, MoA of RA

Mr. A. Harutyunyan

Dear Mr. Harutyunyan,

As an implementation of Article 16 of the law on “Environmental impact assessment and expertise”, I initially give my agreement for implementation of “Yeghvard Irrigation System Improvement Project” within the administrative territory of Yeghvard City.

Regards,

Head of community

Norayr Sargsyan

Appendix K-8: Letter from Nor-Yerznka Village to Chairman of SCWE

1. Original



ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԿՈՏԱՅՔԻ ՄԱՐԶԻ ՆՈՐ ԵՐԶՆԿԱ ՎԱՍՍԱՅՆՔ

Հայաստանի Հանրապետության Կոտայքի մարզի Նոր
Երզնկա համայնք
ՀՀ, Կոտայքի մարզ, գ. Նոր Երզնկա, 2-րդ փող., 33 շ.,
հեռ. (0232)3-67-91, norerznka-village@mail.ru

03.11.2015թ.

ՀՀ ՋՐԱՅԻՆ ՏՆՏԵՍՈՒԹՅԱՆ
ՊԵՏԱԿԱՆ ԿՈՄԻՏԵԻ ՆԱԽԱԳԱՀ
ՊԱՐՈՆ Ա. ՀԱՐՈՒԹՅՈՒՆՅԱՆԻՆ

Հարգելի պարոն Հարությունյան

Ի կատարումն «Շրջակա միջավայրի վրա ազդեցության գնահատման և փորձաքննության
մասին» ՀՀ օրենքի հոդված 16-ի նախնական համաձայնություն եմ տալիս Նոր Երզնկա
համայնքի վարչական տարածքում «Եղվարդի ոռոգման համակարգի բարելավման
նախագծի» իրականացմանը:



ՀԱՍՏԱՆՔԻ ՂԵԿԱՎԱՐ *Ռե. Կասյան* ԱԼԻՆԱ ՀԱՐՈՒԹՅՈՒՆՅԱՆ

2. English (translated)

03.11.2015

To: Chairman of State Committee of Water Economy, MoA of RA
Mr. A. Harutyunyan

Dear Mr. Harutyunyan,

As an implementation of Article 16 of the law on “Environmental impact assessment and expertise”, I initially give my agreement for implementation of “Yeghvard Irrigation System Improvement Project” within the administrative territory of Nor Yernka community.

Head of community
Alina Harutyunyan

Appendix K-9: Terms of Reference for ESIA Report Issued from the MNP

1. Original

Հավելված N2

ՀՀ բնապահպանության նախարարի

2014թ. նոյեմբերի << 18 >>-ի

N 347-Ն հրամանի

ՏԵԽՆԻԿԱԿԱՆ ԱՌԱՋԱԴՐԱՆՔ

/Նախատեսվող գործունեության/

SU 04

<< 14 >> 01 2016թ.

Սույն առաջադրանքը կազմված է <<Շրջակա միջավայրի վրա ազդեցության գնահատման և փորձաքննության մասին>> ՀՀ օրենքի (այսուհետ՝ Օրենք) դրույթների համաձայն և հիմք է հանդիսանում նախատեսվող Ա կամ Բ կատեգորիայի գործունեության՝ փորձաքննության հիմնական փուլին ներկայացվող շրջակա միջավայրի վրա ազդեցության հիմնական գնահատման հաշվետվության մշակման համար՝ ըստ ստորև ներկայացվող պահանջների.

1. Ձեռնարկողի անվանումը և հասցեն՝ ՀՀ գն ջրային տնտեսության պետական կոմիտե
Ք. Երևան 0010, Վարդանանց 13ա.
2. Նախատեսվող գործունեությունը և նրա կատեգորիան՝ <<Եղվարդի ոռոգման համակարգի բարելավումը>> նախագծի նախնական գնահատման հայտ՝ <<Ա>> կատեգորիա
3. Ազդակիր համայնքը (ները) Եղվարդ, Նոր Երզնկա համայնքներ
4. Շրջակա միջավայրի վրա ազդեցության գնահատման գործընթացում դիտարկվող օբյեկտները և բնութագրերը նախատեսել համաձայն Օրենքի 7-րդ հոդվածի 1-ին մասի 1-ից 13-րդ կետերի Անհրաժեշտ է դիտարկել կետերում նշված բոլոր օբյեկտները և բնութագրերը:
5. Շրջակա միջավայրի և մարդու առողջության վրա ազդեցության գնահատման հաշվետվության բովանդակությունը և դրան կից ներկայացվող փաստաթղթերը նախատեսել համաձայն Օրենքի 18-րդ հոդվածի 2-րդ մասի 1-ից 15-րդ և 3-րդ Շրջակա միջավայրի վրա ազդեցության գնահատման հաշվետվությունում անհրաժեշտ է ներառել նշված բոլոր կետերի ցուցանիշները և փաստաթղթերը: Անհրաժեշտ է հաշվետվությունում ներառել նախատեսվող բոլոր գործունեությունների /ջրամբար, ջրանցքներ և այլն/ շրջակա

մասի 2-ից 6-րդ կետերի

միջավայրի վրա հնարավոր ազդեցությունները, նաև գումարային ազդեցությունները՝ շինարարության, շահագործման, արտակարգ և վթարային իրավիճակների դեպքում:

Անհրաժեշտ է դիտարկել նաև նախատեսվող գործունեության ազդեցությունը Հրազդան, Քասախ գետերի, Արզնի Շամիրամ ջրանցքի վրա:

Անհրաժեշտ է՝

- ներկայացնել պահպանման սանիտարական գոտու նկարագրությունը, դրա պահպանմանն ուղղված միջոցառումները:

- մշտադիտարկումների իրականացումը, եղանակները, դիտակետերի տեղադրման քարտեզագրական նյութերը:

- տարածքի վերականգնմանն, ռեկուլտիվացիային ուղղված միջոցառումները, դրանց իրականացման ֆինանսական միջոցները:

Հողաբուսաշերտի հետագա օգտագործման այլընտրանքային լուծումները՝ համապատասխան հիմնավորումներով: Որպես առաջնահերթություն ըննարկել հարցին վերաբերող ազդակիր համայնքի առաջարկությունները:

6. Համապատասխան ոլորտի պետական լիազորված մարմնի եզրակացության կամ կարծիքի վերաբերյալ պահանջը՝

ՀՀ առողջապահության, ՀՀ տարածքային կառավարման և արտակարգ իրավիճակների նախարարություններ, ՀՀԳԱԱ Հիդրոերկրաբանության ինստիտուտ:

7. Գործընթացի մասնակիցները համաձայն Օրենքի 4-րդ հոդվածի 1-ին մասի 22-րդ կետի

Եղվարդ համայնքի քաղաքապետարան, Նոր Երզնկա համայնքապետարան համայնքներ, հանրություն:

8. Հանրության ծանուցումը և ըննարկումների իրականացումը կատարել համաձայն Օրենքի 26-րդ հոդվածի 2-րդ, մասի 2-րդ, 3-րդ կետերի, 3-րդ մասի, 5-րդ մասի 1-ին, 2-րդ կետերի, 7-րդ և 8-րդ մասերի և «Հանրային ծանուցման և ըննարկումների իրականացման կարգը սահմանելու մասին» ՀՀ

Գնահատման ընթացքում համայնքների քաղաքապետարան /գյուղապետարանը՝ ձեռնարկողի հետ համատեղ պետք է իրականացնի հանրության ծանուցում և հանրային ըննարկումներ: Արձանագրությունները, տեսաձայնագրության կրիչը, հանրության դիտողությունների հիմնավորված

կառավարության 19.11.2014թ N1325-Ն որոշման

պատասխանների ամփոփաթեթը պետք է ներառել շրջակա միջավայրի վրա ազդեցության գնահատման հաշվետվությունում և ներկայացնել ՀՀ քննապահպանության նախարարություն՝ փորձաքննության:

9. Պետական տուրքի չափը՝

500.000 (հինգ հարյուր հազար) դրամ՝ Ա կատեգորիայի համար

10. Ստացողը և հաշվի համարը՝

ՀՀ ֆինանսների նախարարության գանձապետարան՝ 900005000196

11. Վճարման նպատակը՝

Նախատեսվող փորձաքննության իրականացման համար գործունեության գործընթացի

12. Փորձաքննության հիմնական փուլի սկիզբը համաձայն Օրենքի 19-րդ հոդվածի և ՀՀ շրջակա միջավայրի վրա ազդեցության փորձաքննության իրականացման կարգը սահմանելու մասին>> ՀՀ կառավարության որոշման

Տեխնիկական առաջադրանքի համապատասխան կազմված ՇՄԱԳ հաշվետվությունը՝ ՀՀ քննապահպանության նախարարություն՝ շրջակա միջավայրի վրա ազդեցության փորձաքննություն ներկայացնելը:

<<Շրջակա միջավայրի վրա ազդեցության փորձաքննական կենտրոն>> ՊՈԱԿ-ի տնօրեն



Ա. Սահակյան

<<Շրջակա միջավայրի վրա ազդեցության փորձաքննական կենտրոն>> ՊՈԱԿ-ի փոխտնօրեն


Ս. Փաիկանյան

<<Շրջակա միջավայրի վրա ազդեցության փորձաքննական կենտրոն>> ՊՈԱԿ-ի մասնագետ


Ա. Դոնոյան

2. English (Translated)

Appendix N2

Of the order N 347-N

Of the Minister of Nature Protection of RA

Dated on 18th November 2014

TECHNICAL REQUIREMENTS (Terms of reference)

(of the planned activity)

ToR 04

14.01.2016

Current ToR is composed according to the provisions of the law of RA “about environmental impact assessment and expertise” (hereinafter referred to as “Law”), and is the basis for preparation of environmental impact assessment report for planned activity of category A or B during the main stage of expertise, with the following requirements:

1	Name and address of undertaker	SCWE, MoA of RA 13a Vardanants str., 0010, Yerevan city
2	Planned activity and its category	Application of initial assessment of “Yeghvard irrigation system improvement” project, category A
3	Affected community (-ies)	Yeghvard, Nor Yerznka community
4	The objects and features subject to environmental impact assessment shall be considered according to the points 1 to 13 of the 1 st part of the 7 th Article of the Law.	All the objects and features mentioned in those points shall be considered.
5	The content of environmental and human health impact assessment report and attached documents shall be considered according to the points 1 to 15 of part 2 and points 2 to 6 of part 3 of the Article 18 of the Law.	Indices and documents of all the mentioned points must be included in the Environmental impact assessment report. Possible environmental impacts of all the planned activities (reservoir, canals, etc.), and also sum impacts (in case of construction, exploitation, emergency situations) must be included in the report, Impact of the planned activity to the Hrazdan and Kasakh rivers and Arzni-Shamiram canal must also be considered. It is necessary to: - Submit the description of the protection sanitary zone, measures for its maintenance; - Implementation and methods of monitoring, cartographic materials of locations of the observation points;

		- Measures for recovery and recultivation of the territory, financial means for its implementation: Alternative solutions for further use of the soil and grass cover with appropriate substantiations. Discuss the proposals of the affected community as a priority issue.
6	Requirement on conclusion or opinion of the state authorized body of the appropriate field.	RA Ministry of Healthcare, RA Ministry of Territorial Administration and Emergency Situations, RA NAS Institute of Hydrogeology
7	Participants of the activity according to the point 22 of the 1 st part of the Article 4 of the Law.	Municipality of Yeghvard community, Nor Yernka community office, public.
8	Public notification and discussions should be done according to the points 2 and 3 of the part 2, part 3, points 1 and 2 of the part 5, parts 7 and 8 of the Article 26 of the Law and according to the RA Government decision N1325-N (dated on 19.11.201) about "defining the order of implementation of public notification and discussions".	The community office together with the undertaker shall implement public notification and public discussions. The minutes, video recording and summary of substantiated answers to the comments of the public must be included in the environmental impact assessment report, which must be submitted to the Ministry of Nature Protection for expertise.
9	Amount of the State fee	500,000 (five hundred thousand) drams for Category A
10	Recipient and account Number	Treasury of the Ministry of Finances: 900005000196
11	Purpose of the payment	for implementation of expertise of the planned activity
12	Start of the main stage of expertise according to the Article 19 of the Law and RA Government decision "about defining the order of implementation of expertise of environmental impact"	Submission of the ESIA report composed according to the ToR to the Ministry of Nature Protection for expertise.

Director of the "Environmental Impact Expertise Center" SNCO

V.Sahakyan

Deputy Director of the "Environmental Impact Expertise Center" SNCO

S.Pahlevanyan

Specialist of the "Environmental Impact Expertise Center" SNCO

A.Drnoyan

Appendix K-10: Questionnaire of Socioeconomic Survey

Questionnaire No. _____

Name of Interviewer: _____

Date of Interview: ____ / ____ / 2016

Cadastral Number: _____

INTERVIEWEE'S PROFILE		
Full Name: Mr. / Ms. _____		Age: (____) years old
Contact Number: _____ - _____		
Marz: _____	City: _____	Community: _____

Family Characteristics

Q.1 Number of family members who live with you (including you)? Male: _____ / Female: _____

Q.2 Number of person older than 65 years old in your household: _____ person(s)

Q.3 Are there any disabled persons in your household? 1. Yes 2. No

(1) If yes, how many? (_____) person(s)

Q.4 Educational status of head of family:

1. None 2. Elementary 3. Primary (8, 9 grade) 4. Secondary general

5. Average professional 6. Higher 7. Postgraduate

6. Other (please specify: _____)

Q.5 Sex of household head: 1. Male 2. Female

Q.6 Does the head of household live together?

1. Yes 2. No. He/ she is out of house, since he/she is a migrant labor in other cities/ countries.

3. Other (please specify: _____)

Domestic Finance

Q.7 What are income sources of your household? (Indicate the all possible options)

1. Farming 2. Aquaculture 3. House/ Land lent income 4. Pension

5. Business/ Shop 6. Carpenter 7. Livestock 8. School teacher

9. Public officer 10. Labor for other person's farmland 11. Factory labor

12. Company worker 13. Remittance from family members who work in other cities/ countries

14. Others (please specify: _____)

Q.8 What is main income source of your household apart from farming? _____

Q.9 How much is the annual gross income of your household apart from farming? _____ AMD

Q.10 How much is the annual gross income of your household from livestock? _____ AMD

Q.11 How much does your household spend for taking care of livestock annually? _____ AMD

Q.12 Please describe annual situation of agricultural activities of your household.

Name of Crop*	Cultivating Area**		Annual Harvest	Income
1. _____	1 st _____ m ² / ha 2 nd _____ m ² / ha 3 rd _____ m ² / ha	_____ time(s)	_____ kg (_____ kg for sale) (_____ kg for house)	_____ AMD
2. _____	1 st _____ m ² / ha 2 nd _____ m ² / ha 3 rd _____ m ² / ha	_____ time(s)	_____ kg (_____ kg for sale) (_____ kg for house)	_____ AMD
3. _____	1 st _____ m ² / ha 2 nd _____ m ² / ha 3 rd _____ m ² / ha	_____ time(s)	_____ kg (_____ kg for sale) (_____ kg for house)	_____ AMD
4. _____	1 st _____ m ² / ha 2 nd _____ m ² / ha 3 rd _____ m ² / ha	_____ time(s)	_____ kg (_____ kg for sale) (_____ kg for house)	_____ AMD
5. _____	1 st _____ m ² / ha 2 nd _____ m ² / ha 3 rd _____ m ² / ha	_____ time(s)	_____ kg (_____ kg for sale) (_____ kg for house)	_____ AMD

* Please use supplemental sheets for more than five crops.

** Please choose the unit.

Q.13 If your household has cultivated within the Project Affected Area, please describe annual situation of agricultural activities within the Project Affected Area. (If no, go to Q.14)

Name of Crop*	Location	Cultivating Area**		Annual Harvest	Income
1. _____	1. Within the Yeghvard Reservoir Area 2. Outside of the Yeghvard Reservoir Area	1 st _____ m ² / ha 2 nd _____ m ² / ha 3 rd _____ m ² / ha	_____ time(s)	_____ kg (_____ kg for sale) (_____ kg for house)	_____ AMD
2. _____	1. Within the Yeghvard Reservoir Area 2. Outside of the Yeghvard Reservoir Area	1 st _____ m ² / ha 2 nd _____ m ² / ha 3 rd _____ m ² / ha	_____ time(s)	_____ kg (_____ kg for sale) (_____ kg for house)	_____ AMD
3. _____	1. Within the Yeghvard Reservoir Area 2. Outside of the Yeghvard Reservoir Area	1 st _____ m ² / ha 2 nd _____ m ² / ha 3 rd _____ m ² / ha	_____ time(s)	_____ kg (_____ kg for sale) (_____ kg for house)	_____ AMD
4. _____	1. Within the Yeghvard Reservoir Area 2. Outside of the Yeghvard Reservoir Area	1 st _____ m ² / ha 2 nd _____ m ² / ha 3 rd _____ m ² / ha	_____ time(s)	_____ kg (_____ kg for sale) (_____ kg for house)	_____ AMD
5. _____	1. Within the Yeghvard Reservoir Area 2. Outside of the Yeghvard Reservoir Area	1 st _____ m ² / ha 2 nd _____ m ² / ha 3 rd _____ m ² / ha	_____ time(s)	_____ kg (_____ kg for sale) (_____ kg for house)	_____ AMD

Q.14 How much does your household spend for farm inputs in this area annually?

Seed: _____AMD, Fertilizer: _____AMD,
Pesticide: _____AMD, Labor: _____AMD,
Water fee: _____AMD, Fee of WUA membership: _____AMD,
Fuel and maintenance cost for agricultural machines: _____AMD

Q.15 If your household has cultivated within the Project Affected Area, how much does your household spend for farm inputs within the Project Affected Area? (If no, go to Q.16)

(1) Within the Yeghvard Reservoir Area

Seed: _____AMD, Fertilizer: _____AMD,
Pesticide: _____AMD, Labor: _____AMD,
Water fee: _____AMD, Fee of WUA membership: _____AMD,
Fuel and maintenance cost for agricultural machines: _____AMD

(2) Outside of the Yeghvard Reservoir Area

Seed: _____AMD, Fertilizer: _____AMD,
Pesticide: _____AMD, Labor: _____AMD,
Water fee: _____AMD, Fee of WUA membership: _____AMD,
Fuel and maintenance cost for agricultural machines: _____AMD

Living Condition

Q.16 Have you done some activities within the Project Affected Area? 1. Yes 2. No (go to Q.17)

(1) If yes, where is the location?

1. Within the Yeghvard Reservoir Area 2. Outside of the Yeghvard Reservoir

(2) If yes, how many years have you owned the land there? (_____) years

(3) If yes, does your household have any certifications?

1. Certifications for property rights from the cadastral office 2. Nothing

3. Others (please specify: _____)

Q.17 Have you had any buildings on the Project Affected Area? 1. Yes 2. No (go to Q.18)

(1) If yes, where is the location?

1. Within the Yeghvard Reservoir Area 2. Outside of the Yeghvard Reservoir

(2) If yes, how many years have you owned the buildings there? (_____) years

(3) If yes, does your household have any certifications?

1. Certifications for property rights from the cadastral office 2. Nothing

3. Others (please specify: _____)

Q.18 What kind of domestic and agricultural machines does your household have?

(Indicate the all possible options)

- | | | | |
|------------------------------------|---------------------------|-----------------------|-------------------|
| 1. TV | 2. Refrigerator | 3. Washing machine | 4. Heating boiler |
| 5. Computer | 6. Passenger car | 7. Truck | 8. Tractor |
| 9. Seeder | 10. Tiller/ cultivator | 11. Combine | 12. Plough |
| 13. Reaper | 14. Grass-cutting vehicle | 15. Forage harvester | |
| 16. Grass pressing machine | 17. Milking equipment | 18. Packaging machine | |
| 19. Fruit processing equipment | 20. Dryer for fruits | | |
| 21. Others (please specify: _____) | | | |

Q.19 Does your household make savings from the revenue of your household?

1. Yes 2. No (go to Q.20)

(1) If yes, how many percent of savings from the total revenue of your household?

Average; _____%

Others

Q.20 What do you think, how will the construction of the Reservoir impact on your community?

(Indicate the all possible options)

1. Water quality in our community will be damaged.
2. Nothing 3. Job opportunity will be increased during the construction period.
4. Others (please specify: _____)

Q.21 What fruits do you expect from the Yeghvard Reservoir Project?

1. We will have the most effective option for water resources protection and use.
2. The shortage of irrigation water in rural lands will be solved.
3. Improvement for irrigation system of our lands.
4. Development of some industries around the Yeghvard Reservoir Area.
5. Irrigation water price will be reduced.
6. Nothing
7. Others (please specify: _____)

Q.22 What is your worries on the Yeghvard Reservoir Project?

1. Safety/ Seismicity related to the Yeghvard Reservoir Project.
2. Financial damage due to the land loss caused by the construction of the Yeghvard Reservoir and related canals.
3. Whether compensation is paid or not for the land loss.
4. Irrigation water price will be increased.
5. Others (please specify: _____)

Appendix K-11: Result of Socioeconomic Survey

No.	Interviewer	Date of Interview	Cadastral no. of Project Affected Lands				Interviewee's PROFILE					Family Characteristics						
			1st	2nd	3rd	4th	1. Mr., 2. Ms.	First Name	Sir Name	Age	Marz	Community	Q.1 Numbers of Family members			Q.2 Numbers of older than 65 years old in your household	Q.3 Are there any disabled persons in your household?	
													Male	Female	Total		1. Yes, 2. No	Numbers
1	-----	11 / 3 / 2016	0024-0006				1	-----	-----	41	Kotayk	Nor Yeznka	4	4	8	1	1	1
2	-----	11 / 3 / 2016	0024-0009				2	-----	-----	42	Kotayk	Nor Yeznka	1	3	4	1	1	1
3	-----	11 / 3 / 2016	0025-0006				1	-----	-----	54	Kotayk	Nor Yeznka	3	2	5	0	2	0
4	-----	11 / 3 / 2016	0024-0005				1	-----	-----	44	Kotayk	Nor Yeznka	2	3	5	0	1	1
5	-----	11 / 3 / 2016	0122-0011				1	-----	-----	43	Kotayk	Nor Yeznka	2	3	5	1	2	0
6	-----	11 / 3 / 2016	0024-0007				1	-----	-----	58	Kotayk	Nor Yeznka	3	3	6	1	2	0
7	-----	11 / 3 / 2016	0134-0001				1	-----	-----	52	Kotayk	Nor Yeznka	1	1	2	1	1	1
8	-----	11 / 3 / 2016	0121-0001-17				1	-----	-----	74	Kotayk	Nor Yeznka	3	4	7	2	2	0
9	-----	11 / 3 / 2016	0026-0017				1	-----	-----	61	Kotayk	Nor Yeznka	2	1	3	1	2	0
10	-----	11 / 3 / 2016	0122-0015	0126-0002	0122-0017	0122-0013	1	-----	-----	66	Kotayk	Nor Yeznka	3	3	6	2	1	2
11	-----	18 / 3 / 2016	0017-0028				2	-----	-----	66	Kotayk	Nor Yeznka	0	2	2	2	1	1
12	-----	18 / 3 / 2016	0026-0024				1	-----	-----	71	Kotayk	Nor Yeznka	3	2	5	1	1	1
13	-----	18 / 3 / 2016	0122-0105				1	-----	-----	35	Kotayk	Nor Yeznka	5	3	8	1	2	0
14	-----	18 / 3 / 2016	0121-0113				2	-----	-----	38	Kotayk	Nor Yeznka	2	6	8	2	2	0
15	-----	18 / 3 / 2016	121-001-09-23	121-001-09-24			1	-----	-----	48	Kotayk	Nor Yeznka	2	2	4	0	2	0
16	-----	30 / 3 / 2016	Illegal	0410-0035			1	-----	-----	52	Kotayk	Yeghvard	2	4	6	0	2	0
17	-----	30 / 3 / 2016	0505-0032				1	-----	-----	79	Kotayk	Yeghvard	4	3	7	2	2	0
18	-----	3 / 3 / 2016	0504-0033	0536-0021			1	-----	-----	54	Kotayk	Yeghvard	3	2	5	0	2	0
19	-----	13 / 3 / 2016	Illegal				1	-----	-----	35	Kotayk	Yeghvard	4	6	10	0	2	0
20	-----	13 / 3 / 2016	Illegal				1	-----	-----	32	Kotayk	Yeghvard	4	2	6	0	2	0
21	-----	13 / 3 / 2016	Illegal				1	-----	-----	39	Kotayk	Yeghvard	2	2	4	0	2	0
22	-----	13 / 3 / 2016	Illegal				1	-----	-----	43	Kotayk	Yeghvard	4	3	7	1	1	1
23	-----	13 / 3 / 2016	0512-0001	0416-0006			1	-----	-----	32	Kotayk	Yeghvard	2	0	2	0	2	0
24	-----	11 / 3 / 2016	0122-0016	0122-0018			1	-----	-----	50	Kotayk	Nor Yeznka	2	2	4	0	2	0
25	-----	4 / 4 / 2016	Illegal				1	-----	-----	59	Kotayk	Yeghvard	4	1	5	0	2	0
26	-----	4 / 4 / 2016	Illegal				1	-----	-----	35	Kotayk	Yeghvard	4	2	6	1	2	0
27	-----	1 / 4 / 2016	Illegal				1	-----	-----	47	Kotayk	Yeghvard	3	2	5	1	2	0
28	-----	5 / 4 / 2016	Illegal				1	-----	-----	44	Kotayk	Yeghvard	3	3	6	2	2	0
29	-----	7 / 4 / 2016	Illegal				1	-----	-----	46	Kotayk	Nor Yeznka	3	3	6	1	2	0
30	-----	7 / 4 / 2016	Illegal				1	-----	-----	32	Kotayk	Nor Yeznka	1	2	3	1	1	1
31	-----	11 / 3 / 2016	Illegal				1	-----	-----	74	Kotayk	Nor Yeznka	3	4	7	2	2	0
32	-----	11 / 3 / 2016	Illegal				1	-----	-----	68	Kotayk	Nor Yeznka	7	5	12	1	2	0

No.	Family Characteristics			Q.6 Does the head of household live together? 1. Yes, 2. No. He/ she is out of house, since he/ she is migrant labor in other cities/ countries. 3. Other (please specify)	Domestic Income			
	Q.4 Educational status of head of family 1. None, 2. Elementary, 3. Primary (8, 9 grade), 4. Secondary general 5. Average professional, 6. Higher, 7. Postgraduate, 8. Other	Q.5 Sex of household head 1. Male, 2. Female			Q.7 What are income sources of your household? (Indicate the all possible options)	Q.8 What is main income source of your household apart from farming?	Q.9 How much is the annual gross income of your household apart from farming?	Q.10 How much is the annual gross income of your household from livestock? (AMD)
1	4	1	1	1,4,7,14-income from work abroad	Income from work abroad	1,000,000	0	
2	5	2	1	1,7,9,14-disability benefit	salary	650,000	0	
3	5	1	1	1,7,14-income from work abroad	Income from work abroad	500,000	400,000	
4	4	1	1	1,14-disability benefit, Income from work abroad	Income from work abroad	500,000	0	
5	4	1	1	1,4,7	pension	400,000	100,000	
6	5	1	1	1,4,14-income from work abroad	Income from work abroad	4,800,000	0	
7	5	1	1	1,3,4	pension	700,000	0	
8	4	1	1	1,4,7	pension	1,000,000	0	
9	5	1	1	1,7,9	salary	1,500,000	100,000	
10	6	1	1	1,4,7,14-disability benefit	pension	1,500,000	300,000	
11	3	2	1	1,4,7	pension	1,300,000	720,000	
12	4	1	1	1,4,7	livestock	2,200,000	1,000,000	
13	4	1	1	1,4,7,9	salary	1,500,000	300,000	
14	5	1	1	1,4,7,9	salary	1,000,000	0	
15	6	1	1	1,7,9	salary	8,000,000	8,000,000	
16	6	1	1	1,7,9,11	salary	4,000,000	2,000,000	
17	6	1	1	1,4,9	salary	5,000,000	0	
18	4	1	1	1,5	salary	10,000,000	0	
19	4	1	1	1,7,14-poverty benefits	poverty benefits	900,000	400,000	
20	4	1	1	1,7,14-self-employed	livestock	3,700,000	2,500,000	
21	5	1	1	1,7	livestock	2,000,000	2,000,000	
22	4	1	1	1,7,14-poverty benefits	poverty benefits	600,000	0	
23	6	1	1	9	salary	2,500,000	0	
24	6	1	1	1,7,12,13	salary	600,000	400,000	
25	4	1	1	1	none	0	0	
26	6	1	1	1,4,7,9,12	pension, salary	3,500,000	1,500,000	
27	5	1	1	1,4,11	salary of labor	2,000,000	0	
28	4	1	1	1,4,7	pension	1,200,000	0	
29	4	1	1	1,4,7,9	salary	1,500,000	0	
30	5	2	1	1,4,7	pension	600,000	0	
31	4	1	1	1,3,4,7	pension	1,100,000	400,000	
32	6	1	1	1,4,7	pension	1,000,000	0	

Domestic Income																
Q.12 Please describe annual situation of agricultural activities of your household.																
No.	3rd Crop							4th Crop								
	Name of crop	Cultivating Area (m2)			No. of times for cultivation (times)	Annual Harvest (kg)		Name of crop	Cultivating Area (m2)			No. of times for cultivation (times)	Annual Harvest (kg)		Annual Income (AMD)	
		1st	2nd	3rd		for sale	for house		1st	2nd	3rd		for sale	for house		
1					0				0	0	0	0			0	0
2					0				0	0	0	0			0	0
3					0				0	0	0	0			0	0
4					0				0	0	0	0			0	0
5	peach				1	3,700	300		0	0	0	0			0	0
6	fruit garden				1	0	100		0	0	0	0			0	0
7	forage grass				2	6,000	0		0	0	0	0			0	0
8					0				0	0	0	0			0	0
9	apricot				1	200	200	walnut	500	0	0	500	0	100	100	0
10					0				0	0	0	0			0	0
11					0				0	0	0	0			0	0
12					0				0	0	0	0			0	0
13					0				0	0	0	0			0	0
14					0			pasture	43,500	0	0	43,500			0	0
15					0				0	0	0	0			0	0
16	Alfalfa	20,000	40,000	0	4	60,000	60,000		0	0	0	0			0	0
17					0				0	0	0	0			0	0
18					0				0	0	0	0			0	0
19					0				0	0	0	0			0	0
20					0				0	0	0	0			0	0
21					0				0	0	0	0			0	0
22					0				0	0	0	0			0	0
23					0				0	0	0	0			0	0
24					0				0	0	0	0			0	0
25					0				0	0	0	0			0	0
26					0				0	0	0	0			0	0
27					0				0	0	0	0			0	0
28					0				0	0	0	0			0	0
29					0				0	0	0	0			0	0
30					0				0	0	0	0			0	0
31					0							0			0	0
32					0							0			0	0

No.	Domestic Finance																	
	Q.13 If your household has cultivated within the Project Affected Area, please describe annual situation of agricultural activities within the Project Affected Area. (If no, go to Q.14)																	
	1st Crop										2nd Crop							
	Name of Crop	Location 1. Within the Reservoir area 2. Outside of the Reservoir area	Cultivating Area (m2)			No. of times for cultivation (times)	Annual Harvest (kg)		Annual Income (AMD)	Name of Crop	Location 1. Within the Reservoir area 2. Outside of the Reservoir area	Cultivating Area (m2)			No. of times for cultivation (times)	Annual Harvest (kg)		Annual Income (AMD)
1st			2nd	3rd	Total		for sale	for house				1st	2nd	3rd		Total	for sale	
1	fruit garden	2	2,000	0	0	2,000	1	100	200	200,000			0	0	0	0	0	0
2	apple	2	200	0	0	200	1	0	275	0		200	0	0	200	0	700	0
3	fruit garden	2	200	0	0	200	1	500	500	500,000			0	0	0	0	0	0
4	fruit garden	2	200	0	0	200	1	50	100	50,000			0	0	0	0	0	0
5	apple	2	2,000	0	0	2,000	1	3,700	300	250,000	2	2,500	0	0	2,500	1	3,700	4,000
6	fruit garden	2	100	0	0	100	1	0	100	0			0	0	0	0	0	250,000
7	forage grass	2	5,000	0	0	5,000	2	6,000	0	350,000			0	0	0	0	0	0
8	forage grass	1	10,000	0	0	10,000	2	0	4,000	0			0	0	0	0	0	0
9	walnut	2	500	0	0	500	1	0	100	0			0	0	0	0	0	0
10	apple	2	700	0	0	700	1	19,700	300	6,000,000			0	0	0	0	0	0
11	apple	2	1,200	0	0	1,200	1	0	150	0	walnut	2	1,200	0	0	1,200	1	70
12	apple	2	400	0	0	400	1	0	500	0			0	0	0	0	0	35,000
13	fruit garden	2	1,400	0	0	1,400	1	2,700	300	1,000,000			0	0	0	0	0	0
14	pasture	1	43,500	0	0	43,500			0				0	0	0	0	0	0
15	pear	1	240,000	0	0	240,000	1	600,000	1,000	150,000,000			0	0	0	0	0	0
16	Alfalfa	1	20,000	0	0	20,000	4	20,000	20,000	1,000,000	apple	2	9,000	3,000	0	12,000	1	7,200
17	wheat	2	10,370	0	0	10,370	1	3,000	2,000	1,000,000			0	0	0	0	800	1,500,000
18	apple	2	11,500	0	0	11,500	1	28,000	2,000	1,400,000			0	0	0	0	0	0
19	wheat	1	10,000	0	0	10,000	1	0	1,500	0			0	0	0	0	0	0
20	barley	1	10,000	0	0	10,000	1	0	2,000	0			0	0	0	0	0	0
21	barley	1	8,000	0	0	8,000	1	2,000	0	240,000			0	0	0	0	0	0
22	barley	1	6,000	0	0	6,000	1	0	1,500	0			0	0	0	0	0	0
23	fallow	1	350,000	0	0	350,000			0		2	9,800	0	0	9,800		0	0
24	forage grass	2	600	1,900	0	2,500	2	4,000	4,000	250,000			0	0	0	0	0	0
25	wheat	1	10,000	5,000	0	15,000	1	0	2,000	0			0	0	0	0	0	750,000
26	sainfoin	1	10,000	0	0	10,000	2	6,000	6,000	1,200,000	wheat or barley	1	15,000	0	0	15,000	1	2,500
27	Alfalfa	1	12,000	0	0	12,000	5	20,000	0	700,000			0	0	0	0	0	0
28	wheat	1	20,000	0	0	20,000	1	0	4,000	0			0	0	0	0	0	0
29	barley	1	10,000	0	0	10,000	1	0	800	0			0	0	0	0	0	0
30	sainfoin	1	35,000	0	0	35,000	1	0	1,800	0			0	0	0	0	0	0
31	forage grass	1	10,000	0	0	10,000	2	0	4,000	0					0	0	0	0
32	wheat	2	10,900	0	0	10,900	1	38,000	2,000	40000					0		0	0

Domestic Finance																
No.	Q.13 If your household has cultivated within the Project Affected Area, please describe annual situation of agricultural activities within the Project Affected Area. (If no, go to Q.14)										Q.14 How much does your household spend for farm inputs?					
	Name of Crop	Location 1 Within Reservoir area 2 Outside of the Reservoir area	Cultivating Area (m2)			No. of times for cultivation (times)	Annual Harvest (kg)		Annual Income (AMD)	Seed (AMD)	Fertilizer (AMD)	Pesticide (AMD)	Labor (AMD)	Water Fee (AMD)	Fee of WUA membership (AMD)	Fuel and maintenance cost for agricultural machines (AMD)
			1st	2nd	3rd		Total	for sale								
1			0	0	0	0				0	20,000	50,000	0	20,000	6,000	0
2			0	0	0	0				0	15,000	0	0	25,000	6,000	15,000
3			0	0	0	0				0	20,000	40,000	0	30,000	6,000	50,000
4			0	0	0	0				0	0	0	0	5,000	6,000	0
5	peach	2	2,500	0	0	2,500	1	3,700	300	4,000	60,000	300,000	150,000	60,000	6,000	30,000
6			0	0	0	0				0	6,000	20,000	0	14,000	6,000	0
7			0	0	0	0				0	70,000	200,000	250,000	130,000	6,000	30,000
8			0	0	0	0				0	40,000	50,000	0	80,000	6,000	0
9			0	0	0	0				0	0	20,000	0	15,000	6,000	0
10			0	0	0	0				0	120,000	500,000	300,000	110,000	6,000	0
11	peach	2	400	0	0	400	1	0	70	70	12,000	0	0	20,000	6,000	0
12			0	0	0	0				0	0	10,000	0	10,000	6,000	50,000
13			0	0	0	0				0	35,000	200,000	200,000	10,000	6,000	150,000
14			0	0	0	0				0	35,000	30,000	0	25,000	6,000	0
15			0	0	0	0				0	6,000,000	6,000,000	2,500,000	3,000,000	6,000	1,000,000
16			0	0	0	0				0	300,000	650,000	470,000	370,000	6,000	120,000
17			0	0	0	0				0	36,000	0	0	0	6,000	0
18			0	0	0	0				0	200,000	400,000	1,200,000	160,000	6,000	200,000
19			0	0	0	0				0	36,000	0	0	0	6,000	0
20			0	0	0	0				0	36,000	0	0	40,000	6,000	130,000
21			0	0	0	0				0	40,000	0	0	20,000	6,000	100,000
22			0	0	0	0				0	25,000	0	0	20,000	6,000	0
23			0	0	0	0				0	0	0	0	0	0	0
24			0	0	0	0				0	60,000	300,000	300,000	120,000	6,000	200,000
25			0	0	0	0				0	80,000	120,000	190,000	180,000	0	30,000
26			0	0	0	0				0	210,000	150,000	0	60,000	0	240,000
27			0	0	0	0				0	15,000	0	150,000	190,000	0	30,000
28			0	0	0	0				0	60,000	50,000	200,000	100,000	0	0
29			0	0	0	0				0	60,000	63,000	230,000	102,000	0	150,000
30			0	0	0	0				0	500,000	0	200,000	70,000	0	60,000
31			0	0	0	0				0	40,000	50,000	0	80,000	6,000	0
32						0				0	1000000	800,000	800,000	1,000,000	6,000	300,000

No.	Domestic Finance											Living Condition			
	Q.15 If your household has cultivated within the Project Affected Area, how much does your household spend for farm inputs within the Project Affected Area? (If no, go to Q.16)											Q.16 Have you done some activities within the Project Affected Area?			
	(1) Within the Reservoir Area						(2) Outside of the Reservoir Area					1. Yes. 2. No	(1) If yes, where is the location? 1. Within the Reservoir Area 2. Outside of the Reservoir Area	(2) If yes, how many years have you owned the land there?	(3) If yes, does your household have any certificates? 1. Certificates for property rights 2. No 3. Others
	Seed (AMD)	Fertilizer (AMD)	Pesticide (AMD)	Labor (AMD)	Water Fee (AMD)	Fee of WUA membership (AMD)	Fuel and maintenance cost for agricultural machines (AMD)	Seed (AMD)	Fertilizer (AMD)	Pesticide (AMD)	Labor (AMD)	Water Fee (AMD)	Fee of WUA membership (AMD)	Fuel and maintenance cost for agricultural machines (AMD)	
1	0	0	0	0	0	0	0	0	20,000	50,000	0	0	2	26	1
2	0	0	0	0	0	0	0	0	15,000	0	0	25,000	6,000	15,000	1
3	0	0	0	0	0	0	0	0	20,000	40,000	0	30,000	6,000	50,000	1
4	0	0	0	0	0	0	0	0	0	0	0	0	6,000	0	1
5	0	0	0	0	0	0	0	0	60,000	300,000	150,000	60,000	6,000	30,000	1
6	0	0	0	0	0	0	0	0	0	10,000	0	5,000	6,000	0	1
7	0	0	0	0	0	0	0	0	0	0	250,000	50,000	6,000	0	1
8	0	20,000	20,000	0	40,000	6,000	0	0	0	0	0	0	0	0	1
9	0	0	0	0	0	0	0	0	0	0	0	0	6,000	0	1
10	0	0	0	0	0	0	0	0	120,000	500,000	300,000	110,000	6,000	0	1
11	0	0	0	0	0	0	0	0	12,000	0	0	20,000	6,000	0	1
12	0	0	0	0	0	0	0	0	0	10,000	0	10,000	6,000	50,000	1
13	0	0	0	0	0	0	0	0	35,000	200,000	200,000	10,000	6,000	150,000	1
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
15	0	6,000,000	6,000,000	2,500,000	3,000,000	6,000	1,000,000	0	0	0	0	0	0	0	1
16	120,000	0	50,000	220,000	300,000	0 or 1000	0	0	300,000	600,000	250,000	70,000	6,000	80,000	1
17	0	0	0	0	0	0	0	72,600	36,000	0	0	0	6,000	0	1
18	0	0	0	0	0	0	0	0	200,000	400,000	1,200,000	160,000	6,000	200,000	1
19	0	36,000	0	0	0	0	0	0	0	0	0	0	0	0	1
20	50,000	36,000	0	0	40,000	6,000	130,000	0	0	0	0	0	0	0	1
21	40,000	40,000	0	0	20,000	6,000	100,000	0	0	0	0	0	0	0	1
22	0	25,000	0	0	20,000	6,000	0	0	0	0	0	0	0	0	1
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
24	0	0	0	0	0	0	0	0	30,000	0	100,000	30,000	6,000	50,000	1
25	80,000	80,000	0	140,000	120,000	0	25,000	0	0	0	0	0	0	0	1
26	120,000	75,000	0	30,000	30,000	0	120,000	0	0	0	0	0	0	0	1
27	15,000	0	35,000	150,000	190,000	0	30,000	0	0	0	0	0	0	0	1
28	60,000	50,000	0	200,000	100,000	0	0	0	0	0	0	0	0	0	1
29	60,000	42,000	0	130,000	60,000	0	100,000	0	0	0	0	0	0	0	1
30	500,000	0	0	200,000	0	0	20,000	0	0	0	0	0	0	0	1
31	0	20,000	20,000	0	40,000	6,000	0	0	0	0	0	0	0	0	1
32	0	0	0	0	0	0	0	1000000	420,000	30,000	180,000	500,000	6,000	150,000	1

No.	Living Condition															Others			
	Q.18 What kind of domestic and agricultural machines does your household have? (Indicate the all possible options)															Q.19 Does your household make savings from the revenue of your household?			
	1. TV	4. Heating Boiler	7. Truck	10. Tiller/ cultivator	13. Peapser vehicle	16. Grass pressing machine	19. Fruit processing equipment	2. Refrigerator	5. Computer	8. Tractor	11. Combine	14. Grass-cutting vehicle	17. Milling equipment	20. Dyer for fruits	21. Other	1. Yes, 2. No	(1) If yes, how many percent of savings from the total revenue of your household? (%)	3. Job opportunity in our community will be damaged.	4. Others (please specify)
1	1,2,3	5, 6	7, 8													2			3
2	1,2,3	5														2			3
3	1,2,3	5, 6														2			3
4	1,2,3															2			3
5	1,2,3	4, 5, 6														2			3
6	1,2,3	5														2			3
7	1,2,3	6	7													2			3
8	1,2,3	5, 6	7													2	1		
9	1,2,3	4, 5, 6														1	2		4-positive
10	1,2,3	5, 6			13							20				2			4-positive
11	1,2,3	5, 6														2	1		
12	1,2,3	5														2			3
13	1,2,3	4, 5, 6	7, 8													1	3		3
14	1,2,3	4, 5														2			3
15	1,2,3	4, 5, 6														1	30		3
16	1,2,3	4, 5, 6	8	10, 12								21. tractor trailer				1	15		3
17	1,2,3	5, 6														2			3
18	1,2,3	4, 5	7, 8	10, 12								19, 20				1	10		3
19	1,2,3	4, 5														2			3
20	1,2,3	4, 5, 6	7, 8		13											2			3
21	1,2,3	4, 5, 6														2		4-hard to say	
22	1,2,3	4, 5, 6	8													2			3
23	1,2,3	4, 5, 6														1	10		3
24	1,2,3	4, 5, 6														1	10	2	
25	1,2	6														2			3
26	1,2,3	5, 6														2			3
27	1,2,3	4, 5, 6														2	1	3, 4-air pollution will be improved, 500-1000 families will lose income	3
28	1,2,3	6														2			
29	1,2,3	4, 5, 6														2	1	3, 4-air pollution will be improved, can't use lands.	
30	1,2,3															2	1	3, 4-air pollution will be improved	
31	1,2,3	5, 6	7													2	1		3
32	1,2,3	4, 5, 6	7, 8, 9	11	13											2			4-negative

Others						
No.	Q.21 What fruits do you expect from the Yeghvard Reservoir Project?			Q.22 What is your worries on the Yeghvard Reservoir Project?		Q.23 Do you want to continue farming activities in this area after the Yeghvard Reservoir Project is restarted? 1. Yes, 2. No
	1. We will have the most effective option for water resources protection and use in our community. 2. The shortage of irrigation water in rural lands will be solved. 3. Improvement for irrigation system of our lands.	4. Development of some industries around the Yeghvard Reservoir Area. 5. Irrigation water price will be reduced. 6. Nothing	7. Others (please specify)	Q.22 What is your worries on the Yeghvard Reservoir Project?		
				1. Safety/ Seismicity related to the Yeghvard Reservoir Project. 2. Financial damage due to the land loss caused by the construction of the Yeghvard Reservoir and related canals.	3. Whether compensation is paid or not for the land loss. 4. Irrigation water price will be increased. 5. Others (please specify)	
1		6		1,2	3	1
2		4		2		1
3	2			2		1
4	2				3	1
5	2			2		1
6		6		1		1
7		5		1		1
8	1			1		1
9	2				3	1
10	1				3	1
11		5		1		1
12	1			1		1
13		6		1,2	3	1
14	1,2,3	4		1,2	3	1
15	1			1,2	3	1
16	1,2,3	4	7-climate change, ecology change	2	3	1
17		6			3	1
18	1,2,3	4,5	7-recreational zones will be built		3	1
19	2			1		1
20		6			3	1
21		4		2		1
22	2			1		1
23	1			1		can't answer
24	1,2,3			1		
25	1,2,3	4, 5	7- recreation, tourism	1, 2	3, 4	1
26	1,2,3	4,5	7- price of real estate will increase, tourism will develop	2	3	1
27		4		2	3	1
28	1,2,3	4		2	3	1
29	1,2,3	4, 5		1		1
30	1,2,3	4		1		1
31	1			1		1
32		6			5-not reliable	1

No.	Others						Q.26 If your household cultivated within the Yeghvard Reservoir Area, have you already know that your household should stop cultivation within the Yeghvard Reservoir Area, when the Yeghvard Reservoir Project is restarted?	If you have any comments or questions on the Yeghvard Reservoir Project, please specify.
	Q.24 If your household cultivated within the Project Affected Area, how did your household get permission for the land use within the Project Affected Area?			Q.25 If your household cultivated within the Project Affected Area, how many years have your household cultivated within the Project Affected Area?				
	(1) Within the Reservoir area			(2) Outside of the Reservoir area				
	1. Without any certification 2. Oral contract with Yeghvard Community	3. With certification 4. Others (please specify)	3. With certification 4. Others (please specify)	1. Without any certification 2. Oral contract with Yeghvard Community	(1) Within the Reservoir area	(2) Outside of the Reservoir area		
1				3		26	2	
2				3		21	1	
3				3		20	2	Worry about security
4				3		25	1	
5				3		25	1	
6				3		25	1	
7				3		25	2	
8	1				20		1	
9				3		25	1	
10				3		don't remember	2	
11				3		25	1	
12				3		30	1	
13				3		25	1	
14		3			1		1	
15		3			10		1	
16	1			3	25	13	1	Will the project be really implemented? Positive to the project
17				3		9	1	
18				3		10	1	
19	1				10		2	
20	1				25		2	
21	1				1		2	
22	1				4		1	
23		3		3	don't remember	don't remember	1	
24				3		26	1	
25	1				25		1	
26	1				25		1	Will be nice if the topsoil will be removed to my other land
27	1				20		1	
28	1				25		1	
29	1				2		1	
30	1				7		1	
31	1				20		1	
32	1			3		4	2	

Appendix K-13: Photos of Public Consultation on the Project Outline by SCWE

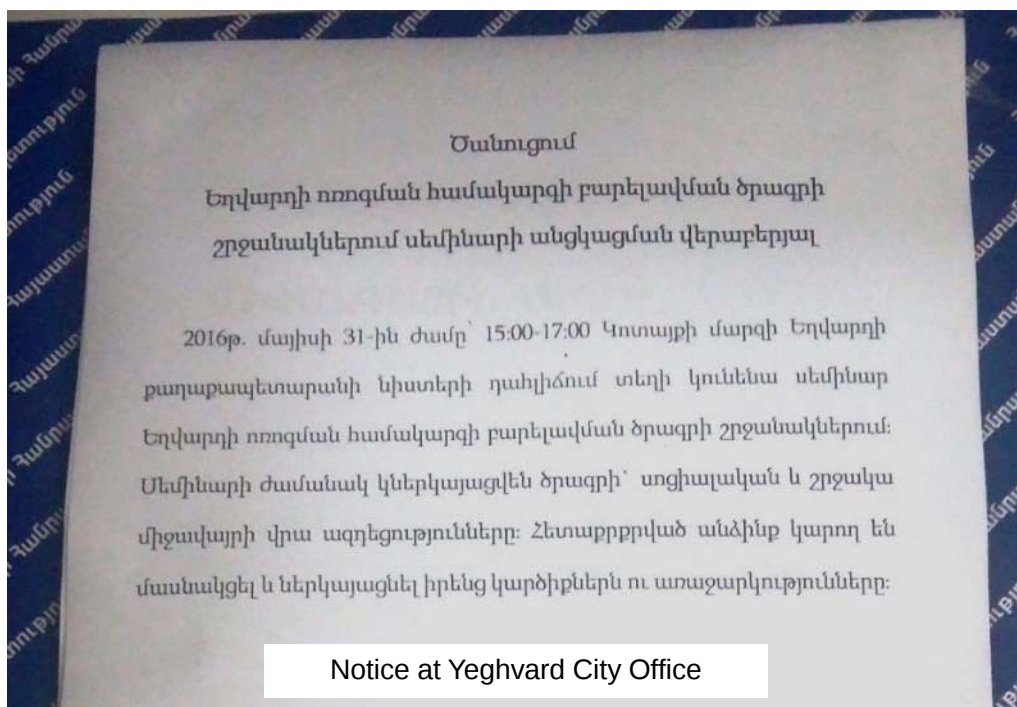
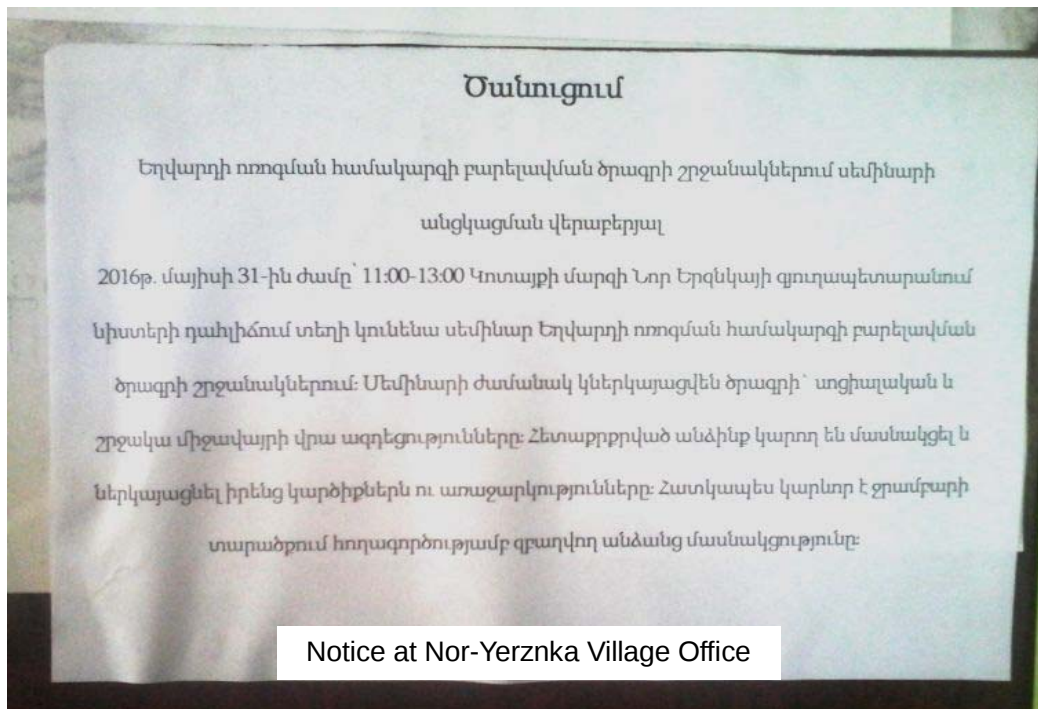


Appendix K-14: Photo of Public Seminar on the Project Outline in Nor-Yerznka Village

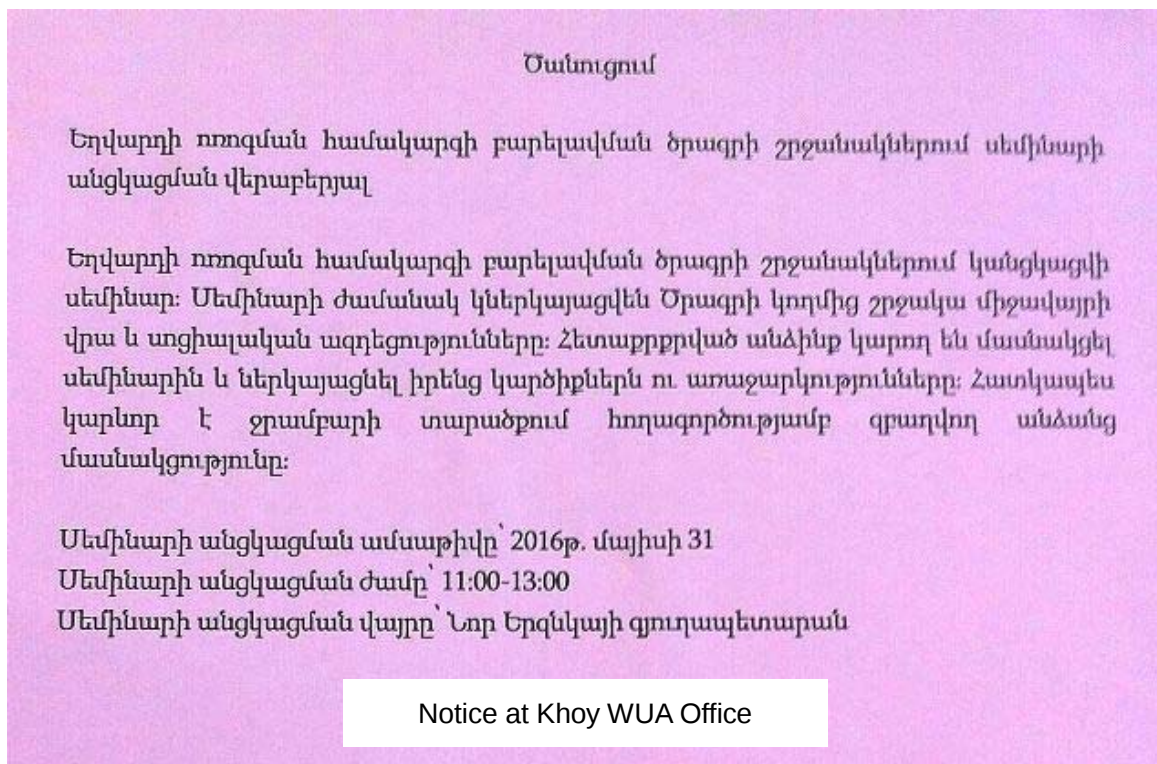
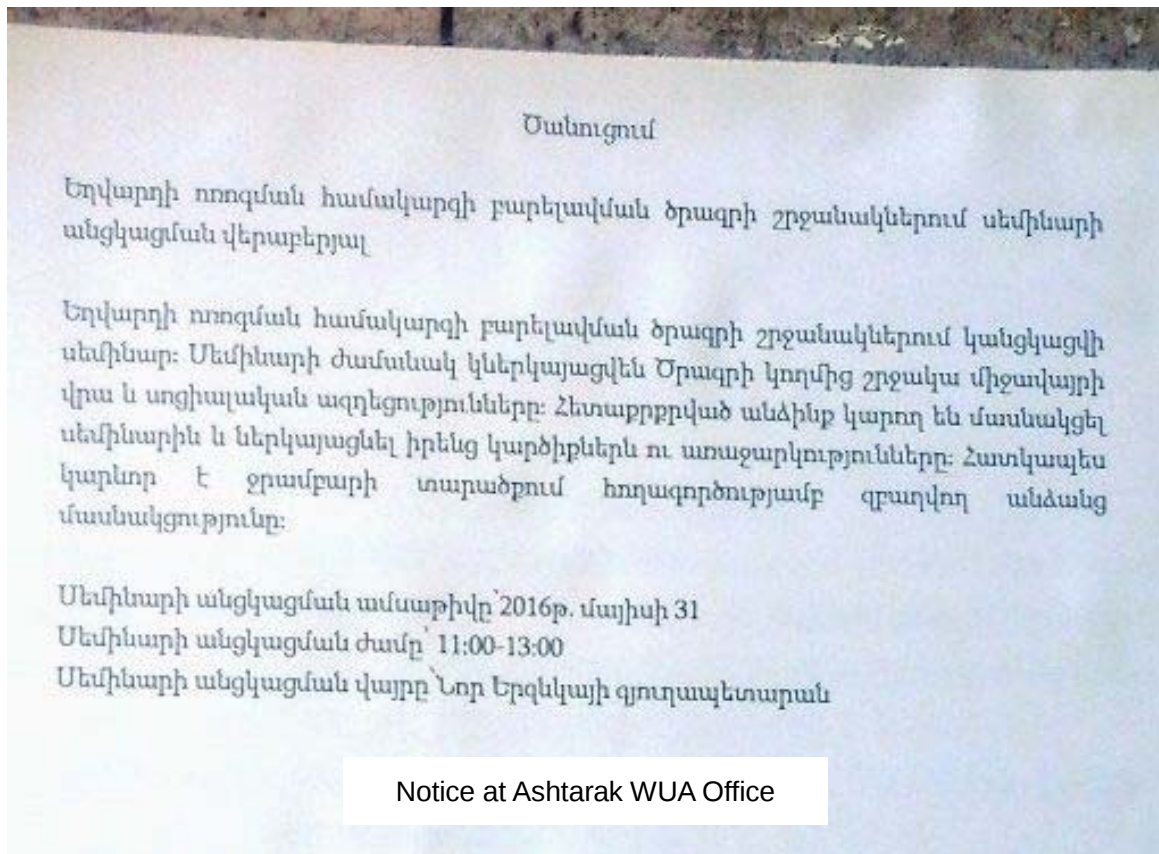


Appendix K-15: Public Notice at Community Offices and WUA Offices for Seminar on Environmental and Social Impacts on 31st May 2016

1. Photos of the Public Notice at Community Offices



2. Photos of the Public Notice at WUAs



Ծանուցում

Եղվարդի ոռոգման համակարգի բարելավման ծրագրի շրջանակներում սեմինարի անցկացման վերաբերյալ

Եղվարդի ոռոգման համակարգի բարելավման ծրագրի շրջանակներում կանցկացվի սեմինար: Սեմինարի ժամանակ կներկայացվեն Ծրագրի կողմից շրջակա միջավայրի վրա և սոցիալական ազդեցությունները: Հետաքրքրված անձինք կարող են մասնակցել սեմինարին և ներկայացնել իրենց կարծիքներն ու առաջարկությունները: Հատկապես կարևոր է ջրամբարի տարածքում հողագործությամբ զբաղվող անձանց մասնակցությունը:

Սեմինարի անցկացման ամսաթիվը՝ 2016թ. մայիսի 31

Սեմինարի անցկացման ժամը՝ 15:00-17:00

Սեմինարի անցկացման վայրը՝ Եղվարդի քաղաքապետարանի քննարկումների սրահ

Notice at Vagharshapat WUA Office

ԾԱՆՈՒԹՈՒՄ

Եղվարդի ոռոգման համակարգի բարելավման ծրագրի
շրջանակներում սեմինարի անցկացման վերաբերյալ

Եղվարդի ոռոգման համակարգի բարելավման ծրագրի
շրջանակներում կանցկացվի սեմինար, որի ընթացքում
կներկայացվեն Ծրագրի ազդեցությունները սոցիալական
ոլորտի և շրջակա միջավայրի վրա:

Հետաքրքրված անձինք կարող են մասնակցել
սեմինարին և հայտնել իրենց կարծիքներն ու
առաջարկությունները: Կարևորվում է ջրամբարի տարածքում
հողագործությամբ զբաղվող անձանց մասնակցությունը:

Սեմինարի անցկացման ամսաթիվը՝ 2016թ. մայիսի 31

Սեմինարի անցկացման ժամը՝ 15:00-17:00

Սեմինարի անցկացման վայրը՝ Եղվարդի քաղաքապետարանի
քննարկումների սրահ

Notice at Yeghvard WUA Office

3. English (Translated)

Notice

Re: Seminar for the Yeghvard Irrigation System Improvement Project

To: all the concerned

The Seminar for the Yeghvard Irrigation System Improvement Project will be organized. Expected environmental and social impacts by the Project will be explained at the seminar. Concerned people are welcome to join and express your opinions at the seminar. Especially, those who cultivate within the Reservoir Area are the most welcome.

Day: 31st May, 2016

Time: 15:00-17:00

Venue: Yeghvard City Conference Room

Notice

Re: Seminar for the Yeghvard Irrigation System Improvement Project

To: all the concerned

The Seminar for the Yeghvard Irrigation System Improvement Project will be organized. Expected environmental and social impacts by the Project will be explained at the seminar. Concerned people welcome to join and express your opinions at the seminar. Especially, those who cultivate within the Reservoir Area are the most welcome.

Day: 31st May, 2016

Time: 11:00-13:00

Venue: Nor Yerznka Village Office

Appendix K-16: Photos of Public Seminar on Environmental and Social Impacts in Nor-Yerznka Village



**Appendix K-17: Photos of Public Seminar on Environmental and Social Impacts
in Yeghvard City**



**Appendix K-18: Photos of Public Seminar on Environmental and Social Impacts
in Yeghvard WUA**



Appendix K-19: Letter from Yeghvard City to Chairman of SCWE

1. Original



ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԿՈՏԱՅՔԻ ՄԱՐԶԻ ԵՂՎԱՐԴԻ ՀԱՄԱՅՆՔԻ ՂԵԿԱՎԱՐ

Հայաստանի Հանրապետության Կոտայքի մարզի Եղվարդ համայնք,
ք. Եղվարդ, Երևանյան 1, Հեռ. (0224) 21110, info@yeghvard.am

N 132
04 ապրիլ 2016թ.

ՀՀ ԳՆ ԶՐԱՅԻՆ ՏՆՏԵՍՈՒԹՅԱՆ
ՊԵՏԱԿԱՆ ԿՈՄԻՏԵՆԱԽԱԳԱՀ
ՊԱՐՈՆ Ա.ՀԱՐՈՒԹՅՈՒՆՅԱՆԻՆ

Հարգելի պարոն Հարությունյան.

Ի պատասխան Ձեր 16.03.2016թ. N 01/510-16 գրության՝ հայտնում ենք, որ Եղվարդի ջրամբարի տարածքը 1991 թվականից ի վեր գյուղատնտեսական նպատակներով ապօրինի կերպով օգտագործվել է համայնքի բնակիչների կողմից: Ժամանակի ընթացքում, փոխամաձայնության գալով, փոխվել են տարածքի որոշ հողօգտագործողներ, մի մասն ընդհանրապես դադարել է մշակել նախապես զավթված հողատարածքները, իսկ որոշ մասը շարունակում է մշակել դրանք մինչև այսօր: Եղվարդի համայնքապետարանը ապօրինի հողօգտագործողների հետ չի կնքել տարածքի վարձակալության կամ օգտագործման իրավունքի պայմանագրեր և հաշվառման չի վերցրել նրանց, քանի որ անորոշ է եղել ջրամբարի տարածքի հետագա ճակատագիրը: Նշված հանգամանքից ելնելով համայնքապետարանի աշխատակազմը չի կարող Ձեզ տրամադրել հողօգտագործողների հստակ ցանկ:

Հարգանքով՝

ՀԱՄԱՅՆՔԻ ՂԵԿԱՎԱՐ՝

ՆՈՐԱՅՐ ՍԱՐԳՍՅԱՆ

Կար. 'Կ. Հարությունյան

0224-2-11-58



2. English (Translated)



HEAD OF YEGHVARD COMMUNITY, RA KOTAYK MARZ

RA Kotayk marz, Yeghvard Community,

Yeghvard city, Yerevanyan 1, Tel. (0224) 21110, info@yeghvard.am

N 132
Harutyunyan

Mr. Aram

04 April 2016

Chairman, RA State Committee of Water Economy (SCWE),

Dear Aram Harutyunyan,

In response to Your N 01/510-16 letter, we inform that the Yeghvard reservoir area since 1991 was used for agricultural purposes by local residents, illegally. Coming to an oral agreement between land users, some of the land users have been changed, some of them stopped to cultivate previously occupied lands, and some of them continued to cultivate until today.

As the future/fate of the reservoir area was uncertain, Yeghvard community did not conclude agreements with illegal land users on land lease or right of use and did not register them as land user.

Based on the above mentioned circumstances, the staff of the community can't provide an exact list of land users.

Regards,

Head of the community

Norayr Sargsyan

Appendix K-20: Letter from Nor-Yerznka Village to Chairman of SCWE

1. Original



ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅԱՆ ԿՈՏԱՅՔԻ ՄԱՐԶԻ ՆՈՐ ԵՐԶՆԿԱ ՎԱՍՏԱՆՔ

Հայաստանի Հանրապետության Կոտայքի մարզի Նոր
Երզնկա համայնք
ՀՀ, Կոտայքի մարզ, գ. Նոր Երզնկա, 2-րդ փող., 33
2., հեռ. (0232)3-67-91, norerznka-village@mail.ru

N 74
18 մարտ 2016թ.

ՀՀ ԳՅՈՒՂԱՏՆՏԵՍՈՒԹՅԱՆ
ՆԱԽԱՐԱՐՈՒԹՅԱՆ ՋՐԱՅԻՆ
ՏՆՏԵՍՈՒԹՅԱՆ ՊԵՏԱԿԱՆ ԿՈՄԻՏԵ
ՆԱԽԱԳԱՀ Ա. ՀԱՐՈՒԹՅՈՒՆՅԱՆԻՆ

Ձեր 16.03.2016 թվականի թիվ 01/511-16 գրությանը ի պատասխան Ձեզ ենք ներկայացնում տեղեկատվություն Եղվարդի ջրամբարի թափի հողատարածքում Նոր Երզնկա համայնքի բնակիչների կողմից հողօգտագործողների վերաբերյալ՝

1. Գրիգորյան Սերյոժա - 1,5 հա ապօրինի
2. Պետրոսյան Տիգրան - 1,0 հա ապօրինի



Կատ. գլխավոր տնտեսագետ՝ Լ. Խուրշուդյան

ՊԵՏԱԿԱՆ՝ *Լ. Խուրշուդյան* ԱԼԻՆԱ ՀԱՐՈՒԹՅՈՒՆՅԱՆ

2. English (Translated)

N74

18.03.2016

Chairman of State Committee
of Water Economy of MoA of RA
Mr. A. Harutyunyan

As a response to your letter N 01/511-16 dated on 16.03.2016, we present you an information about land users of Yeghvard reservoir area from Nor Yerznka community.

1. Grigoryan Seryoja – 1.5ha illegal
2. Petrosyan Tigran – 1.0ha illegal

Head of community

Alina Harutyunyan

Appendix K-21: Letter from Yeghvard WUA to Chairman of SCWE

1. Original

ՀԱՅԱՍՏԱՆԻ ՀԱՆՐԱՊԵՏՈՒԹՅՈՒՆ

«ԵՂՎԱՐԴ»

ՋՐՕԳՏԱԳՈՐԾՈՂՆԵՐԻ

ԸՆԿԵՐՈՒԹՅՈՒՆ



РЕСПУБЛИКА АРМЕНИЯ
ОБЩЕСТВО

ВОДОПОЛЬЗОВАТЕЛЕЙ

«ЕГВАРД»

REPUBLIC OF ARMENIA

«YEGHVARD» WATER USERS
ASSOCIATION

ք. Եղվարդ, Կոմունյանց 14
Հեռախոս (0-24) 2-39-90
Ֆաքս (0-224) 2-39-90
Էլ. փոստ/ yeghvardwua@mail.ru

г. Егвард, Кнунянц 14
Yeghvard, Knunyanc 14
Телефон (Fax): (0-224) 2-39-90
E-mail: yeghvardwua@mail.ru

18.03.2016թ. N 01-ՄՄ 340

ՀՀ ԳՆ ՋՐԱՅԻՆ ՏՆՏԵՍՈՒԹՅԱՆ
ՊԵՏԱԿԱՆ ԿՈՄԻՏԵԻ ՆԱԽԱԳԱՀԻ
ՏԵՂԱԿԱԼ ՊԱՐՈՆ Վ.ՆԱՐԻՄԱՆՅԱՆԻՆ

Հարգելի պարոն Նարիմանյան.

Ի պատասխան Ձեր 16.03.2016թ. N 02/504-16 գրությանը՝ հայտնում եմ, որ
ընկերությունը չի տիրապետում Եղվարդի ջրամբարի կառուցման թասի հողատարածքը
մշակող հողատերերի վերաբերյալ պահանջվող տեղեկատվությանը:

Հարգանքով՝

ԳՈՐԾԱԴԻՐ ՏՆՕՐԵՆ

Մ. ՀՈՎՀԱՆՆԻՍՅԱՆ

Կատարող
Ա. Մաթևոսյան

2. English (Translated)

18.03.2016 N 01MK240

Deputy-Chairman of State Committee
of Water Economy of MoA of RA
Mr. V. Narimanyan

Dear Mr. Narimanyan,

As a response to your letter N 02/504-16 dated on 16.03.2016, I inform you, that the Association doesn't have information about land users of Yeghvard reservoir area required by you.

Regards,

WUA Director

M. Hovhannisyan

Appendix K-22: Public Notice of Public Hearing on the Draft ESIA Report (in Newspaper)

ԾԱՆՈԹՑՈՒՄ	
Նախատեսվող գործունեության վերաբերյալ անցկացվելիք հանրային լսումների (քննարկումների) մասին	
2016 թվականի հոկտեմբերի 10-ին, ժամը՝ 11:00-ին ք. Եղվարդի քաղաքապետարանի նիստերի դահլիճում և ժամը՝ 14:00-ին գ. Նոր Երզնկայի համայնքապետարանում տեղի կունենան հանրային լսումներ (քննարկումներ) «Եղվարդի ոռոգման համակարգի բարելավման ծրագրի» շրջակա միջավայրի վրա ազդեցության գնահատման հաշվետվության վերաբերյալ:	
Ձեռնարկող՝	ՀՀ ԳՆ Ջրային տնտեսության պետական կոմիտե
Շրջակա միջավայրի բաղադրիչների վրա հնարավոր ազդեցություն	Հնարավոր է ոռոշակի ազդեցություն շրջակա միջավայրի բաղադրիչների վրա
Փաստաթղթերին ծանոթանալու եղանակները, վայրը, օրը, ժամը	Փաստաթղթերը տեղակայված են Ջրային տնտեսության պետական կոմիտեի (ք. Երևան, Վարդանանց փակուղի 13Ա) էլ.կայքում՝ www.scws.am և Եղվարդի Օրհնու կենտրոնի (ք. Եղվարդ, Երևանյան 1) էլ.կայքում՝ aarhus.am : Փաստաթղթերին կարող են ծանոթանալ նաև նշված հասցեներում սույն հայտարարության հրապարակման օրվանից ամեն օր ժամը՝ 14:00-18:00 մինչև դիտողություններ և առաջարկություններ ներկայացնելու ժամկետի ավարտը:
Դիտողություններ և առաջարկություններ ներկայացնելու ժամկետը	Յոթ աշխատանքային օր՝ ծանուցման հրապարակման օրվանից
Քննարկումների պատասխանատուներ	Եղվարդի քաղաքապետարան Նոր Երզնկայի համայնքապետարան
Քննարկումների պատասխանատուների էլ. փոստը և հեռախոսահամարները	Եղվարդի քաղաքապետարան (info@yeghvard.am , հեռ. (0224) 21110) Նոր Երզնկայի համայնքապետարան (norerznka-village@mail.ru , հեռ. (0232) 36791)

Newspaper “Hayastany Hanrapetutian Daily” on 28th September

Appendix K-23: Photos of the Public Hearings on the ESIA Report on 10th October 2016

(1) Photos of Public Hearing in Yeghvard Community



(2) Photos of Public Hearing in Nor-Yerznka Community



APPENDIX L

Project Cost

Estimated Project Cost
of
PREPARATORY SURVEY FOR YEGHVARD IRRIGATION SYSTEM IMPROVEMENT PROJECT

Contents		Project Cost (million USD)
1. R. Bottom Anti-Infiltration		78.3
2. Existing Dam (No.1, No.2)		6.8
3. Feeder canal, Outlet canal		17.6
4. Irrigation system, other works		15.6
Direct Construction Cost		118.3
Overhead expenses	13.3%	15.7
sub-total		134.0
Contractor profit	11.0%	14.7
sub-total		148.7
Expenses on Temporary buildings & Climate impact	4.1%	6.1
Indirect expenses		36.5
Construction Cost		154.8
Consultant Service	6.0%	9.3
Sub-total		164.1
Price Contingency	10.2%	16.8
Physical Contingency	5.0%	8.2
Sub-total		25.0
Grand Total		189.1
VAT	20%	37.8
Grand Total with VAT		226.9

Breakdown of the direct cost

1. Cost OF Construction Of Reservoir Basin

Coverage area
5,443,408 m2

Description of calculations	Description of expenses	Direct cost of construction	Overhead Expenses	Direct cost with overhead expenses	Profit of construction company	Direct cost with overhead expenses and profit	Temporary buildings and structures expenses	Climate impacts expenses	Overall expenses without Consultant fee and VAT	Direct cost of construction (USD) In accordance with Armenian cost estimation regulatory system	Overall expenses without Consultant fee and VAT (USD)
2	3	4	5	6	7	8	9	10	11	12	13
Soil-cement and betonite sheet coverage for 1000m2 (Soil-cement layer thickness 0.45m)		37,938,156,608	From Local Estimates 5,046,774,829 13.30%	42,983,931,437	From 6 4,728,232,458 11.00%	47,712,163,895	From 8 1,431,364,917 3.00%	524,833,803	From 8-9+10 49,668,362,615	From Local Estimates 783,330,895	11+12+13 1,025,531,191

Cost OF Construction Of 1000m2 Reservoir Basin With Different Implementation Versions

Description of calculations	Description of expenses	Direct cost of construction	Overhead Expenses	Direct cost with overhead expenses	Profit of construction company	Direct cost with overhead expenses and profit	Temporary buildings and structures expenses	Climate impacts expenses	Overall expenses without Consultant fee and VAT	Direct cost of construction (USD) In accordance with Armenian cost estimation regulatory system	Overall expenses without Consultant fee and VAT (USD)
2	3	4	5	6	7	8	9	10	11	12	13
Soil-cement and betonite sheet coverage for 1000m2 (Soil-cement layer thickness 0.45m)		6,969,560	From Direct cost (4) 926,951 13.30%	7,896,511	From 6 868,616 11.00%	8,765,127	From 8 262,954 3.00%	96,416	From 8-9+10 9,124,497	From Local Estimates 14,482	11+12+13 18,960

2. Existing Dams (No.1, No.2) Construction

No	Description of calculations	Description of expenses	Direct cost of construction (USD)	Overhead Expenses (USD)	Direct cost with overhead expenses (USD)	Profit of construction company (USD)	Direct cost with overhead expenses and profit (USD)	Temporary buildings and structures expenses (USD)	Climate impacts expenses (USD)	Overall expenses without Consultant fee and VAT (USD)
1	2	3	4	5	6	7	8	9	10	11
		Counting method	From Local Estimates	From Direct cost (12)	12+13	From 14	14+15	From 16	From 16	16+17+18
		Counting percentage		13.30%		11.00%		3.00%	1.10%	
Old Dam №1	Enlargement with cement-soil 0.45m thick layer wave protection, Service road construction, width 8m		4,388,085	583,615	4,971,701	546,887	5,518,588	165,558	60,704	5,744,850
Old Dam №2	Enlargement with pebble-gravel 0.5m thick layer wave protection		2,446,800	325,424	2,772,225	304,945	3,077,169	92,315	33,849	3,203,333
North Slope	Service road construction on top of slope, width 4m		3,820	508	4,329	476	4,805	144	53	5,002
South Slope	Service road construction on top of slope, width 4m		2,212	294	2,506	276	2,782	83	31	2,896
TOTAL			6,840,918							8,956,080

3. Feeder Canals, Outlet Canals

№	Irrigation Objects	Direct cost of construction (USD)	Overhead Expenses (USD)	Direct cost with overhead expenses (USD)	Profit of construction company (USD)	Direct cost with overhead expenses and profit (USD)	Temporary buildings and structures expenses (USD)	Climate impacts expenses (USD)	Overall expenses without Consultant fee and VAT (USD)
		From Local Estimates	13.30%				3.00%	1.10%	
1	Feeder Canal 1 from Arzni-Shamiram to the connection Tunnel	5,312,889	706,614	6,019,503	662,145	6,681,648	200,449	73,498	6,955,596
2	Feeder Canal 2 from Arzni-Shamiram to Reservoir	225,043	29,931	254,973	28,047	283,020	8,491	3,113	294,624
3	Outlet Canal 1 to the Arzni-branch	753,776	100,252	854,028	93,943	947,971	28,439	10,428	986,838
4	Outlet Canal 2 to Ashtarak	0	0	0	0	0	0	0	0
5	Outlet Canal 3 to Kasakh river	7,596,745	1,010,367	8,607,112	946,782	9,553,895	286,617	105,093	9,945,604
6	Reservoir Basin Control House, 2 fools, overall 800m2	590,977	78,600	669,577	73,653	743,230	22,297	8,176	773,702
7	Feeder Tunnel	2,414,826	321,172	2,735,998	300,960	3,036,958	91,109	33,407	3,161,473
8	Fixed Cone Valve	751,430	99,940	851,370	93,651	945,021	28,351	10,395	983,767
	TOTAL Cost	17,645,686							23,101,605

4. Irrigation System (Secondary Canals)

№	Secondary Canals	Direct cost of construction (USD)	Overhead Expenses (USD)	Direct cost with overhead expenses (USD)	Profit of construction company (USD)	Direct cost with overhead expenses and profit (USD)	Temporary buildings and structures expenses (USD)	Climate impacts expenses (USD)	Overall expenses without Consultant fee and VAT (USD)
		From Local Estimates	13.30%				3.00%	1.10%	
1	Arzni-Shamiram	1,609,430	214,054	1,823,484	200,583	2,024,067	60,722	22,265	2,107,054
2	Lower Hrazdan part2	7,395,391	983,587	8,378,978	921,688	9,300,665	279,020	102,307	9,681,992
3	Arzni-Branch, from Bp to PK120+00	692,082	92,047	784,129	86,254	870,383	26,111	9,574	906,068
4	Arzni-Branch, from PK 120+00 to EP	851,675	113,273	964,947	106,144	1,071,092	32,133	11,782	1,115,006
5	Tkahan canal	940,812	125,128	1,065,940	117,253	1,183,193	35,496	13,015	1,231,704
6	Shakhi-Aru canal	2,407,241	320,163	2,727,404	300,014	3,027,418	90,823	33,302	3,151,542
7	Inner Aknalich	50,000	6,650	56,650	6,232	62,882	1,886	692	65,460
8	Upper Aknalich canal	1,658,380	220,565	1,878,945	206,684	2,085,628	62,569	22,942	2,171,139
	TOTAL Cost	15,605,009							20,429,966

APPENDIX M

Project Evaluation

M-1: Purpose of Evaluation	APP M-2
M-2: Methodology of Evaluation	APP M-2
M-3: Basic Assumptions of Financial and Economic Analysis	APP M-2
M-4: Conversion Factors Employed in the Evaluation	APP M-4
M-5: Estimated Project Costs	APP M-5
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M-7: Results of Financial Analysis and Economic Evaluation	APP M-43

Appendix M-1: Purpose of Evaluation

Project evaluation is carried out in order to determine the economic viability of the Project. The analysis compares the situations “without” and “with” Project, and is carried out on the point of view of the national economy.

Appendix M-2: Methodology of Evaluation

On the basis of project benefit and cost comparison for the two cases of (i) Current Situation without project and (ii) Situation after project implementation (with project), the financial and economic viability of the projects are examined in terms of the three (3) criteria of internal rate of return (IRR), net present value (NPV) and Benefit-Cost Ratio (B/C).

There are another important indicator; FIRR, which is an indicator evaluating projects on the point of view of private companies, however, the project does not profit-oriented. In this respect, the project cannot be evaluated in terms of financial costs and returns, therefore, FIRR is out of analysis in this evaluation.

Appendix M-3: Basic Assumptions of Financial and Economic Analysis

- 1) Following “conservatism principle” of ordinary project evaluation theory, all of benefit and cost has to be estimated conservatively.
- 2) Referring to similar projects in the agriculture sector in Armenia, the economic life of the Project is designed at 35 years.
- 3) Project costs and benefits are calculated in USD. The current exchange rate, as of averaging February- April 2016, is set at 1USD = 486.99 AMD (Central Bank of Armenia).
- 4) The opportunity cost of capital in Armenia is not established yet. Referring to similar projects, it is 8% in the WB (2013a)¹, 5-12% (three cases) in KfW (2014)², and 4% in AFD (2014)³. From the point of view of “conservatism principle”, the Survey team has targeted the highest ratio within the donors i.e. 12%. The percentage “12%” is widely employed as a reference opportunity cost of capital by the WB, ADB and JICA in the sector of irrigation/agriculture development in the world.
- 5) Price escalation is not considered in economic analysis because the evaluation should be done in real price. Transfer items such as taxes (including VAT), interests, and subsidies are excluded from economic price since it is “zero-sum” when it is aggregated in whole economy.
- 6) Incremental operation and maintenance (O&M) cost is assumed at 1.00 % of initial investment. It should be noted that the current budget expenditures for O&M cost of existing facilities are regarded as insufficient. Therefore, it is difficult to estimate the desirable amount of O&M costs from similar projects in RA. According to similar project in other countries, it is 1.0% in Egypt (2010), is 0.32% in Vietnam (2010), and is 0.37% in Timor-Leste (2006). From the point of view of conservatism principle, the Survey Team has applied the highest O&M fee of the three projects, namely, 1.0% of the project costs.

¹ World Bank (2013a), “Project appraisal document on a proposed loan in the amount of US\$30 million to the republic of Armenia for an irrigation system enhancement project”

² KfW (2014), “Integrated Water Resource Management/Akhouryan River – Construction of Kaps Reservoir and Gravity Irrigation System – Task I Update of feasibility study, Draft feasibility report. ”

³ AFD (2014), “Construction of the Vedi Reservoir for irrigation in the Ararat Valley – Task1: Feasibility Study”

Table M-3.1 O&M costs in other countries

Project Title	Percentage of O&M cost	Basis
1) The Preparatory Survey on the Rehabilitation and Improvement of Dirout Group of Regulators in The Arab Republic of Egypt	1.00%	1% of the project cost is allocated as O&M costs
2) The Project for Rehabilitation of Small-Scale Reservoirs in Quang Ngai Province in Socialist Republic of Vietnam	0.32%	Operation fee, maintenance fee, long-term rehabilitation fee, and other O&M costs
3) The Basic Design Study on the Project for Rehabilitation and Improvement of Maliana Irrigation System in the Democratic Republic of Timor-Leste	0.37%	O&M costs consist of 1) allowance to be paid to four board members of WUA after the establishment thereof, 2) personnel cost required for trainings and monitoring after transferring irrigation facilities, 3) operative return for gate operation by gate keeper or by group leaders, 4) costs for maintaining gates such as purchase of lubricating oil, recoating, exchanging water-seal rubber etc., 5) repairing costs for facilities and 6) labor hiring costs for such routine works as manual scouring in scouring sluice and sediment settling basin, regular dredging and weeding etc.

- 7) In addition to incremental O&M cost, large rehabilitation cost is considered in case of water leakage problem due to unexpected disaster such as earthquake.

Assuming that 1 (one) large maintenance will be needed during the evaluation periods, for instance, due to a large earthquake. The rehabilitation cost is assumed 50% of initial investment of reservoir consisting of construction cost, indirect cost, consultant fee, price escalation, and physical contingency. Since there is a difficulty of forecasting when such large rehabilitation will be needed, therefore, uniform probability (i.e. 1/30 probability every year) is assumed. With these conditions, the expected rehabilitation cost per year is about 2.5 million USD (150 million USD/2/30), or almost equivalent to 1.0% of the project costs.

Summing up incremental O&M cost and large rehabilitation cost, the annual O&M cost is 2.0%.

- 8) The percentage of accrued costs and benefits over the evaluation periods are summarized in Table M-3.2.
- Increase in livestock production is supposed to be realized gradually over a 4-year period as on site-producers shift their agriculture systems step by step.
 - Pumping irrigation system will be shifted to gravity irrigation system. Taking into account that it may take times to change the customs, the Survey Team assumes that it will pass 4 years to abolish the pump station completely.
 - The amount of water distribution from Lake Sevan has been controlled by WSA so it is reasonable assumption that the benefit of conservation of Lake Sevan has been accrued just after the completion of construction.

Table M-3.2 List of Percentage of Project Costs and Benefits accrued over the Evaluation Periods

Costs and Benefits over the periods		Year									
		2017	2018	2019	2020	2021	2022	2023	2024	2025	After 2026
(-)	Project Costs	4%	1%	38%	28%	20%	9%	0%	0%	0%	0%
(-)	O&M	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%
(-)	Opportunity cost of HPPs	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%
(-)	Land Compensation Cost	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
(+)	Increase in Cropping Income	Calculated in Annual Cash Flow by Crops (See Appendix-M)									
(+)	Increase in Livestock Production	0%	0%	0%	0%	0%	25%	50%	75%	100%	100%
(+)	Net Saving in Pump O&M cost	0%	0%	0%	0%	0%	25%	50%	75%	100%	100%
(+)	Conservation of Lake Sevan	0%	0%	0%	0%	0%	100%	100%	100%	100%	100%

Appendix M-4: Conversion Factors Employed in the Evaluation

It should be noted that conversion factors are not standardized in Armenia. Due to data and time limitation, the survey team applies calculation results from similar projects. Following are the calculation basis for specific goods and services;

(1) Standard Conversion Factor

Standard Conversion factor has been calculated with the help of a recent study provided by the World Bank (2013a), which applies a correction factor of 10% in the analysis to reduce all local cost in accordance with IMF estimates⁴. Then, the standard conversion factor is 0.90, which has been employed for project cost pricing, and other ordinary goods and services.

(2) Specific Conversion Factors

(a) Skilled and Unskilled Labor

For skilled labor, generally “competitive market” is assumed. It means that the specific conversion factor for skilled labor is 1.000. In contrast to this, reflecting rural unemployment, 0.700 of the specific conversion factor for unskilled labor is employed, which is widely used in project evaluation.

(b) Fuel requiring works

On the one hand, fuel for the agricultural sector is subsidized 70 AMD/liter of the market price, and the fuel price subsidized is 350AMD/liter. Then, the subsidy-adjusted market price is 420AMD/liter or 20% higher than the one subsidized. On the other hand, fuel is taxed by 2.8 % of the market price, so the unbiased market price is 17.2% higher than the actual one (20% - 2.8%).

It is unclear how much percentage out of the cost for mechanized works can be explained by fuel charge, therefore, referring to similar project, it is assumed that 30% out of them is fuel charge.

From the above mentioned calculation basis, the specific conversion factor for fuel requiring works is; $\{1+0.3 \times (70/350 - 0.028)\} \div 1.052$.

(c) Seeds

According to the interview to MOA, some seeds are subsidized. The market price and selling price to farmers with subsidies are shown in Table M-4.1. Immediately, the specific conversion factors are 1.888 for wheat, 2.532 for barley, 1.797 for alfalfa and 2.663 for maize.

Table M-4.1 Calculation of Conversion Factors for Subsidized Seeds.

Seeds	(AMD/kg)			Conversion Factor 1+(B)/(C)
	Market Price (A)	Selling Price to farmers with subsidies (B)	Difference (C) =(A) - (B)	
Wheat	302	160	142	1.888
Barley	329.1	130	199.1	2.532
Alfalfa	2,695	1,500	1,195	1.797
Maize	932	350	582	2.663

Source) The Survey Team, data is provided by MOA

(d) Fertilizers

Conversion factors for some fertilizers subsidized are calculated as listed in Table M-4.2. The specific conversion factors are 1.536 for nitrogenous fertilizer, 1.971 for phosphoric fertilizer and 1.971 for potassic fertilizer.

⁴ Weber, Anke and Yang, Chunfang. 2011. Armenia: An Assessment of the Real Exchange Rate and Competitiveness. IMF.

Table M-4.2 Calculation of Conversion Factors for Subsidized Fertilizers.

Fertilizer	(AMD/kg)			Conversion Factor 1+(B)/(C)
	Market Price (A)	Selling Price to farmers with subsidies (B)	Difference (C) = (A) - (B)	
Nitrogenous	184.3	120.0	64.3	1.536
Phosphoric	276.0	140.0	136.0	1.971
Potassic	276.0	140.0	136.0	1.971

Source) The Survey Team, data is provided by MOA

(e) Water Fees

According to the WB (2013a), current averaged water cost is approximately 18.7 AMD per m³ or 1.7 times larger than farmer's water fee 11.04 AMD per m³. Therefore, the specific conversion factor is 1.700.

(f) Electricity

According to the WB (2013a), current electricity prices in Armenia (AMD 0.67/kw/h) are significantly lower than their real costs. Consequently, the specific conversion factor of electricity cost is 1.250.

(g) Crop pricing

Due to the data limitation, the survey team applies specific conversion factors calculated in KfW (2014). By using the result, it is estimated 1.020 for winter wheat, 0.720 for barley, 0.820 for maize, and 1.000 for other crops.

(h) Others

Standard Conversion Factor (0.95) has been applied for other economic pricing if it is necessary.

Appendix M-5: Estimated Project Costs

The project cost derived in cost estimation is shown as the bottom of the Table M-5.1 (titled as "Grand Total with VAT"). In order to apply to the economic analysis. The project costs should be converted to economic costs with necessary modifications.

Table M-5.1 Estimated Project Cost by the Options

Contents (Unit: Million USD)		1. Bentonite sheet (2 layers)		2. Soil-Cement coverage		3. Bentonite-soil mixture		4. Soil-Cement with a Sandwiched Bentonite sheet	
		Project Cost (million USD)	%	Project Cost (million USD)	%	Project Cost (million USD)	%	Project Cost (million USD)	%
R. Bottom Anti-Infiltration		80.6	66.8	111.8	73.6	83.3	67.6	78.3	66.2
Existing Dam (No.1, No.2)		6.8	5.6	6.8	4.5	6.8	5.5	6.8	5.7
Feeder canal, Outlet canal		17.6	14.6	17.6	11.6	17.6	14.3	17.6	14.9
Irrigation system, other works		15.6	12.9	15.6	10.3	15.6	12.7	15.6	13.2
Direct Construction Cost		120.6	100	151.8	100	123.3	100	118.3	100
Overhead expenses	13.3%	16		20.2		16.4		15.7	
sub-total		136.6		172.0		139.7		134.0	
Contractor profit	11.0%	15.0		18.9		15.4		14.7	
sub-total		151.6		190.9		155.1		148.7	
Expenses on Temporary buildings & Climate impact	4.1%	6.2		7.8		6.4		6.1	
Indirect expenses		37.2		46.9		38.2		36.5	
Construction Cost		157.8		198.7		161.5		154.8	
Consultant Service	6.0%	9.5		11.9		9.7		9.3	

Sub-total		167.3		210.6		171.2		164.1	
Price Contingency	10.2%	17.1		21.6		17.5		16.8	
Physical Contingency	5.0%	8.4		10.5		8.6		8.2	
Sub-total		25.5		32.1		26.1		25.0	
Grand Total		192.8		242.7		197.3		189.1	
VAT	20%	38.6		48.5		39.5		37.8	
Grand Total with VAT		231.4		291.2		236.8		226.9	

Source) The Survey Team

For carrying out the economic analysis, the cost has to be divided into two partition: foreign currency and domestic currency. Domestic currency partition should be divided into material costs, skilled labor costs, unskilled labor costs, and equipment costs to apply appropriate specific conversion factors.

Table M-5.2 to M-5.5 show the project costs by foreign currency and domestic currency. The economic project cost consists of base cost and physical contingency, which has been applied in the economic analysis is shown in red color.

Table M-5.2 Financial and Economic Costs (Bentonite Sheet)

Component	Cost Estimation	Financial Cost			Economic Cost			
		FC	LC	Total	FC	Conversion Factor	LC	Total
Material (a)	6.0	3.0	3.0	6.0	3.0	0.9	2.7	5.7
Labor (b = c + d)	41.5	2.1	39.4	41.5	2.1	-	34.5	36.6
c. Skilled Labor	24.1	1.2	22.9	24.1	1.2	1.0	22.9	24.1
d. Unskilled Labor	17.4	0.9	16.6	17.4	0.9	0.7	11.6	12.5
Equipment (e)	73.1	36.5	36.5	73.1	36.5	0.9	32.9	69.4
Direct Cost Total (A = a + b + e)	120.6	41.6	79.0	120.6	41.6	-	70.1	111.7
Indirect Expenses (B)	37.2	18.6	18.6	37.2	18.6	0.9	16.7	35.3
Construction Cost Total (C = A + B)	157.8	60.2	97.6	157.8	60.2	-	86.8	147.0
Consultant Service (D)	9.5	7.4	2.1	9.5	7.4	1.0	2.1	9.5
Base Cost (E = C + D)	167.3	67.6	99.7	167.3	67.6	-	88.9	156.5
Physical Contingency (F)	8.4	3.4	5	8.4	3.4	-	4.4	7.8
Economic Cost Components (G = E + F)	175.7	71.0	104.7	175.7	71.0	-	93.3	164.3
Price Contingency (J)	17.1	6.9	10.2	17.1	6.9	-	9.1	16.0
VAT (H)	38.6	15.6	23.0	38.6	15.6	-	20.5	36.1
Grand Total with VAT (K)	231.3	93.5	137.8	231.3	93.5	-	122.8	216.4

Source) The Survey Team

Table M-5.3 Financial and Economic Costs (Soil-cement Coverage)

Component	Cost Estimation	Financial Cost			Economic Cost			
		FC	LC	Total	FC	Conversion Factor	LC	Total
Material (a)	7.6	3.8	3.8	7.6	3.8	0.9	3.4	7.2
Labor (b = c + d)	52.2	2.6	49.6	52.2	2.6	-	43.4	46.0
c. Skilled Labor	30.3	1.5	28.8	30.3	1.5	1.0	28.8	30.3
d. Unskilled Labor	21.9	1.1	20.8	21.9	1.1	0.7	14.6	15.7
Equipment (e)	92.0	46.0	46.0	92.0	46.0	0.9	41.4	87.4
Direct Cost Total (A = a + b + e)	151.8	52.4	99.4	151.8	52.4	-	88.2	140.6
Indirect Expenses (B)	46.9	23.5	23.5	46.9	23.5	0.9	21.1	44.6
Construction Cost Total (C = A + B)	198.7	75.9	122.9	198.7	75.9	-	109.3	185.2
Consultant Service (D)	11.9	9.3	2.6	11.9	9.3	1.0	2.6	11.9
Base Cost (E = C + D)	210.6	85.1	125.5	210.6	85.1	-	111.9	197.0
Physical Contingency (F)	10.5	4.3	6.3	10.6	4.3	-	5.6	9.9
Economic Cost Components (G = E + F)	221.1	89.4	131.8	221.2	89.4	-	117.5	206.9
Price Contingency (J)	21.5	8.7	12.8	21.5	8.7	-	11.4	20.1
VAT (H)	48.5	19.6	28.9	48.5	19.6	-	25.8	45.4
Grand Total with VAT (K)	291.1	117.7	173.5	291.2	117.7	-	154.7	272.4

Source) The Survey Team

Table M-5.4 Financial and Economic Costs (Bentonite-soil Mixture)

Component	Cost Estimation	Financial Cost			Economic Cost			
		FC	LC	Total	FC	Conversion Factor	LC	Total
Material (a)	6.2	3.1	3.1	6.2	3.1	0.9	2.8	5.9
Labor (b = c + d)	42.4	2.1	40.3	42.4	2.1	-	35.2	37.3
c. Skilled Labor	24.6	1.2	23.4	24.6	1.2	1.0	23.4	24.6
d. Unskilled Labor	17.8	0.9	16.9	17.8	0.9	0.7	11.8	12.7
Equipment (e)	74.7	37.4	37.4	74.7	37.4	0.9	33.6	71.0
Direct Cost Total (A = a + b + e)	123.3	42.6	80.7	123.3	42.6	-	71.6	114.2
Indirect Expenses (B)	38.2	19.1	19.1	38.2	19.1	0.9	17.2	36.3
Construction Cost Total (C = A + B)	161.5	61.7	99.8	161.5	61.7	-	88.8	150.5
Consultant Service (D)	9.7	7.6	2.1	9.7	7.6	1.0	2.1	9.7
Base Cost (E = C + D)	171.2	69.2	102.0	171.2	69.2	-	90.9	160.1
Physical Contingency (F)	8.6	3.5	5.1	8.6	3.5	-	4.5	8.0
Economic Cost Components (G = E + F)	179.8	72.7	107.1	179.8	72.7	-	95.4	168.1
Price Contingency (J)	17.5	7.1	10.4	17.5	7.1	-	9.3	16.3
VAT (H)	39.5	16.0	23.5	39.5	16.0	-	20.9	36.9
Grand Total with VAT (K)	236.7	95.7	141.0	236.7	95.7	-	125.6	221.4

Source) The Survey Team

Table M-5.5 Financial and Economic Costs (Soil-cement with a Sandwiched Bentonite Sheet)

Component	Cost Estimation	Financial Cost			Economic Cost			
		FC	LC	Total	FC	Conversion Factor	LC	Total
Material (a)	5.9	3.0	3.0	5.9	3.0	0.9	2.7	5.7
Labor (b = c + d)	40.7	2.0	38.7	40.7	2.0	-	33.8	35.8
c. Skilled Labor	23.6	1.2	22.4	23.6	1.2	1.0	22.4	23.6
d. Unskilled Labor	17.1	0.9	16.2	17.1	0.9	0.7	11.4	12.3
Equipment (e)	71.7	35.8	35.8	71.7	35.8	0.9	32.3	68.1
Direct Cost Total (A = a + b + e)	118.3	40.8	77.5	118.3	40.8	-	68.8	109.6
Indirect Expenses (B)	36.5	18.3	18.3	36.5	18.3	0.9	16.4	34.7
Construction Cost Total (C = A + B)	154.8	59.1	95.7	154.8	59.1	-	85.2	144.3
Consultant Service (D)	9.3	7.3	2.1	9.3	7.3	1.0	2.1	9.4
Base Cost (E = C + D)	164.1	66.3	97.8	164.1	66.3	-	87.3	153.6
Physical Contingency (F)	8.2	3.3	4.9	8.2	3.3	-	4.4	7.7
Economic Cost Components (G = E + F)	172.3	69.6	102.7	172.3	69.6	-	91.7	161.3
Price Contingency (J)	16.7	6.8	10.0	16.7	6.8	-	8.9	15.7
VAT (H)	37.8	15.3	22.5	37.8	15.3	-	20.1	35.4
Grand Total with VAT (K)	226.8	91.7	135.2	226.8	91.7	-	120.7	212.4

Source) The Survey Team

Appendix M-6: Project Benefits

(1) Increment in Cropping Income

To estimate the benefit, valuation of costs and benefits of crop production was made by reference to the collected information in Table M-6.1.

Table M-6.1. Information Sources for Costs and Benefits valuation of Major Crops

Information	Main Source
1. Costs and benefits calculation basis, open field cultivation	Ministry of Agriculture, RA
2. Costs and benefits calculation basis, greenhouse cultivation	The Greenhouse Association, RA
3. Unit prices (inputs, labor, crops, etc.)	Survey result of the Survey Team
4. Productivity of crops	Community offices concerned WUA workshops
5. Farming practice of fruits and grapes	Experienced farmers

Source) The Survey Team

Table M-6.2. Net Benefit per ha without Project by Crops

Without Project (Present Crop Area)

Annual Benefits (1st - 35 years)

Crop	Financial Price (AMD/kg)	Conversion Factor	Price (AMD/kg)	Area (ha)	Area %	Yield (ton/ha)	Production (kg)	Value (AMD)
Wheat	120	1.02	122	1,535	100	3.6	5,526,000	674,172,000
Potato	110	1.00	110	713	100	36.3	25,881,900	2,847,009,000
Tomato, open	120	1.00	120	2,844	29	47.7	39,341,052	4,720,926,240
Tomato, green-house	250	1.00	250	2,844	3	100.0	8,532,000	2,133,000,000
Cucumber, open	100	1.00	100	2,844	14	38.4	15,289,344	1,528,934,400
Cucumber, green-house	220	1.00	220	2,844	2	80.0	4,550,400	1,001,088,000
Eggplant	100	1.00	100	2,844	7	49.8	9,914,184	991,418,400
Sweet pepper	170	1.00	170	2,844	9	38.9	9,956,844	1,692,663,480
Cabbage	110	1.00	110	2,844	16	29.7	13,514,688	1,486,615,680
Water melon	60	1.00	60	2,844	20	42.7	24,287,760	1,457,265,600
Grape	150	1.00	150	1,060	100	11.2	11,872,000	1,780,800,000
Apricot	200	1.00	200	831	64	7.1	3,776,064	755,212,800
Apple	200	1.00	200	831	36	7.7	2,303,532	460,706,400

Table M-6.3. Net Benefit per ha with Project by Crops

With Project (Present Crop Area)

Annual Benefits (1st - 35 years)

Crop	Financial Price (AMD/kg)	Conversion Factor	Economic Price (AMD/kg)	Area (ha)	Area %	Yield (ton/ha)	Production (kg)	Value (AMD)
Wheat	120	1.02	122	1,535	100	3.8	5,769,811	703,916,942
Barley	0	0.71	0	492	76	3.4	1,282,070	0
Maize (grain)	0	0.82	0	492	24	2.6	307,276	0
Alfalfa	0	1.00	0	916	100	11.5	10,492,570	0
Potato	110	1.00	110	713	100	41.8	29,777,379	3,275,511,690
Tomato, open	120	1.00	120	2,844	29	50.4	41,587,153	4,990,458,360
Tomato, green-house	250	1.00	250	2,844	3	100.0	8,532,000	2,133,000,000
Cucumber, open	100	1.00	100	2,844	14	42.0	16,722,720	1,672,272,000
Cucumber, green-house	220	1.00	220	2,844	2	80.0	4,550,400	1,001,088,000
Eggplant	100	1.00	100	2,844	7	53.7	10,681,538	1,068,153,800
Sweet pepper	170	1.00	170	2,844	9	41.4	10,603,055	1,802,519,350
Cabbage	110	1.00	110	2,844	16	32.6	14,824,813	1,630,729,430
Water melon	60	1.00	60	2,844	20	45.3	25,764,639	1,545,878,340
Grape	150	1.00	150	1,060	100	13.5	14,268,585	2,140,287,750
Apricot	200	1.00	200	831	64	7.6	4,041,984	808,396,800
Apple	200	1.00	200	831	36	8.9	2,662,524	532,504,800

Table M-6.4a Net Benefit per ha without Project by Crops

With Project (New Crop Area)																		
<1st batch: 70% of the new cropping area>																		
Crop	1st year			2nd year			3rd year			4th year			5th year			6th year		
	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)
Wheat	3.2	819,840	100,020,480	3.4	871,080	106,271,760	3.6	922,320	112,523,040	3.8	963,013	117,487,586	3.8	963,013	117,487,586	3.8	963,013	117,487,586
Barley	2.6	150,769	18,076,680	2.7	156,568	19,076,800	2.9	168,165	20,154,880	3.4	198,825	25,459,260	3.4	198,825	25,459,260	3.4	198,825	25,459,260
Maize (grain)	2.0	36,624	4,638,080	2.2	40,286	5,136,320	2.3	42,118	5,375,360	2.6	47,653	6,062,720	2.6	47,653	6,062,720	2.6	47,653	6,062,720
Alfalfa	9.6	3,601,920	450,240,000	11.8	4,427,360	553,420,800	11.8	4,427,360	553,420,800	11.8	4,427,360	553,420,800	11.8	4,427,360	553,420,800	11.8	4,427,360	553,420,800
Potato	34.0	3,284,400	361,284,000	36.0	3,477,600	382,536,000	38.0	3,670,800	403,788,000	41.8	4,034,355	443,779,050	41.8	4,034,355	443,779,050	41.8	4,034,355	443,779,050
Tomato, open	41.1	6,657,953	798,954,360	43.5	7,046,736	845,608,680	45.9	7,435,525	892,263,000	50.4	8,168,278	980,193,360	50.4	8,168,278	980,193,360	50.4	8,168,278	980,193,360
Tomato, green-house	100.0	1,675,900	418,950,000	100.0	1,675,900	418,950,000	100.0	1,675,900	418,950,000	100.0	1,675,900	418,950,000	100.0	1,675,900	418,950,000	100.0	1,675,900	418,950,000
Cucumber, open	34.0	2,693,936	265,893,600	36.0	2,815,344	281,534,400	38.0	2,971,752	297,175,200	42.0	3,284,568	328,456,800	42.0	3,284,568	328,456,800	42.0	3,284,568	328,456,800
Cucumber, green-house	80.0	893,760	196,627,200	80.0	893,760	196,627,200	80.0	893,760	196,627,200	80.0	893,760	196,627,200	80.0	893,760	196,627,200	80.0	893,760	196,627,200
Eggplant	45.1	1,793,508	176,350,000	47.8	1,869,076	186,907,600	50.4	1,970,741	197,074,100	53.7	2,097,998	209,799,800	53.7	2,097,998	209,799,800	53.7	2,097,998	209,799,800
Sweet pepper	34.1	1,714,343	291,438,310	36.1	1,814,891	308,531,470	38.1	1,915,439	325,624,630	41.4	2,082,583	354,039,110	41.4	2,082,583	354,039,110	41.4	2,082,583	354,039,110
Cabbage	26.0	2,323,776	255,615,360	27.5	2,457,840	270,362,400	29.1	2,600,842	286,092,630	32.6	2,911,794	320,297,340	32.6	2,911,794	320,297,340	32.6	2,911,794	320,297,340
Water melon	37.7	4,211,844	252,710,640	40.0	4,488,800	268,128,000	42.2	4,714,584	282,875,040	45.3	5,060,523	303,631,380	45.3	5,060,523	303,631,380	45.3	5,060,523	303,631,380
Grape	0.00	0	0	0.00	0	0	10.30	8,003,410	1,320,511,500	11.60	939,4520	1,102,630	12.90	1,025,600	1,653,844,500	14.20	12,136,740	1,820,511,000
Apricot	0.00	0	0	0.00	0	0	0.00	0	0	3.50	1,235,384	2,894,797	8.20	2,894,797	377,294,400	9.50	1,886,472	377,294,400
Apple	0.00	0	0	0.00	0	0	7.10	1,409,880	281,978,000	9.50	1,886,472	377,294,400	9.50	1,886,472	377,294,400	9.50	1,886,472	377,294,400
Sub-total (1st batch)			3,117,843,950			3,265,457,510			5,015,482,330			5,537,734,026			5,951,517,326			6,450,026,426
<2nd batch: 20 % of the new cropping area>																		
Crop	1st year			2nd year			3rd year			4th year			5th year			6th year		
	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)
Wheat	0.0	0	0	3.2	234,240	28,577,280	3.4	248,880	30,363,360	3.6	263,520	32,149,440	3.8	275,147	33,567,934	3.8	275,147	33,567,934
Barley	0.0	0	0	2.6	43,077	5,489,680	2.7	44,734	5,613,380	2.9	48,047	6,046,018	3.4	56,807	7,076,880	3.4	56,807	7,076,880
Maize (grain)	0.0	0	0	2.0	10,664	1,333,120	2.2	11,510	1,441,240	2.3	12,034	1,504,260	2.6	13,615	1,676,100	2.6	13,615	1,676,100
Alfalfa	0.0	0	0	9.6	1,029,120	127,894,080	11.8	1,284,960	158,635,200	11.8	1,284,960	158,635,200	11.8	1,284,960	158,635,200	11.8	1,284,960	158,635,200
Potato	0.0	0	0	34.0	938,400	103,224,000	36.0	993,600	109,296,000	38.0	1,048,800	115,368,000	41.8	1,152,673	126,794,030	41.8	1,152,673	126,794,030
Tomato, open	0.0	0	0	41.1	1,902,272	228,272,640	43.5	2,013,354	241,602,480	45.9	2,124,436	254,932,720	50.4	2,333,794	280,055,280	50.4	2,333,794	280,055,280
Tomato, green-house	0.0	0	0	100.0	478,800	119,700,000	100.0	478,800	119,700,000	100.0	478,800	119,700,000	100.0	478,800	119,700,000	100.0	478,800	119,700,000
Cucumber, open	0.0	0	0	34.0	739,896	75,969,600	36.0	804,384	80,438,400	38.0	849,072	84,907,200	42.0	938,480	93,848,800	42.0	938,480	93,848,800
Cucumber, green-house	0.0	0	0	80.0	255,360	56,179,200	80.0	255,360	56,179,200	80.0	255,360	56,179,200	80.0	255,360	56,179,200	80.0	255,360	56,179,200
Eggplant	0.0	0	0	45.1	503,857	50,385,700	47.8	534,022	53,402,200	50.4	563,069	56,306,900	53.7	599,428	59,942,800	53.7	599,428	59,942,800
Sweet pepper	0.0	0	0	34.1	489,812	83,268,040	36.1	518,540	88,151,800	38.1	547,268	93,035,960	41.4	595,024	101,154,080	41.4	595,024	101,154,080
Cabbage	0.0	0	0	26.0	663,936	73,032,960	27.5	702,240	77,246,400	29.1	743,098	81,740,780	32.6	831,941	91,513,510	32.6	831,941	91,513,510
Water melon	0.0	0	0	37.7	1,203,384	72,203,040	40.0	1,276,800	76,608,000	42.2	1,347,024	80,821,440	45.3	1,445,864	86,751,840	45.3	1,445,864	86,751,840
Grape	0.00	0	0	0.00	0	0	0.00	0	0	10.30	2,515,260	377,269,000	11.60	2,832,720	424,906,000	12.90	3,150,180	472,527,000
Apricot	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	3.50	353,024	70,604,800	9.50	538,982	107,798,400
Apple	0.00	0	0	0.00	0	0	0.00	0	0	7.10	402,826	80,565,200	9.50	538,982	107,798,400	9.50	538,982	107,798,400
Sub-total (2nd batch)			890,812,460			890,812,460			932,987,840			1,432,995,040			1,592,269,874			1,700,433,674
<3rd batch: 10 % of the new cropping area>																		
Crop	1st year			2nd year			3rd year			4th year			5th year			6th year		
	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)
Wheat	0.0	0	0	0.0	0	0	3.2	117,120	14,288,640	3.4	124,440	15,181,680	3.6	131,760	16,074,720	3.8	137,573	16,783,906
Barley	0.0	0	0	0.0	0	0	2.6	21,538	2,692,360	2.7	22,367	2,795,640	2.9	24,024	2,940,240	3.4	28,404	3,480,000
Maize (grain)	0.0	0	0	0.0	0	0	2.0	5,232	654,080	2.2	5,755	719,400	2.3	6,017	750,000	2.6	6,808	851,200
Alfalfa	0.0	0	0	0.0	0	0	9.6	514,560	61,747,200	11.8	632,480	76,537,600	11.8	632,480	76,537,600	11.8	632,480	76,537,600
Potato	0.0	0	0	0.0	0	0	34.0	469,200	51,612,000	36.0	496,800	54,648,000	38.0	524,400	57,884,000	41.8	576,336	63,390,960
Tomato, open	0.0	0	0	0.0	0	0	41.1	951,136	114,136,320	43.5	1,006,677	120,801,240	45.9	1,066,218	127,466,160	50.4	1,166,887	140,027,640
Tomato, green-house	0.0	0	0	0.0	0	0	100.0	239,400	59,850,000	100.0	239,400	59,850,000	100.0	239,400	59,850,000	100.0	239,400	59,850,000
Cucumber, open	0.0	0	0	0.0	0	0	34.0	379,848	37,984,800	36.0	402,192	40,219,200	38.0	424,536	42,453,600	42.0	469,224	46,922,400
Cucumber, green-house	0.0	0	0	0.0	0	0	80.0	127,680	28,089,600	80.0	127,680	28,089,600	80.0	127,680	28,089,600	80.0	127,680	28,089,600
Eggplant	0.0	0	0	0.0	0	0	45.1	251,929	25,192,900	47.8	267,011	26,701,100	50.4	281,534	28,153,400	53.7	299,714	29,971,400
Sweet pepper	0.0	0	0	0.0	0	0	34.1	244,906	41,634,020	36.1	259,270	44,075,900	38.1	273,634	46,517,780	41.4	297,512	50,577,040
Cabbage	0.0	0	0	0.0	0	0	26.0	331,968	36,516,480	27.5	351,120	38,623,200	29.1	371,549	40,970,390	32.6	415,971	45,766,810
Water melon	0.0	0	0	0.0	0	0	37.7	601,692	36,101,520	40.0	638,400	38,304,000	42.2	673,512	40,710,320	45.3	722,932	43,375,920
Grape	0.00	0	0	0.00	0	0	0.00	0	0	10.30	1,257,630	188,644,500	11.60	1,416,380	212,455,000	12.90	1,616,380	245,500,000
Apricot	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0
Apple	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0	0.00	0	0
Sub-total (3rd batch)			445,406,280			445,406,280			465,493,920			791,042,676			932,987,840			1,047,487,676

Table M-6.4b Net Benefit per ha without Project by Crops

With Project (New Crop Area)												
<1st batch: 70 % of the new cropping area>												
Crop	7th year			8th year			9th year			10th year		
	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)
Wheat	3.8	963013	117,487,596	3.8	963013	117,487,596	3.8	963013	117,487,596	3.8	963013	117,487,596
Barley	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0
Maize (grain)	2.6	47653	0	2.6	47653	0	2.6	47653	0	2.6	47653	0
Alfalfa	9.6	3601920	0	11.8	4427360	0	11.8	4427360	0	11.8	4427360	0
Potato	41.8	4034355	443,779,050	41.8	4034355	443,779,050	41.8	4034355	443,779,050	41.8	4034355	443,779,050
Tomato, open	50.4	8168278	980,193,360	50.4	8168278	980,193,360	50.4	8168278	980,193,360	50.4	8168278	980,193,360
Tomato, green-house	100.0	1675800	418,950,000	100.0	1675800	418,950,000	100.0	1675800	418,950,000	100.0	1675800	418,950,000
Cucumber, open	42.0	3284568	328,456,800	42.0	3284568	328,456,800	42.0	3284568	328,456,800	42.0	3284568	328,456,800
Cucumber, green-house	80.0	893760	196,627,200	80.0	893760	196,627,200	80.0	893760	196,627,200	80.0	893760	196,627,200
Eggplant	53.7	2,097,998	209,799,800	53.7	2,097,998	209,799,800	53.7	2,097,998	209,799,800	53.7	2,097,998	209,799,800
Sweet pepper	41.4	2,082,583	354,039,110	41.4	2,082,583	354,039,110	41.4	2,082,583	354,039,110	41.4	2,082,583	354,039,110
Cabbage	32.6	2,911,794	320,297,340	32.6	2,911,794	320,297,340	32.6	2,911,794	320,297,340	32.6	2,911,794	320,297,340
Water melon	45.3	5,060,523	303,631,380	45.3	5,060,523	303,631,380	45.3	5,060,523	303,631,380	45.3	5,060,523	303,631,380
Grape	14.20	12,136,740	1,820,511,000	14.20	12,136,740	1,820,511,000	14.20	12,136,740	1,820,511,000	14.20	12,136,740	1,820,511,000
Apricot	8.20	2,894,797	578,959,400	8.20	2,894,797	578,959,400	8.20	2,894,797	578,959,400	8.20	2,894,797	578,959,400
Apple	9.50	1,886,472	377,294,400	9.50	1,886,472	377,294,400	9.50	1,886,472	377,294,400	9.50	1,886,472	377,294,400
Sub-total (1st batch)			6,450,026,426			6,450,026,426			6,450,026,426			6,450,026,426
<2nd batch: 20 % of the new cropping area>												
Crop	7th year			8th year			9th year			10th year		
	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)
Wheat	3.8	275,147	33,567,934	3.8	275,147	33,567,934	3.8	275,147	33,567,934	3.8	275,147	33,567,934
Barley	3.4	56,807	0	3.4	56,807	0	3.4	56,807	0	3.4	56,807	0
Maize (grain)	2.6	13,615	0	2.6	13,615	0	2.6	13,615	0	2.6	13,615	0
Alfalfa	11.8	1,264,960	0	9.6	1,029,120	0	11.8	1,264,960	0	11.8	1,264,960	0
Potato	41.8	1,152,673	126,794,030	41.8	1,152,673	126,794,030	41.8	1,152,673	126,794,030	41.8	1,152,673	126,794,030
Tomato, open	50.4	2,333,794	280,055,280	50.4	2,333,794	280,055,280	50.4	2,333,794	280,055,280	50.4	2,333,794	280,055,280
Tomato, green-house	100.0	478,800	119,700,000	100.0	478,800	119,700,000	100.0	478,800	119,700,000	100.0	478,800	119,700,000
Cucumber, open	42.0	938,448	93,844,800	42.0	938,448	93,844,800	42.0	938,448	93,844,800	42.0	938,448	93,844,800
Cucumber, green-house	80.0	255,360	56,179,200	80.0	255,360	56,179,200	80.0	255,360	56,179,200	80.0	255,360	56,179,200
Eggplant	53.7	999,428	59,942,800	53.7	999,428	59,942,800	53.7	999,428	59,942,800	53.7	999,428	59,942,800
Sweet pepper	41.4	595,024	101,154,080	41.4	595,024	101,154,080	41.4	595,024	101,154,080	41.4	595,024	101,154,080
Cabbage	32.6	831,941	91,513,510	32.6	831,941	91,513,510	32.6	831,941	91,513,510	32.6	831,941	91,513,510
Water melon	45.3	1,445,864	86,751,840	45.3	1,445,864	86,751,840	45.3	1,445,864	86,751,840	45.3	1,445,864	86,751,840
Grape	14.20	3,467,640	520,146,000	14.20	3,467,640	520,146,000	14.20	3,467,640	520,146,000	14.20	3,467,640	520,146,000
Apricot	8.20	827,085	165,417,000	8.20	827,085	165,417,000	8.20	827,085	165,417,000	8.20	827,085	165,417,000
Apple	9.50	538,992	107,798,400	9.50	538,992	107,798,400	9.50	538,992	107,798,400	9.50	538,992	107,798,400
Sub-total (2nd batch)			1,842,864,874			1,842,864,874			1,842,864,874			1,842,864,874
<3rd batch: 10 % of the new cropping area>												
Crop	7th year			8th year			9th year			10th year		
	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)
Wheat	3.8	137,573	16,783,906	3.8	137,573	16,783,906	3.8	137,573	16,783,906	3.8	137,573	16,783,906
Barley	3.4	28,404	0	3.4	28,404	0	3.4	28,404	0	3.4	28,404	0
Maize (grain)	2.6	6,008	0	2.6	6,008	0	2.6	6,008	0	2.6	6,008	0
Alfalfa	11.8	632,480	0	9.6	514,560	0	11.8	632,480	0	11.8	632,480	0
Potato	41.8	576,336	63,396,960	41.8	576,336	63,396,960	41.8	576,336	63,396,960	41.8	576,336	63,396,960
Tomato, open	50.4	1,166,897	140,027,640	50.4	1,166,897	140,027,640	50.4	1,166,897	140,027,640	50.4	1,166,897	140,027,640
Tomato, green-house	100.0	239,400	59,850,000	100.0	239,400	59,850,000	100.0	239,400	59,850,000	100.0	239,400	59,850,000
Cucumber, open	42.0	469,224	46,922,400	42.0	469,224	46,922,400	42.0	469,224	46,922,400	42.0	469,224	46,922,400
Cucumber, green-house	80.0	127,680	28,089,600	80.0	127,680	28,089,600	80.0	127,680	28,089,600	80.0	127,680	28,089,600
Eggplant	53.7	299,714	29,971,400	53.7	299,714	29,971,400	53.7	299,714	29,971,400	53.7	299,714	29,971,400
Sweet pepper	41.4	297,512	50,577,040	41.4	297,512	50,577,040	41.4	297,512	50,577,040	41.4	297,512	50,577,040
Cabbage	32.6	415,971	45,756,810	32.6	415,971	45,756,810	32.6	415,971	45,756,810	32.6	415,971	45,756,810
Water melon	45.3	722,932	43,375,920	45.3	722,932	43,375,920	45.3	722,932	43,375,920	45.3	722,932	43,375,920
Grape	12.90	175,512	236,263,500	14.20	1,733,820	260,073,000	14.20	1,733,820	260,073,000	14.20	1,733,820	260,073,000
Apricot	3.50	176,512	35,302,400	8.20	413,542	82,708,400	8.20	413,542	82,708,400	8.20	413,542	82,708,400
Apple	9.50	269,496	53,889,200	9.50	269,496	53,889,200	9.50	269,496	53,889,200	9.50	269,496	53,889,200
Sub-total (3rd batch)			850,216,776			921,432,276			921,432,276			921,432,276

Table M-6.4c: Net Benefit per ha without Protect by Crops

15th year													16th year													17th year													18th year																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
<1st batch: 70 % of the new cropping area>													<2nd batch: 20 % of the new cropping area>													<3rd batch: 10 % of the new cropping area>													<4th batch: 10 % of the new cropping area>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
Crop	13th year			14th year			15th year			16th year			17th year			18th year			Crop	13th year			14th year			15th year			16th year			17th year			18th year			Crop	13th year			14th year			15th year			16th year			17th year			18th year																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)		Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)	Yield (ton/ha)	Production (kg)	Value (AMD)		Yield (ton/ha)	Production (kg)	Value (AMD)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
Wheat	3.8	963013	117487586	3.8	963013	117487586	3.8	963013	117487586	3.8	963013	117487586	3.8	963013	117487586	3.8	963013	117487586	3.8	963013	117487586	3.8	963013	117487586	3.8	963013	117487586	3.8	963013	117487586	3.8	963013	117487586	3.8	963013	117487586	3.8	963013	117487586	3.8	963013	117487586	3.8	963013	117487586																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
Barley	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825	0	3.4	198825

Table M-6.4d Net Benefit per ha without Project by Crops

[illegible]

Table M-6.4e Net Benefit per ha without Project by Crops

25th year										26th year										27th year										28th year										29th year										30th year									
With Project (New Crop Area)										With Project (New Crop Area)										With Project (New Crop Area)										With Project (New Crop Area)										With Project (New Crop Area)										With Project (New Crop Area)									
<1st batch: 70 % of the new cropping area>										<1st batch: 70 % of the new cropping area>										<1st batch: 70 % of the new cropping area>										<1st batch: 70 % of the new cropping area>										<1st batch: 70 % of the new cropping area>										<1st batch: 70 % of the new cropping area>									
Crop		Yield (ton/ha)		Value (AMD)		Yield (ton/ha)		Production (kg)		Value (AMD)		Yield (ton/ha)		Production (kg)		Value (AMD)		Yield (ton/ha)		Production (kg)		Value (AMD)		Yield (ton/ha)		Production (kg)		Value (AMD)		Yield (ton/ha)		Production (kg)		Value (AMD)		Yield (ton/ha)		Production (kg)		Value (AMD)																			
Wheat	3.8	963.013	117,487,586	3.8	963.013	117,487,586	3.8	963.013	117,487,586	3.8	963.013	117,487,586	3.8	963.013	117,487,586	3.8	963.013	117,487,586	3.8	963.013	117,487,586	3.8	963.013	117,487,586	3.8	963.013	117,487,586	3.8	963.013	117,487,586	3.8	963.013	117,487,586	3.8	963.013	117,487,586	3.8	963.013	117,487,586	3.8	963.013	117,487,586																	
Barley	3.4	198.825	0	3.4	198.825	0	3.4	198.825	0	3.4	198.825	0	3.4	198.825	0	3.4	198.825	0	3.4	198.825	0	3.4	198.825	0	3.4	198.825	0	3.4	198.825	0	3.4	198.825	0	3.4	198.825	0	3.4	198.825	0	3.4	198.825	0	3.4	198.825															
Maize (grain)	2.6	47.653	0	2.6	47.653	0	2.6	47.653	0	2.6	47.653	0	2.6	47.653	0	2.6	47.653	0	2.6	47.653	0	2.6	47.653	0	2.6	47.653	0	2.6	47.653	0	2.6	47.653	0	2.6	47.653	0	2.6	47.653	0	2.6	47.653	0	2.6	47.653															
Alfalfa	9.6	3,601.920	0	9.6	3,601.920	0	9.6	3,601.920	0	9.6	3,601.920	0	9.6	3,601.920	0	9.6	3,601.920	0	9.6	3,601.920	0	9.6	3,601.920	0	9.6	3,601.920	0	9.6	3,601.920	0	9.6	3,601.920	0	9.6	3,601.920	0	9.6	3,601.920	0	9.6	3,601.920	0	9.6	3,601.920															
Potato	41.8	4,034.355	443,779,050	41.8	4,034.355	443,779,050	41.8	4,034.355	443,779,050	41.8	4,034.355	443,779,050	41.8	4,034.355	443,779,050	41.8	4,034.355	443,779,050	41.8	4,034.355	443,779,050	41.8	4,034.355	443,779,050	41.8	4,034.355	443,779,050	41.8	4,034.355	443,779,050	41.8	4,034.355	443,779,050	41.8	4,034.355	443,779,050	41.8	4,034.355	443,779,050	41.8	4,034.355	443,779,050																	
Tonaton, open	50.4	8,168.278	980,193,360	50.4	8,168.278	980,193,360	50.4	8,168.278	980,193,360	50.4	8,168.278	980,193,360	50.4	8,168.278	980,193,360	50.4	8,168.278	980,193,360	50.4	8,168.278	980,193,360	50.4	8,168.278	980,193,360	50.4	8,168.278	980,193,360	50.4	8,168.278	980,193,360	50.4	8,168.278	980,193,360	50.4	8,168.278	980,193,360	50.4	8,168.278	980,193,360	50.4	8,168.278	980,193,360																	
Tonaton, green-house	100.0	1,675.800	418,950,000	100.0	1,675.800	418,950,000	100.0	1,675.800	418,950,000	100.0	1,675.800	418,950,000	100.0	1,675.800	418,950,000	100.0	1,675.800	418,950,000	100.0	1,675.800	418,950,000	100.0	1,675.800	418,950,000	100.0	1,675.800	418,950,000	100.0	1,675.800	418,950,000	100.0	1,675.800	418,950,000	100.0	1,675.800	418,950,000	100.0	1,675.800	418,950,000	100.0	1,675.800	418,950,000																	
Cucumber, open	42.0	3,284.568	328,456,800	42.0	3,284.568	328,456,800	42.0	3,284.568	328,456,800	42.0	3,284.568	328,456,800	42.0	3,284.568	328,456,800	42.0	3,284.568	328,456,800	42.0	3,284.568	328,456,800	42.0	3,284.568	328,456,800	42.0	3,284.568	328,456,800	42.0	3,284.568	328,456,800	42.0	3,284.568	328,456,800	42.0	3,284.568	328,456,800	42.0	3,284.568	328,456,800	42.0	3,284.568	328,456,800																	
Cucumber, green-house	80.0	893.760	196,627,200	80.0	893.760	196,627,200	80.0	893.760	196,627,200	80.0	893.760	196,627,200	80.0	893.760	196,627,200	80.0	893.760	196,627,200	80.0	893.760	196,627,200	80.0	893.760	196,627,200	80.0	893.760	196,627,200	80.0	893.760	196,627,200	80.0	893.760	196,627,200	80.0	893.760	196,627,200	80.0	893.760	196,627,200	80.0	893.760	196,627,200																	
Eggplant	53.7	2,097.998	209,799,800	53.7	2,097.998	209,799,800	53.7	2,097.998	209,799,800	53.7	2,097.998	209,799,800	53.7	2,097.998	209,799,800	53.7	2,097.998	209,799,800	53.7	2,097.998	209,799,800	53.7	2,097.998	209,799,800	53.7	2,097.998	209,799,800	53.7	2,097.998	209,799,800	53.7	2,097.998	209,799,800	53.7	2,097.998	209,799,800	53.7	2,097.998	209,799,800	53.7	2,097.998	209,799,800																	
Sweet pepper	41.4	2,082.583	354,039,110	41.4	2,082.583	354,039,110	41.4	2,082.583	354,039,110	41.4	2,082.583	354,039,110	41.4	2,082.583	354,039,110	41.4	2,082.583	354,039,110	41.4	2,082.583	354,039,110	41.4	2,082.583	354,039,110	41.4	2,082.583	354,039,110	41.4	2,082.583	354,039,110	41.4	2,082.583	354,039,110	41.4	2,082.583	354,039,110	41.4	2,082.583	354,039,110	41.4	2,082.583	354,039,110																	
Cabbage	32.6	2,911.734	320,297,340	32.6	2,911.734	320,297,340	32.6	2,911.734	320,297,340	32.6	2,911.734	320,297,340	32.6	2,911.734	320,297,340	32.6	2,911.734	320,297,340	32.6	2,911.734	320,297,340	32.6	2,911.734	320,297,340	32.6	2,911.734	320,297,340	32.6	2,911.734	320,297,340	32.6	2,911.734	320,297,340	32.6	2,911.734	320,297,340	32.6	2,911.734	320,297,340																				
Water melon	45.3	5,060.523	303,631,380	45.3	5,060.523	303,631,380	45.3	5,060.523	303,631,380	45.3	5,060.523	303,631,380	45.3	5,060.523	303,631,380	45.3	5,060.523	303,631,380	45.3	5,060.523	303,631,380	45.3	5,060.523	303,631,380	45.3	5,060.523	303,631,380	45.3	5,060.523	303,631,380	45.3	5,060.523	303,631,380	45.3	5,060.523	303,631,380	45.3	5,060.523	303,631,380	45.3	5,060.523	303,631,380																	
Grape	14.20	12,136.740	182,051,100	14.20	12,136.740	182,051,100	14.20	12,136.740	182,051,100	14.20	12,136.740	182,051,100	14.20	12,136.740	182,051,100	14.20	12,136.740	182,051,100	14.20	12,136.740	182,051,100	14.20	12,136.740	182,051,100	14.20	12,136.740	182,051,100	14.20	12,136.740	182,051,100	14.20	12,136.740	182,051,100	14.20	12,136.740	182,051,100	14.20	12,136.740	182,051,100																				
Apricot	8.20	2,894.797	578,959,400	8.20	2,894.797	578,959,400	8.20	2,894.797	578,959,400	8.20	2,894.797	578,959,400	8.20	2,894.797	578,959,400	8.20	2,894.797	578,959,400	8.20	2,894.797	578,959,400	8.20	2,894.797	578,959,400	8.20	2,894.797	578,959,400	8.20	2,894.797	578,959,400	8.20	2,894.797	578,959,400	8.20	2,894.797	578,959,400	8.20	2,894.797	578,959,400	8.20	2,894.797	578,959,400																	
Apple	9.50	1,886.472	377,294,400	9.50	1,886.472	377,294,400	9.50	1,886.472	377,294,400	9.50	1,886.472	377,294,400	9.50	1,886.472	377,294,400	9.50	1,886.472	377,294,400	9.50	1,886.472	377,294,400	9.50	1,886.472	377,294,400	9.50	1,886.472	377,294,400	9.50	1,886.472	377,294,400	9.50	1,886.472	377,294,400	9.50	1,886.472	377,294,400	9.50	1,886.472	377,294,400	9.50	1,886.472	377,294,400																	
Sub-total (1st batch)				6,450,026,426				6,450,026,426		6,450,026,426				6,450,026,426		6,450,026,426				6,450,026,426		6,450,026,426				6,450,026,426		6,450,026,426				6,450,026,426		6,450,026,426				6,450,026,426		6,450,026,426																			
<2nd batch: 20 % of the new cropping area>										<2nd batch: 20 % of the new cropping area>										<2nd batch: 20 % of the new cropping area>										<2nd batch: 20 % of the new cropping area>										<2nd batch: 20 % of the new cropping area>										<2nd batch: 20 % of the new cropping area>									
Crop		Yield (ton/ha)		Value (AMD)		Yield (ton/ha)		Production (kg)		Value (AMD)		Yield (ton/ha)		Production (kg)		Value (AMD)		Yield (ton/ha)		Production (kg)		Value (AMD)		Yield (ton/ha)		Production (kg)		Value (AMD)		Yield (ton/ha)		Production (kg)		Value (AMD)		Yield (ton/ha)		Production (kg)		Value (AMD)																			
Wheat	3.8	275.147	33,567,934	3.8	275.147	33,567,934	3.8	275.147	33,567,934	3.8	275.147	33,567,934	3.8	275.147	33,567,934	3.8	275.147	33,567,934	3.8	275.147	33,567,934	3.8	275.147	33,567,934	3.8	275.147	33,567,934	3.8	275.147	33,567,934	3.8	275.147	33,567,934	3.8	275.147	33,567,934	3.8	275.147	33,567,934	3.8	275.147	33,567,934																	
Barley	3.4	56,807	0	3.4	56,807	0	3.4	56,807	0	3.4	56,807	0	3.4	56,807	0	3.4	56,807	0	3.4	56,807	0	3.4	56,807	0	3.4	56,807	0	3.4	56,807	0	3.4	56,807	0	3.4	56,807	0	3.4	56,807	0	3.4	56,807	0	3.4	56,807															
Maize (grain)	2.6	13,615	0	2.6	13,615	0	2.6	13,615	0	2.6	13,615	0	2.6	13,615	0	2.6	13,615	0	2.6	13,615	0	2.6	13,615	0	2.6	13,615	0	2.6	13,615	0	2.6	13,615	0	2.6	13,615	0	2.6	13,615	0	2.6	13,615	0	2.6	13,615															
Alfalfa	11.8	1,264.960	0	9.6	1,029.120	0	9.6	1,029.120	0	11.8	1,264.960	0	11.8	1,264.960	0	11.8	1,264.960	0	11.8	1,264.960	0	11.8	1,264.960	0	11.8	1,264.960	0	11.8	1,264.960	0	11.8	1,264.960	0	11.8	1,264.960	0	11.8	1,264.960	0	11.8	1,264.960	0	11.8	1,264.960															
Potato	41.8	1,152.673	126,794,030	41.8	1,152.673	126,794,030	41.8	1,152.673	126,794,030	41.8	1,152.673	126,794,030	41.8	1,152.673	126,794,030	41.8	1,152.673	126,794,030	41.8	1,152.673	126,794,030	41.8	1,152.673	126,794,030	41.8	1,152.673	126,794,030	41.8	1,152.673	126,794,030	41.8	1,152.673	126,794,030	41.8	1,152.673	126,794,030	41.8	1,152.673	126,794,030	41.8	1,152.673	126,794,030																	
Tonaton, open	50.4	2,333.794	280,055,280	50.4	2,333.794	280,055,280	50.4	2,333.794	280,055,280	50.4	2,333.794	280,055,280	50.4	2,333.794	280,055,280	50.4	2,333.794	280,055,280	50.4	2,333.794	280,055,280	50.4	2,333.794	280,055,280	50.4	2,333.794	280,055,280	50.4	2,333.794	280,055,280	50.4	2,333.794	280,055,280	50.4</																									

Table M-6.4f Net Benefit per ha without Project by Crops

With Project (New Crop Area)											
<1st batch: 70 % of the new cropping area>											
31st year				32nd year				33rd year			
Crop	Yield (ton/ha)	Production (kg)	Value (AMD)	32nd year			Value (AMD)	33rd year			Value (AMD)
				Yield (ton/ha)	Production (kg)	Value (AMD)		Yield (ton/ha)	Production (kg)	Value (AMD)	
Wheat	3.8	963,013	117,487,586	3.8	963,013	117,487,586	3.8	963,013	117,487,586	3.8	963,013
Barley	3.4	198,825	0	3.4	198,825	0	3.4	198,825	0	3.4	198,825
Maize (grain)	2.6	47,653	0	2.6	47,653	0	2.6	47,653	0	2.6	47,653
Alfalfa	9.6	3,601,920	0	11.8	4,427,360	0	11.8	4,427,360	0	11.8	4,427,360
Potato	41.8	4,034,355	443,779,050	41.8	4,034,355	443,779,050	41.8	4,034,355	443,779,050	41.8	4,034,355
Tomato, open	50.4	8,168,278	980,193,360	50.4	8,168,278	980,193,360	50.4	8,168,278	980,193,360	50.4	8,168,278
Tomato, green-house	100.0	1,675,800	418,950,000	100.0	1,675,800	418,950,000	100.0	1,675,800	418,950,000	100.0	1,675,800
Cucumber, open	42.0	3,284,568	328,456,800	42.0	3,284,568	328,456,800	42.0	3,284,568	328,456,800	42.0	3,284,568
Cucumber, green-house	80.0	893,760	196,627,200	80.0	893,760	196,627,200	80.0	893,760	196,627,200	80.0	893,760
Eggplant	53.7	2,097,998	209,799,800	53.7	2,097,998	209,799,800	53.7	2,097,998	209,799,800	53.7	2,097,998
Sweet pepper	41.4	2,082,583	354,039,110	41.4	2,082,583	354,039,110	41.4	2,082,583	354,039,110	41.4	2,082,583
Cabbage	32.6	2,911,794	320,297,340	32.6	2,911,794	320,297,340	32.6	2,911,794	320,297,340	32.6	2,911,794
Water melon	45.3	5,060,523	303,631,380	45.3	5,060,523	303,631,380	45.3	5,060,523	303,631,380	45.3	5,060,523
Grape	14.20	12,136,740	1,820,511,000	14.20	12,136,740	1,820,511,000	14.20	12,136,740	1,820,511,000	14.20	12,136,740
Apricot	8.20	2,894,797	578,959,400	8.20	2,894,797	578,959,400	8.20	2,894,797	578,959,400	8.20	2,894,797
Apple	9.50	1,886,472	377,294,400	9.50	1,886,472	377,294,400	9.50	1,886,472	377,294,400	9.50	1,886,472
Sub-total (1st batch)			6,450,026,426			6,450,026,426			6,450,026,426		6,450,026,426
<2nd batch: 20 % of the new cropping area>											
Crop	Yield (ton/ha)	Production (kg)	Value (AMD)	32nd year			Value (AMD)	33rd year			Value (AMD)
				Yield (ton/ha)	Production (kg)	Value (AMD)		Yield (ton/ha)	Production (kg)	Value (AMD)	
Wheat	3.8	275,147	33,567,934	3.8	275,147	33,567,934	3.8	275,147	33,567,934	3.8	275,147
Barley	3.4	56,807	0	3.4	56,807	0	3.4	56,807	0	3.4	56,807
Maize (grain)	2.6	13,615	0	2.6	13,615	0	2.6	13,615	0	2.6	13,615
Alfalfa	11.8	1,264,960	0	9.6	1,029,120	0	11.8	1,264,960	0	11.8	1,264,960
Potato	41.8	1,152,673	126,794,030	41.8	1,152,673	126,794,030	41.8	1,152,673	126,794,030	41.8	1,152,673
Tomato, open	50.4	2,333,794	280,055,280	50.4	2,333,794	280,055,280	50.4	2,333,794	280,055,280	50.4	2,333,794
Tomato, green-house	100.0	478,800	119,700,000	100.0	478,800	119,700,000	100.0	478,800	119,700,000	100.0	478,800
Cucumber, open	42.0	938,448	93,844,800	42.0	938,448	93,844,800	42.0	938,448	93,844,800	42.0	938,448
Cucumber, green-house	80.0	255,360	561,792,000	80.0	255,360	561,792,000	80.0	255,360	561,792,000	80.0	255,360
Eggplant	53.7	599,428	59,942,800	53.7	599,428	59,942,800	53.7	599,428	59,942,800	53.7	599,428
Sweet pepper	41.4	595,024	101,154,080	41.4	595,024	101,154,080	41.4	595,024	101,154,080	41.4	595,024
Cabbage	32.6	831,941	91,513,510	32.6	831,941	91,513,510	32.6	831,941	91,513,510	32.6	831,941
Water melon	45.3	1,445,864	86,751,840	45.3	1,445,864	86,751,840	45.3	1,445,864	86,751,840	45.3	1,445,864
Grape	14.20	3,467,640	520,146,000	14.20	3,467,640	520,146,000	14.20	3,467,640	520,146,000	14.20	3,467,640
Apricot	8.20	827,085	165,417,000	8.20	827,085	165,417,000	8.20	827,085	165,417,000	8.20	827,085
Apple	9.50	538,992	107,796,400	9.50	538,992	107,796,400	9.50	538,992	107,796,400	9.50	538,992
Sub-total (2nd batch)			1,842,864,874			1,842,864,874			1,842,864,874		1,842,864,874
<3rd batch: 10 % of the new cropping area>											
Crop	Yield (ton/ha)	Production (kg)	Value (AMD)	32nd year			Value (AMD)	33rd year			Value (AMD)
				Yield (ton/ha)	Production (kg)	Value (AMD)		Yield (ton/ha)	Production (kg)	Value (AMD)	
Wheat	3.8	137,573	16,783,906	3.8	137,573	16,783,906	3.8	137,573	16,783,906	3.8	137,573
Barley	3.4	28,404	0	3.4	28,404	0	3.4	28,404	0	3.4	28,404
Maize (grain)	2.6	6,808	0	2.6	6,808	0	2.6	6,808	0	2.6	6,808
Alfalfa	11.8	632,480	0	11.8	632,480	0	11.8	632,480	0	11.8	632,480
Potato	41.8	576,336	63,396,960	41.8	576,336	63,396,960	41.8	576,336	63,396,960	41.8	576,336
Tomato, open	50.4	1,166,897	140,027,640	50.4	1,166,897	140,027,640	50.4	1,166,897	140,027,640	50.4	1,166,897
Tomato, green-house	100.0	239,400	59,850,000	100.0	239,400	59,850,000	100.0	239,400	59,850,000	100.0	239,400
Cucumber, open	42.0	469,224	46,922,400	42.0	469,224	46,922,400	42.0	469,224	46,922,400	42.0	469,224
Cucumber, green-house	80.0	127,680	28,089,600	80.0	127,680	28,089,600	80.0	127,680	28,089,600	80.0	127,680
Eggplant	53.7	299,714	29,971,400	53.7	299,714	29,971,400	53.7	299,714	29,971,400	53.7	299,714
Sweet pepper	41.4	297,512	50,577,040	41.4	297,512	50,577,040	41.4	297,512	50,577,040	41.4	297,512
Cabbage	32.6	415,971	45,756,810	32.6	415,971	45,756,810	32.6	415,971	45,756,810	32.6	415,971
Water melon	45.3	722,932	43,375,920	45.3	722,932	43,375,920	45.3	722,932	43,375,920	45.3	722,932
Grape	14.20	1,733,820	260,073,000	14.20	1,733,820	260,073,000	14.20	1,733,820	260,073,000	14.20	1,733,820
Apricot	8.20	413,542	82,708,400	8.20	413,542	82,708,400	8.20	413,542	82,708,400	8.20	413,542
Apple	9.50	269,496	53,899,200	9.50	269,496	53,899,200	9.50	269,496	53,899,200	9.50	269,496
Sub-total (3rd batch)			921,432,276			921,432,276			921,432,276		921,432,276

(a) Costs factors

1) Crop production costs

Table M-6.5. Production Costs of Major Crops (per ha)

No.	Crop	Financial Costs (AMD/ha)	Economic Costs (AMD/ha)	Remarks
1	Wheat	344,000	416,394	1 crop
2	Barley	298,667	357,619	1 crop
3	Maize (grain)	468,800	523,462	1 crop
4	Alfalfa	3,783,000	3,553,503	6 years total
5	Potato	1,735,000	1,778,478	1 crop
6	Tomato, open	1,761,800	1,713,074	1 crop
7	Tomato, green-house	14,951,500	12,772,680	1 crop
	Greenhouse construction	38,000,000	38,000,000	20 years-life
8	Cucumber, open	1,533,200	1,490,021	1 crop
9	Cucumber, green-house	12,849,600	11,448,500	1 crop
	Greenhouse construction	38,000,000	38,000,000	20 years-life
10	Eggplant	1,746,600	1,708,581	1 crop
11	Sweet pepper	1,738,600	1,700,168	1 crop
12	Cabbage	1,420,200	1,404,204	1 crop
13	Water melon	1,550,000	1,596,869	1 crop
14	Grape (50 years average)	76,760,000	63,253,398	50 years total
15	Apricot (60 years average)	48,831,400	42,304,211	60 years total
16	Apple (30 years average)	38,699,200	33,968,055	30 years total

Source: The Survey Team

2) Additional initial costs for new cropping

Table M-6.6 Additional Initial Costs for New Cropping

Inputs	Financial Costs (AMD/ha)	Economic Costs (AMD/ha)	Remarks
Land cleaning & stone collection	50,000	3,5000	Hired labor
Deep Tillage	70,000	73,640	Tractor
Land levelling	20,000	21,040	Tractor
Compost	80,000	80,000	10 ton/ha
Total	220,000	209,680	

Source: The Survey Team

Table M-6.7 Economic Costs per ha for Present Cropping Area

Present Cropping Area

Crop	Area (ha)	Area (%)	Unit cost (AMD/ha)	Annual Costs (AMD)
Wheat	1,535	100	416,394	639,164,790
Potato	713	100	1,778,478	1,268,054,814
Tomato, open	2,844	29	1,713,074	1,412,874,912
Tomato, green-house	2,844	3	12,772,680	1,089,765,058
Cucumber, open	2,844	14	1,490,021	593,266,761
Cucumber, green-house	2,844	2	11,448,500	651,190,680
Eggplant	2,844	7	1,708,581	340,144,305
Sweet pepper	2,844	9	1,700,168	435,175,001
Cabbage	2,844	16	1,404,204	638,968,988
Water melon	2,844	20	1,596,869	908,299,087
Grape	1,160	100	1,253,116	1,453,614,352
Apricot	831	64	705,070	374,984,526
Apple	831	36	1,132,269	338,729,444
Green-house materials & aggregate	2,844	5	38,000,000	270,180,000
Total				10,414,412,718

Source: The Survey Team

Table M-6.8a Economic Costs per ha for newly developed Area

1st year			2nd year			3rd year			4th year			5th year			6th year			7th year			8th year			9th year		
Crop	Area (ha)	Adjustment (%)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)		
Wheat	366	100	70	416,394	106,680,143	416,394	106,680,143	416,394	106,680,143	416,394	106,680,143	416,394	106,680,143	416,394	106,680,143	416,394	106,680,143	416,394	106,680,143	416,394	106,680,143	416,394	106,680,143	416,394	106,680,143	
Barley	109	76	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Maize (grain)	536	100	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Potato	138	100	70	1,778,478	171,800,975	1,778,478	171,800,975	1,778,478	171,800,975	1,778,478	171,800,975	1,778,478	171,800,975	1,778,478	171,800,975	1,778,478	171,800,975	1,778,478	171,800,975	1,778,478	171,800,975	1,778,478	171,800,975	1,778,478	171,800,975	
Tonaton, open	798	29	70	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	
Tonaton, closed	798	3	70	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	1,217,074	277,507,210	
Cucumber, open	798	14	70	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	
Cucumber, green-house	798	14	70	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	1,490,021	118,525,602	
Strawberry	798	7	70	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	
Swet pepper	798	9	70	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	
Calabaz	798	16	70	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	
Watermelon	798	20	70	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	
Apple	798	36	70	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	1,708,581	66,808,924	
Pre-cropping works in new cropping land	1,947	100	70	209,680	285,772,872	209,680	285,772,872	209,680	285,772,872	209,680	285,772,872	209,680	285,772,872	209,680	285,772,872	209,680	285,772,872	209,680	285,772,872	209,680	285,772,872	209,680	285,772,872	209,680	285,772,872	
Pre-cropping works in new cropping land & aggregate	798	5	70	38,000,000	1,061,340,000	38,000,000	1,061,340,000	38,000,000	1,061,340,000	38,000,000	1,061,340,000	38,000,000	1,061,340,000	38,000,000	1,061,340,000	38,000,000	1,061,340,000	38,000,000	1,061,340,000	38,000,000	1,061,340,000	38,000,000	1,061,340,000	38,000,000	1,061,340,000	
Sub-total (2nd batch, 20 % of the new cropping area)																										
Sub-total (2nd batch, 20 % of the new cropping area)																										
Wheat	366	100	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Barley	109	76	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Maize (grain)	536	100	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Potato	138	100	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tonaton, open	798	29	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tonaton, closed	798	3	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cucumber, open	798	14	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cucumber, green-house	798	2	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Strawberry	798	7	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Swet pepper	798	9	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Calabaz	798	16	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Watermelon	798	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Apple	798	36	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pre-cropping works in new cropping land	1,947	100	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pre-cropping works in new cropping land & aggregate	798	5	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sub-total (2nd batch, 20 % of the new cropping area)																										
Sub-total (2nd batch, 20 % of the new cropping area)																										
Wheat	366	100	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Barley	109	76	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Maize (grain)	536	100	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Potato	138	100	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tonaton, open	798	29	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tonaton, closed	798	3	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cucumber, open	798	14	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cucumber, green-house	798	2	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Strawberry	798	7	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Swet pepper	798	9	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Calabaz	798	16	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Watermelon	798	20	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Apple	798	36	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pre-cropping works in new cropping land	1,947	100	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Pre-cropping works in new cropping land & aggregate	798	5	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sub-total (2nd batch, 20 % of the new cropping area)																										
Sub-total (2nd batch, 20 % of the new cropping area)																										
Wheat	366	100	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Barley	109	76	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Maize (grain)	536	100	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Potato	138	100	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tonaton, open	798	29	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Tonaton, closed	798	3	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cucumber, open	798	14	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cucumber, green-house	798	2	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Strawberry	798	7	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Swet pepper	798	9	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Calabaz	798	16	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Watermelon																										

Table M-6.8b Economic Costs per ha for newly developed Area

New Cropping Area			10th year		11th year		12th year		13th year		14th year		15th year		16th year		17th year		18th year		
Crop	Area (ha)	Adjusted area (%)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD/ha)	Costs (AMD)	
Wheat	366	100	70	25,620	25,620	25,620	25,620	25,620	25,620	25,620	25,620	25,620	25,620	25,620	25,620	25,620	25,620	25,620	25,620	25,620	
Barley	109	76	70	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	
Millet (grain)	109	76	70	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	7,632	
Alfalfa	536	100	70	37,532	37,532	37,532	37,532	37,532	37,532	37,532	37,532	37,532	37,532	37,532	37,532	37,532	37,532	37,532	37,532	37,532	
Potato	138	100	70	9,666	9,666	9,666	9,666	9,666	9,666	9,666	9,666	9,666	9,666	9,666	9,666	9,666	9,666	9,666	9,666	9,666	
Tomato, open	798	29	70	5,112	5,112	5,112	5,112	5,112	5,112	5,112	5,112	5,112	5,112	5,112	5,112	5,112	5,112	5,112	5,112	5,112	
Cucumber, open	798	14	70	1,490.021	1,490.021	1,490.021	1,490.021	1,490.021	1,490.021	1,490.021	1,490.021	1,490.021	1,490.021	1,490.021	1,490.021	1,490.021	1,490.021	1,490.021	1,490.021	1,490.021	
Cucumber, green-house	798	14	70	1,448.850	1,448.850	1,448.850	1,448.850	1,448.850	1,448.850	1,448.850	1,448.850	1,448.850	1,448.850	1,448.850	1,448.850	1,448.850	1,448.850	1,448.850	1,448.850	1,448.850	
Eggplant	798	7	70	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	
Sweet pepper	798	7	70	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	1,708.581	
Cabbage	798	16	70	1,404.204	1,404.204	1,404.204	1,404.204	1,404.204	1,404.204	1,404.204	1,404.204	1,404.204	1,404.204	1,404.204	1,404.204	1,404.204	1,404.204	1,404.204	1,404.204	1,404.204	
Winter melon	798	20	70	1,596.869	1,596.869	1,596.869	1,596.869	1,596.869	1,596.869	1,596.869	1,596.869	1,596.869	1,596.869	1,596.869	1,596.869	1,596.869	1,596.869	1,596.869	1,596.869	1,596.869	
Grain melon	1,221	100	70	8,418.521	8,418.521	8,418.521	8,418.521	8,418.521	8,418.521	8,418.521	8,418.521	8,418.521	8,418.521	8,418.521	8,418.521	8,418.521	8,418.521	8,418.521	8,418.521	8,418.521	
Apple	788	64	70	684.026	684.026	684.026	684.026	684.026	684.026	684.026	684.026	684.026	684.026	684.026	684.026	684.026	684.026	684.026	684.026	684.026	
Pre-planting works in new cropping land	1,947	100	70	1,108.610	1,108.610	1,108.610	1,108.610	1,108.610	1,108.610	1,108.610	1,108.610	1,108.610	1,108.610	1,108.610	1,108.610	1,108.610	1,108.610	1,108.610	1,108.610	1,108.610	
Green-house materials & aggregate	798	5	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sub-total (at batch)				2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	
Sub-total (at batch)				2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	2,634,362.937	
Wheat	366	100	20	116.394	30,180.011	116.394	30,180.011	116.394	30,180.011	116.394	30,180.011	116.394	30,180.011	116.394	30,180.011	116.394	30,180.011	116.394	30,180.011	116.394	30,180.011
Barley	109	76	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Millet (grain)	109	76	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Alfalfa	536	100	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Potato	138	100	20	1,778.478	49,085.993	1,778.478	49,085.993	1,778.478	49,085.993	1,778.478	49,085.993	1,778.478	49,085.993	1,778.478	49,085.993	1,778.478	49,085.993	1,778.478	49,085.993	1,778.478	
Tomato, open	798	29	20	1,713.074	79,287.017	1,713.074	79,287.017	1,713.074	79,287.017	1,713.074	79,287.017	1,713.074	79,287.017	1,713.074	79,287.017	1,713.074	79,287.017	1,713.074	79,287.017	1,713.074	
Cucumber, open	798	14	20	1,277.268	6,115.559	1,277.268	6,115.559	1,277.268	6,115.559	1,277.268	6,115.559	1,277.268	6,115.559	1,277.268	6,115.559	1,277.268	6,115.559	1,277.268	6,115.559	1,277.268	
Cucumber, green-house	798	14	20	1,490.021	33,293.029	1,490.021	33,293.029	1,490.021	33,293.029	1,490.021	33,293.029	1,490.021	33,293.029	1,490.021	33,293.029	1,490.021	33,293.029	1,490.021	33,293.029	1,490.021	
Eggplant	798	7	20	1,144.850	3,654.361	1,144.850	3,654.361	1,144.850	3,654.361	1,144.850	3,654.361	1,144.850	3,654.361	1,144.850	3,654.361	1,144.850	3,654.361	1,144.850	3,654.361	1,144.850	
Sweet pepper	798	7	20	1,708.581	19,088.267	1,708.581	19,088.267	1,708.581	19,088.267	1,708.581	19,088.267	1,708.581	19,088.267	1,708.581	19,088.267	1,708.581	19,088.267	1,708.581	19,088.267	1,708.581	
Cabbage	798	16	20	1,708.581	21,212.13	1,708.581	21,212.13	1,708.581	21,212.13	1,708.581	21,212.13	1,708.581	21,212.13	1,708.581	21,212.13	1,708.581	21,212.13	1,708.581	21,212.13	1,708.581	
Winter melon	798	20	20	1,596.869	19,088.267	1,596.869	19,088.267	1,596.869	19,088.267	1,596.869	19,088.267	1,596.869	19,088.267	1,596.869	19,088.267	1,596.869	19,088.267	1,596.869	19,088.267	1,596.869	
Grain melon	1,221	100	20	1,881.521	288,527.428	1,881.521	288,527.428	1,881.521	288,527.428	1,881.521	288,527.428	1,881.521	288,527.428	1,881.521	288,527.428	1,881.521	288,527.428	1,881.521	288,527.428	1,881.521	
Apple	788	64	20	684.026	68,927.993	684.026	68,927.993	684.026	68,927.993	684.026	68,927.993	684.026	68,927.993	684.026	68,927.993	684.026	68,927.993	684.026	68,927.993	684.026	
Pre-planting works in new cropping land	1,947	100	20	1,108.610	62,898.097	1,108.610	62,898.097	1,108.610	62,898.097	1,108.610	62,898.097	1,108.610	62,898.097	1,108.610	62,898.097	1,108.610	62,898.097	1,108.610	62,898.097	1,108.610	
Green-house materials & aggregate	798	5	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sub-total (at batch)				752,671.309	753,723.695	752,671.309	753,723.695	752,671.309	753,723.695	752,671.309	753,723.695	752,671.309	753,723.695	752,671.309	753,723.695	752,671.309	753,723.695	752,671.309	753,723.695	752,671.309	
Sub-total (at batch)				752,671.309	753,723.695	752,671.309	753,723.695	752,671.309	753,723.695	752,671.309	753,723.695	752,671.309	753,723.695	752,671.309	753,723.695	752,671.309	753,723.695	752,671.309	753,723.695	752,671.309	
Wheat	366	100	10	416.394	15,240.020	416.394	15,240.020	416.394	15,240.020	416.394	15,240.020	416.394	15,240.020	416.394	15,240.020	416.394	15,240.020	416.394	15,240.020	416.394	
Barley	109	76	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Millet (grain)	109	76	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Alfalfa	536	100	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Potato	138	100	10	1,778.478	24,542.996	1,778.478	24,542.996	1,778.478	24,542.996	1,778.478	24,542.996	1,778.478	24,542.996	1,778.478	24,542.996	1,778.478	24,542.996	1,778.478	24,542.996	1,778.478	
Tomato, open	798	29	10	1,713.074	39,613.959	1,713.074	39,613.959	1,713.074	39,613.959	1,713.074	39,613.959	1,713.074	39,613.959	1,713.074	39,613.959	1,713.074	39,613.959	1,713.074	39,613.959	1,713.074	
Cucumber, open	798	14	10	1,277.268	3,057.780	1,277.268	3,057.780	1,277.268	3,057.780	1,277.268	3,057.780	1,277.268	3,057.780	1,277.268	3,057.780	1,277.27					

Table M-6.8c Economic Costs per ha for newly developed Area

New Cropping Area	19th year				20th year				21th year				22th year				23th year				24th year				25th year				26th year				27th year			
	Area (ha)	Area (%)	Adjusted area (%)	Unit cost (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD)	Unit cost (AMD/ha)	Costs (AMD)	Unit cost (AMD)	Unit cost (AMD/ha)	Costs (AMD)						
Wheat	366	100	70	416.394	106,680.143	416.394	106,680.143	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975						
Barley	109	76	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Maize (grain)	169	24	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Alfalfa	535	100	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Potato	138	100	70	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478	171,800.975	1,778.478						
Tenacious, open	798	29	70	1,713.074	277,507.710	1,713.074	277,507.710	2,775,077.10	1,713.074	2,775,077.10	1,713.074	2,775,077.10	1,713.074	2,775,077.10	1,713.074	2,775,077.10	1,713.074	2,775,077.10	1,713.074	2,775,077.10	1,713.074	2,775,077.10	1,713.074	2,775,077.10	1,713.074	2,775,077.10	1,713.074	2,775,077.10	1,713.074	2,775,077.10						
Green-house	798	3	70	1,277.268	21,401.157	1,277.268	21,401.157	1,277.268	21,401.157	1,277.268	21,401.157	1,277.268	21,401.157	1,277.268	21,401.157	1,277.268	21,401.157	1,277.268	21,401.157	1,277.268	21,401.157	1,277.268	21,401.157	1,277.268	21,401.157	1,277.268	21,401.157	1,277.268	21,401.157	21,401.157						
Accumulator, open	798	14	70	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	118,525.602						
Green-house	798	14	70	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	1,490.021	118,525.602	118,525.602						
Accumulator, green-house	798	7	70	1,708.581	66,808.934	1,708.581	66,808.934	1,708.581	66,808.934	1,708.581	66,808.934	1,708.581	66,808.934	1,708.581	66,808.934	1,708.581	66,808.934	1,708.581	66,808.934	1,708.581	66,808.934	1,708.581	66,808.934	1,708.581	66,808.934	1,708.581	66,808.934	1,708.581	66,808.934	66,808.934						
Green-house	798	7	70																																	
Swiss chard	798	9	70	1,700.168	85,474.246	1,700.168	85,474.246	1,700.168	85,474.246	1,700.168	85,474.246	1,700.168	85,474.246	1,700.168	85,474.246	1,700.168	85,474.246	1,700.168	85,474.246	1,700.168	85,474.246	1,700.168	85,474.246	1,700.168	85,474.246	1,700.168	85,474.246	1,700.168	85,474.246	85,474.246						
Swiss chard	798	16	70	1,404.204	125,502.137	1,404.204	125,502.137	1,404.204	125,502.137	1,404.204	125,502.137	1,404.204	125,502.137	1,404.204	125,502.137	1,404.204	125,502.137	1,404.204	125,502.137	1,404.204	125,502.137	1,404.204	125,502.137	1,404.204	125,502.137	1,404.204	125,502.137	1,404.204	125,502.137	125,502.137						
Winter melon	798	20	70	1,596.869	178,402.305	1,596.869	178,402.305	1,596.869	178,402.305	1,596.869	178,402.305	1,596.869	178,402.305	1,596.869	178,402.305	1,596.869	178,402.305	1,596.869	178,402.305	1,596.869	178,402.305	1,596.869	178,402.305	1,596.869	178,402.305	1,596.869	178,402.305	1,596.869	178,402.305	178,402.305						
Winter melon	1,221	100	70	1,181.523	1,009,845.999	1,181.523	1,009,845.999	1,181.523	1,009,845.999	1,181.523	1,009,845.999	1,181.523	1,009,845.999	1,181.523	1,009,845.999	1,181.523	1,009,845.999	1,181.523	1,009,845.999	1,181.523	1,009,845.999	1,181.523	1,009,845.999	1,181.523	1,009,845.999	1,181.523	1,009,845.999	1,181.523	1,009,845.999	1,009,845.999						
Apricot	788	36	70	6,984.620	245,146.926	6,984.620	245,146.926	6,984.620	245,146.926	6,984.620	245,146.926	6,984.620	245,146.926	6,984.620	245,146.926	6,984.620	245,146.926	6,984.620	245,146.926	6,984.620	245,146.926	6,984.620	245,146.926	6,984.620	245,146.926	6,984.620	245,146.926	6,984.620	245,146.926	245,146.926						
Apricot	788	36	70	1,086.610	220,143.339	1,086.610	220,143.339	1,086.610	220,143.339	1,086.610	220,143.339	1,086.610	220,143.339	1,086.610	220,143.339	1,086.610	220,143.339	1,086.610	220,143.339	1,086.610	220,143.339	1,086.610	220,143.339	1,086.610	220,143.339	1,086.610	220,143.339	1,086.610	220,143.339	220,143.339						
Pre-planting weeds in new cropping land	1,947	100	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Pre-planting weeds in new cropping land	798	5	70	0	38,000.000	1,061,340.000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Pre-planting weeds in new cropping land					2,638,032.937	2,638,032.937																									2,638,032.937					
Sub-total (2nd batch)						3,699,327.937																									3,699,327.937					
Sub-total (2nd batch)						2,638,032.937																									2,638,032.937					
Sub-total (2nd batch)						2,638,032.937																									2,638,032.937					
Sub-total (2nd batch)						2,638,032.937																									2,638,032.937					
Sub-total (2nd batch)						2,638,032.937																									2,638,032.937					
Sub-total (2nd batch)						2,638,032.937																									2,638,032.937					
Sub-total (2nd batch)						2,638,032.937																									2,638,032.937					
Sub-total (2nd batch)						2,638,032.937																									2,638,032.937					
Sub-total (2nd batch)						2,638,032.937																									2,638,032.937					
Sub-total (2nd batch)						2,638,032.937																									2,638,032.937					
Sub-total (2nd batch)						2,638,032.937																									2,638,032.937					
Sub-total (2nd batch)						2,638,032.937																									2,638,032.937					
Sub-total (2nd batch)						2,638,032.937																									2,638,032.937					
Sub-total (2nd batch)						2,638,032.937																									2,638,032.937					
Sub-total (2nd batch)						2,638,032.937																									2,638,032.937					
Sub-total (2nd batch)						2,638,032.937																					</									

Table M-6.8d Economic Costs per ha for newly developed Area

[illegible]

b. Crop farm-gate prices

Crop farm-gate prices as shown in Table M-6.9 were collected through the survey and converted into economic prices using conversion factors referenced from KFW (2014).

Table M-6.9 Crop Farm-gate Prices

No.	Crop	Financial Price (AMD/kg)	Economic Price (AMD/kg)	Remarks
1	Wheat	120	122	
2	Barley	-	-	Converted to livestock value
3	Maize (grain)	-	-	Converted to livestock value
4	Alfalfa	-	-	Converted to livestock value
5	Potato	110	110	
6	Tomato, open	120	120	
7	Tomato, green-house	250	250	
8	Cucumber, open	100	100	
9	Cucumber, green-house	220	220	
10	Eggplant	100	100	
11	Sweet pepper	170	170	
12	Cabbage	110	110	
13	Water melon	60	60	
14	Grape	150	150	
15	Apricot	200	200	
16	Apple	200	200	

Source) The Survey Team

Table M-6.10a Annual Cash Flow of Agricultural Income

(Unit: AMD)

Title		1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year	11th year	12th year
Without	New Area, without	Gross Profit	0	0	0	0	0	0	0	0	0	0	0
		Total Cost	0	0	0	0	0	0	0	0	0	0	0
		Net Profit	0	0	0	0	0	0	0	0	0	0	0
	Present Area, without	Gross Profit	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000
		Total Cost	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718
With	New Area, 1st batch	Gross Profit	3,117,843,950	3,265,457,510	5,015,482,330	5,537,734,026	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426
		Total Cost	5,008,538,762	2,965,847,964	2,465,014,510	2,488,820,020	2,585,598,433	2,624,291,452	2,634,361,487	2,634,361,487	2,634,361,487	2,638,032,937	2,638,032,937
		Net Profit	-1,890,694,812	299,609,546	2,550,467,820	3,048,914,006	3,865,918,893	3,825,734,974	3,208,827,939	3,815,664,939	3,815,664,939	3,811,993,489	3,811,993,489
	New Area, 2nd batch	Gross Profit	0	890,812,460	932,987,840	1,432,995,040	1,582,209,874	1,700,433,674	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874
		Total Cost	0	1,431,011,074	847,385,131	704,289,858	711,091,432	738,742,408	749,797,556	936,056,709	752,674,709	752,674,709	753,723,695
With - Without	New Area, 3rd batch	Gross Profit	0	0	445,406,280	466,493,920	716,497,470	791,104,876	921,432,276	921,432,276	921,432,276	921,432,276	921,432,276
		Total Cost	0	0	715,505,538	423,692,567	352,144,931	355,545,718	374,888,779	463,028,356	376,337,356	376,337,356	376,337,356
		Net Profit	0	0	-270,099,258	42,801,353	364,352,539	435,559,158	546,533,497	458,403,920	545,094,920	545,094,920	545,094,920
	New Area, Total	Gross Profit	3,117,843,950	4,156,269,970	6,393,876,450	7,437,222,986	8,250,224,670	8,941,564,976	9,143,108,076	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576
		Total Cost	5,008,538,762	4,396,859,038	4,027,905,179	3,616,802,445	3,648,834,796	3,718,579,578	3,935,316,975	3,850,064,552	3,763,373,552	3,767,045,002	3,768,093,988
With - Without	Present Area, with	Gross Profit	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262
		Total Cost	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718
		Net Profit	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544
	With - Without, New Area	Gross Profit	3,117,843,950	4,156,269,970	6,393,876,450	7,437,222,986	8,250,224,670	8,941,564,976	9,143,108,076	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576
		Total Cost	5,008,538,762	4,396,859,038	4,027,905,179	3,616,802,445	3,648,834,796	3,718,579,578	3,935,316,975	3,850,064,552	3,763,373,552	3,767,045,002	3,768,093,988
With - Without	With - Without, Present Area	Gross Profit	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262
		Total Cost	0	0	0	0	0	0	0	0	0	0	0
		Net Profit	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262
	With - Without, All Area	Gross Profit	4,892,749,212	5,931,175,232	8,168,781,712	9,212,128,248	10,025,129,932	10,716,470,238	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838
		Total Cost	5,008,538,762	4,396,859,038	4,027,905,179	3,616,802,445	3,648,834,796	3,718,579,578	3,935,316,975	3,850,064,552	3,763,373,552	3,767,045,002	3,768,093,988
With - Without		Net Profit	-115,789,550	1,534,316,194	4,140,876,533	5,595,325,803	6,367,295,136	6,997,890,660	7,053,911,863	7,139,164,286	7,225,855,286	7,222,183,836	7,221,134,850

Table M-6.10b Economic Costs per ha for newly developed Area

(Unit: AMD)

Title	Year											
	13th year	14th year	15th year	16th year	17th year	18th year	19th year	20th year	21st year	22nd year	23rd year	24th year
Without	Gross Profit	0	0	0	0	0	0	0	0	0	0	0
	Total Cost	0	0	0	0	0	0	0	0	0	0	0
	Net Profit	0	0	0	0	0	0	0	0	0	0	0
Present Area, without	Gross Profit	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000
	Total Cost	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718
	Net Profit	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282
New Area, 1st batch	Gross Profit	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426
	Total Cost	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937
	Net Profit	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489
New Area, 2nd batch	Gross Profit	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874
	Total Cost	753,723,695	753,723,695	753,723,695	753,723,695	753,723,695	927,105,695	753,723,695	1,056,963,695	753,723,695	753,723,695	753,723,695
	Net Profit	1,089,141,179	1,089,141,179	1,089,141,179	1,089,141,179	1,089,141,179	915,759,179	1,089,141,179	785,901,179	1,089,141,179	1,089,141,179	1,089,141,179
New Area, 3rd batch	Gross Profit	921,432,276	921,432,276	921,432,276	921,432,276	921,432,276	921,432,276	921,432,276	921,432,276	921,432,276	921,432,276	921,432,276
	Total Cost	376,861,848	376,861,848	376,861,848	376,861,848	376,861,848	376,861,848	463,552,848	376,861,848	528,481,848	376,861,848	376,861,848
	Net Profit	544,570,428	544,570,428	544,570,428	544,570,428	544,570,428	544,570,428	457,879,428	544,570,428	392,950,428	544,570,428	544,570,428
New Area, Total	Gross Profit	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576
	Total Cost	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480	3,942,000,480	4,916,649,480	4,071,858,480	3,970,238,480	3,768,618,480	3,768,618,480
	Net Profit	5,445,705,096	5,445,705,096	5,445,705,096	5,445,705,096	5,445,705,096	5,272,323,096	4,297,674,096	5,142,465,096	5,294,085,096	5,445,705,096	5,445,705,096
Present Area, with	Gross Profit	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262
	Total Cost	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718
	Net Profit	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544
With - Without, New Area	Gross Profit	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576
	Total Cost	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480	3,942,000,480	4,916,649,480	4,071,858,480	3,970,238,480	3,768,618,480	3,768,618,480
	Net Profit	5,445,705,096	5,445,705,096	5,445,705,096	5,445,705,096	5,445,705,096	5,272,323,096	4,297,674,096	5,142,465,096	5,294,085,096	5,445,705,096	5,445,705,096
With - Without, Present Area	Gross Profit	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262
	Total Cost	0	0	0	0	0	0	0	0	0	0	0
	Net Profit	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262
With - Without, All Area	Gross Profit	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838
	Total Cost	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480	3,942,000,480	4,916,649,480	4,071,858,480	3,970,238,480	3,768,618,480	3,768,618,480
	Net Profit	7,220,610,358	7,220,610,358	7,220,610,358	7,220,610,358	7,220,610,358	7,047,228,358	6,072,579,358	6,917,370,358	7,068,990,358	7,220,610,358	7,220,610,358

Table M-6.10c Economic Costs per ha for newly developed Area

(Unit: AMD)

	Title	2017-2022											
		25th year	26th year	27th year	28th year	29th year	30th year	31st year	32nd year	33rd year	34th year	35th year	
Without	New Area, without	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0
	Net Profit	0	0	0	0	0	0	0	0	0	0	0	0
	Gross Profit	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000	21,529,812,000
	Total Cost	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718
	Net Profit	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282	11,115,399,282
	Gross Profit	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426	6,450,026,426
	Total Cost	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937	2,638,032,937
	Net Profit	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489	3,811,993,489
	Gross Profit	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874	1,842,864,874
With	New Area, 2nd batch	753,723,695	753,723,695	753,723,695	753,723,695	753,723,695	927,105,695	753,723,695	753,723,695	753,723,695	753,723,695	753,723,695	753,723,695
		1,089,141,179	1,089,141,179	1,089,141,179	1,089,141,179	1,089,141,179	915,759,179	1,089,141,179	1,089,141,179	1,089,141,179	1,089,141,179	1,089,141,179	1,089,141,179
	Gross Profit	921,432,276	921,432,276	921,432,276	921,432,276	921,432,276	921,432,276	921,432,276	921,432,276	921,432,276	921,432,276	921,432,276	921,432,276
	Total Cost	376,861,848	376,861,848	376,861,848	376,861,848	376,861,848	376,861,848	463,552,848	376,861,848	376,861,848	376,861,848	376,861,848	376,861,848
	Net Profit	544,570,428	544,570,428	544,570,428	544,570,428	544,570,428	544,570,428	457,879,428	544,570,428	544,570,428	544,570,428	544,570,428	544,570,428
	Gross Profit	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576
	Total Cost	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480	3,942,000,480	3,855,309,480	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480
	Net Profit	5,445,705,096	5,445,705,096	5,445,705,096	5,445,705,096	5,445,705,096	5,272,323,096	5,359,014,096	5,445,705,096	5,445,705,096	5,445,705,096	5,445,705,096	5,445,705,096
	Gross Profit	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262	23,304,717,262
	Total Cost	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718	10,414,412,718
With - Without	Present Area, with	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544	12,890,304,544
		9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576	9,214,323,576
	Gross Profit	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480	3,942,000,480	3,855,309,480	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480
	Total Cost	5,445,705,096	5,445,705,096	5,445,705,096	5,445,705,096	5,445,705,096	5,272,323,096	5,359,014,096	5,445,705,096	5,445,705,096	5,445,705,096	5,445,705,096	5,445,705,096
	Net Profit	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262
	Gross Profit	0	0	0	0	0	0	0	0	0	0	0	0
	Total Cost	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262	1,774,905,262
	Net Profit	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838	10,989,228,838
	Gross Profit	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480	3,942,000,480	3,855,309,480	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480	3,768,618,480
	Total Cost	7,220,610,358	7,220,610,358	7,220,610,358	7,220,610,358	7,220,610,358	7,047,228,358	7,133,773,358	7,220,610,358	7,220,610,358	7,220,610,358	7,220,610,358	7,220,610,358

Table M-6.11 Economic Farming Cost per ha (Wheat)

Wheat (1ha)												
No	Works & Inputs	Unit	Q'ty	Unit Price (in AMD)	Financial Cost Total (in AMD)	Fuel Share	Taxes		Subsidies		Conversion Factor	Economic Cost Total (in AMD)
1	Tillage, tractor	ha	1		35,000	30%	2.8%	294	20%	2,100	1.052	36,806
2	Levelling, tractor	ha	1		20,000	30%	2.8%	168	20%	1,200	1.052	21,032
3	Sowing, tractor	ha	1		20,000	30%	2.8%	168	20%	1,200	1.052	21,032
4	Developing ditches, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
5	Inter-cultivation & topdressing, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
6	Chemical spraying, tractor	times/ha	2	12,000	24,000	30%	2.8%	202	20%	1,440	1.052	25,238
7	Harvesting, combine	ha	1		30,000	30%	2.8%	252	20%	1,800	1.052	31,548
8	Transportation of harvest				10,000	30%	2.8%	84	20%	600	1.052	10,516
9	Price of seeds	kg	300	160	16,000				89%	14,200	1.888	30,200
10	Irrigation fee	ha	1		40,000						1.700	68,000
11	Watering labors	man/day	6	5,000	30,000						0.700	21,000
12	Price of fertilizers											
	* Ammonia selitra	kg	300	120	36,000				54%	19,290	1.536	55,290
	* Super phosphate	kg	150	140	21,000				97%	20,400	1.971	41,400
	* Potasic salt	kg	50	140	7,000				97%	6,800	1.971	13,800
13	Compost/manure	ton	0	8,000	0							0
14	Price of chemicals	ha	1		15,000						1.000	15,000
15	Land tax	ha	1		15,000			15,000				0
16	Other expenditure				5,000						0.900	4,500
Production Cost Total (A)					344,000							416,394

Table M-6.12 Economic Farming Cost per ha (Grain)

Maize for grain (1ha)												
No	Works & Inputs	Unit	Q'ty	Unit Price (in AMD)	Financial Cost Total (in AMD)	Fuel Share	Taxes		Subsidies		Conversion Factor	Economic Cost Total (in AMD)
1	Tillage, tractor	ha	1		35,000	30%	2.8%	294	20%	2,100	1.052	36,806
2	Harrow, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
3	Levelling, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
4	Sowing, tractor	ha	1		20,000	30%	2.8%	168	20%	1,200	1.052	21,032
5	Developing ditches, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
6	Seeds	kg	20	4,000	80,000							80,000
7	Inter-cultivation & topdressing, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
8	Weeding with tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
9	Chemical spraying, tractor	times/ha	2	12,000	24,000	30%	2.8%	202	20%	1,440	1.052	25,238
10	Price of fertilizers											
	* Ammonia selitra	kg	300	120	36,000				54%	19,290	1.536	55,290
	* Super phosphate	kg	120	140	16,800				97%	16,320	1.971	33,120
	* Potasic salt	kg	50	140	7,000				97%	6,800	1.971	13,800
11	Compost/manure	ton	0	8,000	0							0
12	Chemicals	ha	1		40,000						1.000	40,000
13	Irrigation fee	ha	1		40,000						1.700	68,000
14	Watering labors	man/day	6	5,000	30,000						0.700	21,000
15	Harvesting with combine harvester	ha	1		40,000	30%	2.8%	336	20%	2,400	1.052	42,064
16	Transportation handling				20,000	30%	2.8%	168	20%	1,200	1.052	21,032
17	Land tax	ha	1		15,000							0
18	Other expenditure				15,000						0.900	13,500
Production Cost Total (A)					468,800							523,462

Table M-6.13 Economic Farming Cost per ha (Barley)

Barley (1ha)												
No	Works & Inputs	Unit	Q'ty	Unit Price (in AMD)	Financial Cost Total (in AMD)	Fuel Share	Taxes		Subsidies		Conversion Factor	Economic Cost Total (in AMD)
1	Deep tillage (27-30cm), tractor	ha			35,000	30%	2.8%	294	20%	2,100	1.052	36,806
2	Levelling, tractor	ha			20,000	30%	2.8%	168	20%	1,200	1.052	21,032
3	Sowing, tractor	ha			20,000	30%	2.8%	168	20%	1,200	1.052	21,032
4	Developing ditches, tractor	ha			10,000	30%	2.8%	84	20%	600	1.052	10,516
5	Inter-cultivation & topdressing, tractor	ha			10,000	30%	2.8%	84	20%	600	1.052	10,516
6	Chemical spraying, tractor	times/ha	2	12,000	24,000	30%	2.8%	202	20%	1,440	1.052	25,238
7	Harvesting, combine	ha			30,000	30%	2.8%	252	20%	1,800	1.052	31,548
8	Transportation of harvest				10,000	30%	2.8%	84	20%	600	1.052	10,516
9	Price of seeds	kg	200	130	8,667				153%	13,273	2.532	21,940
10	Irrigation fee	ha			30,000						1.700	51,000
11	Watering labors	man/day	3	5,000	15,000						0.700	10,500
12	Price of fertilizers											
	* Ammonia selitra	kg	250	120	30,000				54%	16,075	1.536	46,075
	* Super phosphate	kg	100	140	14,000				97%	13,600	1.971	27,600
	* Potasic salt	kg	50	140	7,000				97%	6,800	1.971	13,800
13	Compost/manure	ton	0	8,000	0							0
14	Price for chemicals	ha			15,000						1.000	15,000
15	Land tax	ha			15,000							0
16	Other expenditure				5,000						0.900	4,500
Production Cost Total (A)					298,667							357,619

Table M-6.14a Economic Farming Cost per ha (Alfalfa)

Alfalfa (1ha)												
No	Works & Inputs	Unit	Unit Price (in AMD)	1st year								
				Q'ty	Financial Cost Total (in	Fuel Share	Taxes		Subsidies		Conversion Factor	Economic Cost Total (in AMD)
1	Tillage, tractor	ha		1	35,000	30%	2.8%	294	20%	2,100	1.052	36,806
2	Harrow, tractor	ha		1	10,000	30%	2.8%	84	20%	600	1.052	10,516
3	Levelling, tractor	ha		1	10,000	30%	2.8%	84	20%	600	1.052	10,516
4	Sowing, tractor	ha		1	20,000	30%	2.8%	168	20%	1,200	1.052	21,032
5	Developing ditches, tractor	ha		1	10,000	30%	2.8%	84	20%	600	1.052	10,516
6	Seeds	kg	2,500	30	75,000						1.000	75,000
7	Fertilizers											
*	Ammonia selitra	kg	120	0	0							0
*	Super phosphate	kg	140	200	28,000				97%	27,200	1.971	55,200
*	Potasic salt	kg	140	50	7,000				97%	6,800	1.971	13,800
8	Compost/manure	ton	8,000	20	160,000						1.000	160,000
9	Chemicals (3 times), spraying	times	12,000	0	0						1.000	0
10	Chemicals	ha	40,000	0	0						1.000	0
11	Irrigation fee	ha	85,000	1	85,000						1.700	144,500
12	Watering labors	man/day	5,000	6	30,000						0.700	21,000
13	Mowing	times/ha	25,000	3	75,000						0.700	52,500
14	Upturn the swath	times/ha	5,000	3	15,000						0.700	10,500
15	Baling	times/ha	25,000	3	75,000						0.700	52,500
16	Handling	times/ha	10,000	3	30,000	30%	2.8%	252	20%	1,800	1.052	31,548
17	Transportation	times/ha	6,000	3	18,000	30%	2.8%	151	20%	1,080	1.052	18,929
17	Land tax				15,000							0
18	Other expenditure				20,000						0.900	18,000
Production Cost Total (A)					718,000							742,863

Table M-6.14b Economic Farming Cost per ha (Alfalfa)

Alfalfa (1ha)														
No	Works & Inputs	Unit	Unit Price (in AMD)	2nd - 6th year (5 years)								Total Production Cost 6 years		
				Q'ty	Financial Cost Total (in	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)	Financial Cost Total (in AMD)	Economic Cost Total (in AMD)		
1	Tillage, tractor	ha		0	0							35,000	36,806	
2	Harrow, tractor	ha		0	0							10,000	10,516	
3	Levelling, tractor	ha		0	0							10,000	10,516	
4	Sowing, tractor	ha		0	0							20,000	21,032	
5	Developing ditches, tractor	ha		0	0							10,000	10,516	
6	Seeds	kg	2,500	0	0							75,000	75,000	
7	Fertilizers											0	0	
*	Ammonia selitra	kg	120	0	0							0	0	
*	Super phosphate	kg	140	0	0							28,000	55,200	
*	Potasic salt	kg	140	0	0							7,000	13,800	
8	Compost/manure	ton	8,000	0	0							160,000	160,000	
9	Chemicals (3 times), spraying	times	12,000	4 x 5years	240,000					1.000	240,000	240,000	240,000	
10	Chemicals	ha	40,000	1 x 5years	200,000					1.000	200,000	200,000	200,000	
11	Irrigation fee	ha	85,000	1 x 5years	425,000					1.700	722,500	510,000	867,000	
12	Watering labors	man/day	5,000	10 x 5years	250,000					0.700	175,000	280,000	196,000	
13	Mowing	times/ha	25,000	5 x 5years	625,000					0.700	437,500	700,000	490,000	
14	Upturn the swath	times/ha	5,000	5 x 5years	125,000					0.700	87,500	140,000	98,000	
15	Baling	times/ha	25,000	5 x 5years	625,000					0.700	437,500	700,000	490,000	
16	Handling	times/ha	10,000	5 x 5years	250,000	30%	2.8%	2,100	20%	15,000	1.052	262,900	280,000	294,448
17	Transportation	times/ha	6,000	5 x 5years	150,000	30%	2.8%	1,260	20%	9,000	1.052	157,740	168,000	176,669
17	Land tax			5 years	75,000							0	90,000	0
18	Other expenditure			5 years	100,000						0.900	90,000	120,000	108,000
Production Cost Total (A)					3,065,000						2,810,640	3,783,000	3,553,503	

Table M-6.15 Economic Farming Cost per ha (Potato)

Potato, irrigated (1ha)												
No	Works & Inputs	Unit	Q'ty	Unit Price (in AMD)	Financial Cost Total (in AMD)	Fuel Share	Taxes		Subsidies		Conversion Factor	Economic Cost Total (in AMD)
1	Tillage, tractor	ha	1		35,000	30%	2.8%	294	20%	2,100	1.052	36,806
2	Levelling, tractor	ha	1		20,000	30%	2.8%	168	20%	1,200	1.052	21,032
3	Planting, planter	ha	1		30,000	30%	2.8%	252	20%	1,800	1.052	31,548
4	Weeding & intercultivation, tractor	ha	1		15,000	30%	2.8%	126	20%	900	1.052	15,774
5	Earthing up – nutrition, tractor	ha	1		20,000	30%	2.8%	168	20%	1,200	1.052	21,032
6	Developing ditches, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
7	Chemicals (4 times), spraying	times	4	12,000	48,000						1.000	48,000
8	Watering labors	man/day	10	5,000	50,000						0.700	35,000
9	Harvesting manually, labors	man/day	30	5,000	150,000						0.700	105,000
10	Transportation of harvest				50,000	30%	2.8%	420	20%	3,000	1.052	52,580
11	Seed potatoes	kg	3,800	250	950,000						1.000	950,000
12	Irrigation fee	ha			55,000						1.700	93,500
13	Price of fertilizers											
*	Ammonia selitra	kg	300	120	36,000				54%	19,290	1.536	55,290
*	Super phosphate	kg	250	140	35,000				97%	34,000	1.971	69,000
*	Potasic salt	kg	150	140	21,000				97%	20,400	1.971	41,400
14	Compost/manure	ton	15	8,000	120,000						1.000	120,000
15	Price of chemicals	ha	1		45,000						1.000	45,000
16	Land tax	ha			15,000							0
17	Other expenditure				30,000						0.900	27,000
Production Cost Total (A)					1,735,000							1,778,478

Table M-6.16 Economic Farming Cost per ha (Tomato, open)

Tomato (1ha)												
No	Works & Inputs	Unit	Q'ty	Unit Price (in AMD)	Financial Cost Total (in AMD)	Fuel Share	Taxes		Subsidies		Conversion Factor	Economic Cost Total (in AMD)
1	Tillage, tractor	ha	1		35,000	30%	2.8%	294	20%	2,100	1.052	36,806
2	Harrow, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
3	Levelling, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
4	Ridging, tractor	ha	1		25,000	30%	2.8%	210	20%	1,500	1.052	26,290
5	Seedling	seedlings	45,000	5	225,000						1.000	225,000
6	Seedling transplanting works	man/day	16	5,000	80,000						0.700	56,000
7	Watering labors	time/ha	12	8,000	96,000						0.700	67,200
8	Irrigation fee	ha	1		100,000						1.700	170,000
9	Weeding & intercultivation, tractor	ha	1		15,000	30%	2.8%	126	20%	900	1.052	15,774
10	Intercultivation + nutrition twice	time/ha	2	10,000	20,000						1.000	20,000
11	Earthing up, tractor	ha	1		20,000	30%	2.8%	168	20%	1,200	1.052	21,032
12	Spraying (with tractor)	time/ha	2	12,000	24,000	30%	2.8%	202	20%	1,440	1.052	25,238
13	Weeding (manually 1 st time)	man/day	24	5,000	120,000						0.700	84,000
14	Weeding (manually 2 nd time)	man/day	20	5,000	100,000						0.700	70,000
15	Correction of plant trellis	man/day	5	5,000	25,000						0.700	17,500
16	Fertilizers											
	* Ammonia selitra	kg	300	120	36,000				54%	19,290	1.536	55,290
	* Super phosphate	kg	220	140	30,800				97%	29,920	1.971	60,720
	* Potasic salt	kg	250	140	35,000				97%	34,000	1.971	69,000
17	Compost/manure	ton	30	8,000	240,000						1.000	240,000
18	Herbicide	ha	1		40,000						1.000	40,000
19	Chemicals	ha	1		80,000						1.000	80,000
20	Harvesting	man/day	48	5,000	240,000						0.700	168,000
21	Harvest transportation to the plant				120,000	30%	2.8%	1008	20%	7,200	1.052	126,192
22	Land tax	ha	1		15,000							0
23	Other expenditure				20,000						0.900	18,000
Production Cost Total (A)					1,761,800							1,713,074

Table M-6.17 Economic Farming Cost per ha (Cucumber, open)

Cucumber (1ha)												
No	Works & Inputs	Unit	Q'ty	Unit Price (in AMD)	Financial Cost Total (in AMD)	Fuel Share	Taxes		Subsidies		Conversion Factor	Economic Cost Total (in AMD)
1	Tillage, tractor	ha	1		35,000	30%	2.8%	294	20%	2,100	1.052	36,806
2	Harrow, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
3	Levelling, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
4	Ridging, tractor	ha	1		25,000	30%	2.8%	210	20%	1,500	1.052	26,290
5	Sowing	man/day	14	5,000	70,000						0.700	49,000
6	Seeds	kg	1.5	20,000	30,000						1.000	30,000
7	Watering labors	time/ha	12	8,000	96,000						0.700	67,200
8	Irrigation fee	ha	1		100,000						1.700	170,000
9	Weeding & intercultivation, tractor	ha	1		15,000	30%	2.8%	126	20%	900	1.052	15,774
10	Intercultivation + nutrition twice	time/ha	2	10,000	20,000						1.000	20,000
11	Earthing up, tractor	ha	1		20,000	30%	2.8%	168	20%	1,200	1.052	21,032
12	Spraying (with tractor)	time/ha	2	16,000	32,000	30%	2.8%	269	20%	1,920	1.052	33,651
13	Weeding (manually 1 st time)	man/day	24	5,000	120,000						0.700	84,000
14	Weeding (manually 2 nd time)	man/day	20	5,000	100,000						0.700	70,000
15	Fertilizers											
	* Ammonia selitra	kg	280	120	33,600				54%	18,004	1.536	51,604
	* Super phosphate	kg	200	140	28,000				97%	27,200	1.971	55,200
	* Potasic salt	kg	240	140	33,600				97%	32,640	1.971	66,240
16	Compost/manure	ton	30	8,000	240,000						1.000	240,000
17	Herbicide	ha	1		40,000						1.000	40,000
18	Chemicals	ha	1		80,000						1.000	80,000
19	Harvesting	man/day	48	5,000	240,000						0.700	168,000
20	Transporting harvest to the plant				120,000	30%	2.8%	1,008	20%	7,200	1.052	126,192
21	Land tax	ha	1		15,000							0
22	Other expenditure				20,000						0.900	18,000
Production Cost Total (A)					1,533,200							1,490,021
Production and Net Sales (B)		kg	39,900	100	3,990,000						1.000	3,990,000
Net Income (B-A)					2,456,800							2,499,979

Table M-6.18 Economic Farming Cost per ha (Eggplant)

Eggplant (1ha)												
No	Works & Inputs	Unit	Q'ty	Unit Price (in AMD)	Financial Cost Total (in AMD)	Fuel Share	Taxes		Subsidies		Conversion Factor	Economic Cost Total (in AMD)
1	Tillage, tractor	ha	1		35,000	30%	2.8%	294	20%	2,100	1.052	36,806
2	Harrow, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
3	Levelling, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
4	Ridging, tractor	ha	1		25,000	30%	2.8%	210	20%	1,500	1.052	26,290
5	Seedling	seedlings	45,000	5	225,000						1.000	225,000
6	Seedling transplanting works	man/day	16	5,000	80,000						0.700	56,000
7	Watering labors	time/ha	12	8,000	96,000						0.700	67,200
8	Irrigation fee	ha	1		100,000						1.700	170,000
9	Weeding & intercultivation, tractor	ha	1		15,000	30%	2.8%	126	20%	900	1.052	15,774
10	Intercultivation + nutrition twice	time/ha	2	10,000	20,000						1.000	20,000
11	Earthing up, tractor	ha	1		20,000	30%	2.8%	168	20%	1,200	1.052	21,032
12	Spraying (with tractor)	time/ha	2	16,000	32,000	30%	2.8%	269	20%	1,920	1.052	33,651
13	Weeding (manually 1 st time)	man/day	24	5,000	120,000						0.700	84,000
14	Weeding (manually 2 nd time)	man/day	20	5,000	100,000						0.700	70,000
15	Fertilizers											
*	Ammonia selitra	kg	280	120	33,600				54%	18,004	1.536	51,604
*	Super phosphate	kg	200	140	28,000				97%	27,200	1.971	55,200
*	Potasic salt	kg	300	140	42,000				97%	40,800	1.971	82,800
16	Compost/manure	ton	30	8,000	240,000						1.000	240,000
17	Herbicide	ha	1		40,000						1.000	40,000
18	Chemicals	ha	1		80,000						1.000	80,000
19	Harvesting	man/day	48	5,000	240,000						0.700	168,000
20	Transportation of harvest to the plant				120,000	30%	2.8%	1,008	20%	7,200	1.052	126,192
21	Land tax	ha	1		15,000							0
22	Other expenditure				20,000						0.900	18,000
Production Cost Total (A)					1,746,600							1,708,581

Table M-6.19 Economic Farming Cost per ha (Sweet Pepper)

Sweet pepper (1ha)												
No	Works & Inputs	Unit	Q'ty	Unit Price (in AMD)	Financial Cost Total (in AMD)	Fuel Share	Taxes		Subsidies		Conversion Factor	Economic Cost Total (in AMD)
1	Tillage, tractor	ha	1		35,000	30%	2.8%	294	20%	2,100	1.052	36,806
2	Harrow, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
3	Levelling, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
4	Ridging, tractor	ha	1		25,000	30%	2.8%	210	20%	1,500	1.052	26,290
5	Seedling	seedlings	45,000	5	225,000						1.000	225,000
6	Seedling transplanting works	man/day	16	5,000	80,000						0.700	56,000
7	Watering labors	time/ha	12	8,000	96,000						0.700	67,200
8	Irrigation fee	ha	1		100,000						1.700	170,000
9	Weeding & intercultivation, tractor	ha	1		15,000	30%	2.8%	126	20%	900	1.052	15,774
10	Intercultivation + nutrition twice	time/ha	2	10,000	20,000						1.000	20,000
11	Earthing up, tractor	ha	1		20,000	30%	2.8%	168	20%	1,200	1.052	21,032
12	Spraying (with tractor)	time/ha	2	12,000	24,000	30%	2.8%	202	20%	1,440	1.052	25,238
13	Weeding (manually 1 st time)	man/day	24	5,000	120,000						0.700	84,000
14	Weeding (manually 2 nd time)	man/day	20	5,000	100,000						0.700	70,000
15	Fertilizers											
*	Ammonia selitra	kg	280	120	33,600				54%	18,004	1.536	51,604
*	Super phosphate	kg	200	140	28,000				97%	27,200	1.971	55,200
*	Potasic salt	kg	300	140	42,000				97%	40,800	1.971	82,800
16	Compost/manure	ton	30	8,000	240,000						1.000	240,000
17	Herbicide	ha	1		40,000						1.000	40,000
18	Chemicals	ha	1		80,000						1.000	80,000
19	Harvesting	man/day	48	5,000	240,000						0.700	168,000
20	Transportation of harvest to the plant				120,000	30%	2.8%	1008	20%	7,200	1.052	126,192
21	Land tax	ha	1		15,000							0
22	Other expenditure				20,000						0.900	18,000
Production Cost Total (A)					1,738,600							1,700,168

Table M-6.20 Economic Farming Cost per ha (Cabbage)

Cabbage (1ha)												
No	Works & Inputs	Unit	Q'ty	Unit Price (in AMD)	Financial Cost Total (in AMD)	Fuel Share	Taxes		Subsidies		Conversion Factor	Economic Cost Total (in AMD)
1	Tillage, tractor	ha	1		35,000	30%	2.8%	294	20%	2,100	1.052	36,806
2	Harrow, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
3	Levelling, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
4	Ridging, tractor	ha	1		25,000	30%	2.8%	210	20%	1,500	1.052	26,290
5	Developing watering ditches, tractor	ha	1		15,000	30%	2.8%	126	20%	900	1.052	15,774
6	Seedling	seedling	45,000	4	180,000						1.000	180,000
7	Seedling transplanting works	man/day	16	5,000	80,000						0.700	56,000
8	Intercultivation + nutrition twice	time/ha	2	10,000	20,000						1.000	20,000
9	Earthing up, tractor	ha	1		20,000	30%	2.8%	168	20%	1,200	1.052	21,032
10	Spraying (with tractor)	time/ha	2	12,000	24,000	30%	2.8%	202	20%	1,440	1.052	25,238
11	Weeding manually	man/day	24	5,000	120,000						0.700	84,000
12	Fertilizers											
	* Ammonia selitra	kg	200	120	24,000				54%	12,860	1.536	36,860
	* Super phosphate	kg	300	140	42,000				97%	40,800	1.971	82,800
	* Potasic salt	kg	180	140	25,200				97%	24,480	1.971	49,680
13	Compost/manure	ton	25	8,000	200,000						1.000	200,000
14	Chemicals	ha	1		50,000						1.000	50,000
15	Irrigation fee	ha	1		85,000						1.700	144,500
16	Watering labors	man/day	12	5,000	60,000						0.700	42,000
17	Harvesting	man/day	48	5,000	240,000						0.700	168,000
18	Transportation handling				120,000	30%	2.8%	1008	20%	7,200	1.052	126,192
19	Land tax	ha	1		15,000							0
20	Other expenditure				20,000						0.900	18,000
Production Cost Total (A)					1,420,200							1,404,204

Table M-6.21 Economic Farming Cost per ha (Watermelon)

Water-melon (1ha)												
No	Works & Inputs	Unit	Q'ty	Unit Price (in AMD)	Financial Cost Total (in AMD)	Fuel Share	Taxes		Subsidies		Conversion Factor	Economic Cost Total (in AMD)
1	Tillage, tractor	ha	1		35,000	30%	2.8%	294	20%	2,100	1.052	36,806
2	Harrow, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
3	Levelling, tractor	ha	1		10,000	30%	2.8%	84	20%	600	1.052	10,516
4	Ridging, tractor	ha	1		25,000	30%	2.8%	210	20%	1,500	1.052	26,290
7	Seed	seed	10,000	20	200,000						1.000	200,000
5	Sowing	man/day	14	5,000	70,000						0.700	49,000
6	Watering labors	man/day	6	5,000	30,000						0.700	21,000
7	Irrigation fee	ha	1		80,000						1.700	136,000
8	Weeding & intercultivation, tractor	ha	1		15,000	30%	2.8%	126	20%	900	1.052	15,774
9	Intercultivation + nutrition twice	time/ha	2	10,000	20,000						1.000	20,000
10	Earthing up, tractor	ha	1		20,000	30%	2.8%	168	20%	1,200	1.052	21,032
11	Spraying (with tractor)	time/ha	2	12,000	24,000	30%	2.8%	202	20%	1,440	1.052	25,238
12	Weeding (manually 1 st time)	man/day	24	5,000	120,000						0.700	84,000
13	Weeding (manually 2 nd time)	man/day	20	5,000	100,000						0.700	70,000
14	Fertilizers											
	* Ammonia selitra	kg	350	120	42,000				54%	22,505	1.536	64,505
	* Super phosphate	kg	300	140	42,000				97%	40,800	1.971	82,800
	* Potasic salt	kg	200	140	28,000				97%	27,200	1.971	55,200
15	Compost/manure	ton	25	8,000	200,000						1.000	200,000
16	Herbicide	ha	1		4,000						1.000	4,000
17	Chemicals	ha	1		80,000						1.000	80,000
18	Harvesting				240,000						1.000	240,000
19	Transportation of harvest				120,000	30%	2.8%	1008	20%	7,200	1.052	126,192
20	Land tax				15,000							0
21	Other expenditure				20,000						0.900	18,000
Production Cost Total (A)					1,550,000							1,596,869

Table M-6.22 Economic Farming Cost per ha (House Tomato)

Cost-Benefit of Green House Vegetables (0.1ha) : Tomato													
No	Works & Inputs	Means	Unit	Unit Price (in AMD)	Q'ty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)		
1	Sterilization (spraying) of greenhouse	chemicals	ha	350,000	0.1	35,000				1.000	35,000		
2	Land preparation, tillage	tractor	ha	50,000	0.1	5,000	30%	2.8%	42	20%	300	1.052	5,258
3	Seed		pcs	60	2,500	150,000				1.000	150,000		
4	1 Bio-hums		kg	100	500	50,000				1.000	50,000		
	2 Compost		kg	8	12,000	96,000				1.000	96,000		
5	1 Fertilizer	MgSO ₄	kg	350	13	4,550				1.000	4,550		
	2 Fertilizer	Ca (NO ₃)	kg	450	18	8,100				1.000	8,100		
	3 Fertilizer	KH ₂ PO ₄	kg	1,000	13	13,000				1.000	13,000		
	4 Fertilizer	KNO ₃	kg	800	13.5	10,800				1.000	10,800		
	5 Fertilizer, lime stone		kg	50	10	500				1.000	500		
6	1 Plant protection, pesticide	chemicals	ha	400,000	0.1	40,000				1.000	40,000		
	2 Plant protection, fungicide	chemicals	ha	54,000	0.1	5,400				1.000	5,400		
7	Irrigation		m3	11	1,800	19,800				1.700	33,660		
8	Labor hiring	1man x 6	month	125,000	6	750,000				0.700	525,000		
9	Green house material, plastic film		m2	300	1,000	300,000				1.000	300,000		
10	Land tax		ha	70,000	0.1	7,000				0.000	0		
Production Cost Total (A)						1,495,150						1,277,268	

Table M-6.23 Economic Farming Cost per ha (Cucumber)

Cost-Benefit of Green House Vegetables (0.1ha) : Cucumber													
No	Works & Inputs	Means	Unit	Unit Price (in AMD)	Q'ty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)		
1	Sterilization (spraying) of greenhouse	chemicals	ha	350,000	0.1	35,000				1.000	35,000		
2	Land preparation, tillage	tractor	ha	50,000	0.1	5,000	30%	2.8%	42	20%	300	1.052	5,258
3	Seed		pcs	65	3,000	195,000				1.000	195,000		
4	1 Bio-hums		kg	100	600	60,000				1.000	60,000		
	2 Compost		kg	8	12,000	96,000				1.000	96,000		
5	1 Fertilizer	MgSO ₄	kg	350	12	4,200				1.000	4,200		
	2 Fertilizer	Ca (NO ₃)	kg	450	20	9,000				1.000	9,000		
	3 Fertilizer	KH ₂ PO ₄	kg	1,000	11	11,000				1.000	11,000		
	4 Fertilizer	KNO ₃	kg	800	12.5	10,000				1.000	10,000		
	5 Fertilizer, lime stone		kg	50	10	500				1.000	500		
6	1 Plant protection, pesticide	chemicals	ha	250,000	0.1	25,000				1.000	25,000		
	2 Plant protection, fungicide	chemicals	ha	35,000	0.1	3,500				1.000	3,500		
7	Irrigation		m3	11	2,160	23,760				1.700	40,392		
8	Labor hiring	1 man x 4	month	125,000	4	500,000				0.700	350,000		
9	Green house material, plastic film		m2	300	1,000	300,000				1.000	300,000		
10	Land tax		ha	70,000	0.1	7,000				0.000	0		
Production Cost Total (A)						1,284,960						1,144,850	

Table M-6.24a Economic Farming Cost per ha (Grape)

Grape (1ha)

Spacing : 2.7 x 1.35-1.4 m or 2.5x 1.5m

No	Works & Inputs	unit	Unit Price (in AMD)	1st year								2nd year							
				Qty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)	Qty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)		
1	Tillage, tractor	ha	35,000	1	35,000	30%	2.8%	294	20%	2,100	1.052	36,866	0	0					
2	Land clearing & stone collection	man.day	5,000	10	50,000						0.700	35,000	0	0					
3	Land leveling, tractor	ha	20,000	1	20,000	30%	2.8%	168	20%	1,200	1.052	21,032	0	0					
4	Ridging, tractor	ha	25,000	1	25,000	30%	2.8%	210	20%	1,500	1.052	26,290	0	0					
5	Transplanting of seedling	man.day	5,000	25	125,000						0.700	87,500	0	0			0.700	0	
6	Post maintenance and tightening of wires	man.day	5,000	0	0						0.700	0	0	0			0.700	0	
7	Grapesvines opening after the winter	man.day	5,000	0	0						0.700	0	16	80,000			0.700	56,000	
8	Dry pruning	man.day	5,000	0	0						0.700	0	10	50,000			0.700	35,000	
9	Pruning and shaping	man.day	5,000	0	0						0.700	0	0	0			0.700	0	
10	Post installation	man.day	5,000	70	350,000						0.700	245,000	0	0			0.700	0	
11	Wiring	man.day	5,000	100	500,000						0.700	350,000	0	0			0.700	0	
12	Herbicide application	man.day	5,000	0	0						0.700	0	0	0			0.700	0	
13	Labor for watering	man.day	5,000	12	60,000						0.700	42,000	6	30,000			0.700	21,000	
14	Tying main stem & side branches, spring	man.day	5,000	0	0						0.700	0	14	70,000			0.700	49,000	
15	Tying each flowering side (twice)	man.day	5,000	0	0						0.700	0	0	0			0.700	0	
16	Intercultivation between the rows, tractor	ha	10,000	1	10,000	30%	2.8%	84	20%	600	1.052	10,516	1	10,000	30%	2.8%	84	20%	600
17	Intercultivation between the rows,	man.day	5,000	0	0						0.700	0	30	150,000			0.700	70,000	
18	Top dressing	man.day	5,000	0	0						0.700	0	10	50,000			0.700	35,000	
19	Spraying chemicals (diseases and pests)	time	12,000	0	0						0.700	0	2	24,000			0.700	16,800	
20	Tying the grapesvines from wires	man.day	5,000	0	0						0.700	0	10	50,000			0.700	35,000	
21	Harvesting	man.day	5,000	0	0						0.700	0	0	0			0.700	0	
22	Wintering of grapesvines	man.day	5,000	26	130,000						0.700	91,000	26	130,000			0.700	91,000	
23	Seeding	pc	150	2,900	435,000						1.000	435,000	0	0			1.000	0	
24	Irrigation water fee	m ³	11	8,000	88,000						1.700	149,600	8,000	88,000			1.700	149,600	
25	Price of fertilizers																		
*	Ammonia selitra	kg	120	0	0						0	100	12,000			54%	6,430	1,536	18,430
*	Super phosphate	kg	140	0	0						0	200	28,000			97%	27,200	1,971	55,200
*	Potassic salt	kg	140	0	0						0	100	14,000			97%	13,600	1,971	27,600
26	Compost manure	ton	8,000	40	320,000						1.000	320,000	0	0			1.000	0	
27	Chemicals	time	25,000	0	0						1.000	0	2	50,000			1.000	50,000	
28	Post	pc	1,500	0	0						1.000	0	450	675,000			1.000	675,000	
29	Wire	kg	800	0	0						1.000	0	450	360,000			1.000	360,000	
30	Land tax	ha	25,000	1	25,000							0	1	25,000				0	
31	Other continuity works and expenses	ha	90,000	1	90,000						0.900	81,000	1	90,000			0.900	81,000	
Production Cost Total (A)					2,263,000							1,930,744		1,936,000				1,836,146	

Table M-6.24b Economic Farming Cost per ha (Grape)

Grape (1ha)

Spacing : 2.7 x 1.35-1.4 m or 2.5x 1.5m

No	Works & Inputs	3rd year						4th year											
		Q'ty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)	Q'ty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)				
1	Tillage, tractor	0	0	0				0	0	0					0				
2	Land clearing & stone collection	0	0					0	0	0					0				
3	Land leveling, tractor	0	0					0	0	0					0				
4	Ridging, tractor	0	0					0	0	0					0				
5	Transplanting of seedling	0	0				0.700	0	0	0				0.700	0				
6	Post maintenance and tightening of wires	8	40,000				0.700	28,000	8	40,000				0.700	28,000				
7	Grapevines opening after the winter	16	80,000				0.700	56,000	16	80,000				0.700	56,000				
8	Dry pruning	10	50,000				0.700	35,000	10	50,000				0.700	35,000				
9	Pruning and shaping	18	90,000				0.700	63,000	18	90,000				0.700	63,000				
10	Post installation	0	0				0.700	0	0	0				0.700	0				
11	Wiring	0	0				0.700	0	0	0				0.700	0				
12	Herbicide application	1	5,000				0.700	3,500	1	5,000				0.700	3,500				
13	Labor for watering	6	30,000				0.700	21,000	6	30,000				0.700	21,000				
14	Tying main stem & side branches, spring	14	70,000				0.700	49,000	14	70,000				0.700	49,000				
15	Tying each flowering side (twice)	24	120,000				0.700	84,000	24	120,000				0.700	84,000				
16	Intercultivation between the rows, tractor	1	10,000	30%	2.8%	84	20%	600	1,052	10,516	1	10,000	30%	2.8%	84	20%	600	1,052	10,516
17	Intercultivation between the rows,	20	100,000				0.700	70,000	20	100,000				0.700	70,000				
18	Top dressing	10	50,000				0.700	35,000	10	50,000				0.700	35,000				
19	Spraying chemicals (diseases and pests)	6	72,000				0.700	50,400	6	72,000				0.700	50,400				
20	Untying the grapevines from wires	10	50,000				0.700	35,000	10	50,000				0.700	35,000				
21	Harvesting	20	100,000				0.700	70,000	25	125,000				0.700	87,500				
22	Wintering of grapevines	26	130,000				0.700	91,000	26	130,000				0.700	91,000				
23	Seedling	0	0				1.000	0	0	0				1.000	0				
24	Irrigation water fee	8,000	88,000				1.700	149,600	8,000	88,000				1.700	149,600				
25	Price of fertilizers																		
	* Ammonia selitra	350	42,000			54%	22,505	1,536	64,505	350	42,000			54%	22,505	1,536	64,505		
	* Super phosphate	0	0						0	0	0					0			
	* Potassic salt	0	0						0	0	0					0			
25	Compost manure	0	0				1.000	0	0	0				1.000	0				
27	Chemicals	6	150,000				1.000	150,000	6	150,000				1.000	150,000				
28	Post	0	0				1.000	0	0	0				1.000	0				
29	Wire	0	0				1.000	0	0	0				1.000	0				
30	Land tax	1	25,000					0	1	25,000					0				
31	Other contingency works and expenses	1	90,000				0.900	81,000	1	90,000				0.900	81,000				
Production Cost Total (A)			1,392,000					1,146,521		1,417,000					1,164,021				

Table M-6.24c Economic Farming Cost per ha (Grape)

Grape (1ha)

Spacing : 2.7 x 1.35-1.4 m or 2.5x 1.5m

No	Works & Inputs	5th year						6th year								
		Q/ty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)	Q/ty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)	
1	Tillage, tractor	0	0					0	0	0					0	
2	Land cleaning & stone collection	0	0					0	0	0					0	
3	Land leveling, tractor	0	0					0	0	0					0	
4	Ridging, tractor	0	0					0	0	0					0	
5	Transplanting of seedling	0	0				0.700	0	0	0				0.700	0	
6	Post maintenance and tightening of wires	8	40,000				0.700	28,000	8	40,000				0.700	28,000	
7	Grapevines opening after the winter	16	80,000				0.700	56,000	16	80,000				0.700	56,000	
8	Dry pruning	10	50,000				0.700	35,000	10	50,000				0.700	35,000	
9	Pruning and shaping	18	90,000				0.700	63,000	18	90,000				0.700	63,000	
10	Post installation	0	0				0.700	0	0	0				0.700	0	
11	Wiring	0	0				0.700	0	0	0				0.700	0	
12	Herbicide application	1	5,000				0.700	3,500	1	5,000				0.700	3,500	
13	Labor for watering	6	30,000				0.700	21,000	6	30,000				0.700	21,000	
14	Tying main stem & side branches, spring	14	70,000				0.700	49,000	14	70,000				0.700	49,000	
15	Tying each flowering side (twice)	24	120,000				0.700	84,000	24	120,000				0.700	84,000	
16	Intercultivation between the rows, tractor	1	10,000	30%	2.8%	84	20%	1,052	10,516	1	10,000	30%	2.8%	84	20%	1,052
17	Intercultivation between the rows,	20	100,000				0.700	70,000	20	100,000				0.700	70,000	
18	Top dressing	10	50,000				0.700	35,000	10	50,000				0.700	35,000	
19	Spraying chemicals (diseases and pests)	6	72,000				0.700	50,400	6	72,000				0.700	50,400	
20	Untying the grapevines from wires	10	50,000				0.700	35,000	10	50,000				0.700	35,000	
21	Harvesting	28	140,000				0.700	98,000	28	140,000				0.700	98,000	
22	Wintering of grapevines	26	130,000				0.700	91,000	26	130,000				0.700	91,000	
23	Seedling	0	0				1.000	0	0	0				1.000	0	
24	Irrigation water fee	8,000	88,000				1.700	149,600	8,000	88,000				1.700	149,600	
25	Price of fertilizers															
	* Ammonia selitra	350	42,000			54%	22,505	1,536	64,505	350	42,000			54%	22,505	1,536
	* Super phosphate	0	0					0	0	0					0	
	* Potassic salt	0	0					0	0	0					0	
25	Compost manure	0	0				1.000	0	0	0				1.000	0	
27	Chemicals	6	150,000				1.000	150,000	6	150,000				1.000	150,000	
28	Post	0	0				1.000	0	0	0				1.000	0	
29	Wire	0	0				1.000	0	0	0				1.000	0	
30	Land tax	1	25,000					0	1	25,000					0	
31	Other contingency works and expenses	1	90,000				0.900	81,000	1	90,000				0.900	81,000	
Production Cost Total (A)			1,432,000					1,174,521		1,432,000					1,174,521	

Table M-6.24d Economic Farming Cost per ha (Grape)

Grape (1ha)

Spacing : 2.7 x 1.35-1.4 m or 2.5x 1.5m

Spacing: 2.7 x 1.35-1.4 m or 2.5 x 1.2m															
No	Works & Inputs	7th year						8th-17th years (10 years)							
		Qty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)	Qty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)
1	Tillage, tractor	0	0					0	0	0					0
2	Land clearing & stone collection	0	0					0	0	0					0
3	Land leveling, tractor	0	0					0	0	0					0
4	Ridging, tractor	0	0					0	0	0					0
5	Transplanting of seedling	0	0				0.700	0	0	0				0.700	0
6	Post maintenance and tightening of wires	8	40,000				0.700	28,000	8 x 10 years	400,000				0.700	280,000
7	Grapevines opening after the winter	16	80,000				0.700	56,000	16 x 10 years	800,000				0.700	560,000
8	Dry pruning	10	50,000				0.700	35,000	10 x 10 years	500,000				0.700	350,000
9	Pruning and shaping	18	90,000				0.700	63,000	18 x 10 years	900,000				0.700	630,000
10	Post installation	0	0				0.700	0	0	0				0.700	0
11	Wiring	100	500,000				0.700	350,000	0	0				0.700	0
12	Herbicide application	1	5,000				0.700	3,500	1 x 10 years	50,000				0.700	35,000
13	Labor for watering	6	30,000				0.700	21,000	6 x 10 years	300,000				0.700	210,000
14	Tying main stem & side branches, spring	14	70,000				0.700	49,000	14 x 10 years	700,000				0.700	490,000
15	Tying each flowering side (twice)	24	120,000				0.700	84,000	24 x 10 years	1,200,000				0.700	840,000
16	Intercultivation between the rows, tractor	20	100,000	30%	2.8%	84	20%	600	10,516	1 x 10 years	1,000,000	30%	2.8%	840	1,051,600
17	Intercultivation between the rows,	20	100,000				0.700	70,000	20 x 10 years	1,000,000				0.700	700,000
18	Top dressing	10	50,000				0.700	35,000	10 x 10 years	500,000				0.700	350,000
19	Spraying chemicals (diseases and pests)	6	72,000				0.700	50,400	6 x 10 years	720,000				0.700	504,000
20	Untying the grapevines from wires	10	50,000				0.700	35,000	10 x 10 years	500,000				0.700	350,000
21	Harvesting	30	150,000				0.700	105,000	30 x 10 years	1,500,000				0.700	1,050,000
22	Wintering of grapevines	26	130,000				0.700	91,000	26 x 10 years	1,300,000				0.700	910,000
23	Seedling	0	0				1.000	0	0	0				1.000	0
24	Irrigation water fee	8,000	88,000				1.700	149,600	000 x 10 year	880,000				1.700	1,496,000
25	Price of fertilizers														
*	Ammonia selitra	350	42,000			54%	22,505	1,536	64,505	350 x 10 years	420,000			54%	225,050
*	Super phosphate	0	0						0	0					0
*	Potassic salt	0	0						0	0					0
25	Compost manure	0	0				1.000	0	0	0				1.000	0
27	Chemicals	6	150,000				1.000	150,000	6 x 10 years	1,500,000				1.000	1,500,000
28	Post	0	0				1.000	0	0	0				1.000	0
29	Wire	450	360,000				1.000	360,000	0	0				1.000	0
30	Land tax	1	25,000					0	1 x 10 years	250,000					0
31	Other contingency works and expenses	1	90,000				0.900	81,000	1 x 10 years	900,000				0.900	810,000
Production Cost Total (A)			2,302,000					1,891,521		14,420,000					11,815,210

Table M-6.24e Economic Farming Cost per ha (Grape)

Grape (1ha)

Spacing : 2.7 x 1.35-1.4 m or 2.5x 1.5m

No	Works & Inputs	18th year						19th-28th years (10 years)							
		Qty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)	Qty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)
1	Tillage, tractor	0	0					0	0	0					0
2	Land clearing & stone collection	0	0					0	0	0					0
3	Land leveling, tractor	0	0					0	0	0					0
4	Ridging, tractor	0	0					0	0	0					0
5	Transplanting of seedling	0	0				0.700	0	0	0				0.700	0
6	Post maintenance and tightening of wires	8	40,000				0.700	28,000	8 x 10 years	400,000				0.700	280,000
7	Grapevines opening after the winter	16	80,000				0.700	56,000	16 x 10 years	800,000				0.700	560,000
8	Dry pruning	10	50,000				0.700	35,000	10 x 10 years	500,000				0.700	350,000
9	Pruning and shaping	18	90,000				0.700	63,000	18 x 10 years	900,000				0.700	630,000
10	Post installation	0	0				0.700	0	0	0				0.700	0
11	Wiring	100	500,000				0.700	350,000	0	0				0.700	0
12	Herbicide application	1	5,000				0.700	3,500	1 x 10 years	50,000				0.700	35,000
13	Labor for watering	6	30,000				0.700	21,000	6 x 10 years	300,000				0.700	210,000
14	Tying main stem & side branches, spring	14	70,000				0.700	49,000	14 x 10 years	700,000				0.700	490,000
15	Tying each flowering side (twice)	24	120,000				0.700	84,000	24 x 10 years	1,200,000				0.700	840,000
16	Intercultivation between the rows, tractor	1	10,000	30%	2.8%	84	20%	600	10,516	1 x 10 years	100,000	30%	2.8%	840	1,051.6
17	Intercultivation between the rows,	20	100,000				0.700	70,000	20 x 10 years	1,000,000				0.700	700,000
18	Top dressing	10	50,000				0.700	35,000	10 x 10 years	500,000				0.700	350,000
19	Spraying chemicals (diseases and pests)	6	72,000				0.700	50,400	6 x 10 years	720,000				0.700	504,000
20	Untying the grapevines from wires	10	50,000				0.700	35,000	10 x 10 years	500,000				0.700	350,000
21	Harvesting	30	150,000				0.700	105,000	30 x 10 years	1,500,000				0.700	1,050,000
22	Wintering of grapevines	26	130,000				0.700	91,000	26 x 10 years	1,300,000				0.700	910,000
23	Seedling	0	0				1.000	0	0	0				1.000	0
24	Irrigation water fee	8,000	88,000				1.700	149,600	000 x 10 year	880,000				1.700	1,496,000
25	Price of fertilizers														
	* Ammonia selitra	350	42,000			54%	22,505	1,536	64,505	350 x 10 years	420,000		54%	225,050	1,536
	* Super phosphate	0	0						0	0					0
	* Potassic salt	0	0						0	0					0
25	Compost/manure	0	0				1.000	0	0	0				1.000	0
27	Chemicals	6	150,000				1.000	150,000	6 x 10 years	1,500,000				1.000	1,500,000
28	Post	0	0				1.000	0	0	0				1.000	0
29	Wire	450	360,000				1.000	360,000	0	0				1.000	0
30	Land tax	1	25,000					0	1 x 10 years	250,000					0
31	Other contingency works and expenses	1	90,000				0.900	81,000	1 x 10 years	900,000				0.900	810,000
Production Cost Total (A)			2,302,000					1,891,521		14,420,000					11,815,210

Table M-6.24f Economic Farming Cost per ha (Grape)

Grape (1ha)

Spacing : 2.7 x 1.35-1.4 m or 2.5x 1.5m

No	Works & Inputs	29th year							30th-39th years (10 years)							
		Qty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)	Qty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)	
1	Tillage, tractor	0	0					0	0	0					0	
2	Land clearing & stone collection	0	0					0	0	0					0	
3	Land leveling, tractor	0	0					0	0	0					0	
4	Ridging, tractor	0	0					0	0	0					0	
5	Transplanting of seedling	0	0				0.700	0	0	0				0.700	0	
6	Post maintenance and tightening of wires	8	40,000				0.700	28,000	8 x 10 years	400,000				0.700	280,000	
7	Grapes vines opening after the winter	16	80,000				0.700	56,000	16 x 10 years	800,000				0.700	560,000	
8	Dry pruning	10	50,000				0.700	35,000	10 x 10 years	500,000				0.700	350,000	
9	Pruning and shaping	18	90,000				0.700	63,000	18 x 10 years	900,000				0.700	630,000	
10	Post installation	0	0				0.700	0	0	0				0.700	0	
11	Wiring	100	500,000				0.700	350,000	0	0				0.700	0	
12	Herbicide application	1	5,000				0.700	3,500	1 x 10 years	50,000				0.700	35,000	
13	Labor for watering	6	30,000				0.700	21,000	6 x 10 years	300,000				0.700	210,000	
14	Tying main stem & side branches, spring	14	70,000				0.700	49,000	14 x 10 years	700,000				0.700	490,000	
15	Tying each flowering side (twice)	24	120,000				0.700	84,000	24 x 10 years	1,200,000				0.700	840,000	
16	Intercultivation between the rows, tractor	1	10,000	30%	2.8%	84	20%	1,052	10,516	1 x 10 years	100,000	30%	2.8%	840	1,052	105,160
17	Intercultivation between the rows,	20	100,000				0.700	70,000	20 x 10 years	1,000,000				0.700	700,000	
18	Top dressing	10	50,000				0.700	35,000	10 x 10 years	500,000				0.700	350,000	
19	Spraying chemicals (diseases and pests)	6	72,000				0.700	50,400	6 x 10 years	720,000				0.700	504,000	
20	Untying the grapevines from wires	10	50,000				0.700	35,000	10 x 10 years	500,000				0.700	350,000	
21	Harvesting	30	150,000				0.700	105,000	30 x 10 years	1,500,000				0.700	1,050,000	
22	Wintering of grapevines	26	130,000				0.700	91,000	26 x 10 years	1,300,000				0.700	910,000	
23	Seedling	0	0				1.000	0	0	0				1.000	0	
24	Irrigation water fee	8,000	88,000				1.700	149,600	8,000 x 10 years	880,000				1.700	1,496,000	
25	Price of fertilizers															
* 26	Ammonia selitra	350	42,000			54%	22,505	1,536	64,505	350 x 10 years	420,000		54%	225,050	1,536	645,050
* 27	Super phosphate	0	0						0	0					0	
* 28	Potassic salt	0	0						0	0					0	
29	Compost/manure	0	0				1.000	0	0	0				1.000	0	
30	Chemicals	6	150,000				1.000	150,000	6 x 10 years	1,500,000				1.000	1,500,000	
31	Post	0	0				1.000	0	0	0				1.000	0	
32	Wire	450	360,000				1.000	360,000	0	0				1.000	0	
33	Land tax	1	25,000					0	1 x 10 years	250,000					0	
34	Other contingency works and expenses	1	90,000				0.900	81,000	1 x 10 years	900,000				0.900	810,000	
Production Cost Total (A)			2,302,000					1,891,521		14,420,000					11,815,210	

Table M-6.24g Economic Farming Cost per ha (Grape)

Grape (1ha)

Spacing : 2.7 x 1.35-1.4 m or 2.5x 1.5m

No	Works & Inputs	40th year							41th-50th years (10 years)							Total Production Cost 50 years		
		Qty	Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)	Qty	Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)	Financial Cost Total (in AMD)	Economic Cost Total (in AMD)	
1	Tillage, tractor	0	0					0	0	0					0	35,000	36,806	
2	Land clearing & stone collection	0	0					0	0	0					0	50,000	35,000	
3	Land leveling, tractor	0	0					0	0	0					0	20,000	21,032	
4	Ridging, tractor	0	0					0	0	0					0	25,000	26,290	
5	Transplanting of seedling	0	0				0.700	0	0	0				0.700	0	125,000	87,500	
6	Post maintenance and tightening of wires	8	40,000				0.700	28,000	8 x 10 years	400,000				0.700	280,000	1,920,000	1,344,000	
7	Grapes vines opening after the winter	16	80,000				0.700	56,000	16 x 10 years	800,000				0.700	560,000	3,920,000	2,744,000	
8	Dry pruning	10	50,000				0.700	35,000	10 x 10 years	500,000				0.700	350,000	2,450,000	1,715,000	
9	Pruning and shaping	18	90,000				0.700	63,000	18 x 10 years	900,000				0.700	630,000	4,320,000	3,024,000	
10	Post installation	0	0				0.700	0	0	0				0.700	0	350,000	245,000	
11	Wiring	100	500,000				0.700	350,000	0	0				0.700	0	2,500,000	1,750,000	
12	Herbicide application	1	5,000				0.700	3,500	1 x 10 years	50,000				0.700	35,000	240,000	168,000	
13	Labor for watering	6	30,000				0.700	21,000	6 x 10 years	300,000				0.700	210,000	1,530,000	1,071,000	
14	Tying main stem & side branches, spring	14	70,000				0.700	49,000	14 x 10 years	700,000				0.700	490,000	2,530,000	2,401,000	
15	Tying each flowering side (twice)	24	120,000				0.700	84,000	24 x 10 years	1,200,000				0.700	840,000	4,760,000	4,032,000	
16	Intercultivation between the rows, tractor	1	10,000	30%	2.8%	84	20%	600	10,516	1 x 10 years	100,000	30%	2.8%	840	1,052	500,000	575,800	
17	Intercultivation between the rows,	20	100,000				0.700	70,000	20 x 10 years	1,000,000				0.700	700,000	4,900,000	3,430,000	
18	Top dressing	10	50,000				0.700	35,000	10 x 10 years	500,000				0.700	350,000	2,450,000	1,715,000	
19	Spraying chemicals (diseases and pests)	6	72,000				0.700	50,400	6 x 10 years	720,000				0.700	504,000	3,480,000	2,436,000	
20	Untying the grapevines from wires	10	50,000				0.700	35,000	10 x 10 years	500,000				0.700	350,000	2,450,000	1,715,000	
21	Harvesting	30	150,000				0.700	105,000	30 x 10 years	1,500,000				0.700	1,050,000	7,105,000	4,975,500	
22	Wintering of grapevines	26	130,000				0.700	91,000	26 x 10 years	1,300,000				0.700	910,000	6,500,000	4,550,000	
23	Seedling	0	0				1.000	0	0	0				1.000	0	435,000	435,000	
24	Irrigation water fee	8,000	88,000				1.700	149,600	8,000 x 10 years	880,000				1.700	1,496,000	4,400,000	7,480,000	
25	Price of fertilizers																	
26	* Ammonia selitra	350	42,000			54%	22,505	1,536	64,505	350 x 10 years	420,000		54%	225,050	1,536	645,050	2,028,000	3,114,670
27	* Super phosphate	0	0						0	0					0	28,000	55,200	
28	* Potassic salt	0	0						0	0					0	14,000	27,600	
29	Compost/mannure	0	0						0	0				1.000	0	320,000	320,000	
30	Chemicals	6	150,000				1.000	150,000	6 x 10 years	1,500,000				1.000	1,500,000	7,250,000	7,250,000	
31	Post	0	0				1.000	0	0	0				1.000	0	675,000	675,000	
32	Wire	450	360,000				1.000	360,000	0	0				1.000	0	1,800,000	1,800,000	
33	Land tax	1	25,000				0	0	1 x 10 years	250,000				0	0	1,250,000	0	
34	Other contingency works and expenses	1	90,000				0.900	81,000	1 x 10 years	900,000				0.900	810,000	4,500,000	4,050,000	
Production Cost Total (A)			2,302,000					1,891,521		14,420,000					11,815,210	76,760,000	63,253,398	

Table M-6.25a Economic Farming Cost per ha (Apricot)

Apricot (1ha) Spacing: 8 x 8 m																	
No	Works & Inputs	unit	Unit Price (in AMD)	1st year							2nd year						
				Q'ty	Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)	Q'ty	Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)
1	Digging holes for planting, tractor	ha	35,000	1	35,000	30%	2.8%	294	20%	2,100	1,052	36,806	0				0
2	Soil preparing (mixing with compost)	man/day	5,000	20	100,000				0.700	70,000	0	0				0.700	0
3	Transplanting of seedling	man/day	5,000	20	100,000				0.700	70,000	0	0				0.700	0
4	Brushwood collecting	man/day	5,000	0	0				0.700	0	5	25,000				0.700	17,500
5	Pruning of trees and shaping	tree	800	0	0				0.700	0	0	0				0.700	0
6	Whitening of tree trunks	man/day	5,000	4	20,000				0.700	14,000	4	20,000				0.700	14,000
7	Digging around the tree trunk (2 times)	tree	350	312	109,200				0.700	76,440	312	109,200				0.700	76,440
8	Developing ditches for watering	ha	25,000	1	25,000				0.700	17,500	1	25,000				0.700	17,500
9	Labor for watering	man/day	5,000	6	30,000				0.700	21,000	6	30,000				0.700	21,000
10	Compost application	man/day	5,000	0	0				0.700	0	20	100,000				0.700	70,000
11	Top dressing	man/day	5,000	0	0				0.700	0	0	0				0.700	0
12	Spraying chemicals (diseases and pests)	time	12,000	0	0				0.700	0	0	0				0.700	0
13	Harvesting	man/day	5,000	0	0				0.700	0	0	0				0.700	0
14	Transporting the harvest	ha	50,000	0	0					0	0	0					0
15	Seedling	pc	1,500	170	255,000				1,000	255,000	0	0				1,000	0
16	Irrigation water fee, 6-7 times	m³	11	6,200	68,200				1.700	115,940	6,200	68,200				1.700	115,940
17	Fertilizers																
*1	Ammonia selitra	kg	120	0	0					0	0	0					0
*2	Super phosphate	kg	140	0	0					0	0	0					0
*3	Potassic salt	kg	140	0	0					0	0	0					0
18	Compost/manure	ton	8,000	5	40,000				1,000	40,000	2	16,000				1,000	16,000
19	Chemicals	time	20,000	0	0				1,000	0	0	0				1,000	0
20	Other contingency works and expenses	ha	50,000	1	50,000				0.900	45,000	1	50,000				0.900	45,000
21	Land tax	ha	30,000	1	30,000					0	1	30,000					0
Production Cost Total (A)					862,400					761,686		473,400					393,380

Table M-6.25b Economic Farming Cost per ha (Apricot)

Apricot (1ha) Spacing: 8 x 8 m																	
No	Works & Inputs	Q'ty	Total (in AMD)	3rd year							4th year						
				Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)	Q'ty	Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)		
1	Digging holes for planting, tractor	0	0					0	0	0					0		
2	Soil preparing (mixing with compost)	0	0				0.700	0	0	0					0.700		
3	Transplanting of seedling	0	0				0.700	0	0	0					0.700		
4	Brushwood collecting	5	25,000				0.700	17,500	5	25,000					0.700		17,500
5	Pruning of trees and shaping	156	124,800				0.700	87,360	156	124,800					0.700		87,360
6	Whitening of tree trunks	4	20,000				0.700	14,000	4	20,000					0.700		14,000
7	Digging around the tree trunk (2 times)	312	109,200				0.700	76,440	312	109,200					0.700		76,440
8	Developing ditches for watering	1	25,000				0.700	17,500	1	25,000					0.700		17,500
9	Labor for watering	6	30,000				0.700	21,000	6	30,000					0.700		21,000
10	Compost application	0	0				0.700	0	0	0					0.700		0
11	Top dressing	2	10,000				0.700	7,000	2	10,000					0.700		7,000
12	Spraying chemicals (diseases and pests)	0	0				0.700	0	1	12,000					0.700		8,400
13	Harvesting	0	0				0.700	0	0	0					0.700		0
14	Transporting the harvest	0	0					0	0	0							0
15	Seedling	0	0				1,000	0	0	0					1,000		0
16	Irrigation water fee, 6-7 times	6,200	68,200				1.700	115,940	6,200	68,200					1.700		115,940
17	Fertilizers																
*1	Ammonia selitra	30	3,600			54%	1,929	1,536	5,529	45	5,400			54%	2,894	1,536	8,294
*2	Super phosphate	20	2,800			97%	2,720	1,971	5,520	30	4,200			97%	4,080	1,971	8,280
*3	Potassic salt	10	1,400			97%	1,360	1,971	2,760	15	2,100			97%	2,040	1,971	4,140
18	Compost/manure	0	0				1,000	0	0	0					1,000		0
19	Chemicals	0	0				1,000	0	1	20,000					1,000		20,000
20	Other contingency works and expenses	1	50,000				0.900	45,000	1	50,000					0.900		45,000
21	Land tax	1	30,000					0	1	30,000							0
Production Cost Total (A)					500,000				415,549		535,900						450,854

Table M-6.25c Economic Farming Cost per ha (Apricot)

Apricot (1ha) Spacing: 8 x 8 m																	
No	Works & Inputs	Q'ty	Total (in AMD)	5th year							6th year						
				Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)	Q'ty	Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)		
1	Digging holes for planting, tractor	0	0					0	0	0					0		
2	Soil preparing (mixing with compost)	0	0				0.700	0	0	0					0.700		
3	Transplanting of seedling	0	0				0.700	0	0	0					0.700		
4	Brushwood collecting	5	25,000				0.700	17,500	5	25,000					0.700		17,500
5	Pruning of trees and shaping	156	124,800				0.700	87,360	156	124,800					0.700		87,360
6	Whitening of tree trunks	4	20,000				0.700	14,000	4	20,000					0.700		14,000
7	Digging around the tree trunk (2 times)	312	109,200				0.700	76,440	312	109,200					0.700		76,440
8	Developing ditches for watering	1	25,000				0.700	17,500	1	25,000					0.700		17,500
9	Labor for watering	6	30,000				0.700	21,000	6	30,000					0.700		21,000
10	Compost application	0	0				0.700	0	0	0					0.700		0
11	Top dressing	2	10,000				0.700	7,000	2	10,000					0.700		7,000
12	Spraying chemicals (diseases and pests)	1	12,000				0.700	8,400	4	48,000					0.700		33,600
13	Harvesting	15	75,000				0.700	52,500	20	100,000					0.700		70,000
14	Transporting the harvest	1	50,000	30%	2.8%	420	20%	3,000	1,052	52,580	1	50,000	30%	2.8%	420	20%	3,000
15	Seedling	0	0				1,000	0	0	0					1,000		0
16	Irrigation water fee, 6-7 times	6,200	68,200				1.700	115,940	6,200	68,200					1.700		115,940
17	Fertilizers																
*1	Ammonia selitra	60	7,200			54%	3,858	1,536	11,058	75	9,000			54%	4,823	1,536	13,823
*2	Super phosphate	40	5,600			97%	5,440	1,971	11,040	50	7,000			97%	6,800	1,971	13,800
*3	Potassic salt	20	2,800			97%	2,720	1,971	5,520	25	3,500			97%	3,400	1,971	6,900
18	Compost/manure	0	0				1,000	0	0	0					1,000		0
19	Chemicals	1	20,000				1,000	20,000	4	80,000					1,000		80,000
20	Other contingency works and expenses	1	50,000				0.900	45,000	1	50,000					0.900		45,000
21	Land tax	1	30,000					0	1	30,000							0
Production Cost Total (A)					664,800				562,838		789,700						672,443

Table M-6.25d Economic Farming Cost per ha (Apricot)

Apricot (1ha)

Spacing: 8 x 8 m

No	Works & Inputs	Qty	Total (in AMD)	7th-10 years (4 years)					Conversion Factor	Economic Cost Total (in AMD)	11th-60th years (50 years)					Conversion Factor	Economic Cost Total (in AMD)
				Fuel Share	Taxes	Subsidies					Qty	Total (in AMD)	Fuel Share	Taxes	Subsidies		
1	Digging holes for planting, tractor	0	0						0.700	0	0	0				0.700	0
2	Soil preparing (mixing with compost)	0	0						0.700	0	0	0				0.700	0
3	Transplanting of seedling	0	0						0.700	0	0	0				0.700	0
4	Brushwood collecting	5 x 4 years	100,000						0.700	70,000	5 x 50 years	1,250,000				0.700	875,000
5	Pruning of trees and shaping	156 x 4 years	499,200						0.700	349,440	156 x 50 years	6,240,000				0.700	4,368,000
6	Whitening of tree trunks	4 x 4 years	80,000						0.700	56,000	4 x 50 years	1,000,000				0.700	700,000
7	Digging around the tree trunk (2 times)	312 x 4 years	436,800						0.700	305,760	312 x 50 years	5,460,000				0.700	3,822,000
8	Developing ditches for watering	1 x 4 years	100,000						0.700	70,000	1 x 50 years	1,250,000				0.700	875,000
9	Labor for watering	6 x 4 years	120,000						0.700	84,000	6 x 50 years	1,500,000				0.700	1,050,000
10	Compost application	0	0						0.700	0	0	0				0.700	0
11	Top dressing	2 x 4 years	40,000						0.700	28,000	2 x 50 years	500,000				0.700	350,000
12	Spraying chemicals (diseases and pests)	4 x 4 years	192,000						0.700	134,400	4 x 50 years	2,400,000				0.700	1,680,000
13	Harvesting	25 x 4 years	500,000						0.700	350,000	25 x 50 years	6,250,000				0.700	4,375,000
14	Transporting the harvest	1 x 4 years	200,000		30%	2.8%	1,680	20%	12,000	1,052	210,320	1 x 50 years	2,500,000	30%	2.8%	21,000	2,629,000
15	Seedling	0	0						1.000	0	0	0				1.000	0
16	Irrigation water fee, 6-7 times	6,200 x 4 years	272,800						1.700	463,760	200 x 50 year	3,410,000				1.700	5,797,000
17	Fertilizers																
	* Ammonia selitra	110 x 4 years	52,800							52,800	150 x 50 years	900,000					900,000
	* Super phosphate	75 x 4 years	42,000							42,000	100 x 50 years	700,000					700,000
	* Potassic salt	35 x 4 years	19,600							19,600	50 x 50 years	350,000					350,000
18	Compost/manure	0	0						1.000	0	0	0				1.000	0
19	Chemicals	4 x 4 years	320,000						1.000	320,000	4 x 50 years	4,000,000				1.000	4,000,000
20	Other contingency works and expenses	1 x 4 years	200,000						0.900	180,000	1 x 50 years	2,500,000				0.900	2,250,000
21	Land tax	1 x 4 years	120,000							0	1 x 50 years	1,500,000					0
Production Cost Total (A)			3,295,200							2,736,080		41,710,000					34,721,000

Table M-6.25e Economic Farming Cost per ha (Apricot)

Apricot (1ha)

Spacing: 8 x 8 m

No	Works & Inputs	Qty	Total Production Cost 60 years					Conversion Factor	Economic Cost Total (in AMD)
			Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies			
1	Digging holes for planting, tractor	1	35,000	30%	2.8%	294	20%	2,100	36,800
2	Soil preparing (mixing with compost)	20	100,000					1.052	70,000
3	Transplanting of seedling	20	100,000					0.700	70,000
4	Brushwood collecting	295	1,475,000					0.700	1,032,500
5	Pruning of trees and shaping	9,048	7,238,400					0.700	5,066,880
6	Whitening of tree trunks	240	1,200,000					0.700	840,000
7	Digging around the tree trunk (2 times)	18,720	6,552,000					0.700	4,586,400
8	Developing ditches for watering	60	1,500,000					0.700	1,050,000
9	Labor for watering	360	1,800,000					0.700	1,260,000
10	Compost application	20	100,000					0.700	70,000
11	Top dressing	116	580,000					0.700	406,000
12	Spraying chemicals (diseases and pests)	222	2,664,000					0.700	1,864,800
13	Harvesting	1,385	6,925,000					0.700	4,847,500
14	Transporting the harvest	56	2,800,000	30%	2.8%	23,520	20%	168,000	2,944,480
15	Seedling	224	755,000					1.000	255,000
16	Irrigation water fee, 6-7 times	372,000	4,092,000					1.700	6,956,400
17	Fertilizers								
	* Ammonia selitra	8,150	978,000			54%	524,045	1.536	1,502,045
	* Super phosphate	5,440	761,600			97%	739,840	1.971	1,501,440
	* Potassic salt	2,710	379,400			97%	368,560	1.971	747,960
18	Compost/manure	7	56,000					1.000	56,000
19	Chemicals	222	4,440,000					1.000	4,440,000
20	Other contingency works and expenses	60	3,000,000					0.900	2,700,000
21	Land tax	60	1,800,000						0
Production Cost Total (A)			48,831,400						42,304,211

Table M-6.26a Economic Farming Cost per ha (Apple)

Apple (1ha)

Spacing: 4 x 1.75 m

No	Works & Inputs	unit	Unit Price (in AMD)	1st year					Conversion Factor	Economic Cost Total (in AMD)	2nd year					Conversion Factor	Economic Cost Total (in AMD)
				Qty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies			Qty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies		
1	Land preparing and mixing compost	man day	5,000	30	150,000				0.700	105,000	0	0				0.700	0
2	Transplanting of seedling	man day	5,000	8	40,000				0.700	28,000	0	0				0.700	0
3	Brushwood collecting	man day	5,000	0	0				0.700	0	5	25,000				0.700	17,500
4	Pruning of trees and shaping	tree	5,000	0	0				0.700	0	0	0				0.700	0
5	Whitening of tree trunks	man day	5,000	0	0				0.700	0	4	20,000				0.700	14,000
6	Digging/weeding around the tree (2 times)	man day	5,000	30	150,000				0.700	105,000	30	150,000				0.700	105,000
7	Developing ditches for watering	ha	25,000	1	25,000				0.700	17,500	1	25,000				0.700	17,500
8	Labor for watering	man day	5,000	12	60,000				0.700	42,000	6	30,000				0.700	21,000
9	Compost application	man day	5,000	0	0				0.700	0	0	0				0.700	0
10	Top dressing & inter cultivation	time	10,000	0	0				1.000	0	0	0				1.000	0
11	Spraying chemicals (diseases and pests)	time	12,000	0	0				0.700	0	4	48,000				0.700	33,600
12	Covering trees for protecting from cold	man day	5,000	2	10,000				0.700	7,000	0	0				0.700	0
13	Harvesting	man day	5,000	0	0				0.700	0	0	0				0.700	0
14	Transporting the harvest	ha	50,000	0	0				0.700	0	0	0				0.700	0
15	Seedling	pc	1,500	1,550	2,325,000				1.000	2,325,000	0	0				1.000	0
16	Irrigation water fee, 6-7 times	m ³	11	6,600	72,600				1.700	123,420	6,600	72,600				1.700	123,420
17	Fertilizers																
	* Ammonia selitra	kg	120	0	0					0	0	0					0
	* Super phosphate	kg	140	0	0					0	0	0					0
	* Potassic salt	kg	140	0	0					0	0	0					0
18	Compost/manure	ton	8,000	15	120,000				1.000	120,000	0	0				1.000	0
19	Chemicals	time	25,000	0	0				1.000	0	4	100,000				1.000	100,000
20	Other contingency works and expenses	ha	50,000	1	50,000				0.900	45,000	1	50,000				0.900	45,000
21	Land tax	ha	30,000	1	30,000					0	1	30,000					0
Production Cost Total (A)					3,032,600					3,917,920		550,600					477,020

Table M-6.26b Economic Farming Cost per ha (Apple)

Apple (1ha)

Spacing: 4 x 1.75 m

No	Works & Inputs	3rd year							4th year										
		Qty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)	Qty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)				
1	Land preparing and mixing compost	0	0				0.700	0	0	0				0.700	0				
2	Transplanting seedling	0	0				0.700	0	0	0				0.700	0				
3	Brushwood collection	5	25,000				0.700	17,500	5	25,000				0.700	17,500				
4	Pruning of trees and shaping	20	100,000				0.700	70,000	20	100,000				0.700	70,000				
5	Whitening of tree trunks	4	20,000				0.700	14,000	4	20,000				0.700	14,000				
6	Digging/weeding around the tree (2 times)	30	150,000				0.700	105,000	30	150,000				0.700	105,000				
7	Developing ditches for watering	1	25,000				0.700	17,500	1	25,000				0.700	17,500				
8	Labor for watering	6	30,000				0.700	21,000	6	30,000				0.700	21,000				
9	Compost application	5	25,000				0.700	17,500	0	0				0.700	0				
10	Low dressing & inter cultivation	5	20,000				1.000	20,000	2	20,000				1.000	20,000				
11	Spraying chemicals (diseases and pests)	4	48,000				0.700	33,600	6	72,000				0.700	50,400				
12	Covering trees for protecting from cold	0	0				0.700	0	0	0				0.700	0				
13	Harvesting	25	125,000				0.700	87,500	35	175,000				0.700	122,500				
14	Transporting the harvest	1	50,000	30%	3%	420	20%	3,000	1,052	52,580	1	50,000	30%	3%	420	20%	3,000	1,052	52,580
15	Seedling	0	0				1.000	0	0	0				1.000	0				
16	Irrigation water fee, 6-7 times	6,600	72,600				1.700	123,420	6,600	72,600				1.700	123,420				
17	Fertilizers																		
*	Ammonia selitra	100	12,000			54%	6,430	1,536	18,430	150	18,000			54%	9,645	1,536	27,645		
*	Super phosphate	50	7,000			97%	6,800	1,971	13,800	70	9,800			97%	9,520	1,971	19,320		
*	Potasic salt	25	3,500			97%	3,400	1,971	6,900	35	4,900			97%	4,760	1,971	9,660		
18	Compost manure	15	120,000				1.000	120,000	0	0				1.000	0				
19	Chemicals	4	100,000				1.000	100,000	6	150,000				1.000	150,000				
20	Other contingency works and expenses	1	50,000				0.900	45,000	1	50,000				0.900	45,000				
21	Land tax	1	30,000					0	1	30,000					0				
Production Cost Total (A)			1,013,100					883,730		1,002,300					865,525				

Table M-6.26c Economic Farming Cost per ha (Apple)

Apple (1ha)

Spacing: 4 x 1.75 m

No		Works & Inputs	5th-10th years (26 years)						Total Production Cost 30 years									
			Qty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)	Qty	Financial Cost Total (in AMD)	Fuel Share	Taxes	Subsidies	Conversion Factor	Economic Cost Total (in AMD)		
1		Land preparing and mixing compost	0	0				0.700	0	30	150,000				0.700	105,000		
2		Transplanting of seedling	0	0				0.700	0	8	40,000				0.700	28,000		
3		Bushwood collecting	5 x 26 years	650,000				0.700	455,000	145	725,000				0.700	507,500		
4		Pruning of trees and shaping	20 x 26 years	2,600,000				0.700	1,820,000	560	2,800,000				0.700	1,960,000		
5		Whitening of tree trunks	4 x 26 years	520,000				0.700	364,000	116	580,000				0.700	406,000		
6		Digging/wooding around the tree (2 times)	30 x 26 years	3,900,000				0.700	2,730,000	900	4,500,000				0.700	3,150,000		
7		Developing ditches for watering	1 x 26 years	650,000				0.700	455,000	30	750,000				0.700	525,000		
8		Labor for watering	6 x 26 years	780,000				0.700	546,000	186	930,000				0.700	651,000		
9		Compost application	5 x 13 years	325,000				0.700	227,500	70	350,000				0.700	245,000		
10		Tree dressing & insect chemicals (diseases and pests)	2 x 26 years	1,000,000				0.700	520,000	56	1,660,000				0.700	1,460,000		
11		Spraying chemicals (diseases and pests)	9 x 26 years	2,808,000				0.700	1,965,600	248	2,976,000				0.700	2,083,200		
12		Covering trees for protecting from cold	0	0				0.700	0	2	10,000				0.700	7,000		
13		Harvesting	50 x 26 years	6,500,000				0.700	4,550,000	1,360	6,800,000				0.700	4,760,000		
14		Transporting the harvest	1 x 26 years	1,300,000	30%	3%	10,920	1.052	1,367,080	28	1,400,000	30%	3%	11,760	20%	84,000	1.052	1,472,240
15		Seedling	0	0				1.000	0	1,550	2,325,000				1.000	2,325,000		
16		Irrigation water fee, 6-7 times	6,600 x 26 years	1,887,600				1.700	3,208,920	198,000	2,178,000				1.700	3,702,600		
17		Fertilizers																
*		Ammonia solitra	200 x 26 years	624,000			54%	334,360	1,536	958,360	5,450	654,000		54%	350,435	1,536	1,004,435	
*		Super phosphate	100 x 26 years	364,000			97%	353,600	1,971	717,600	2,720	380,800		97%	369,920	1,971	750,720	
*		Potassic salt	50 x 26 years	182,000			97%	176,800	1,971	358,800	1,360	190,400		97%	184,960	1,971	375,360	
18		Compost/manure	15 x 13 years	1,560,000				1.000	1,560,000	225	1,500,000				1.000	1,800,000		
19		Chemicals	9 x 26 years	5,850,000				1.000	5,850,000	248	6,200,000				1.000	6,200,000		
20		Other contingency works and expenses	1 x 26 years	1,300,000				0.900	1,170,000	30	1,500,000				0.900	1,350,000		
21		Land tax	1 x 26 years	780,000					0	30	900,000					0		
Production Cost Total (A)				33,100,600					28,823,860		38,699,200					33,968,050		

(2) Increment in Livestock Production

Table M-6.27 Number of Cattles Fed by Produced Forages in 2015 and in 2023

Crop	Livestock Production in 2015			Livestock Production in 2023		
	Area (ha)	Yield (kg/ha)	Production (ton)	Area (ha)	Yield (kg/ha)	Production (ton)
Alfalfa	916	11.3	10.4	1,452	11.5	16.7
Barley	374	2.7	1.01	457	3.4	1.55
Maize (grain)	118	2.4	0.28	144	2.6	0.37
Total (ton)			11.7			18.62
Forage requirement per cattle (kg)			2.4			2.4
Cattles can be fed by forages (heads)			4,870			7,761

Source) The survey Team based on interviews to livestock producers

Table M-6.28 Aggregated Livestock Income in 2015 and in 2023

Livestock	Without (2015)			With (2023)			With - Without
	Heads	Net Profit (USD)	Profit (USD)	Heads	Net Profit (USD)	Profit (USD)	
Cattle	4,870	108	525,960	7,761	108	838,179	312,219

Source) The survey Team

(3) Net Saving in Pump O&M cost

Table M-6.29 Operation and Maintenance cost of Pump Station operated by WSA

Name of the pump station	O&M title	Unit	Years					
			2011	2012	2013	2014	2015	Average
Ranchpar 1	Electricity	thousand kWh	2,000.4	3,063.3	7,340.7	9,281.7	8,593.8	6,056.0
		thousand AMD	45,362.9	68,767.9	223,603.2	311,327.9	333,074.0	196,427.2
	Repair and maintenance	thousand AMD	9,450.0	8,125.2	10,221.0	10,620.0	15,000.0	10,683.2
Ranchpar 2	Electricity	thousand kWh	125.3	548.5	4,480.5	6,018.0	5,138.3	3,262.1
		thousand AMD	2,458.6	10,781.6	122,936.1	179,079.7	180,838.9	99,219.0
	Repair and maintenance	thousand AMD	6,725.0	7,120.5	5,840.0	9,720.0	12,000.0	8,281.1
Aknalich	Electricity	thousand kWh	2,202.2	1,983.6	1,550.9	1,779.9	1,183.5	1,740.0
		thousand AMD	49,729.9	44,563.7	43,879.7	59,355.7	45,456.3	48,597.1
	Repair and maintenance	thousand AMD	4,950.0	6,120.0	8,346.0	4,620.0	5,000.0	5,807.2
Total	Electricity	thousand kWh	4,327.9	5,595.4	13,372.1	17,079.6	14,915.6	11,058.1
		thousand AMD	97,551.4	124,113.2	390,419.0	549,763.3	559,369.2	344,243.2
	Repair and maintenance	thousand AMD	21,125.0	21,365.7	24,407.0	24,960.0	32,000.0	24,771.5

Source: WSA

Table M-6.30 Electricity Consumption and Costs by WUA

WUA	1.Deep Wells						2.Small Pump Station					
	Electricity (thousand kWh/year)						Electricity (thousand kWh/year)					
	2011	2012	2013	2014	2015	Average	2011	2012	2013	2014	2015	Average
Yegvard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ashtarak	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Khoy	3,627.7	4,480.2	4,619.5	5,320.1	5,042.7	4,618.0	2,934.5	4,843.6	4,777.5	3,750.2	4,169.5	4,095.1
Vagharshapat	5,503.2	7,075.9	6,843.3	7,769.6	7,638.0	6,966.0	35.2	39.8	41.6	55.4	77.5	49.9
WUA	3.Medium Pump Station						Total ("1"+"2"+"3")					
	Electricity (thousand kWh/year)						Electricity (thousand kWh/year)					
	2011	2012	2013	2014	2015	Average	2011	2012	2013	2014	2015	Average
Yegvard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ashtarak	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Khoy	0.0	0.0	0.0	0.0	0.0	0.0	6,562.2	9,323.8	9,397.0	9,070.3	9,212.3	8,713.1
Vagharshapat	453.7	973.5	1,012.6	1,155.6	1,333.3	985.7	5,992.0	8,089.1	7,897.5	8,980.6	9,048.8	8,001.6

WUA	1.Deep Wells						2.Small Pump Station					
	Electricity Cost (AMD/year)						Electricity Cost (AMD/year)					
	2011	2012	2013	2014	2015	Average	2011	2012	2013	2014	2015	Average
Yegvard	0	0	0	0	0	0	0	0	0	0	0	0
Ashtarak	0	0	0	0	0	0	0	0	0	0	0	0
Khoy	95,045,557	113,349,060	136,737,496	177,132,169	192,151,196	142,883,095	76,883,166	122,541,967	141,414,355	124,863,181	158,879,230	124,916,380
Vagharshapat	154,198,823	196,850,147	207,487,764	264,166,740	299,828,093	224,506,313	962,197	11,056,414	1,286,182	1,872,790	2,971,734	3,629,863
WUA	3.Medium Pump Station						Total ("1"+"2"+"3")					
	Electricity Cost (AMD/year)						Electricity Cost (AMD/year)					
	2011	2012	2013	2014	2015	Average	2011	2012	2013	2014	2015	Average
Yegvard	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Ashtarak	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0
Khoy	0	0	0	0	0	0	171,928,723	235,891,027	278,151,851	301,995,350	351,030,425	267,799,475
Vagharshapat	12,412,685	27,072,924	31,289,340	39,058,300	51,035,899	32,173,830	167,573,705	225,028,685	240,063,286	308,097,830	353,835,726	258,919,846

Source: WUA

Table M-6.31 Operation and Maintenance cost of the 4 WUAs

WUA	Vagharshapat				Khoy			
	2013	2014	2015	Average	2013	2014	2015	Average
Cleaning from garbage	29,905.3	30,742.2	64,333.2	41,660.2	51,324.9	49,402.1	66,747.5	55,824.8
Including	Manual	12,639.3	14,101.1	26,677.2	17,805.9	18,928.4	29,764.4	21,314.8
	Mechanical	17,196.0	16,641.1	37,656.0	32,392.7	34,150.4	36,983.1	34,508.7
Network Rehabilitation	11,875.0	7,662.0	26,730.7	15,422.6	20,095.5	33,774.7	24,960.1	26,276.8
Rehabilitation(such as gates,...)	1,510.0	1,644.4	3,039.2	2,064.5	0.0	437.2	1,149.0	528.7
P/S and D/W Rehabilitation	19,840.4	22,245.4	76,775.2	39,620.3	21,922.2	43,360.4	21,698.9	28,993.8
Machinery Rehabilitation	2,844.0	2,609.4	11,232.0	5,561.8	5,182.6	3,739.8	5,332.2	4,751.5
Total	65,974.7	64,903.4	182,110.3	104,329.4	98,525.1	130,714.1	119,887.7	116,375.6

WUA	Ashtarak				Yeghvard			
	2013	2014	2015	Average	2013	2014	2015	Average
Cleaning from garbage	5,494.6	10,061.4	13,300.6	9,618.9	6758.2	5971.1	4763.4	5,830.9
Including	Manual	2,792.8	3,638.8	9,685.2	5011.3	4581.9	2198.9	3,930.7
	Mechanical	2,701.8	3,504.9	3,615.4	1746.9	1389.2	2564.5	1,900.2
Network Rehabilitation	17,027.5	12,343.3	6,056.1	11,809.0	7533.1	6430	9833.9	7,932.3
Rehabilitation(such as gates,...)	30.8	0.0	31.4	20.7	407.1	362	348.2	372.4
P/S and D/W Rehabilitation	0.0	0.0	0.0	0.0	53	648.7	39.1	246.9
Machinery Rehabilitation	1,670.0	2,866.0	3,305.4	2,613.8	0	0	937.9	312.6
Total	24,222.9	25,270.7	22,693.5	24,062.4	14,751.4	13,411.8	15,922.5	14,695.1

Source: WUA

Table M-6.32 Operation and Maintenance cost of Pump Station operated by WUA

WUA	O&M title	Unit	Years			
			2013	2014	2015	Average
Vagharshapat	Electricity	thousand AMD	240,063.3	308,097.8	353,835.7	300,665.6
	P/S and D/W Rehabilitation	thousand AMD	19,840.4	22,245.4	76,775.2	39,620.3
Khoy	Electricity	thousand AMD	278,151.9	301,995.3	351,030.4	310,392.5
	P/S and D/W Rehabilitation	thousand AMD	21,922.2	43,360.4	21,698.9	28,993.8
Ashtarak	Electricity	thousand AMD	0.0	0.0	0.0	0.0
	P/S and D/W Rehabilitation	thousand AMD	0.0	0.0	0.0	0.0
Yeghvard	Electricity	thousand AMD	0.0	0.0	0.0	0.0
	P/S and D/W Rehabilitation	thousand AMD	53.0	648.7	39.1	246.9
Total	Electricity	thousand AMD	518,215.1	610,093.2	704,866.2	611,058.2
	P/S and D/W Rehabilitation	thousand AMD	41,762.6	65,605.8	98,474.1	68,861.1

Source: WUA

Table M-6.33 Aggregated Saving Costs for Operation and Maintenance of D/W and P/S

O&M title		Financial O&M		Conversion Factor	Economic O&M (thousand AMD)
		(thousand AMD)	(USD)		
Electricity	WSA	344,243.3	706,879.6	1.25	883,599.5
	WUA	611,058.2	1,254,765.3	1.25	1,568,456.6
Repair and Maintenance	WSA	24,771.5	50,866.5	0.90	45,779.9
	WUA	68,861.1	141,401.5	0.90	127,261.4
Total		1,048,934.1	2,153,912.9	-	2,625,097.3

Source: The Survey Team

(4) Conservation of Lake Sevan

Lake Sevan, the world's largest high-altitude lakes located in the central part of Armenia, has environmental, economic, and social significance and is an important multipurpose water reservoir for

irrigation, hydropower and recreational uses. The beneficial area is no exception since 50MCM/year out of irrigation water demand is now distributed from the Lake. To protect the Lake, Armenian government adapted two laws in 2001 that recognized the importance of Lake Sevan and targeted to raise the level 6 meters by 2030. From these reasons, it is essentially important to reduce the dependency of Lake Sevan in irrigation by developing another water resource within the Yeghvard basin.

With the Project, snow melting water, which is now in no use in irrigation, will be utilized for irrigation purposes, and the water dependency from Lake Sevan is expected to be zero thanks to the project. Since this “conservation of Lake Sevan” is consistent with Armenian national strategy, it is better to be estimated as the numerical value on the viewpoint of the national economy.

Since “water resource” is generally non-marketed goods, the benefit should be converted to monetary basis in some sort of ways. In order to do this, the benefit calculation applies the idea “alternative method” with necessary modification. This is an approach assuming if “without the project”, this conservation Lake Sevan shall be achieved by an alternative methods. In this case, additional cost is needed, for instance, construction of alternative facilities. It can be said that the cost of alternative facility is the saving cost thanks to the project.

In this analysis, three alternative methods are proposed with following conditions;

Alternative 1): without project, conservation of Lake Sevan will be achieved by 50MCM of water saving thanks to extension of drip irrigation system in somewhere outside of project areas.

Alternative 2): without project, construction of another reservoir has to be needed in order to stock same amount (50 MCM) of free water.

Alternative 3): without project, conservation of Lake Sevan will be achieved by constructing tunnel like Arpa-Sevan tunnel that transfers up to 50 MCM.

(a) The Cost of Alternative 1 (Introduce of Drip Irrigation)

Explanation: Without project, independence from Lake Sevan will be achieved by 50MCM/year of water saving thanks to extension of drip irrigation system;

- 1) Current irrigation water demand with furrow irrigation which including water loss during conveyance per ha is $12,472 \text{ m}^3/\text{ha}$ ($154 \text{ MCM}/12,347 \text{ ha}$).
- 2) Current net irrigation water demand with furrow irrigation not including water loss during conveyance per ha is $5,837 \text{ m}^3/\text{ha}$ ($12,472 \text{ m}^3/\text{ha} \times 46.8 \%$).
- 3) Irrigation water demand with drip irrigation including water loss during conveyance per ha is $8,186 \text{ m}^3/\text{ha}$ ($5,837 \text{ m}^3/\text{ha} \div 71.3 \%$)
- 4) Taking difference, the volume of saving water by introducing drip irrigation is $4,286 \text{ m}^3/\text{ha}$ ($12,472 \text{ m}^3/\text{ha} - 8,186 \text{ m}^3/\text{ha}$).
- 5) To save irrigation water up to the volume of 50 MCM, $11,666 \text{ ha}$ of furrow irrigation system should be converted to drip irrigation ($50,000,000 \text{ m}^3 \div 4,286 \text{ m}^3/\text{ha}$), which costs 13,357 million AMD or equivalent to 27.43 million USD. ----- (A)

Note: Assume that the on-farm investment cost of introducing drip irrigation is 1,145,000AMD, referring KfW (2014).

Table M-6-34. Capacity of Reservoir by Irrigation Area and Irrigation Method

Trial	Area	Irrigation Type	Conveyance Efficiency	Demand (MCM)	Yeghvard (MCM)
-	12,347	Furrow	46.8%	154	94
(i)	3,644	Furrow	46.8%	40	35
(ii)	12,347	Furrow	46.8%	146	84
		Drip	71.3%		
(iii)	12,347	Furrow	46.8%	140	79
		Drip	71.3%		

Source: This Report, Table 6-4-3.6

Note: The conveyance efficiency by furrow irrigation defines 46.8% which is calculated as 72% times 65%, and that of drip irrigation defines 71.3% which is calculated as 75% times 95%.

(b) The Cost of Alternative 2 (Reservoir Construction)

Explanation: Without project, construction of another reservoir has to be needed in order to stock 50 MCM of free water;

- 1) To employ the ordinal unit cost of water development in RA, WB (2015) is referred (Table M-6-33).
- 2) The unit cost of water development is 1.82USD/m³ (480.8 million USD/263.81 MCM).
- 3) To develop alternative reservoir with the volume of 50MCM, it is estimated that the cost is 91.0 million USD (1.82 USD/m³ × 50MCM). ----- (B)

Table M-6-35. Key Features of Priority Reservoirs

Reservoir name	River basin	Marz (province)	Status	Total vol. (MCM)	Est. cost ^a (million US\$)
Kaps	Akhuryan	Shirak	Partially constructed; feasibility study is in progress for to 60 MCM reservoir option	60.00	44.0
Yegvard	Hrazdan	Kotayk	Partially constructed; feasibility study to be conducted	90.00	139.1
Vedi	Vedi	Ararat	Designed in Soviet times; feasibility study is ongoing; will be followed by preparation of final design for construction of dam	20.00	40.8
Apna	Kasakh	Aragatsotn	Partially constructed; final design was prepared in Soviet times	5.25	8.7
Karmir Guygh	Voskepar	Tavush	Partially constructed	8.50	33.0
Artik	Karkachun	Shirak	Partially constructed	1.69	3.5
Getik	Chichkhan	Lori	Partially constructed; preliminary design available	3.00	7.8
Lichk (Meghriget)	Meghriget	Syunik	New; preliminary design has been prepared by MCA	1.17	6.5
Oshakan (Kasakh)	Kasakh	Aragatsotn	New; feasibility study report is available	13.85	35.0
Argichi	Argichi	Gegharkunik	New dam; preliminary design is available, prepared by Millennium Challenge Corporation	5.50	4.2
Getikvanq	Elegis	Vayots Dzor	New; preliminary investigations have been implemented	23.00	54.0
Gegardalich 2	Yot Aghbyur	Kotayk	New; preliminary design is available	5.50	18.4
Hartavan	Gegharot	Aragatsotn	New; preliminary design is available	3.00	9.7
Khndzoreshk	Karkachun	Syunik	New; preliminary investigations have been implemented	5.20	13.0
Upper Sasnashen	Upper Sasnashen canal	Aragatsotn	New; preliminary investigations have been implemented	1.00	6.5
Elpin	Elpin	Vayots Dzor	New; final design is available	1.00	4.0
Khachik	Khachik canal	Vayots Dzor	New; preliminary investigations have been implemented	0.50	3.1
Astghhadsor	Astghhadsor	Gegharkunik	New; preliminary investigations have been implemented	1.25	2.3
Byurakan (Hamberd)	Hamberd	Aragatsotn	New; preliminary investigations have been implemented	2.70	8.7
Geghadzor	Geghadzor	Aragatsotn	New; preliminary design is available	1.50	6.5
Selav-Mastara	Selav-Mastara	Armavir	New; feasibility study was updated	10.20	32.0
Total				263.81	480.8^b

Source: WB (2015) "Toward Integrated Water Resource Management in Armenia"

(c) The Cost of Alternative 3 (Tunnel Construction)

Explanation: To cope with the decreasing trend of the level of Lake Sevan, programs to stabilize the lake level had started in the 1980s. This includes the construction of Arpa-Sevan tunnels, which transferring up to 250 MCM. As the cost of alternative three (3), construction of another tunnel is derived from the project cost of Apra-Sevan tunnel.

- 1) The project cost of Arpa-Sevan Tunnel is estimated at 4.5 billion USD evaluated in the present monetary value.
- 2) Planted volume of water conveyance from Lake Arpa to Lake Sevan is 250MCM/year.

Therefore, the unit price of water development per m³ is:

$$4,500 \text{ million USD}/250\text{MCM} = 18.0 \text{ USD}/\text{m}^3$$

The cost of similar tunnel with the water conveyance is up to 50 MCM/year is 900 million USD (18.0 USD/m³ × 50MCM). ----- (C)

(d) Annual Benefit Estimation

The comparison between alternative1-3 finds that the most efficient option is alternative one (1): introduce of drip irrigation. From the point of conservatism principle, alternative one (1) is applied as the saving cost of the project.

Annual benefit is calculated as initial investment cost times discount factor (d_{in}) which is defined as following.

$$\text{Discount Factor (d}_{in}) = \frac{ix(1+i)^n}{(1+i)^n - 1}$$

i: social discount ratio (12 % is assumed), n: design service life of the facilities (80 years is assumed)

Therefore, the annual benefit of conservation of Lake Sevan is;

$$\text{The cost of Alternative1} \times \text{Discount Factor} = 27.43 \text{ Million USD} \times 0.12 \doteq 3.3 \text{ Million USD}$$

(5) Opportunity Cost of HPPs Operation

Taking irrigation water from the basin may negatively influence other sectors of the region. The most concerning sector is hydropower station of Sevan-Hrazdan cascade operated by Russian company.

There are seven hydropower stations which account for 10% of the country's electricity. The annual electrical energy production of seven (7) hydropower station is 535.283 million kWh on averaging 2011-2015. The opportunity cost of HPPs is calculated as following;

- 1) The average annual production by the seven HPPs is 535.283 million kWh on averaging 5 years (2011-2015).
- 2) On the other hand, the total annual water flow of Hrazdan River connected to seven HPPs is 2,089.382 MCM on averaging 2011-2015.
- 3) It is assumed that taking 154MCM (104MCM as for irrigation water + 50MCM as for conservation of Lake Sevan) of irrigation water from Hrazdan river reduce the productions of HPPs following the same proportion of water volume: 7.3% (153MCM/2089.382MCM × 100).
- 4) According to power tariff study in Armenia, cost-recovery tariff of Sevan-Hrazdan Cascade of HPPs is 4.578AMD/kWh.

Then, the annual opportunity cost of seven HPPs is estimated as 179.4 million AMD (535.283 million kWh × 4.578 AMD/kWh × 7.3%), or equivalent to 0.37 million USD.

Table M-6-36. Energy Production by HPPs by month 2011-2015 (Million KWh)

Year	Month	Portion of Electrical Energy Production by HPPs of IEC CJSC by months (mln kWh)						
		Sevan HPP	Hrazdan HPP	Arzel HPP (Gyumush)	Arzni HPP	Ganager HPP	Yerevan HPP-1	Yerevan HPP-3
2011	January			4.640	4.090	7.390	3.830	1.240
	February			4.160	3.770	6.710	3.420	1.150
	March			9.760	6.010	9.980	5.710	1.010
	April			44.750	23.610	33.650	15.000	0.840
	May			66.120	23.500	29.140	12.440	0.500
	June	0.720	3.230	28.860	10.790	15.030	6.970	
	July	8.040	20.930	35.120	10.510	14.200	5.970	
	August	6.671	16.743	28.736	9.115	12.402	5.253	
	September	3.083	7.582	14.590	4.533	6.435	2.354	
	October			2.770	1.891	4.127	0.906	
	November			6.926	4.217	6.721	2.860	0.244
	December			4.689	4.000	7.419	2.776	1.275
	Total	18.518	48.518	251.148	106.033	152.959	67.488	6.232
2012	January			3.456	3.404	3.896	2.355	1.308
	February			3.604	3.956	6.428	2.315	1.207
	March			5.038	4.220	7.312	2.040	0.955
	April			27.943	16.418	23.912	11.531	0.173
	May	4.026	13.197	43.123	9.866	13.649	6.746	
	June	9.175	24.750	48.001	10.193	13.527	6.306	
	July	7.688	20.063	39.358	8.722	12.049	5.141	
	August	9.447	24.484	44.092	8.640	11.647	4.916	
	September	4.494	11.571	21.660	5.447	7.475	3.141	
	October			2.913	1.349	2.902	0.053	
	November			4.529	3.253	6.631	2.798	0.290
	December			5.087	3.762	6.751	3.912	1.042
	Total	34.830	94.065	248.804	78.630	115.979	52.054	4.975
2013	January			4.134	3.350	6.520	3.803	0.939
	February			4.392	3.318	6.245	3.652	0.786
	March			13.114	9.639	14.933	7.590	1.358
	April			31.583	15.919	23.407	10.706	0.079
	May			28.013	7.761	11.275	5.025	
	June	2.408	9.033	21.636	7.700	10.582	4.303	
	July	8.637	22.131	37.616	7.644	10.501	0.510	
	August	6.270	15.679	30.744	5.183	6.733		
	September	1.673	4.195	7.658	1.689	1.934		
	October			2.311	0.961	1.666		
	November			1.983		5.101		0.027
	December			5.028		7.155	0.300	1.165
	Total	18.988	51.238	188.212	63.164	106.052	35.889	4.354
2014	January			2.995		5.329	2.089	0.998
	February			3.059		4.791	2.778	0.412
	March			8.031		9.266	3.863	0.762
	April		2.785	20.544	5.700	12.787	6.540	
	May	4.507	16.815	39.200	8.529	12.102	5.894	
	June	6.942	17.982	32.025	6.172	8.121	4.012	
	July	8.543	22.900	38.804	6.434	8.945	4.395	
	August	7.626	19.869	37.590	4.894	6.290	3.698	
	September	0.108		4.986	1.346	1.785	0.467	
	October			3.264	1.580	2.954	0.666	
	November			1.595	1.957	4.947	2.131	0.190
	December			4.731	4.657	7.176	4.134	1.010
	Total	27.726	80.851	196.824	41.269	84.493	40.667	3.372
2015	January			3.555	3.998	6.103	3.690	0.756
	February			3.115	3.557	4.364	3.128	0.654
	March			5.771	5.266	7.647	3.122	0.170
	April			22.683	8.542	12.502	5.917	0.181
	May			39.624	10.921	15.188	7.670	
	June	6.492	17.137	34.961	7.253	10.414	5.178	
	July	7.418	19.621	32.653	5.039	6.179	3.157	
	August	6.580	17.346	33.026	4.962	6.248	3.013	
	September	0.677	1.713	10.177	1.860	2.181	0.435	
	October			4.817	0.285	0.357	0.346	
	November			6.216	1.499	2.321	0.104	
	December			3.349	2.776	5.526	3.178	0.752
	Total	21.167	55.817	199.947	55.958	79.030	38.938	2.513
Average 2011-2015	January	0.000	0.000	3.756	2.968	5.808	3.153	1.048
	February	0.000	0.000	3.666	2.800	5.708	3.059	0.842
	March	0.000	0.000	8.343	5.027	9.828	4.625	0.851
	April	0.000	0.557	29.501	14.038	21.252	9.939	0.255
	May	1.707	6.002	43.216	12.115	16.271	7.555	0.100
	June	5.147	14.426	33.097	8.422	11.535	5.354	0.000
	July	8.065	21.129	36.710	7.670	10.375	3.835	0.000
	August	7.319	18.864	34.838	6.559	8.664	3.376	0.000
	September	2.007	5.012	11.814	2.975	3.962	1.279	0.000
	October	0.000	0.000	3.215	1.213	2.401	0.394	0.000
	November	0.000	0.000	4.250	2.185	5.144	1.579	0.150
	December	0.000	0.000	4.577	3.039	6.805	2.860	1.049
	Total	24.245	65.991	216.982	69.011	107.752	47.007	4.295

Source: Rus Hydro International Energy Corporation

Table M-6-37. Energy Production by HPPs by month 2011-2015 (Million KWh)

Year	Month \ HPP	Volume of water passed through HPPs, mln. M3						
		Sevan HPP	Hrazdan HPP	Argel HPP (Gyumush)	Arzni HPP	Ganagor HPP	Yerevan HPP-1	Yerevan HPP-3
2011	January	0.000	0.000	9.980	18.590	18.480	18.290	14.700
	February	0.000	0.000	8.700	15.760	15.580	15.410	13.650
	March	0.000	0.000	17.220	19.680	14.600	17.390	11.950
	April	0.000	0.000	67.130	95.410	91.820	77.270	9.880
	May	0.000	0.000	119.840	141.560	122.520	108.670	5.910
	June	11.785	11.670	59.980	73.200	72.480	71.750	0.000
	July	71.199	70.130	81.390	89.840	88.940	88.050	0.000
	August	58.864	57.910	66.600	73.400	72.720	71.990	0.000
	September	28.490	28.170	37.080	44.190	43.670	43.230	0.000
	October	0.000	0.000	9.770	17.690	17.530	17.360	0.000
	November	0.000	0.000	10.140	19.690	19.590	19.400	2.890
	December	0.000	0.000	8.720	16.570	16.260	16.100	15.170
	Total	170.334	167.882	496.500	625.600	594.200	564.900	74.200
2012	January	0.000	0.000	9.050	16.680	16.440	16.440	15.570
	February	0.000	0.000	6.990	13.870	13.620	13.520	14.370
	March	0.000	0.000	9.470	18.570	18.310	18.120	11.370
	April	0.000	0.000	63.490	62.160	62.800	62.160	2.060
	May	42.650	42.540	71.470	49.910	48.900	48.850	0.000
	June	83.300	83.040	92.640	62.000	60.280	60.220	0.000
	July	69.210	68.670	78.780	55.270	53.630	53.570	0.000
	August	83.970	83.480	86.300	55.770	54.290	54.230	0.000
	September	38.500	38.400	41.940	35.300	34.350	34.310	0.000
	October	0.000	0.000	7.740	14.090	13.880	2.850	0.000
	November	0.000	0.000	7.760	15.930	15.690	15.670	3.450
	December	0.000	0.000	8.690	17.310	17.790	17.780	12.400
	Total	317.621	316.130	484.240	416.860	409.980	397.740	59.220
2013	January	0.000	0.000	7.830	16.420	16.220	16.190	11.200
	February	0.000	0.000	8.300	16.240	16.140	16.090	9.360
	March	0.000	0.000	21.940	37.550	37.980	37.930	16.160
	April	0.000	0.000	54.390	77.420	77.390	77.290	0.940
	May	0.000	0.000	53.990	76.210	75.430	75.340	0.000
	June	28.920	28.850	44.280	44.870	43.330	43.280	0.000
	July	77.040	71.480	77.060	50.110	47.930	2.800	0.000
	August	53.000	51.290	60.340	35.500	31.760	0.000	0.000
	September	10.990	10.960	19.470	18.140	17.430	0.000	0.000
	October	0.000	0.000	8.800	15.460	14.800	0.000	0.000
	November	0.000	0.000	7.450	16.320	17.110	0.000	0.330
	December	0.000	0.000	12.390	21.490	22.270	1.650	13.860
	Total	169.950	162.580	376.250	425.730	417.790	270.580	51.840
2014	January	0.000	0.000	7.500	16.190	15.890	15.910	11.880
	February	0.000	0.000	6.600	15.170	15.320	15.320	4.900
	March	0.000	0.000	13.430	25.720	25.680	25.650	9.070
	April	0.000	0.000	35.240	25.650	45.280	45.230	0.000
	May	52.920	52.780	66.240	47.950	47.300	47.240	0.000
	June	60.190	60.000	66.030	45.750	44.400	44.350	0.000
	July	81.060	80.400	80.430	51.860	50.160	50.100	0.000
	August	65.540	65.020	69.960	40.690	39.280	39.260	0.000
	September	0.620	0.620	12.180	12.400	12.170	11.810	0.000
	October	0.000	0.000	5.360	9.380	8.710	8.700	0.000
	November	0.000	0.000	2.360	8.230	8.454	8.445	2.260
	December	0.000	0.000	10.250	16.490	16.760	16.840	12.020
	Total	269.633	267.480	375.590	315.480	329.400	328.840	40.130
2015	January	0.000	0.000	6.840	12.860	12.600	12.570	8.990
	February	0.000	0.000	5.810	11.430	10.790	10.819	7.780
	March	0.000	0.000	9.110	17.370	17.350	17.335	2.010
	April	0.000	0.000	30.330	31.090	30.920	30.770	2.160
	May	0.000	0.000	59.870	53.840	53.330	53.260	0.000
	June	54.840	54.630	66.740	47.830	46.370	46.320	0.000
	July	61.760	61.070	58.780	38.640	35.540	34.120	0.000
	August	42.400	41.750	47.140	22.780	20.610	19.810	0.000
	September	8.750	8.700	23.360	19.570	18.220	17.140	0.000
	October	0.000	0.000	9.620	13.910	12.580	12.080	0.000
	November	0.000	0.000	8.510	15.630	15.005	14.405	2.260
	December	0.000	0.000	7.100	14.380	14.100	13.530	8.950
	Total	167.743	157.440	333.220	299.330	287.420	282.150	32.150
Average 2011–2015	January	0.000	0.000	8.236	16.148	15.926	15.880	12.468
	February	0.000	0.000	7.280	14.494	14.290	14.232	10.012
	March	0.000	0.000	14.234	23.778	22.784	23.285	10.112
	April	0.000	0.000	50.116	58.346	61.642	58.544	3.008
	May	19.114	19.064	74.282	73.894	69.496	66.672	1.182
	June	47.807	47.638	65.934	54.730	53.372	53.184	0.000
	July	72.054	70.350	75.288	57.144	55.240	45.728	0.000
	August	60.755	59.890	66.068	45.628	43.732	37.058	0.000
	September	17.470	17.370	26.806	25.920	25.168	21.298	0.000
	October	0.000	0.000	8.258	14.106	13.500	8.198	0.000
	November	0.000	0.000	7.244	15.160	15.170	11.584	2.238
	December	0.000	0.000	9.430	17.248	17.436	13.180	12.480
	Total	217.200	214.312	413.176	416.596	407.756	368.843	51.500

Source: Rus Hydro International Energy Corporation

(6) Land Compensation and Land Acquisition

According to JICA's guideline, "land compensation and acquisition cost" have to be considered as "opportunity cost" of the project. According to chapter 5, Land compensation cost of the project is about 0.9 million USD in total.

Appendix M-7: Results of Financial Analysis and Economic Evaluation

Table M-7.1 summarizes the economic evaluation by the options. As already mentioned, the economic Project cost consists of base cost and physical contingency. In the economic analysis, benefits and costs are standardized in economic terms using conversion factors. Three indicators have been applied: economic internal rate of return (EIRR), net present value (NPV), and benefit-cost ratio (B/C). NPV and B/C are calculated with 12.0% opportunity cost of capital.

Comparing the four (4) options, "soil-cement with bentonite sheet" marked highest on EIRR and NPV, indicating 5.15 % of EIRR with -59.7 million USD of NPV, and 0.50 of B/C in base 0 case. Still, it is not regarded as viable even the base 1 case (including the benefit from conservation of Lake Sevan) as the EIRR is 7.09% against 12.0% referenced opportunity cost of capital.

Table M-7.1 Summary of the Economic Evaluation by the Options

Indicators	Options			
	Bentonite Sheet	Bentonite-Soil mixture	Soil-Cement	Soil-cement with bentonite sheet
<i>Project Cost calculated in Cost Estimation</i>				
Grand Total with VAT (Million USD)	231.4	291.2	236.8	226.9
<i>Economic Analysis</i>				
Economic Cost (million USD)	164.3	206.9	168.1	161.3
Incremental O&M Cost (million USD)	1.6	2.1	1.7	1.6
Total Benefit (Base 0) (million USD)	16.7	16.7	16.7	16.7
EIRR (Base 0, %)	4.94%	2.91%	4.74%	5.15%
B/C (Base 0)	0.49	0.39	0.48	0.50
NPV (Base0, Million USD)	-62.7M\$	-94.4M\$	-65.6M\$	-59.7M\$
Total Benefit (Base1) (million USD)	19.0	19.0	19.0	19.0
EIRR (Base1, %)	6.86%	4.70%	6.64%	7.09%
B/C (Base1)	0.61	0.49	0.60	0.63
NPV (Base1, Million USD)	-47.7M\$	-79.3M\$	-50.5M\$	-44.7M\$

Source) The Survey Team

Table M-7.2 Economic Cash Flow, Bentonite Sheet (Base 0)

Year	Project Cost				Project Benefit					Benefit-Cost	Discount Rate (12%)	Discounted Cost	Discounted Benefit
	Initial Investment (-)	Land Compensation (-)	Incremental O&M Cost (-)	(Total)	Crop (+)	Livestock (+)	O&M Reduction (+)	Conservation of Lake Sevan (+)	Opportunity Cost of HPPs (-)				
0	2016										1.0000		
1	2017	6,572,000	900,000.0	7,472,000						-7,472,000	0.8929	6,671,429	0
2	2018	1,643,000								-1,643,000	0.7972	1,309,790	0
3	2019	62,434,000		62,434,000						-62,434,000	0.7118	44,439,288	0
4	2020	46,004,000		46,004,000						-46,004,000	0.6355	29,236,374	0
5	2021	32,860,000		32,860,000						-32,860,000	0.5674	18,645,646	0
6	2022	14,787,000		3,286,000	-237,766	78,055	656,274	0	369,429	-17,945,866	0.5066	9,156,344	64,410
7	2023			3,286,000	4,935,481	156,110	1,312,549	0	369,429	6,034,710	0.4523	1,486,420	2,729,796
8	2024			3,286,000	8,591,748	234,164	1,968,823	0	369,429	10,425,306	0.4039	1,327,160	4,210,606
9	2025			3,286,000	13,167,085	312,219	2,625,097	0	369,429	15,734,973	0.3606	1,184,965	5,674,189
10	2026			3,286,000	14,167,080	312,219	2,625,097	0	369,429	16,734,967	0.3220	1,058,004	5,388,211
11	2027			3,286,000	14,457,844	312,219	2,625,097	0	369,429	17,025,531	0.2875	944,646	4,894,433
12	2028			3,286,000	13,139,778	312,219	2,625,097	0	369,429	15,076,665	0.2567	843,434	4,031,766
13	2029			3,286,000	14,012,589	312,219	2,625,097	0	369,429	16,580,476	0.2292	753,066	3,799,817
14	2030			3,286,000	14,187,649	312,219	2,625,097	0	369,429	16,755,536	0.2046	672,381	3,428,515
15	2031			3,286,000	14,365,663	312,219	2,625,097	0	369,429	16,933,550	0.1827	600,340	3,093,696
16	2032			3,286,000	14,358,123	312,219	2,625,097	0	369,429	16,926,011	0.1631	536,018	2,760,999
17	2033			3,286,000	14,355,969	312,219	2,625,097	0	369,429	16,923,857	0.1456	478,587	2,464,864
18	2034			3,286,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	0.1300	427,310	2,200,631
19	2035			3,286,000	14,354,892	312,219	2,625,097	0	369,429	16,922,700	0.1161	381,527	1,964,849
20	2036			3,286,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	0.1037	340,649	1,754,330
21	2037			3,286,000	14,354,892	312,219	2,625,097	0	369,429	16,922,700	0.0926	304,151	1,566,366
22	2038			3,286,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	0.0826	271,563	1,398,541
23	2039			3,286,000	13,108,795	312,219	2,625,097	0	369,429	15,676,682	0.0738	242,467	1,156,750
24	2040			3,286,000	13,998,865	312,219	2,625,097	0	369,429	15,666,752	0.0659	216,489	1,091,452
25	2041			3,286,000	11,997,491	312,219	2,625,097	0	369,429	14,565,378	0.0588	193,293	856,784
26	2042			3,286,000	13,732,210	312,219	2,625,097	0	369,429	16,300,098	0.0525	172,583	856,094
27	2043			3,286,000	14,043,551	312,219	2,625,097	0	369,429	16,611,439	0.0469	154,092	778,970
28	2044			3,286,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	0.0419	137,582	708,544
29	2045			3,286,000	14,354,892	312,219	2,625,097	0	369,429	16,922,700	0.0374	122,841	632,629
30	2046			3,286,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	0.0334	109,680	564,847
31	2047			3,286,000	14,354,892	312,219	2,625,097	0	369,429	16,922,700	0.0298	97,928	504,328
32	2048			3,286,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	0.0266	87,436	450,293
33	2049			3,286,000	14,354,892	312,219	2,625,097	0	369,429	16,922,700	0.0238	78,068	402,047
34	2050			3,286,000	13,108,795	312,219	2,625,097	0	369,429	15,676,682	0.0212	69,704	332,538
35	2051			3,286,000	13,998,865	312,219	2,625,097	0	369,429	16,566,752	0.0189	62,235	313,767
Total		164,300,000	900,000	263,780,000	391,393,430	8,888,242	74,815,274	0	11,082,868	464,024,077	8.1755	122,813,492	60,075,065

IRR	4.94%
B/C	0.490
NPV	-62.7M\$

Table M-7.3 Economic Cash Flow, Bentonite Sheet (Base1)

Year	Project Cost			Project Benefit					Benefit-Cost	Discount Rate (12%)	Discounted Cost	Discounted Benefit
	Initial Investment (-)	Land Compensation (-)	Incremental O&M Cost (-)	(Total)	Crop (+)	Livestock (+)	O&M Reduction (+)	Conservation of Lake Sevan (+)	Opportunity Cost of HPPs (-)			
0	2016									1.0000		
1	2017	6,572,000	900,000.0	7,472,000						0	-7,472,000	0
2	2018	1,643,000		1,643,000						0	-1,643,000	0
3	2019	62,434,000		62,434,000						0	-62,434,000	0
4	2020	46,004,000		46,004,000						0	-46,004,000	0
5	2021	32,860,000		32,860,000						0	-32,860,000	0
6	2022	14,787,000		18,073,000	-237,766	78055	656,274	3,291,461	369,429	3,418,595	-14,654,405	1,731,967
7	2023			3,286,000	4,935,481	156,110	1,312,549	3,291,461	369,429	9,326,171	6,040,171	4,218,686
8	2024			3,286,000	8,591,748	234,164	1,968,823	3,291,461	369,429	13,716,767	10,430,767	5,539,972
9	2025			3,286,000	13,167,085	312,219	2,625,097	3,291,461	369,429	19,026,434	15,740,434	6,861,123
10	2026			3,286,000	14,167,080	312,219	2,625,097	3,291,461	369,429	20,026,428	16,740,428	6,447,974
11	2027			3,286,000	14,457,644	312,219	2,625,097	3,291,461	369,429	20,316,992	17,030,992	5,840,650
12	2028			3,286,000	13,139,778	312,219	2,625,097	3,291,461	369,429	18,999,126	15,713,126	4,876,602
13	2029			3,286,000	14,012,589	312,219	2,625,097	3,291,461	369,429	19,871,937	16,585,937	4,554,135
14	2030			3,286,000	14,187,649	312,219	2,625,097	3,291,461	369,429	20,046,997	16,760,997	4,102,013
15	2031			3,286,000	14,355,663	312,219	2,625,097	3,291,461	369,429	20,225,011	16,939,011	3,695,034
16	2032			3,286,000	14,358,123	312,219	2,625,097	3,291,461	369,429	20,217,472	16,931,472	3,297,908
17	2033			3,286,000	14,355,969	312,219	2,625,097	3,291,461	369,429	20,215,318	16,929,318	2,944,247
18	2034			3,286,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,928,241	2,628,652
19	2035			3,286,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,928,241	2,347,010
20	2036			3,286,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,928,241	2,095,545
21	2037			3,286,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,928,241	1,871,022
22	2038			3,286,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,928,241	1,670,556
23	2039			3,286,000	13,108,795	312,219	2,625,097	3,291,461	369,429	18,968,143	15,682,143	1,399,621
24	2040			3,286,000	13,998,865	312,219	2,625,097	3,291,461	369,429	19,858,213	16,572,213	1,308,301
25	2041			3,286,000	11,997,491	312,219	2,625,097	3,291,461	369,429	17,856,839	14,570,839	1,050,398
26	2042			3,286,000	13,732,210	312,219	2,625,097	3,291,461	369,429	19,591,559	16,305,559	1,028,965
27	2043			3,286,000	14,043,551	312,219	2,625,097	3,291,461	369,429	19,902,900	16,616,900	933,318
28	2044			3,286,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,928,241	846,355
29	2045			3,286,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,928,241	755,675
30	2046			3,286,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,928,241	674,709
31	2047			3,286,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,928,241	602,419
32	2048			3,286,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,928,241	537,874
33	2049			3,286,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,928,241	480,245
34	2050			3,286,000	13,108,795	312,219	2,625,097	3,291,461	369,429	18,968,143	15,682,143	402,357
35	2051			3,286,000	13,998,865	312,219	2,625,097	3,291,461	369,429	19,858,213	16,572,213	376,105
Total	164,300,000	900,000	98,580,000	263,780,000	391,393,430	8,898,242	74,815,274	98,743,830	11,082,868	562,767,907	298,987,907	75,119,437

IRR	6.86%
B/C	0.610
NPV	-47.7M\$

Table M-7.4 Economic Cash Flow, Bentonite- Soil Mixture (Base 0)

Year	Project Cost				Project Benefit					Benefit- Cost (12%)	Discounted Cost	Discounted Benefit
	Initial Investment (-)	Land Compensation (-)	Incremental O&M Cost (-)	(Total)	Crop (+)	Livestock (+)	O&M Reduction (+)	Conservation of Lake Sevan (+)	Opportunity Cost of HPPs (-)	(Total)		
0	2016											
1	2017	8,276,000	900,000.0							0	-91,76,000	8,192,857
2	2018	2,069,000								0	-2,069,000	1,649,394
3	2019	78,622,000								0	-78,622,000	55,961,587
4	2020	57,932,000								0	-57,932,000	36,816,833
5	2021	41,380,000								0	-41,380,000	23,480,123
6	2022	18,621,000								0	-41,380,000	0
7	2023									127,134	-2,631,866	64,410
8	2024									6,034,710	1,896,710	1,871,821
9	2025									10,425,306	6,287,306	1,671,269
10	2026									15,734,973	11,596,973	1,492,204
11	2027									16,734,967	12,596,967	1,332,325
12	2028									17,025,531	12,887,531	1,189,576
13	2029									15,707,665	11,569,665	1,062,122
14	2030									16,380,476	12,442,476	948,323
15	2031									16,755,536	12,617,536	846,717
16	2032									16,933,550	12,795,550	755,997
17	2033									16,926,011	12,788,011	674,997
18	2034									16,922,780	12,784,780	602,676
19	2035									16,922,780	12,784,780	538,104
20	2036									16,922,780	12,784,780	480,450
21	2037									16,922,780	12,784,780	428,973
22	2038									16,922,780	12,784,780	383,012
23	2039									16,922,780	12,784,780	341,975
24	2040									16,922,780	12,784,780	305,335
25	2041									16,566,752	12,428,752	272,620
26	2042									14,565,378	10,427,378	243,411
27	2043									16,300,098	12,162,098	217,331
28	2044									16,611,439	12,473,439	194,046
29	2045									16,922,780	12,784,780	173,255
30	2046									16,922,780	12,784,780	154,692
31	2047									16,922,780	12,784,780	138,118
32	2048									16,922,780	12,784,780	123,320
33	2049									16,922,780	12,784,780	110,107
34	2050									15,676,682	11,538,682	98,310
35	2051									16,566,752	12,428,752	87,776
Total		206,900,000	900,000	124,140,000	331,940,000	391,393,430	8,898,242	74,815,274	0	11,082,868	154,448,444	60,075,065

IRR	2.91%
B/C	0.390
NPV	-94.4M\$

Table M-7.5 Economic Cash Flow, Bentonite- Soil Mixture (Base 1)

Year	Project Cost				Project Benefit						Discount Rate (12%)	Discounted Cost	Discounted Benefit
	Initial Investment (-)	Land Compensation (-)	Incremental O&M Cost (-)	(Total)	Crop (+)	Livestock (+)	O&M Reduction (+)	Conservation of Lake Sevan (+)	Opportunity Cost of HPs (-)	(Total)			
0	206,900,000										1.0000		
1	8,276,000	900,000.0		9,176,000								8,192,857	0
2	2,069,000			2,069,000								1,649,394	0
3	78,622,000			78,622,000								55,961,587	0
4	57,932,000			57,932,000								36,816,833	0
5	41,380,000			41,380,000								23,480,123	0
6	18,621,000			18,621,000								11,530,418	0
7												1,871,821	0
8												1,671,269	0
9												1,492,204	0
10												1,332,325	0
11												1,189,576	0
12												1,062,122	0
13												948,323	0
14												846,717	0
15												755,997	0
16												607,676	0
17												538,104	0
18												480,450	0
19												428,973	0
20												383,012	0
21												341,975	0
22												305,335	0
23												272,620	0
24												243,411	0
25												217,331	0
26												194,046	0
27												173,255	0
28												154,692	0
29												138,118	0
30												123,320	0
31												110,107	0
32												98,310	0
33												87,776	0
34												78,372	0
35												154,448,444	0
Total	206,900,000	900,000	124,140,000	331,940,000	391,393,430	8,898,242	74,815,274	98,743,830	11,082,868	562,767,907	8.1755	154,448,444	75,119,437

IRR	4.70%
B/C	0.490
NPV	-79.3M\$

Table M-7.6 Economic Cash Flow, Soil-Cement (Base 0)

Year	Project Cost			Project Benefit					Benefit-Cost	Discount Rate (12%)	Discounted Cost	Discounted Benefit
	Initial Investment (-)	Land Compensation (-)	Incremental O&M Cost (-)	(Total)	Crop (+)	Livestock (+)	O&M Reduction (+)	Conservation of Lake Sevan (+)	Opportunity Cost of HPPs (-)	(Total)		
0	2016									1.0000		
1	2017	6,724,000	900,000.0	7,624,000						0	-7,624,000	6,807,143
2	2018	1,681,000		1,681,000						0	-1,681,000	1,340,083
3	2019	63,878,000		63,878,000						0	-63,878,000	45,467,099
4	2020	47,068,000		47,068,000						0	-47,068,000	29,912,565
5	2021	33,620,000		33,620,000						0	-33,620,000	19,076,891
6	2022	15,129,000		3,362,000	18,491,000	-237,766	656,274	0	369,429	127,134	-18,363,866	9,368,116
7	2023			3,362,000	4,935,481	156,110	1,312,549	0	369,429	6,034,710	2,672,710	1,520,798
8	2024			3,362,000	8,591,748	234,164	1,968,823	0	369,429	10,425,306	7,063,306	1,357,855
9	2025			3,362,000	3,362,000	312,219	2,625,097	0	369,429	15,734,973	12,372,973	1,212,371
10	2026			3,362,000	14,167,080	312,219	2,625,097	0	369,429	16,734,967	13,372,967	1,082,474
11	2027			3,362,000	14,457,644	312,219	2,625,097	0	369,429	17,025,531	13,663,531	966,495
12	2028			3,362,000	13,139,778	312,219	2,625,097	0	369,429	15,707,665	12,345,665	862,942
13	2029			3,362,000	14,012,589	312,219	2,625,097	0	369,429	16,580,476	13,218,476	770,484
14	2030			3,362,000	14,187,649	312,219	2,625,097	0	369,429	16,755,536	13,393,536	687,925
15	2031			3,362,000	14,365,663	312,219	2,625,097	0	369,429	16,933,550	13,571,550	614,225
16	2032			3,362,000	14,358,123	312,219	2,625,097	0	369,429	16,926,011	13,564,011	548,415
17	2033			3,362,000	14,355,969	312,219	2,625,097	0	369,429	16,923,857	13,561,857	489,656
18	2034			3,362,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	13,560,780	437,193
19	2035			3,362,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	13,560,780	390,351
20	2036			3,362,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	13,560,780	348,528
21	2037			3,362,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	13,560,780	311,185
22	2038			3,362,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	13,560,780	277,844
23	2039			3,362,000	13,108,795	312,219	2,625,097	0	369,429	15,676,682	12,314,682	248,075
24	2040			3,362,000	13,998,865	312,219	2,625,097	0	369,429	16,566,752	13,204,752	221,496
25	2041			3,362,000	11,997,491	312,219	2,625,097	0	369,429	14,565,378	11,203,378	197,764
26	2042			3,362,000	13,732,210	312,219	2,625,097	0	369,429	16,300,098	12,938,098	176,575
27	2043			3,362,000	14,043,551	312,219	2,625,097	0	369,429	16,611,439	13,249,439	157,656
28	2044			3,362,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	13,560,780	140,764
29	2045			3,362,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	13,560,780	125,683
30	2046			3,362,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	13,560,780	112,217
31	2047			3,362,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	13,560,780	100,193
32	2048			3,362,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	13,560,780	89,458
33	2049			3,362,000	14,354,892	312,219	2,625,097	0	369,429	16,922,780	13,560,780	79,874
34	2050			3,362,000	13,108,795	312,219	2,625,097	0	369,429	15,676,682	12,314,682	71,316
35	2051			3,362,000	13,998,865	312,219	2,625,097	0	369,429	16,566,752	13,204,752	63,675
Total	168,100,000	900,000	100,860,000	269,860,000	391,393,430	8,898,242	74,815,274	0	11,082,868	464,024,077	194,164,077	60,075,065

IRR	4.74%
B/C	0.480
NPV	-65.6M\$

Table M-7.7 Economic Cash Flow, Soil-Cement (Base 1)

Year	Project Cost			Project Benefit					Benefit-Cost	Discount Rate (12%)	Discounted Cost	Discounted Benefit
	Initial Investment (-)	Land Compensation (-)	Incremental O&M Cost (-)	(Total)	Crop (+)	Livestock (+)	O&M Reduction (+)	Conservation of Lake Sevan (+)	Opportunity Cost of HPPs (-)	(Total)		
0	2016											
1	2017	6,724,000	900,000.0	7,624,000						0	-7,624,000	6,807,143
2	2018	1,681,000		1,681,000						0	-1,681,000	1,340,083
3	2019	63,878,000		63,878,000						0	-63,878,000	45,467,099
4	2020	47,068,000		47,068,000						0	-47,068,000	29,912,565
5	2021	33,620,000		33,620,000						0	-33,620,000	19,076,891
6	2022	15,129,000		3,362,000	18,491,000	-237,766	656,274	3,291,461	369,429	3,418,595	-15,072,405	9,368,116
7	2023			3,362,000	4,935,481	156,110	1,312,549	3,291,461	369,429	9,326,171	5,964,171	4,218,686
8	2024			3,362,000	8,591,748	234,164	1,988,823	3,291,461	369,429	13,716,767	10,354,767	1,357,855
9	2025			3,362,000	13,167,085	312,219	2,625,097	3,291,461	369,429	19,026,434	15,664,434	5,539,972
10	2026			3,362,000	14,167,080	312,219	2,625,097	3,291,461	369,429	20,026,428	16,664,428	6,447,974
11	2027			3,362,000	14,457,644	312,219	2,625,097	3,291,461	369,429	20,316,992	16,954,992	5,840,650
12	2028			3,362,000	13,139,778	312,219	2,625,097	3,291,461	369,429	18,999,126	15,637,126	4,876,602
13	2029			3,362,000	14,012,589	312,219	2,625,097	3,291,461	369,429	19,871,937	16,509,937	4,554,135
14	2030			3,362,000	14,187,649	312,219	2,625,097	3,291,461	369,429	20,046,997	16,684,997	4,102,013
15	2031			3,362,000	14,365,663	312,219	2,625,097	3,291,461	369,429	20,225,011	16,863,011	3,695,034
16	2032			3,362,000	14,358,123	312,219	2,625,097	3,291,461	369,429	20,217,472	16,853,472	3,297,908
17	2033			3,362,000	14,355,969	312,219	2,625,097	3,291,461	369,429	20,215,318	16,853,318	2,944,247
18	2034			3,362,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,852,241	2,628,652
19	2035			3,362,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,852,241	2,347,010
20	2036			3,362,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,852,241	2,095,545
21	2037			3,362,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,852,241	1,871,022
22	2038			3,362,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,852,241	1,670,556
23	2039			3,362,000	13,108,795	312,219	2,625,097	3,291,461	369,429	18,968,143	15,606,143	1,399,621
24	2040			3,362,000	13,998,865	312,219	2,625,097	3,291,461	369,429	19,858,213	16,496,213	1,308,301
25	2041			3,362,000	11,997,491	312,219	2,625,097	3,291,461	369,429	17,856,839	14,494,839	1,050,398
26	2042			3,362,000	13,732,210	312,219	2,625,097	3,291,461	369,429	19,591,559	16,229,559	1,028,965
27	2043			3,362,000	14,043,551	312,219	2,625,097	3,291,461	369,429	19,902,900	16,540,900	933,318
28	2044			3,362,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,852,241	846,355
29	2045			3,362,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,852,241	755,675
30	2046			3,362,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,852,241	674,709
31	2047			3,362,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,852,241	602,419
32	2048			3,362,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,852,241	537,874
33	2049			3,362,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,852,241	480,245
34	2050			3,362,000	13,108,795	312,219	2,625,097	3,291,461	369,429	18,968,143	15,606,143	402,357
35	2051			3,362,000	13,998,865	312,219	2,625,097	3,291,461	369,429	19,858,213	16,496,213	376,105
Total		168,100,000	900,000	100,860,000	269,860,000	391,393,430	74,815,274	98,743,830	11,082,868	562,767,907	292,907,907	75,119,437
										IRR		6.64%
										B/C		0.600
										NPV		-50.5M\$

Table M-7.8 Economic Cash Flow, Soil-Cement with bentonite sheet (Base Case)

Year	Project Cost			Project Benefit					Benefit- Cost	Discount Rate (12%)	Discounted Cost	Discounted Benefit
	Initial Investment (-)	Land Compensation (-)	Incremental O&M Cost (-)	(Total)	Crop (+)	Livestock (+)	O&M Reduction (+)	Conservation of Lake Sevan (+)	Opportunity Cost of HPPs (-)	(Total)		
0	2016		900,000.0									
1	2017	6,452,000		6,452,000						0	-6,452,000	5,760,714
2	2018	1,613,000		1,613,000						0	-1,613,000	1,285,874
3	2019	61,294,000		61,294,000						0	-61,294,000	43,627,859
4	2020	45,164,000		45,164,000						0	-45,164,000	28,702,538
5	2021	32,260,000		32,260,000						0	-32,260,000	18,305,190
6	2022	14,517,000		3,226,000	17,743,000	-237,766	656,274	0	369,429	127,134	-17,615,866	8,989,156
7	2023			3,226,000	3,226,000	4935,481	1,312,549	0	369,429	6,034,710	2,808,710	1,459,279
8	2024			3,226,000	3,226,000	8,591,748	1,988,823	0	369,429	10,425,306	7,199,306	1,302,927
9	2025			3,226,000	3,226,000	13,167,085	312,219	2,625,097	0	15,734,973	12,508,973	1,163,328
10	2026			3,226,000	3,226,000	14,167,080	312,219	2,625,097	0	16,734,967	13,508,967	1,038,686
11	2027			3,226,000	3,226,000	14,457,644	312,219	2,625,097	0	17,025,531	13,799,531	927,398
12	2028			3,226,000	3,226,000	13,139,778	312,219	2,625,097	0	15,707,665	12,481,665	828,034
13	2029			3,226,000	3,226,000	14,012,589	312,219	2,625,097	0	16,580,476	13,354,476	739,316
14	2030			3,226,000	3,226,000	14,187,649	312,219	2,625,097	0	16,755,536	13,529,536	660,104
15	2031			3,226,000	3,226,000	14,365,663	312,219	2,625,097	0	16,933,550	13,707,550	589,378
16	2032			3,226,000	3,226,000	14,358,123	312,219	2,625,097	0	16,926,011	13,700,011	526,230
17	2033			3,226,000	3,226,000	14,355,969	312,219	2,625,097	0	16,923,857	13,697,857	469,849
18	2034			3,226,000	3,226,000	14,354,892	312,219	2,625,097	0	16,922,780	13,696,780	419,508
19	2035			3,226,000	3,226,000	14,354,892	312,219	2,625,097	0	16,922,780	13,696,780	374,560
20	2036			3,226,000	3,226,000	14,354,892	312,219	2,625,097	0	16,922,780	13,696,780	334,429
21	2037			3,226,000	3,226,000	14,354,892	312,219	2,625,097	0	16,922,780	13,696,780	298,597
22	2038			3,226,000	3,226,000	14,354,892	312,219	2,625,097	0	16,922,780	13,696,780	266,605
23	2039			3,226,000	3,226,000	13,108,795	312,219	2,625,097	0	15,676,682	12,450,682	238,040
24	2040			3,226,000	3,226,000	13,998,865	312,219	2,625,097	0	16,566,752	13,340,752	212,536
25	2041			3,226,000	3,226,000	11,997,491	312,219	2,625,097	0	14,565,378	11,335,378	189,764
26	2042			3,226,000	3,226,000	13,732,210	312,219	2,625,097	0	16,300,098	13,074,098	169,432
27	2043			3,226,000	3,226,000	14,043,551	312,219	2,625,097	0	16,611,439	13,385,439	151,279
28	2044			3,226,000	3,226,000	14,354,892	312,219	2,625,097	0	16,922,780	13,696,780	135,070
29	2045			3,226,000	3,226,000	14,354,892	312,219	2,625,097	0	16,922,780	13,696,780	120,598
30	2046			3,226,000	3,226,000	14,354,892	312,219	2,625,097	0	16,922,780	13,696,780	107,677
31	2047			3,226,000	3,226,000	14,354,892	312,219	2,625,097	0	16,922,780	13,696,780	96,140
32	2048			3,226,000	3,226,000	14,354,892	312,219	2,625,097	0	16,922,780	13,696,780	85,840
33	2049			3,226,000	3,226,000	14,354,892	312,219	2,625,097	0	16,922,780	13,696,780	76,642
34	2050			3,226,000	3,226,000	13,108,795	312,219	2,625,097	0	15,676,682	12,450,682	68,431
35	2051			3,226,000	3,226,000	13,998,865	312,219	2,625,097	0	16,566,752	13,340,752	61,099
Total		161,300,000	0	96,780,000	258,080,000	391,393,430	8,898,242	74,815,274	0	11,082,868	464,024,077	60,075,065

IRR	5.15%
B/C	0.500
NPV	-59,7M\$

Table M-7.9 Economic Cash Flow, Soil-Cement with bentonite sheet (Reference Case)

Year	Project Cost				Project Benefit					Benefit-Cost	Discount Rate (12%)	Discounted Cost	Discounted Benefit
	Initial Investment (-)	Land Compensation (-)	Incremental O&M Cost (-)	(Total)	Crop (+)	Livestock (+)	O&M Reduction (+)	Conservation of Lake Sevan (+)	Opportunity Cost of HPPs (-)	(Total)			
0	2016	900,000.0									1.0000		
1	2017	6,452,000		6,452,000						0	-6,452,000	5,760,714	0
2	2018	1,613,000		1,613,000						0	-1,613,000	1,285,874	0
3	2019	61,294,000		61,294,000						0	-61,294,000	43,627,859	0
4	2020	451,164,000		451,164,000						0	-451,164,000	28,702,538	0
5	2021	32,260,000		32,260,000						0	-32,260,000	18,305,190	0
6	2022	145,17,000		17,743,000	-237,766	78,055	656,274	3,291,461	369,429	3,418,595	-14,324,405	8,989,156	1,731,967
7	2023			3,226,000	4,935,481	156,110	1,312,549	3,291,461	369,429	9,326,171	6,100,171	1,459,279	4,218,686
8	2024			3,226,000	8,591,748	234,164	1,968,823	3,291,461	369,429	13,716,767	10,490,767	1,302,927	5,539,972
9	2025			3,226,000	13,167,085	312,219	2,625,097	3,291,461	369,429	19,026,434	15,800,434	1,103,328	6,861,123
10	2026			3,226,000	14,167,080	312,219	2,625,097	3,291,461	369,429	20,026,428	16,800,428	0.3220	1,038,686
11	2027			3,226,000	14,457,644	312,219	2,625,097	3,291,461	369,429	20,316,992	17,090,992	0.2875	927,398
12	2028			3,226,000	13,139,778	312,219	2,625,097	3,291,461	369,429	18,999,126	15,773,126	0.2567	828,034
13	2029			3,226,000	14,012,589	312,219	2,625,097	3,291,461	369,429	19,871,937	16,645,937	0.2292	739,316
14	2030			3,226,000	14,187,649	312,219	2,625,097	3,291,461	369,429	20,046,997	16,820,997	0.2046	589,378
15	2031			3,226,000	14,365,663	312,219	2,625,097	3,291,461	369,429	20,225,011	16,999,011	0.1827	526,230
16	2032			3,226,000	14,358,123	312,219	2,625,097	3,291,461	369,429	20,217,472	16,991,472	0.1631	469,849
17	2033			3,226,000	14,355,969	312,219	2,625,097	3,291,461	369,429	20,215,318	16,989,318	0.1456	419,508
18	2034			3,226,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,988,241	0.1300	374,560
19	2035			3,226,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,988,241	0.1161	334,429
20	2036			3,226,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,988,241	0.1037	298,597
21	2037			3,226,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,988,241	0.0926	266,605
22	2038			3,226,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,988,241	0.0826	238,040
23	2039			3,226,000	13,108,795	312,219	2,625,097	3,291,461	369,429	18,966,143	15,742,143	0.0738	212,536
24	2040			3,226,000	13,998,865	312,219	2,625,097	3,291,461	369,429	19,858,213	16,632,213	0.0659	193,318
25	2041			3,226,000	11,997,491	312,219	2,625,097	3,291,461	369,429	19,591,559	16,365,559	0.0588	189,764
26	2042			3,226,000	13,732,210	312,219	2,625,097	3,291,461	369,429	19,902,900	16,676,900	0.0525	169,432
27	2043			3,226,000	14,043,551	312,219	2,625,097	3,291,461	369,429	20,214,241	16,988,241	0.0469	151,279
28	2044			3,226,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,988,241	0.0419	135,070
29	2045			3,226,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,988,241	0.0374	120,598
30	2046			3,226,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,988,241	0.0334	107,677
31	2047			3,226,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,988,241	0.0298	96,140
32	2048			3,226,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,988,241	0.0266	85,840
33	2049			3,226,000	14,354,892	312,219	2,625,097	3,291,461	369,429	20,214,241	16,988,241	0.0238	76,642
34	2050			3,226,000	13,108,795	312,219	2,625,097	3,291,461	369,429	18,966,143	15,742,143	0.0212	68,431
35	2051			3,226,000	13,998,865	312,219	2,625,097	3,291,461	369,429	19,858,213	16,632,213	0.0189	61,099
Total		161,300,000	0	96,780,000	258,080,000	8,898,242	74,815,274	98,743,830	11,082,868	562,767,907	304,687,907	119,782,107	75,119,437

IRR	7.09%
B/C	0.630
NPV	-44.7M\$