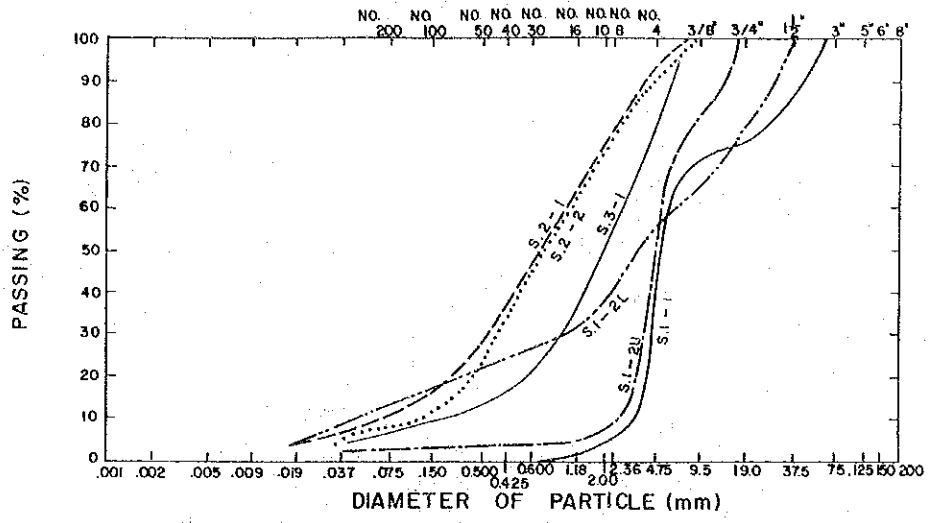


Fig. M 2.7 Gradation Curve (Imha)

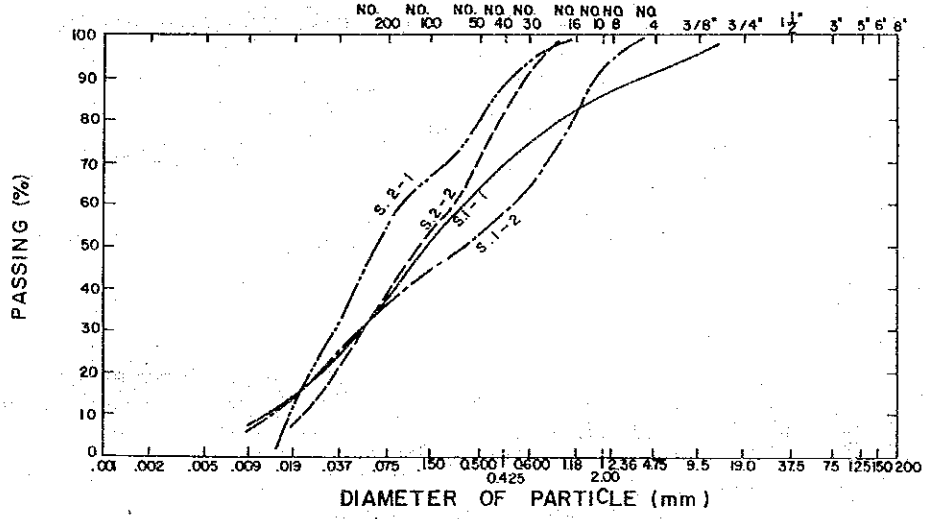


Fig. M 2.8 Gradation Curve (Hamyang)

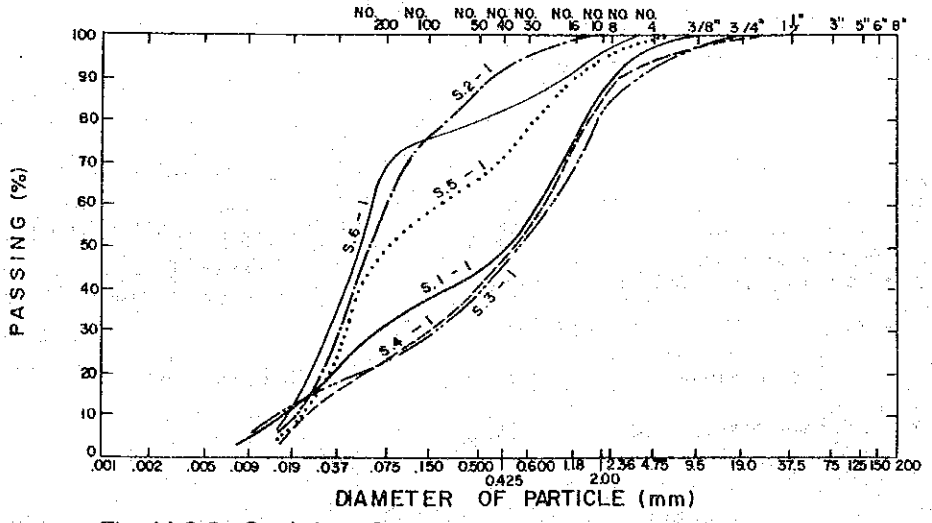
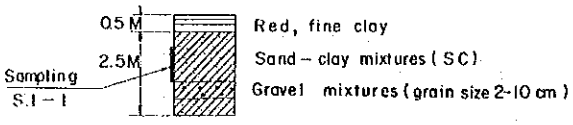
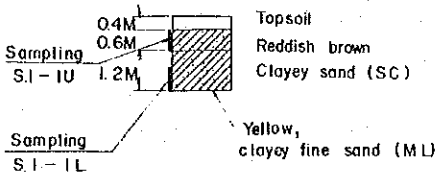


Fig. M 2.9 Gradation Curve
(Juam)

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY



Ba. S-1 (Bamseonggol)



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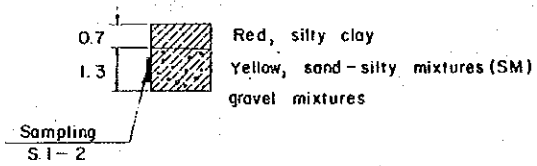

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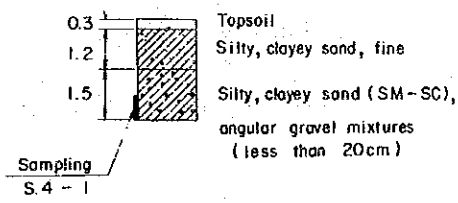

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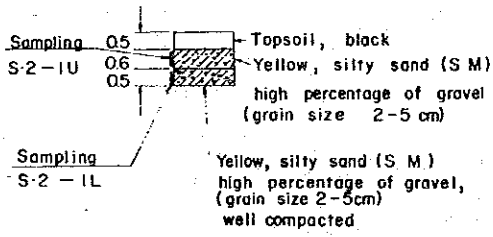
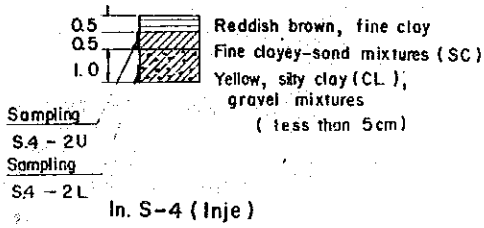


Ba. S-2 (Bamseonggol)



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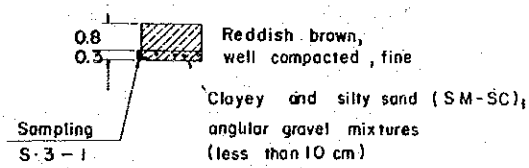

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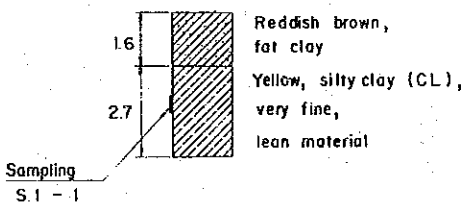
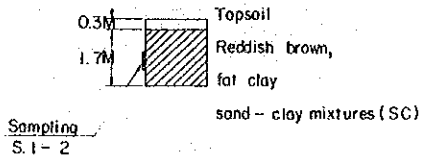


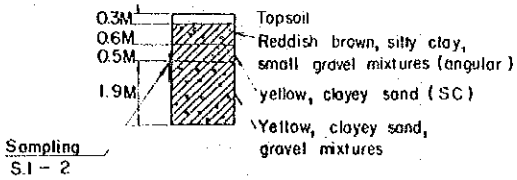
Ho. S-1 (Hongcheon)

Fig.M3.1 Log of Test Pits

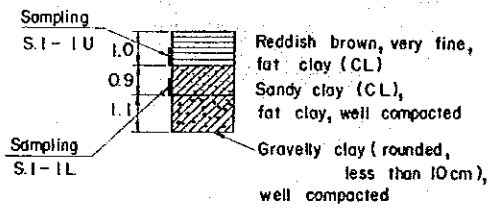
MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY



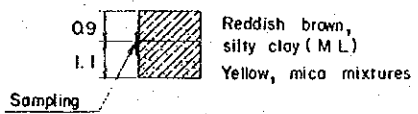
Ho. S-I (Hongcheon)



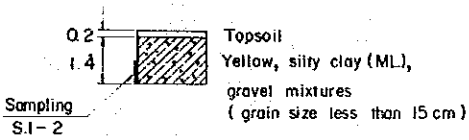
Ga. S-I (Ganhyeon)



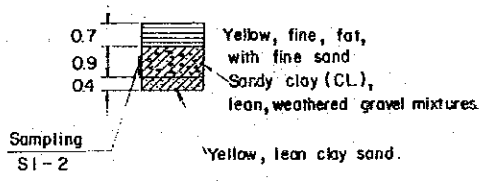
Gu. S-I (Gujeol)



Da. S-I (Dalcheon)



Da. S-I (Dalcheon)



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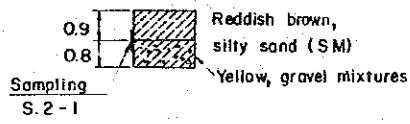

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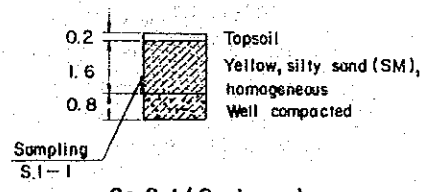
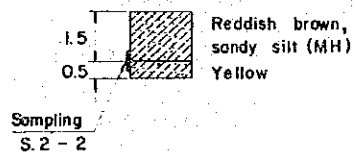


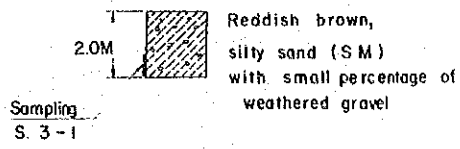
Ga. S-I (Ganhyeon)



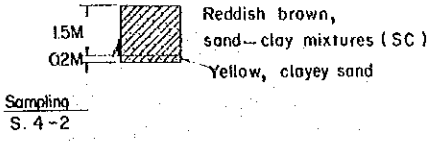
Da. S-2 (Dalcheon)

Fig. M 3.2 Log of Test Pits

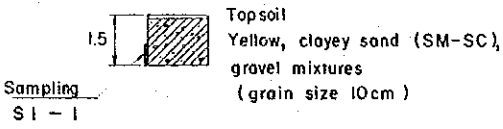
MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY



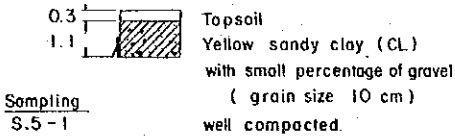
Da. S-3 (Dalcheon)



Ba. S-4 (Bonghwa)



Ba. S-1 (Bonghwa)



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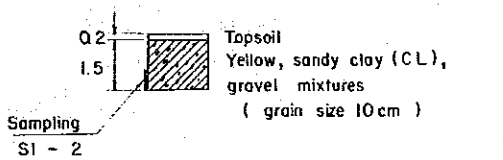
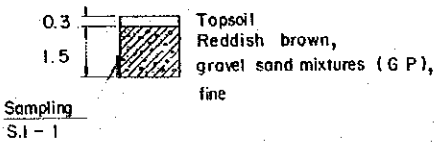
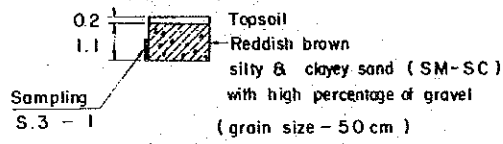


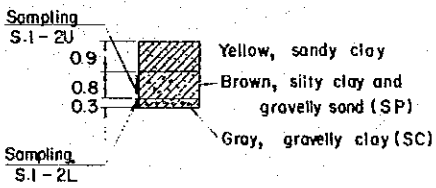
Ba. S-1 (Bonghwa)



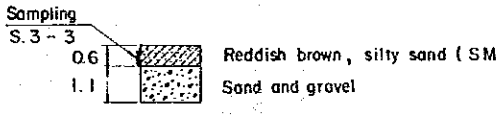
Im. S-1 (Imha)



Ba. S-3 (Bonghwa)



Im. S-1 (Imha)



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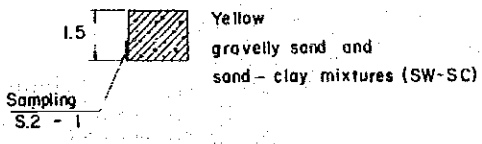
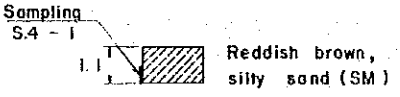


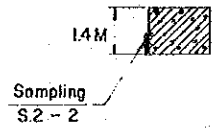
Im. S-2 (Imha)



Ba. S-4 (Bonghwa)

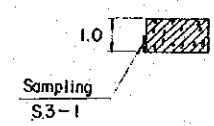
Fig. M3.3 Log of Test Pits

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY



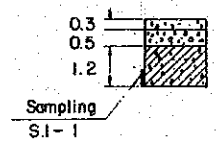
Gray,
gravelly sand and
sand - clay mixtures (SW-SC)
with high percentage of
weathered gravel
with mica

Im. S-2 (Imha)



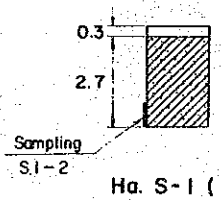
Dark gray,
gravelly sand and
sand - clay mixtures (SW-SC)

Im. S-3 (Imha)



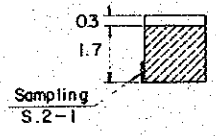
Topsoil with gravel
Sand and gravel
Dark gray,
clayey sand (SC)
small gravel mixtures

Ha. S-1 (Hamyang)



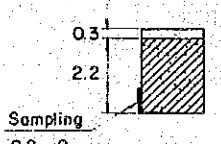
Topsoil
Gray,
clayey sand (SC)
with mica

Ha. S-1 (Hamyang)



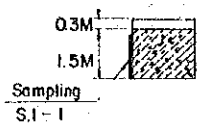
Topsoil
Reddish brown,
sandy silt (MH),
very fine
with mica

Ha. S-2 (Hamyang)



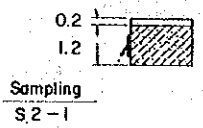
Topsoil
Brown, clayey sand (SC)
with high percentage of mica,
lean clay

Ha. S-2 (Hamyang)



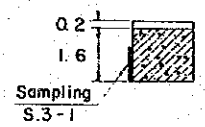
Topsoil, light brown
Light brown,
silty sand (SM)
with sand and gravel
(less than 5cm)

Ju. S-1 (Juam)



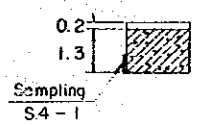
Topsoil
Light brown,
silty fine sand (ML), lean

Ju. S-2 (Juam)



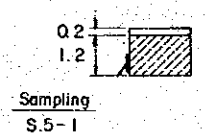
Topsoil
Reddish brown,
Silty sand (SM), lean
with much sand & small gravel

Ju. S-3 (Juam)



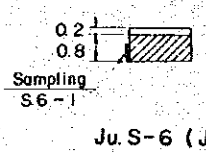
Topsoil
Light brown,
Silty sand (SM), lean
with weathered gravel (granite)

Ju. S-4 (Juam)



Topsoil
Light brown
Silty or clayey fine sand with
slight plasticity

Ju. S-5 (Juam)



Topsoil
Reddish brown,
silty fine clay, (CL)
fat

Ju. S-6 (Juam)

Fig. M3.4 Log of Test Pits

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY

A N N E X N

FLOOD CONTROL BENEFIT

BY THE PROPOSED DAMS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

N 1 INTRODUCTION

This ANNEX presents the estimate of the flood control benefit attributable to the proposed dams. It is logically a continuation of ANNEX D and, therefore, the river stretches and flood reduction ratios defined in ANNEX D are followed.

The countable direct flood control benefit comprises the direct flood damage reduction, indirect flood damage reduction and land enhancement benefit. The indirect flood damage arising from the interruption of business, transportation, etc. is usually taken to be 5 % to 10 % of the direct damage. Taking into account the preliminary nature of the study, the indirect flood damage reduction was disregarded.

A stage-damage curve was constructed for each river stretch based on the historical flood damage. The direct flood damage reduction was obtained by use of this curve and the probable flood water levels under with- and without-dam conditions which were estimated in ANNEX D.

The land enhancement benefit was measured as the increase in agricultural income owing to more benefical cropping which would be made possible under the condition of less frequent flooding. With flood control provided, the area subject to frequent flood reduces, while the area subject to less frequent flood increases. A stage-inundated area (paddy & upland) curve derived from historical record together with the probable flood water level resulted the increase and decrease in the area corresponding to an arbitrary probability of flooding. On the other hand, the net production value and irrigation cost for the typical cropping corresponding to the probability of flooding was estimated in ANNEX F. Consequently the land enhancement benefit was obtained.

Both the direct flood damage reduction and land enhancement benefit in each stretch were plotted against the flood reduction ratio K (see ANNEX D). Thence, the flood control benefit against varying flood control space was calculated for each proposed dam.

N 2 FLOOD DAMAGE REDUCTION

N 2.1 Stage-Damage Curve

The annual flood damage statistics are published by MOC every year (Ref. O 1). The damage items in the statistics are buildings, ships, agricultural land, crops, public facilities and others. The public facilities are further divided into roads, river structure, waterworks, harbors, schools, railways, irrigation facilities, sabo, forest, communication facilities and power facilities. Among these items, ships, harbors, sabo and forest were not taken into account in this study, because they could not be affected by the proposed dams.

The flood vulnerable area in a river stretch is a part of several cities/Guns, which are the minimum units of classification in the flood damage statistics. The proportion of damage in a stretch to that in a city/Gun was estimated as follows: For the agricultural land, crops and irrigation facilities, all flat area in a city/Gun was planimetered on 1/50,000 maps and the ratio of the flat land in the river stretch to all the flat land was applied. For the other items, the proportion was determined by judgment based on the density of houses and facilities on the map. The proportion, thus determined are shown in Table N 1.

The annual maximum gauge height at the representative water level gauge and the estimated flood damage in each river stretch are as shown in Table N 2. The stage-damage curves in Fig. N 1 were constructed by plotting the data in Table N 2 for each river stretch.

For the river stretches N-2, S-6 and NA-7 where no discharge rating curve was available, the flood damage was related with the annual maximum 3-day basin rainfall.

N 2.2 Reduction Ratio-Damage Reduction Curve

The flood damage for varying probability of exceedence under the present condition (affected by the existing dams) can be obtained by reading off the flood damage in Fig. N 1 corresponding to the water

level or annual maximum 3-day basin rainfall which are shown in Table D 11.

Given a value of flood reduction ratio K in a river stretch, the reduced flood discharge for varying probability of exceedence is calculated from Table D 5, and it can be converted to the reduced water level. The corresponding flood damage is obtained from Fig. N 1. The damage reduction for an arbitrary probability of exceedence is calculated as the difference between the flood damages obtained for the given K-value and for the present condition. The damage reduction integrated by the probability of exceedence is the average damage reduction for the given K-value. The calculated average damage reduction was plotted against the reduction ratio K as shown in the flood reduction ratio-damage reduction curve in Fig. N 2.

The flood damage reduction by each proposed dam was estimated by means of Tables D 9 and D 10 and Fig. N 2 as shown in Table N 3.

N 3 LAND ENHANCEMENT BENEFIT

N 3.1 Stage-Inundated Area Curve

The inundated areas of paddy and upland in each city and Gun in MOC flood statistics were adjusted to each river stretch by use of the proportion in Table N 1, as shown in Table N 4. The stage inundated area curve in Fig. N 3 is a plotting of data in Table N 4.

N 3.2 Reduction Ratio-Enhancement Benefit Curve

The inundated area for an arbitrary probability of exceedence can be obtained for the existing condition and proposed condition from Fig. N 3 by the same procedure as in N 2.2.

The net agricultural production values and net agricultural benefits (net production value less capital and O & M costs of irrigation facilities) are provided in ANNEX F for the probability of inundation of less than 1/10, between 1/10 and 1/5, between 1/5 and 1/3, between 1/3 and 1/2, and less than 1/2, respectively. The increase and decrease in the areas of paddy and upland from the present condition to a condition represented by a given value of reduction ratio K was estimated for the abovementioned intervals of probability of inundation. The area increased was multiplied by the net agricultural benefit and the area decreased was multiplied by the agricultural production value. The land enhancement benefit for the given value of K was obtained as the sum of the abovementioned products of area and unit value (reduced area negative). The results are expressed in the reduction ratio-enhancement benefit curve in Fig. N 4.

The land enhancement benefit by each proposed dam was estimated by means of Tables D 9 and D 10 and Fig. N 4 as shown in Table N 5.

N 4 FLOOD CONTROL BENEFIT IN RELATION TO FLOOD CONTROL SPACE

The flood control benefit consist of the flood damage reduction and land enhancement benefit by each proposed dam are summarized for alternative volume of flood control space as shown in Table N 6 and the relationship between the flood control space and flood control benefit is as shown in Fig. N 5.

REFERENCES

N 1. FLOODS IN KOREA, 1967-1969, 1970, 1971, 1972, 1973, 1974 and 1915-1975, MOC

N 2 DISASTER STATISTICS IN KOREA, 1977, MOC

Table N 1 CITIES AND GUNS RELATED WITH RIVER STRETCH

River Stretch	City/Gun	a(%)	b(%)
LOWER HAN RIVER			
D - 0	Goyang	80	90
	Gimpo	60	73
D - 1	Seoul City	93	100
D - 2	Yangju	26	49
	Gwangju	33	90
NORTH HAN RIVER			
N - 1	Yangpyeong	22	41
	Yangju	22	41
	Gapyeong	21	49
N- 2	Gapyeong	18	41
	Chunseong	48	90
	Chuncheon	95	90
	Inje	10	90
	Hawcheon	25	90
SOUTH HAN RIVER			
S - 2	Yeoju	43	90
	Yangpyeong	26	49
S - 3	Jungweon	36	90
	Weonseong	12	10
	Chungju	85	90
S - 4	Yeongweol	5	28
	Danyang	28	90
S - 5	Jeongseon	60	90
	Yeongweol	11	62
S - 6	Weonseong	48	79
NAGDONG RIVER			
NA - 1	Milyang	54	90
	Changweon	78	90
	Changnyeong	36	52
	Haman	59	90
NAGDONG RIVER (Continued)			
NA - 2	Changnyeong	26	38
	Euiryeong	29	90
	Habcheon	11	90
	Dalseong	62	69
	Goryeong	40	90
NA - 3	Dalseong	18	21
	Seungju	22	90
	Chilgug	51	90
	Seonsan	56	62
NA - 4	Seonsan	25	28
	Euiseong	3	62
	Sangju	35	90
	Yecheon	12	46
NA - 5	Yecheon	12	44
	Euiseong	2	28
	Andong	35	54
	Andong City	46	55
NA - 6	Andong	10	15
	Andong City	30	35
NA - 7	Sancheong	41	90
	Hamyang	11	90
SOMJIN RIVER			
SE - 1	Hadong	38	90
	Gwangyang	21	90
	Gurye	47	90
	Gogseong	35	90
	Seungju	13	90

Remarks ; a : Estimated proportion of crop, farmland irrigation facilities damage attributable to the river stretch
b : Estimated proportion of houses, residential properties and public utilities damage attributable to the river stretch

Table N 2 HISTORICAL DAMAGE BY RIVER STRETCH

Unit : $ 10^3 at 1978 level

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
STRETCH D - 0										
Gauge Height (m)	6.60	7.86	9.42	9.02	6.53	11.24	4.97	5.65	7.40	8.40
Crop	0	1	325	311	22	3,164	420	0	10	37
Farmland	0	3	4	8	9	1	0	0	0	1
Irr.Facilities	0	0	3	3	28	19	0	1	1	0
Others	21	30	92	54	161	390	1	0	2	14
Total	21	34	424	376	220	3,574	421	1	13	52
STRETCH D - 1										
Gauge Height (m)	6.60	7.86	9.42	9.02	6.53	11.24	4.97	5.65	7.40	8.40
Crop	0	0	0	0	0	0	0	0	0	0
Farmland	0	0	6	0	1	0	0	0	0	0
Irr.Facilities	0	0	0	0	0	0	0	0	0	0
Others	140	428	934	223	711	9,779	44	36	9	127
Total	140	428	934	223	711	9,779	44	36	9	127
STRETCH D - 2										
Gauge Height (m)	8.12	8.20	11.30	10.97	8.30	16.94	7.40	8.34	8.60	9.41
Crop	1	8	67	36	0	388	0	0	12	3
Farmland	4	44	1	8	0	87	0	0	56	1
Irr.Facilities	1	6	3	1	0	42	0	0	22	14
Others	37	367	71	138	25	1,867	2	0	292	54
Total	43	424	142	183	25	2,384	2	0	382	72
STRETCH N - 1										
Gauge Height (m)	9.20	8.56	14.23	13.05	7.81	15.20	7.50	6.10	7.75	5.75
Crop	3	0	180	28	0	243	3	0	35	20
Farmland	12	1	18	11	0	92	0	0	95	3
Irr.Facilities	1	3	6	17	0	16	0	0	27	16
Others	92	17	214	200	5	1,479	2	0	377	76
Total	108	211	418	256	5	1,830	5	0	534	115
STRETCH N - 2										
Rainfall (mm)	103	149	175	131	122	246	73	126	123	271
Crop	10	78	178	36	0	26	0	0	1	16
Farmland	23	32	290	52	0	47	0	0	2	11
Irr.Facilities	4	6	100	31	0	27	0	0	2	5
Others	114	590	1,300	352	4	737	2	20	28	198
Total	156	706	1,868	471	4	837	2	20	33	230

Table N 2 Continued (2)

Unit : $ 10^3 at 1978 level

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
STRETCH S - 2										
Gauge										
Height (m)	5.59	6.95	8.37	6.80	6.99	11.28	4.28	7.58	8.20	9.20
Crop	3	0	195	40	14	944	3	0	38	459
Farmland	5	1	42	12	1	368	0	0	36	256
Irr.Facilities	0	3	5	20	5	21	0	0	7	1
Others	24	49	322	157	12	2,590	1	2	195	428
Total	31	53	564	229	32	3,923	4	2	326	1,144
STRETCH S - 3										
Gauge										
Height (m)	4.98	6.25	8.72	8.70	6.00	16.00	3.37	6.90	7.50	10.60
Crop	0	0	45	16	4	674	0	1	313	261
Farmland	0	0	44	0	7	863	0	0	4	231
Irr.Facilities	4	0	41	8	20	430	0	0	0	52
Others	2	8	170	43	89	5,024	0	34	46	653
Total	6	8	300	67	120	6,991	0	35	363	1,197
STRETCH S - 4										
Gauge										
Height (m)	2.47	4.25	6.10	7.15	6.90	3.91	1.87	2.95	-	-
Crop	0	2	9	6	0	520	0	2	1	19
Farmland	1	0	6	11	0	197	0	0	1	5
Irr.Facilities	0	4	1	4	0	32	0	0	0	2
Others	10	31	118	257	41	6,109	0	3	46	164
Total	11	37	134	278	41	6,858	0	5	48	190
STRETCH S - 5										
Gauge										
Height (m)	7.80	3.56	3.43	5.60	5.20	8.19	2.38	5.10	6.75	4.80
Crop	0	0	29	128	5	314	0	10	0	55
Farmland	5	1	8	82	0	437	0	0	3	47
Irr.Facilities	0	8	31	206	14	215	0	0	0	9
Others	22	85	1,445	469	43	8,000	0	33	36	434
Total	27	94	1,513	885	62	8,966	0	43	39	545
STRETCH S - 6										
Rainfall (mm)	103	190	198	165	154	318	82	163	104	343
Crop	0	0	11	17	4	53	0	0	0	477
Farmland	0	0	18	1	0	401	0	0	0	337
Irr.Facilities	0	0	70	11	4	354	0	0	0	169
Others	0	12	67	30	0	3,588	0	0	3	1,477
Total	0	12	166	59	8	4,396	0	0	3	2,460

Table N 2 Continued (3)

Unit : $ 10^3 at 1978 level

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
STRETCH NA - 1										
Gauge										
Height (m)	5.96	9.92	9.06	9.20	7.48	9.15	6.50	8.78	7.84	6.20
Crop	11	705	9,074	1,019	184	1,632	56	1,664	89	74
Farmland	9	153	1,855	206	6	184	47	34	0	1
Irr.Facilities	0	48	1,446	595	0	306	55	235	2	62
Others	43	435	7,587	2,049	16	1,268	415	713	385	241
Total	63	1,341	19,962	3,869	206	3,390	573	2,646	476	378
STRETCH NA - 2										
Gauge										
Height (m)	6.26	9.91	10.05	10.00	8.85	10.50	7.80	9.25	8.25	7.18
Crop	5	1,323	1,935	1,141	77	446	172	542	12	0
Farmland	6	373	58	363	19	14	84	1	1	0
Irr.Facilities	0	143	298	500	8	16	23	13	2	0
Others	25	1,259	5,337	1,441	114	144	898	154	59	2
Total	36	3,098	7,628	3,445	218	620	1,177	710	74	2
STRETCH NA - 3										
Gauge										
Height (m)	5.32	6.84	7.75	7.94	6.89	-	5.52	7.05	6.89	6.03
Crop	0	710	750	444	83	107	11	64	3	0
Farmland	0	137	47	161	23	13	0	20	8	4
Irr.Facilities	0	66	66	213	24	4	0	11	23	1
Others	4	372	509	869	63	58	1	51	61	14
Total	4	1,285	1,372	1,687	193	182	12	146	95	19
STRETCH NA - 4										
Gauge										
Height (m)	5.45	6.35	7.55	7.35	7.54	6.78	6.00	7.65	7.55	5.86
Crop	1	122	108	198	1	9	0	36	49	0
Farmland	1	45	17	43	30	10	0	6	4	2
Irr.Facilities	0	20	22	37	13	1	0	4	8	1
Others	22	98	238	830	139	306	4	54	210	19
Total	24	285	385	1,108	183	326	4	100	271	22
STRETCH NA - 5										
Gauge										
Height (m)	1									
Crop	75	22	175	131	7	149	0	2	16	1
Farmland	16	16	10	45	7	54	0	7	0	2
Irr.Facilities	4	3	3	45	3	18	0	16	0	0
Others	26	39	69	682	17	353	11	52	209	45
Total	121	80	257	903	34	574	11	77	225	48

Table N 2 Continued (4)

Unit : $ 10^3 at 1978 level

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
STRETCH NA - 6										
Gauge Height (m)	2.41	2.60	3.83	5.44	3.40	4.90	3.40	4.10	3.85	4.20
Crop	21	8	39	24	2	39	0	0	4	0
Farmland	4	4	1	27	2	14	0	5	0	1
Irr.Facilities	1	1	1	29	1	5	0	10	0	0
Other	2	3	4	128	3	67	6	14	5	19
Total	28	16	45	208	8	125	6	29	9	20
STRETCH NA - 7										
Rainfall (mm)	82	154	207	159	132	191	124	139	127	149
Crop	0	68	20	14	2	10	0	133	0	0
Farmland	0	109	11	2	2	14	3	1	2	0
Irr.Facilities	0	24	123	32	7	14	4	1	0	0
Others	5	837	356	129	24	51	44	12	36	3
Total	5	1,038	510	177	35	89	51	147	38	3
STRETCH SE - 1										
Gauge Height (m)										
Crop	0	80	788	459	40	137	88	763	1,084	46
Farmland	0	92	67	12	33	54	18	32	15	1
Irr.Facilities	4	238	274	119	18	140	28	39	28	10
Others	1	359	1,153	954	75	345	187	484	254	183
Total	5	769	2,282	1,544	166	676	321	1,318	1,381	240

Table N 3 SUMMARY OF FLOOD DAMAGE REDUCTION BY PROPOSED DAMS

Unit : $ 10^3

	Bamseonggol	Inje	Hongcheon	Dalcheon	Ganhyeon
			m = 0.2		
D - 0	34	39	79	76	73
D - 1	118	130	270	258	244
D - 2	4	5	26	24	21
N - 1	22	25	71	-	-
N - 2	60	132	-	-	-
S - 2	-	-	-	356	345
S - 3	-	-	-	163	-
S - 6	-	-	-	-	545
Total	238	331	446	877	1,228
			m = 0.5		
D - 0	23	23	72	70	67
D - 1	80	80	240	234	222
D - 2	2	2	20	19	16
N - 1	14	15	63	-	-
N - 2	30	70	-	-	-
S - 2	-	-	-	334	318
S - 3	-	-	-	133	-
S - 6	-	-	-	-	290
Total	149	190	395	790	913
			m = 0.8		
D - 0	15	15	55	53	52
D - 1	60	60	182	176	172
D - 2	1	1	10	9	8
N - 1	9	9	42	-	-
N - 2	10	25	-	-	-
S - 2	-	-	-	265	257
S - 3	-	-	-	78	-
S - 6	-	-	-	-	100
Total	95	110	289	581	589

Gujeol

	m = 0.2	m = 0.5	m = 0.8
S - 4	40	37	24
S - 5	26	23	16
Total	66	60	40

Table N 3 Continued (2)

Unit: $ 10^3

	Banghwa	Imha	Hamyang	Juam
		m = 0.2		
NA-1	127	516	-	-
NA-2	78	377	-	-
NA-3	25	195	-	-
NA-4	29	150	-	-
NA-5	7	74	-	-
NA-6	-	44	-	-
NA-7	-	-	245	-
SE-1	-	-	-	270
Total	266	1,356	245	270
		m = 0.5		
NA-1	96	465	-	-
NA-2	56	319	-	-
NA-3	16	158	-	-
NA-4	20	125	-	-
NA-5	5	56	-	-
NA-6	-	31	-	-
NA-7	-	-	149	-
SE-1	-	-	-	195
Total	193	1,154	149	195
		m = 0.8		
NA-1	53	331	-	-
NA-2	37	191	-	-
NA-3	9	82	-	-
NA-4	9	79	-	-
NA-5	3	28	-	-
NA-6	-	15	-	-
NA-7	-	-	56	-
SE-1	-	-	-	90
Total	111	726	56	90

Table N 4 INUNDATED FARMLAND BY RIVER STRETCH

Unit : ha

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
STRETCH D - 0										
Gauge Ht.(m)	6.60	7.86	9.42	9.02	6.53	11.24	4.97	5.65	7.40	8.40
Paddy	0	50	822	823	665	4,285	0	3	0	247
Upland	0	8	61	2	0	81	0	0	80	10
STRETCH D - 1										
Gauge Ht.(m)	6.60	7.86	9.42	9.02	6.53	11.24	4.17	5.65	7.40	8.40
Paddy	0	20	212	283	2	1,579	0	0	0	153
Upland	0	5	749	566	0	1,400	0	0	0	588
STRETCH D - 2										
Gauge Ht.(m)	8.12	8.20	11.30	10.97	8.30	15.94	7.40	8.34	8.60	9.41
Paddy	0	478	136	112	0	232	0	0	54	7
Upland	0	245	374	47	0	477	0	0	11	4
STRETCH N - 1										
Gauge Ht.(m)	9.20	8.56	14.23	13.05	7.81	15.20	7.50	6.10	7.75	5.75
Paddy	12	3	94	69	0	250	0	0	82	35
Upland	2	0	288	41	0	243	0	0	14	28
STRETCH N - 2										
Rainfall (mm)	103	149	175	131	122	246	73	126	123	271
Paddy	6	8	68	28	0	35	0	0	4	8
Upland	3	2	47	21	0	31	0	0	0	0
STRETCH S - 2										
Gauge Ht.(m)	5.59	6.95	8.37	6.80	6.99	11.28	4.28	7.58	8.20	9.20
Paddy	13	3	118	61	38	883	0	24	151	574
Upland	0	0	993	16	23	597	0	10	24	269
STRETCH S - 3										
Gauge Ht.(m)	4.98	6.25	8.72	8.20	6.00	16.00	3.37	6.90	7.50	10.60
Paddy	0	0	3	2	0	1,093	0	10	56	227
Upland	0	1	1	7	0	509	0	0	95	295
STRETCH S - 4										
Gauge Ht.(m)	2.47	4.25	6.10	7.15	6.90	3.91	1.87	2.95	-	-
Paddy	0	0	0	1	0	59	0	0	1	14
Upland	0	0	2	2	0	162	0	0	1	6
STRETCH S - 5										
Gauge Ht.(m)	7.80	3.56	3.43	5.60	5.20	8.19	2.38	5.10	6.75	4.80
Paddy	0	0	1	3	0	106	0	0	0	15
Upland	0	0	5	5	0	321	0	0	0	16

Table N 4 Continued (2)

Unit : ha

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
STRETCH S- 6										
Rainfall (mm)	104	190	198	165	154	318	82	163	104	343
Paddy	0	0	11	9	0	184	0	0	0	247
Upland	0	2	4	25	0	116	0	0	0	152
STRETCH NA - 1										
Gauge Ht.(m)	5.95	9.92	9.06	9.20	7.48	9.15	6.50	8.78	7.84	6.20
Paddy	40	2,779	6,136	5,956	0	5,960	238	4,424	388	330
Upland	0	1,673	3,083	2,578	0	1,934	70	1,550	75	257
STRETCH NA - 2										
Gauge Ht.(m)	6.26	9.91	10.05	10.00	8.85	10.50	7.80	9.25	8.25	7.18
Paddy	29	3,739	3,220	5,254	690	2,518	335	1,291	1,026	3
Upland	0	951	1,830	2,083	50	1,129	90	569	242	60
STRETCH NA - 3										
Gauge Ht.(m)	5.32	6.84	7.75	7.94	6.89	-	5.52	7.05	6.89	6.03
Paddy	0	1,920	1,013	2,654	277	1,359	54	231	411	0
Upland	0	214	634	921	101	991	10	269	77	0
STRETCH NA - 4										
Gauge Ht.(m)	5.45	6.35	7.55	7.35	7.54	6.78	6.00	7.65	7.55	5.86
Paddy	4	523	251	1,095	168	414	0	86	41	2
Upland	0	32	93	254	42	269	0	367	23	0
STRETCH NA - 5										
Gauge Ht.(m)	3.80	3.36	4.40	7.50	3.65	6.20	2.55	3.62	2.75	3.50
Paddy	4	33	221	129	86	576	0	245	147	88
Upland	0	54	112	82	17	473	0	26	29	19
STRETCH NA - 6										
Gauge Ht.(m)	2.41	2.60	3.83	5.44	3.40	4.90	3.40	4.10	3.85	4.20
Paddy	0	4	46	14	13	141	0	55	35	24
Upland	0	13	21	22	0	133	0	0	5	5
STRETCH NA - 7										
Rainfall (mm)	82	154	207	159	132	191	124	139	127	149
Paddy	0	421	59	111	0	28	0	0	3	0
Upland	0	22	55	12	0	0	0	0	0	0
STRETCH SE - 1										
Gauge Ht.(m)	5.24	6.89	11.10	10.12	7.23	10.30	7.40	10.20	11.00	11.40
Paddy	0	655	1,923	1,865	90	1,020	400	453	114	360
Upland	0	110	87	49	0	35	2	139	11	0

Table N 5 SUMMARY OF LAND ENHANCEMENT BENEFIT BY PROPOSED DAMS

Unit: $ 10^3

	Bamseonggol	Inje	Honcheon	Dalcheon	Ganhyeon
			m = 0.2		
D - 0	10.0	10.0	58.7	55.0	48.0
D - 1	5.0	6.0	28.7	26.0	23.0
D - 2	0.6	0.8	54.0	5.2	5.2
N - 1	0.6	0.8	3.2	-	-
N - 2	3.0	0	-	-	-
S - 2	-	-	-	27.0	24.0
S - 3	-	-	-	11.6	-
S - 6	-	-	-	-	52.2
Total	19.2	17.6	144.6	124.8	152.4
			m = 0.5		
D - 0	6.8	6.8	45.8	43.6	38.0
D - 1	4.4	4.4	22.4	21.0	19.0
D - 2	0.4	0.4	4.0	4.0	3.2
N - 1	0.4	0.4	2.6	-	-
N - 2	0.4	4.0	-	-	-
S - 2	-	-	-	21.8	19.4
S - 3	-	-	-	10.2	-
S - 6	-	-	-	-	36.0
Total	12.4	16.0	74.8	100.6	115.6
			m = 0.8		
D - 0	5.0	5.0	25.0	24.0	22.0
D - 1	3.0	3.0	13.4	12.2	12.0
D - 2	0.4	0.4	2.0	18.0	1.4
N - 1	0.2	0.2	1.4	-	-
N - 2	0.2	0.4	-	-	-
S - 2	-	-	-	12.4	12.6
S - 3	-	-	-	5.0	-
S - 6	-	-	-	-	18.0
Total	8.8	9.0	41.8	71.6	66.0

Gujeol

	m = 0.2	m = 0.5	m = 0.8
S - 4	5.0	5.0	1.0
S - 5	18.0	12.6	5.6
Total	23.0	17.6	6.6

Table N 5 Continued (2)

Unit: $ 10^3

	Bonghwa	Imha	Hamyang	Juam
		m = 0.2		
NA - 1	17.0	135.0	-	-
NA - 2	15.0	147.5	-	-
NA - 3	8.5	78.0	-	-
NA - 4	11.0	50.0	-	-
NA - 5	4.5	44.0	-	-
NA - 6	-	20.5	-	-
NA - 7	-	-	95.0	-
SE - 1	-	-	-	227.5
Total	56.0	475.0	95.0	227.5
		m = 0.5		
NA - 1	2.5	113.0	-	-
NA - 2	8.0	121.5	-	-
NA - 3	6.0	52.5	-	-
NA - 4	3.0	45.0	-	-
NA - 5	3.0	31.5	-	-
NA - 6	-	11.5	-	-
NA - 7	-	-	51.5	-
SE - 1	-	-	-	198.0
Total	22.5	375	51.5	198.0
		m = 0.8		
NA - 1	7.0	57.5	-	-
NA - 2	8.0	53.0	-	-
NA - 3	3.0	32.5	-	-
NA - 4	2.5	14.0	-	-
NA - 5	1.5	12.0	-	-
NA - 6	-	4.0	-	-
NA - 7	-	-	15.0	-
SE - 1				70.0
Total	22.0	173.0	15.0	70.0

Table N 6 SUMMARY OF FLOOD CONTROL BENEFIT BY ALTERNATIVE FLOOD CONTROL SPACE

	m = 0.2	m = 0.5	m = 0.8
Bamseonggol			
Flood control space (10^6 m^3)	110	60	20
Damage reduction ($ 10^3)	238	149	95
Enhancement ($ 10^3)	19	12	9
Total benefit ($ 10^3)	257	161	104
Inje			
Flood control space (10^6 m^3)	245	130	45
Damage reduction ($ 10^3)	331	190	110
Enhancement ($ 10^3)	18	16	9
Total benefit ($ 10^3)	349	206	119
Hongcheon			
Flood control space (10^6 m^3)	310	165	55
Damage reduction ($ 10^3)	446	395	289
Enhancement ($ 10^3)	145	75	42
Total benefit ($ 10^3)	591	470	331
Gujeol			
Flood control space (10^6 m^3)	30	15	5
Damage reduction ($ 10^3)	66	60	40
Enhancement ($ 10^3)	23	17	7
Total benefit ($ 10^3)	89	77	47
Dalcheon			
Flood control space (10^6 m^3)	225	120	40
Damage reduction ($ 10^3)	877	790	581
Enhancement ($ 10^3)	125	101	72
Total benefit ($ 10^3)	1,002	891	653
Ganhyeon			
Flood control space (10^6 m^3)	245	130	45
Damage reduction ($ 10^3)	1,228	913	589
Enhancement ($ 10^3)	152	116	66
Total benefit ($ 10^3)	1,380	1,029	655

Remarks ; m: Flood reduction ratio at dam site

Table N 6 Continued (2)

	m = 0.2	m = 0.5	m = 0.8
Bonghwa			
Flood control space (10^6 m^3)	145	80	30
Damage reduction ($ 10^3)	266	193	111
Enhancement ($ 10^3)	56	23	22
Total benefit ($ 10^3)	322	216	133
Imha			
Flood control space (10^6 m^3)	115	60	20
Damage reduction ($ 10^3)	1,356	1,154	726
Enhancement ($ 10^3)	475	375	173
Total benefit ($ 10^3)	1,831	1,529	899
Hamyang			
Flood control space (10^6 m^3)	65	35	10
Damage reduction ($ 10^3)	245	149	56
Enhancement ($ 10^3)	95	52	15
Total benefit ($ 10^3)	340	201	71
Juam			
Flood control space (10^6 m^3)	200	105	35
Damage reduction ($ 10^3)	270	195	90
Enhancement ($ 10^3)	228	198	70
Total benefit ($ 10^3)	498	393	160

Remarks ; m : Flood reduction ratio at dam site

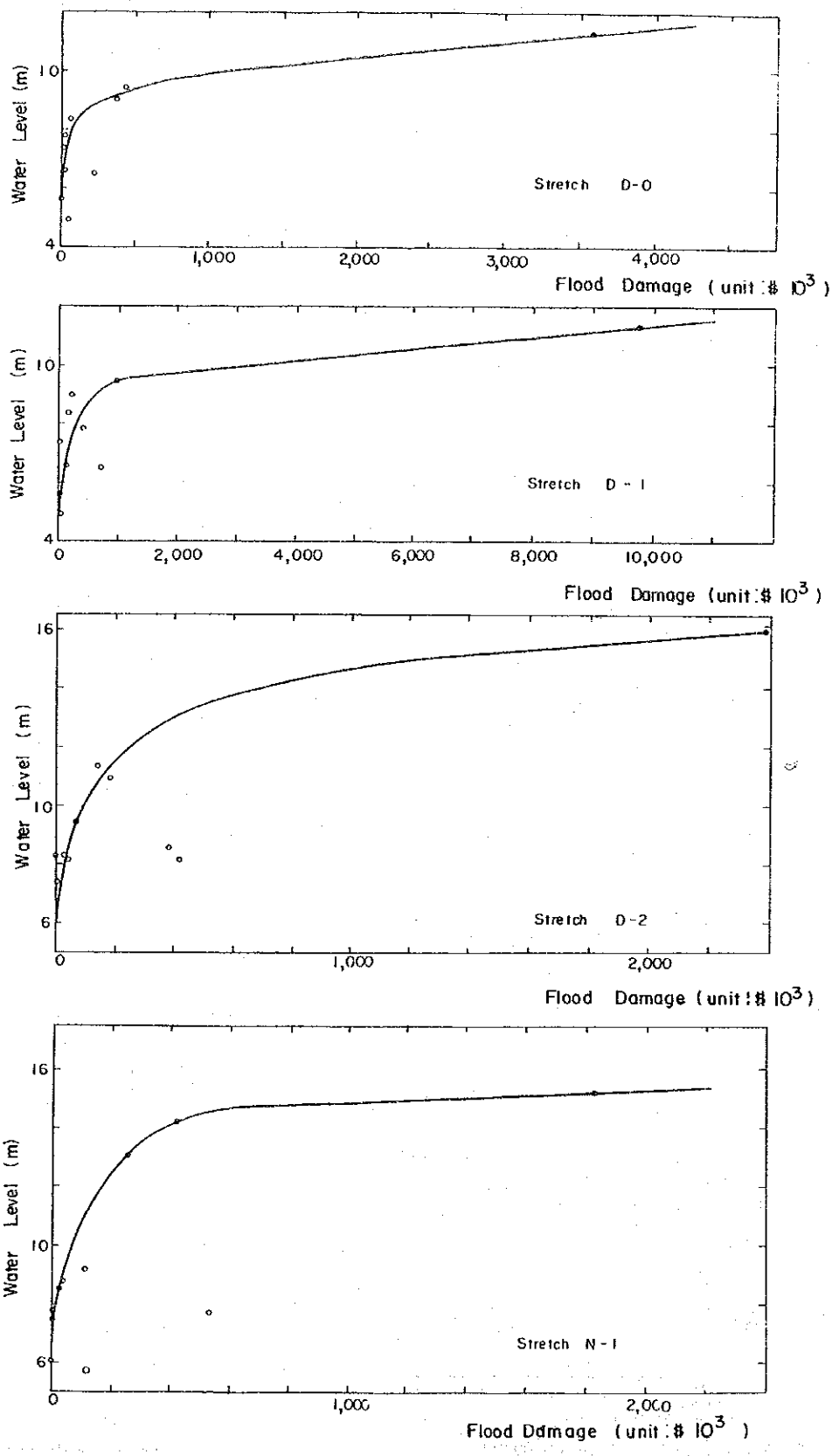
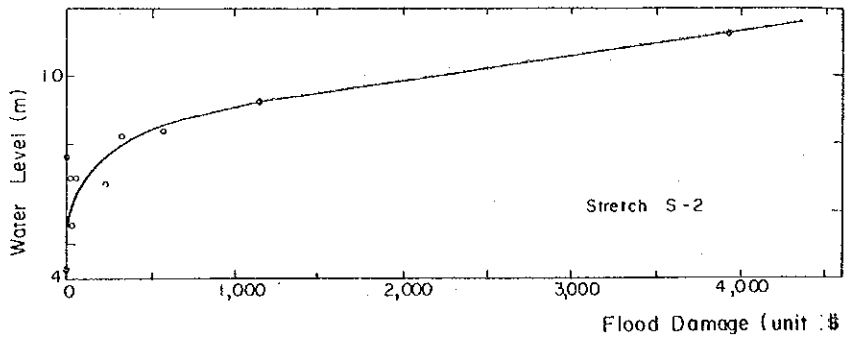
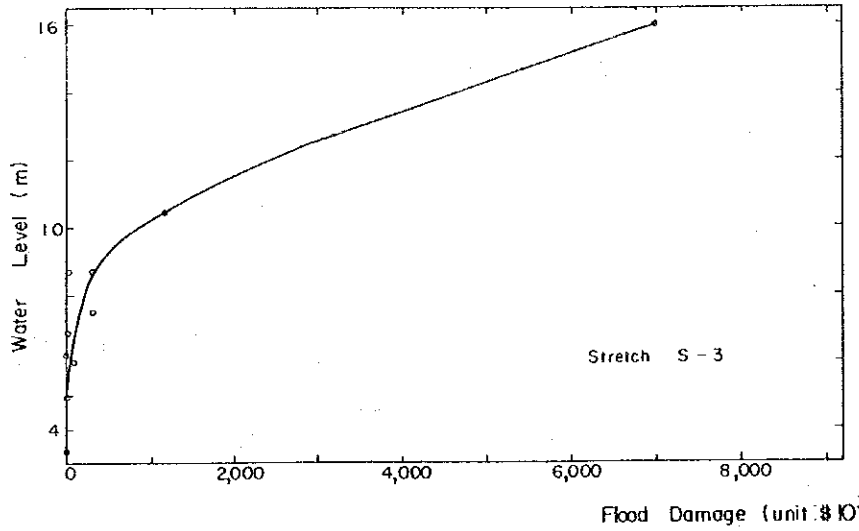
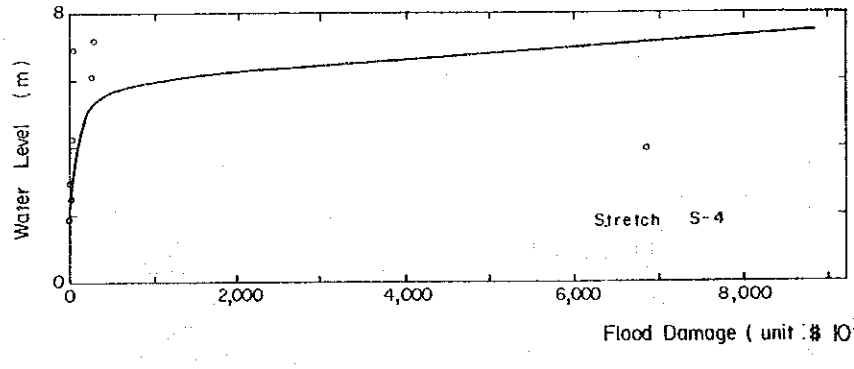


Fig. N 1 Stage-Damage Curves

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY







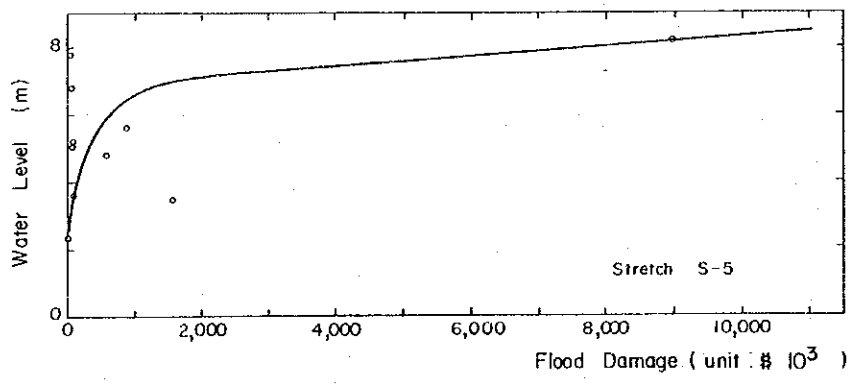


Fig. N I Contiuned (2)

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY

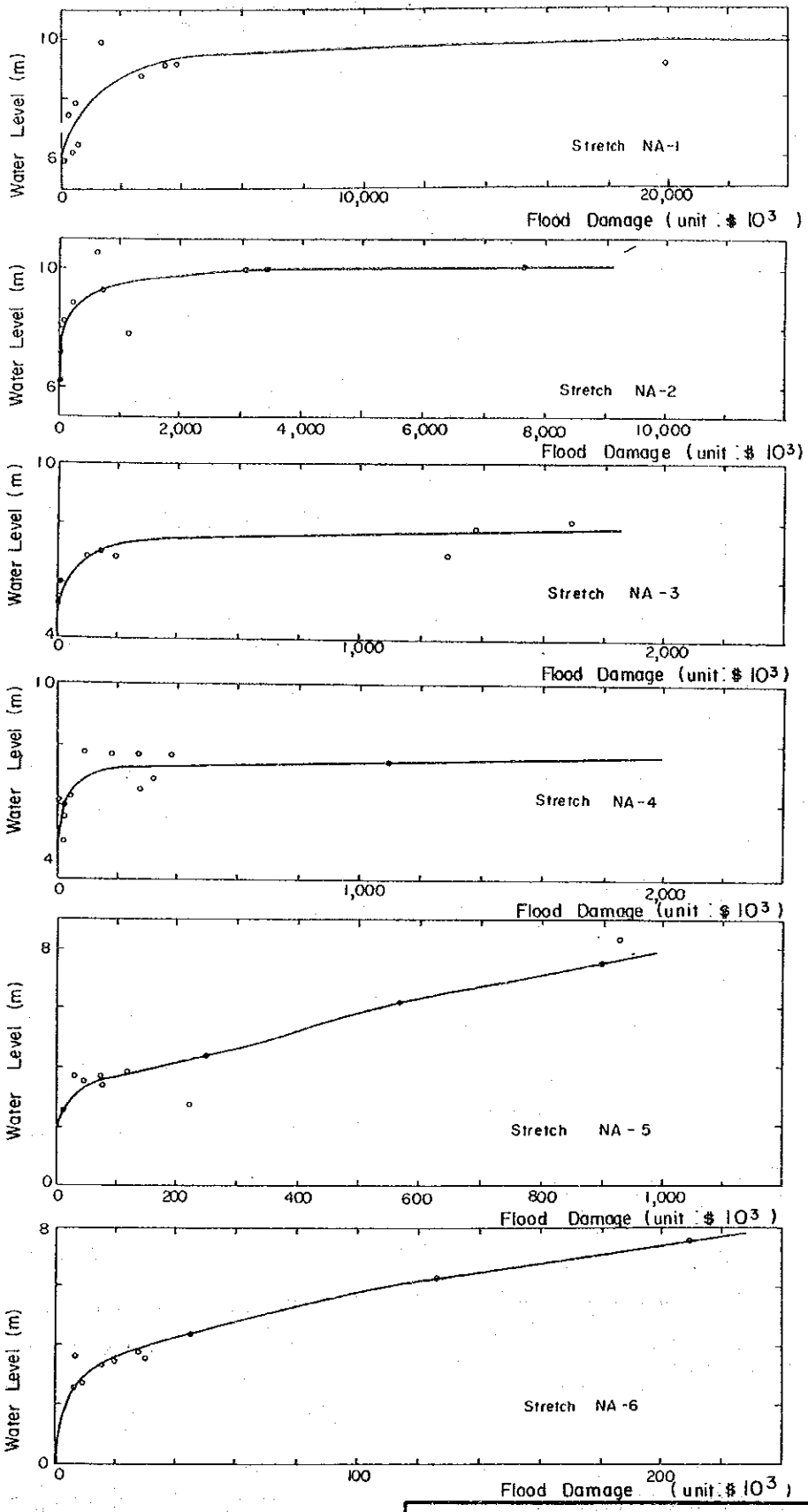


Fig. N I Continued (3)

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY

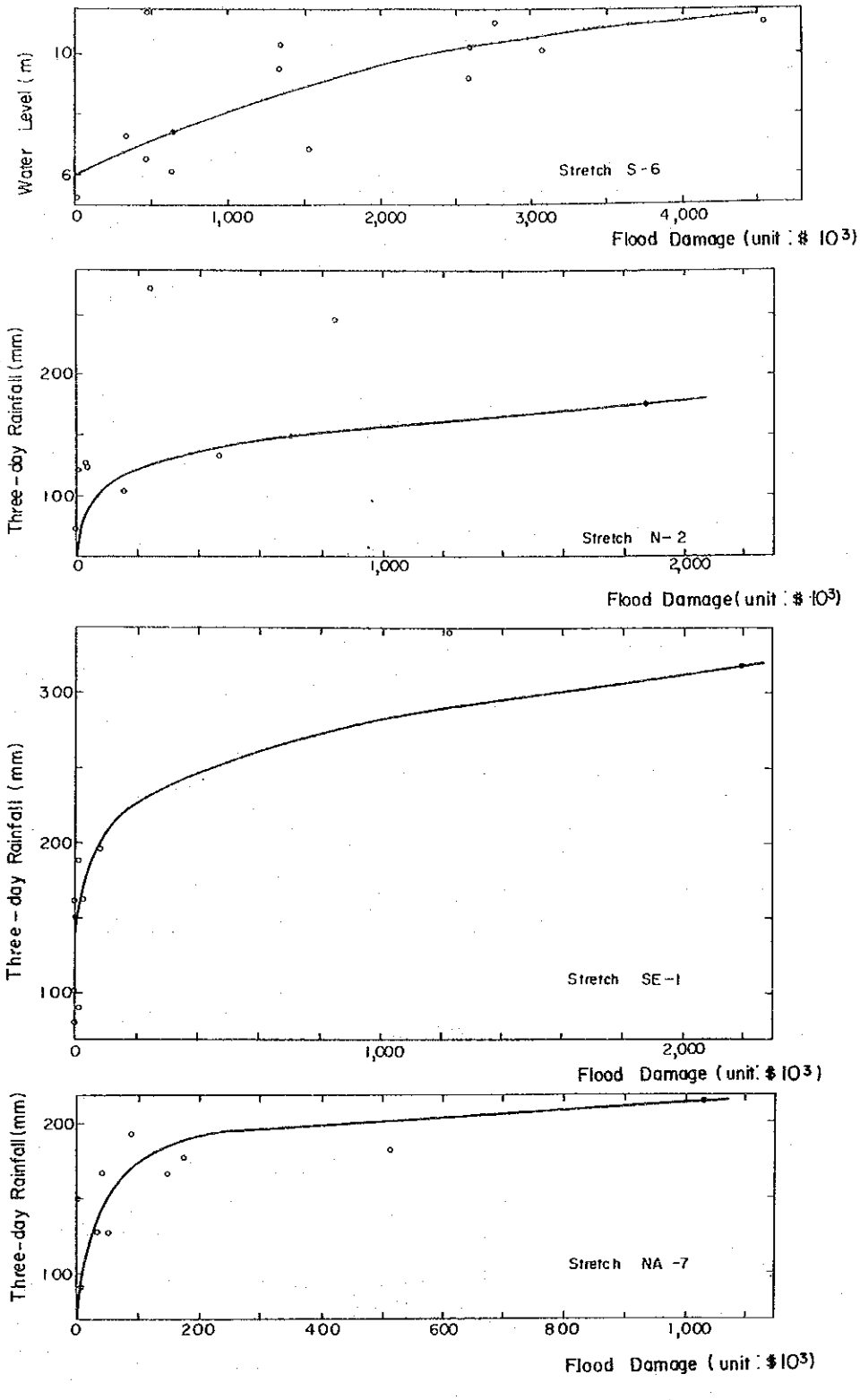
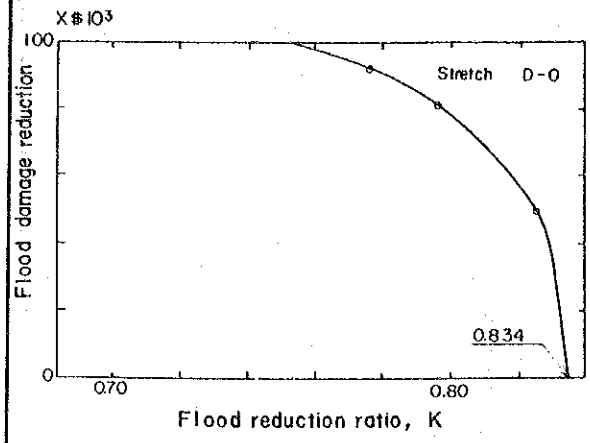
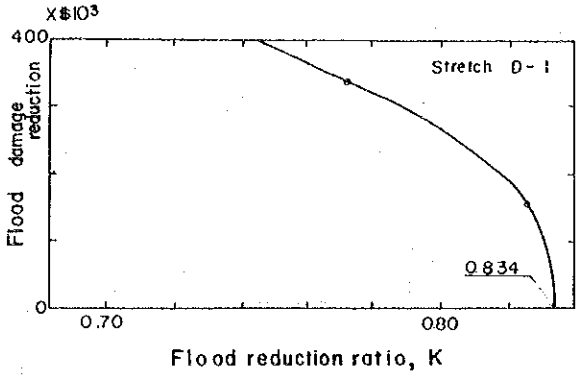
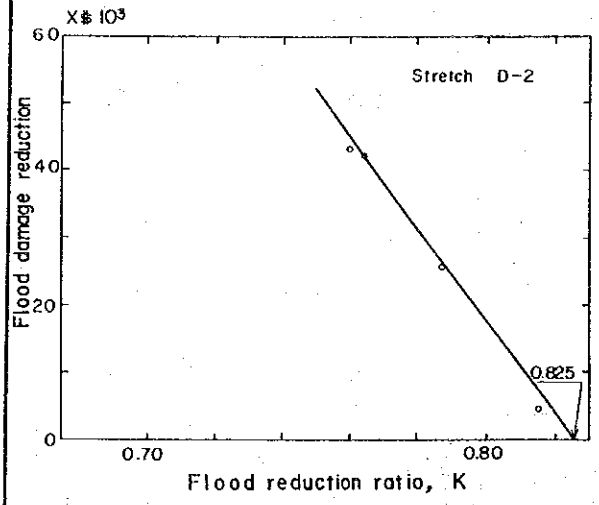


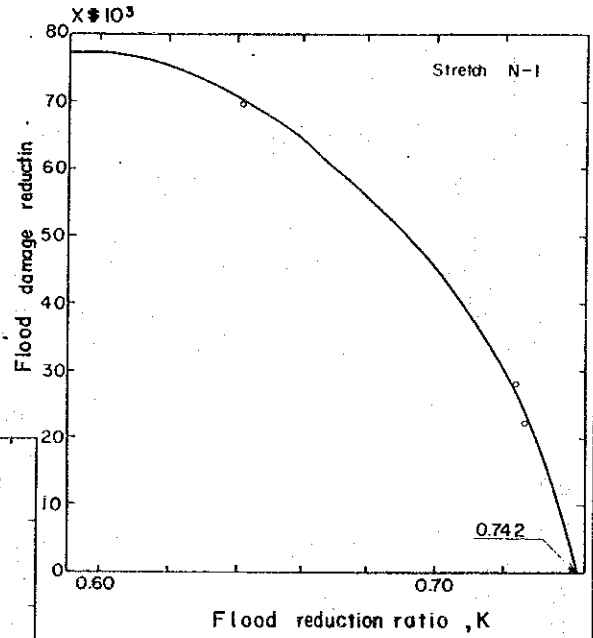
Fig. N 1 Continued (4)

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY









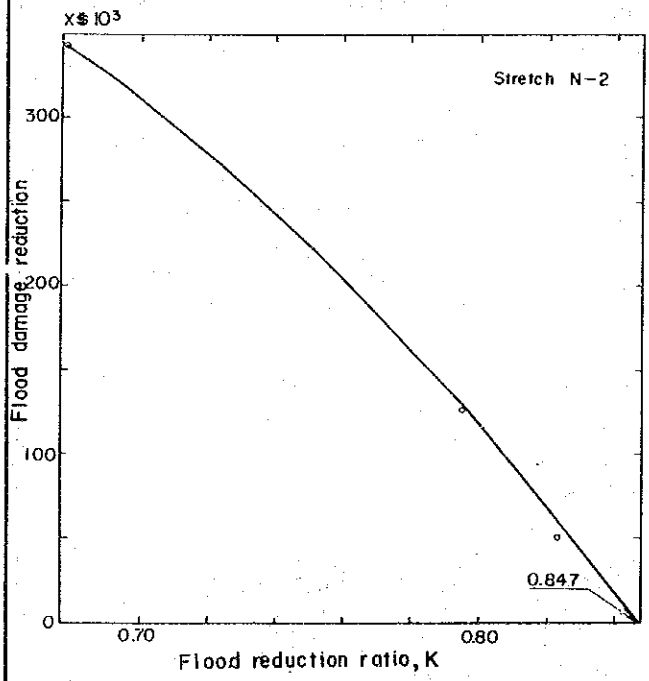
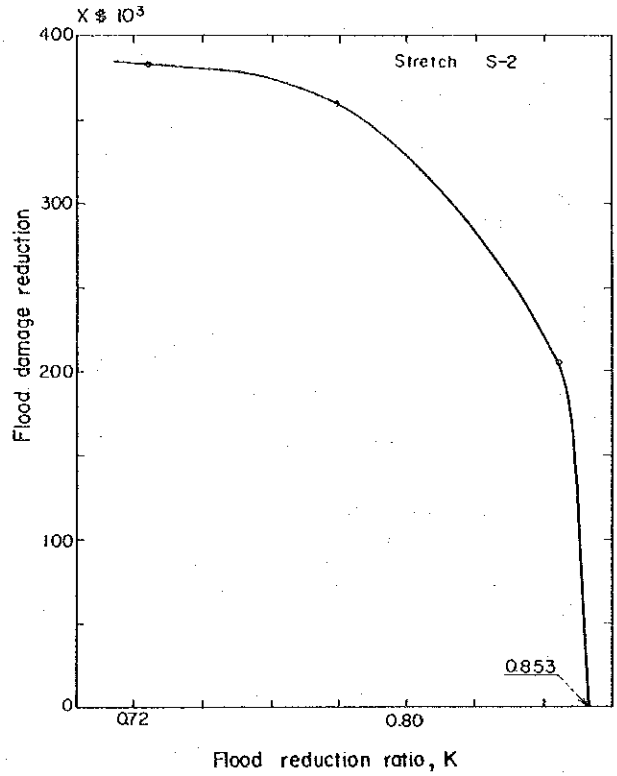
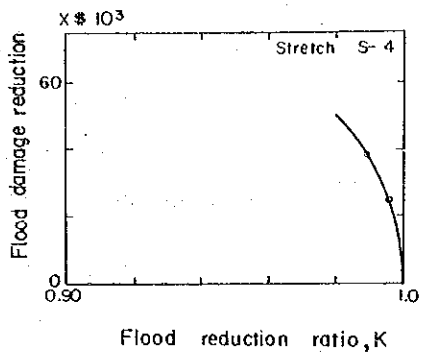
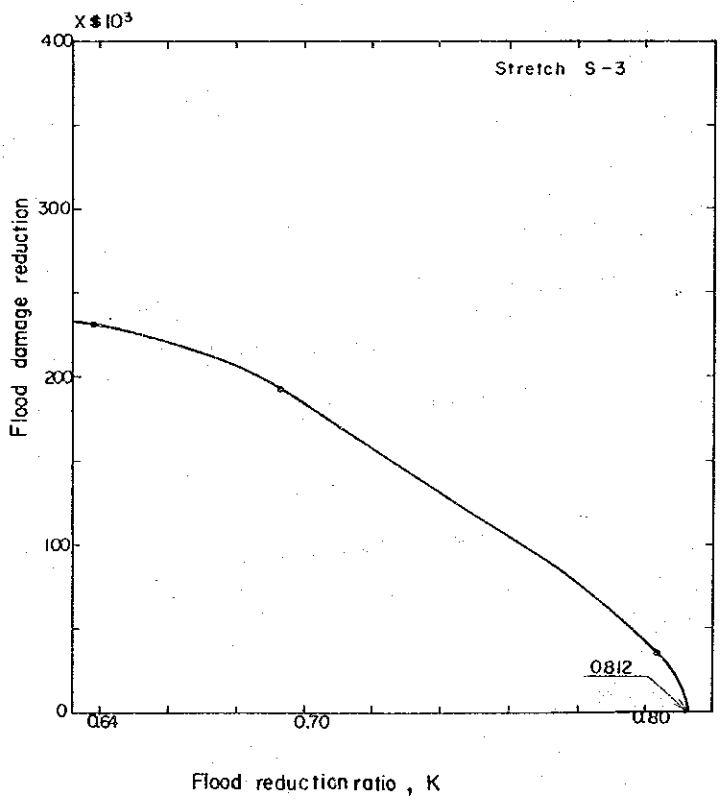


Fig. N 2 Flood Reduction Ratio - Damage Reduction Curve

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY







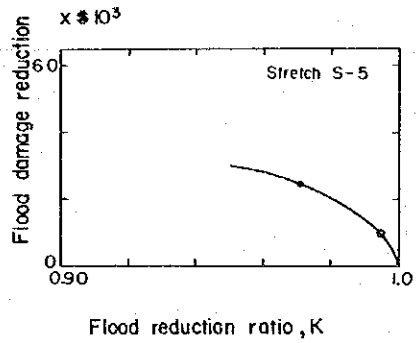
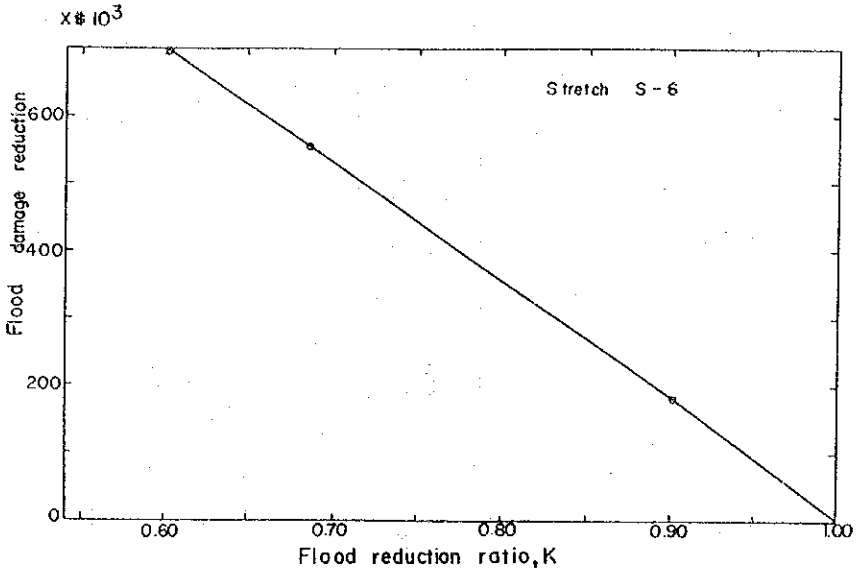
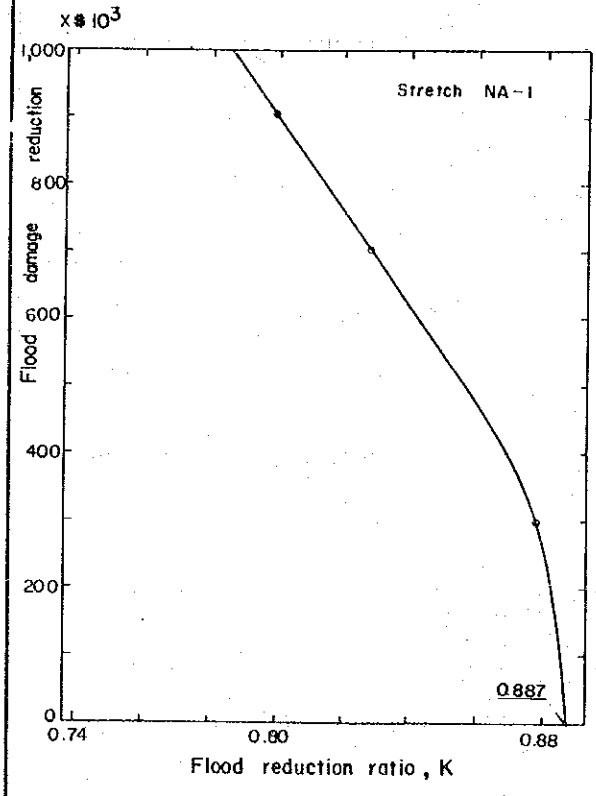


Fig. N 2 Continued (2)

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY





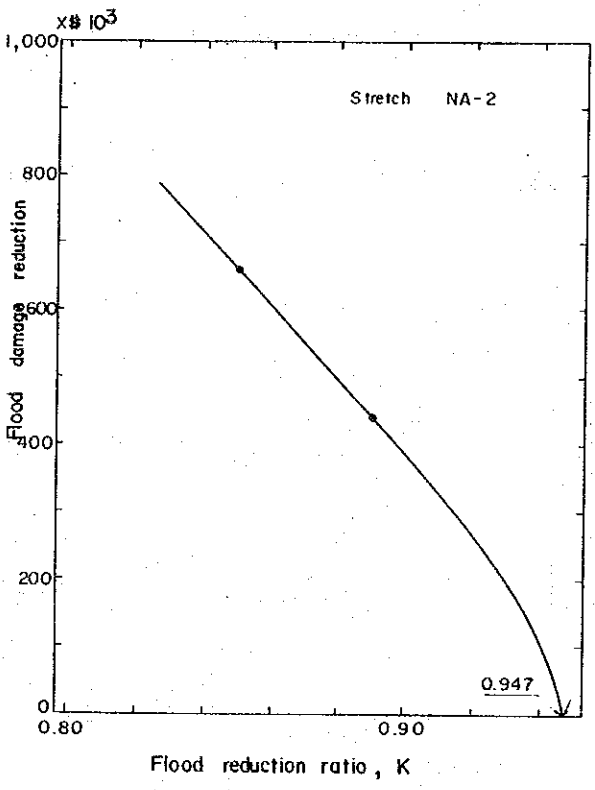
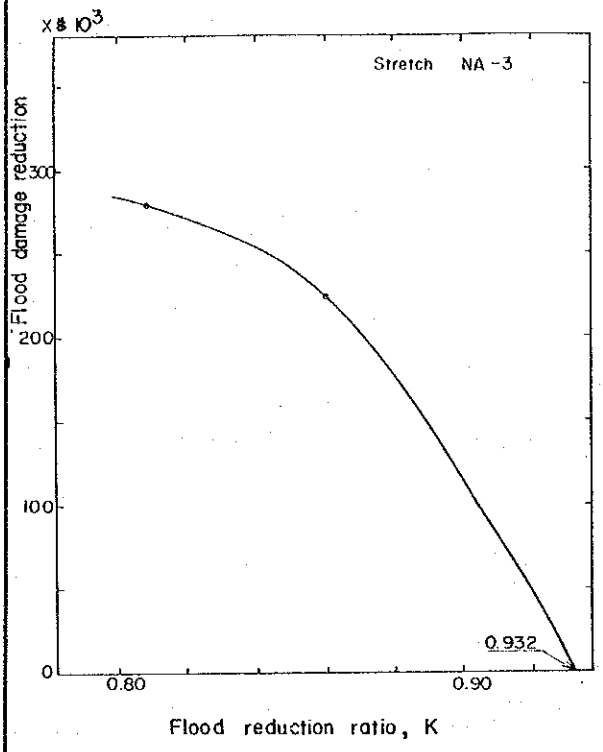
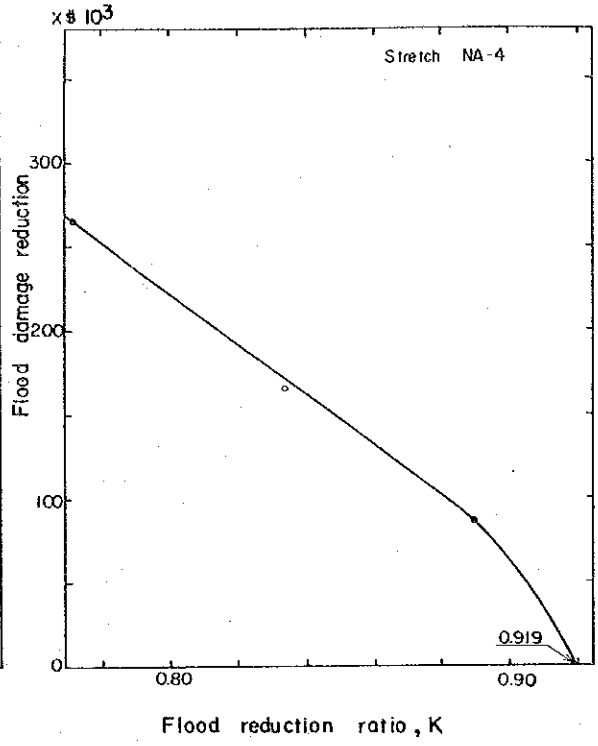


Fig. N 2 Continued (3)

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY





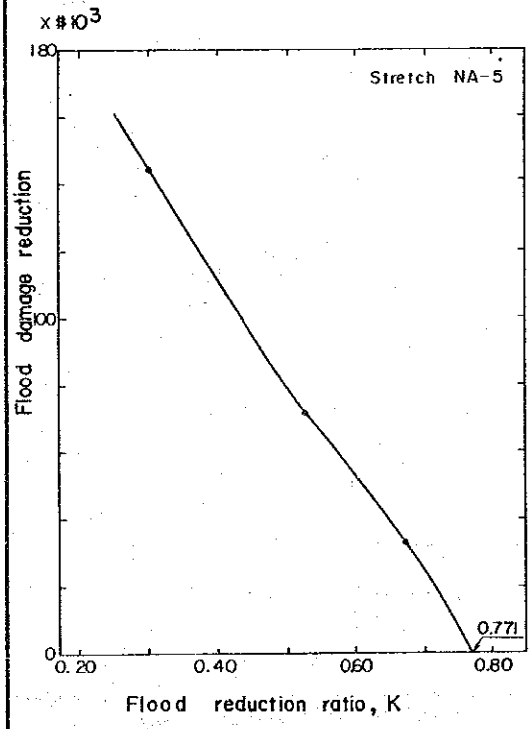
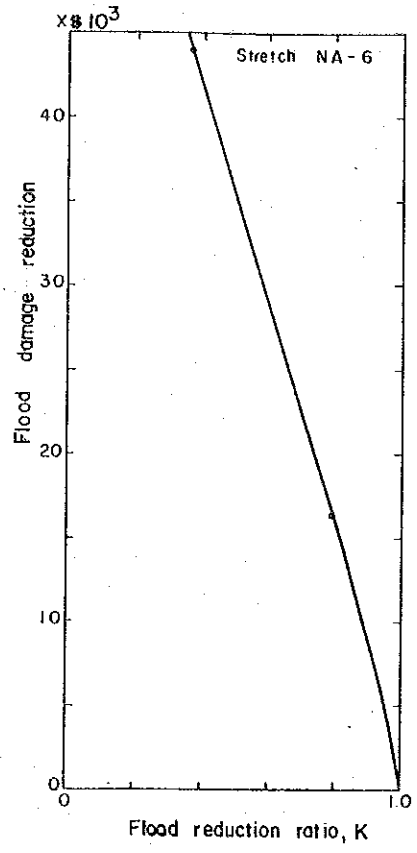
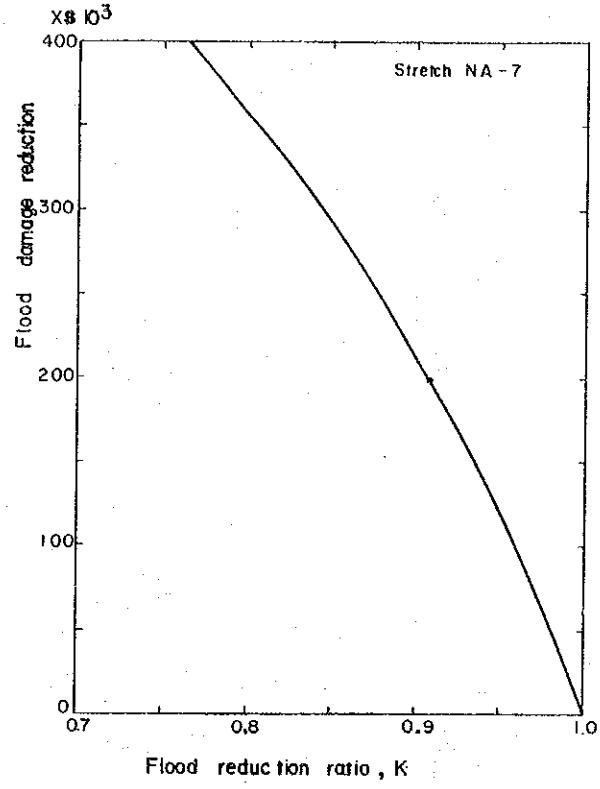


Fig. N 2 Continued (4)

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY

JAPAN INTERNATIONAL COOPERATION AGENCY





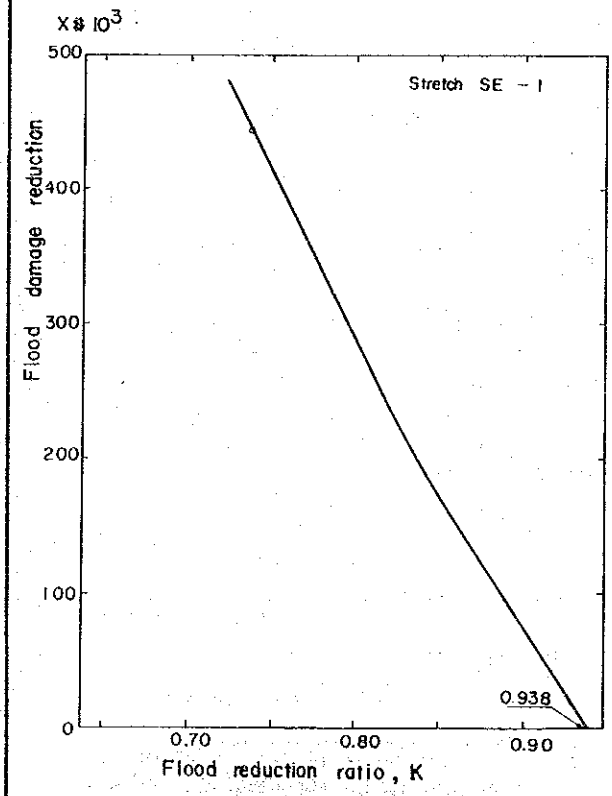
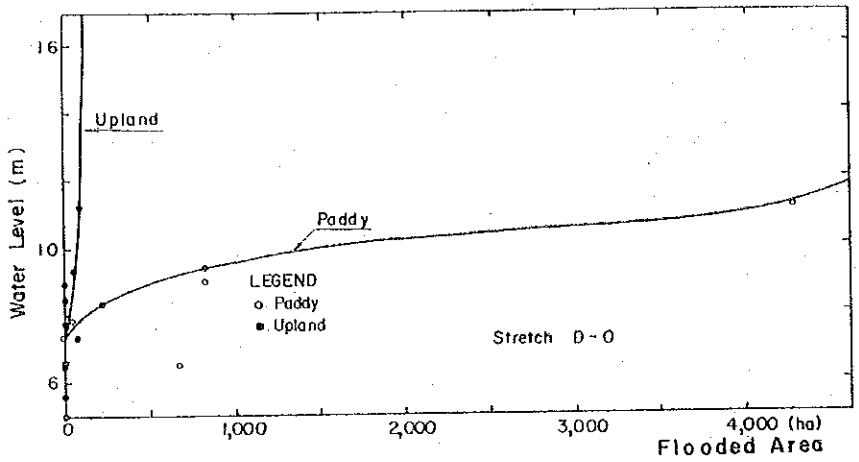
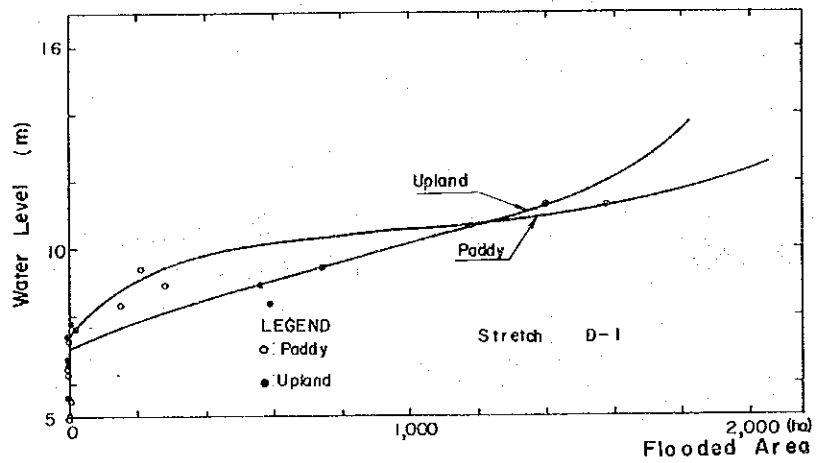


Fig. N 2 Continued (5)

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY





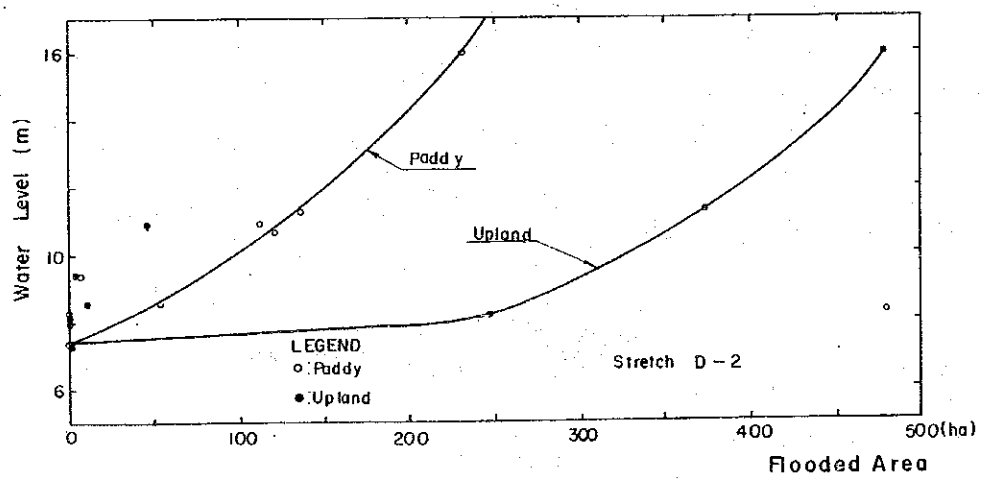
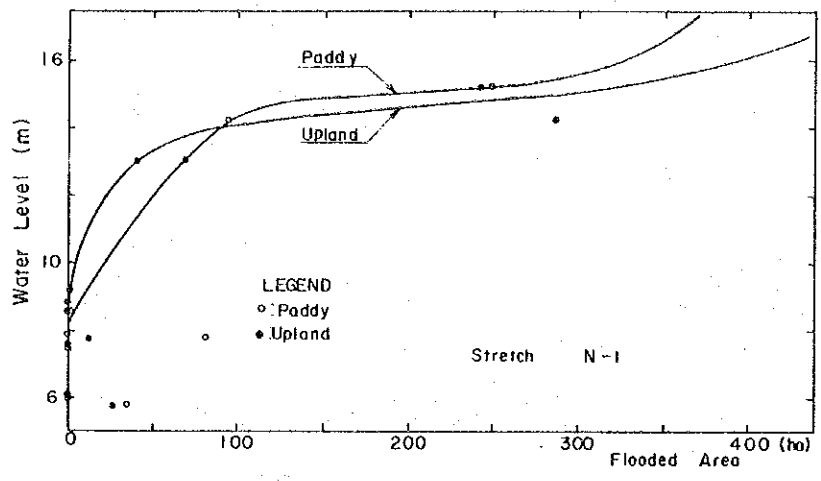
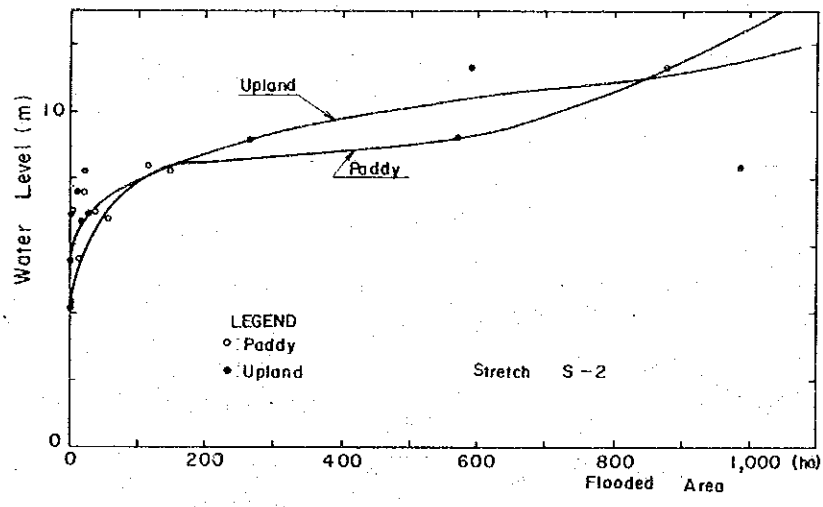


Fig. N 3 Stage-Inundated Area Curves

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY





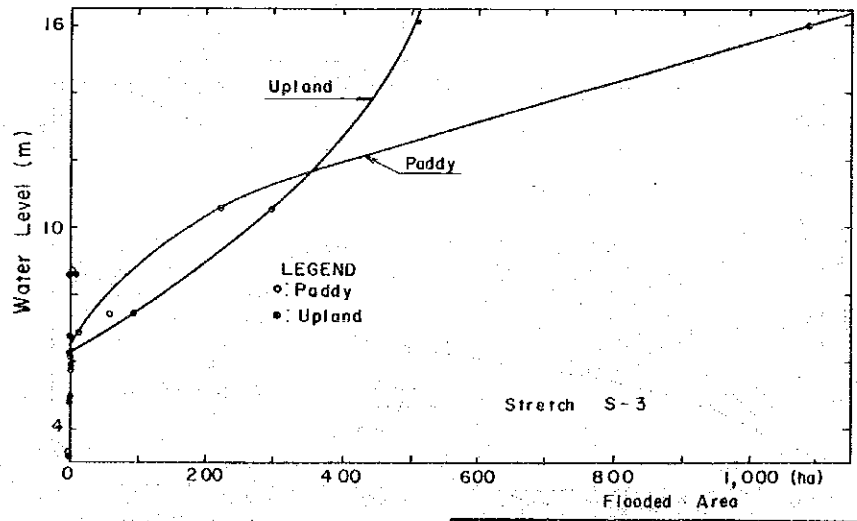
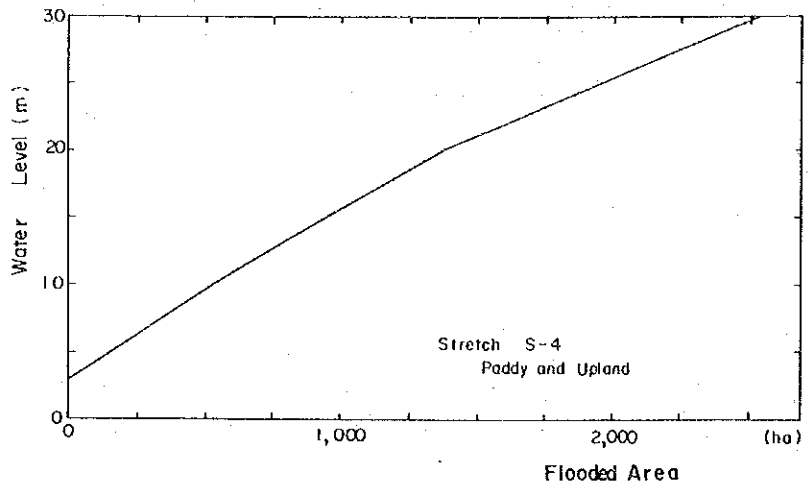
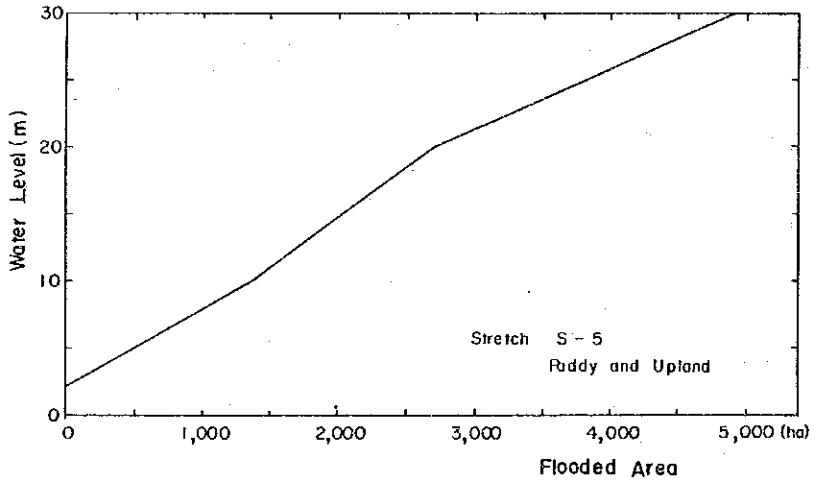


Fig. N 3 Continued (2)

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY





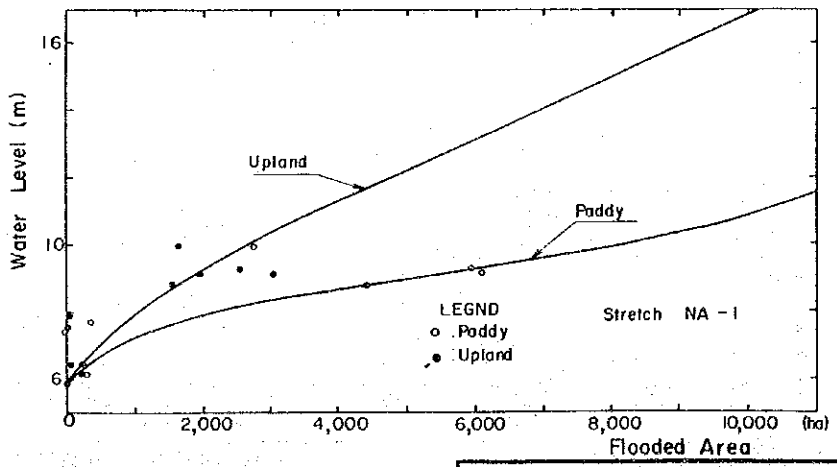
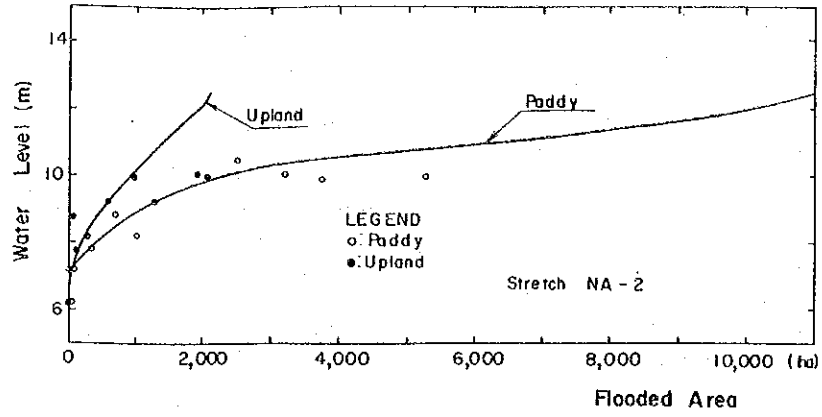
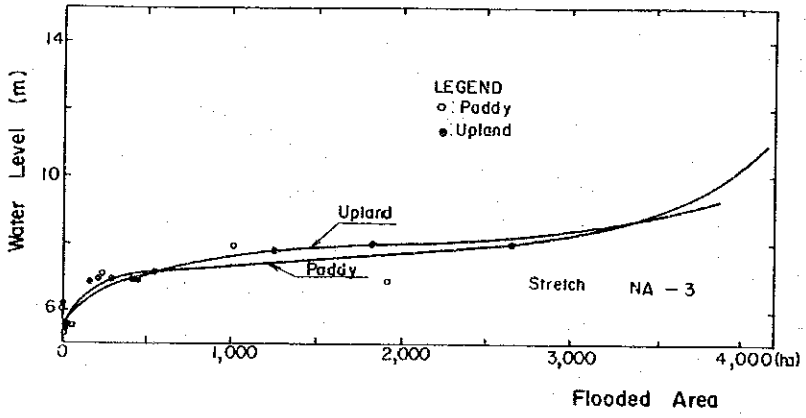


Fig. N 3 Continued (3)

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY

JAPAN INTERNATIONAL COOPERATION AGENCY





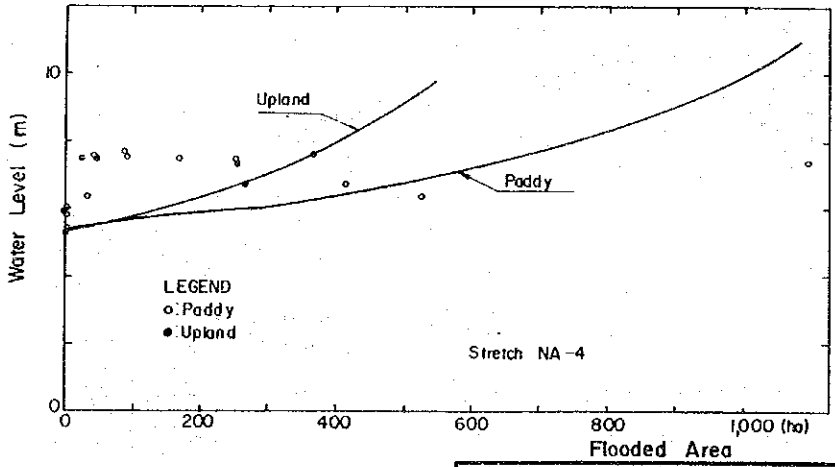
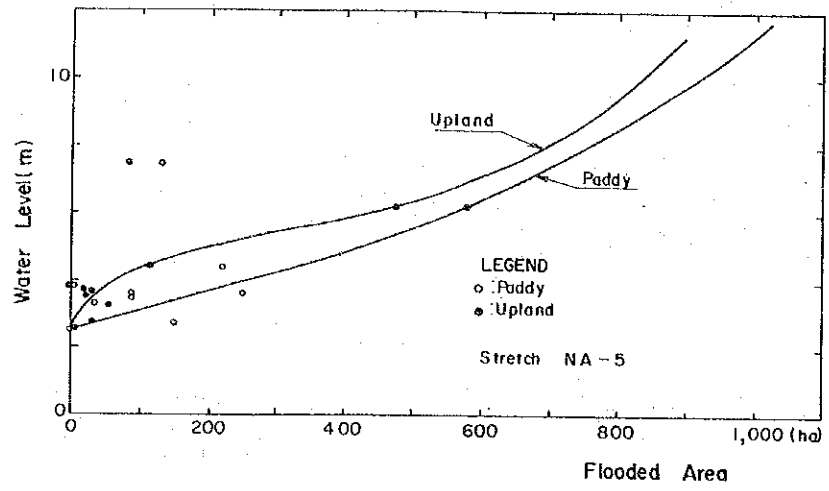
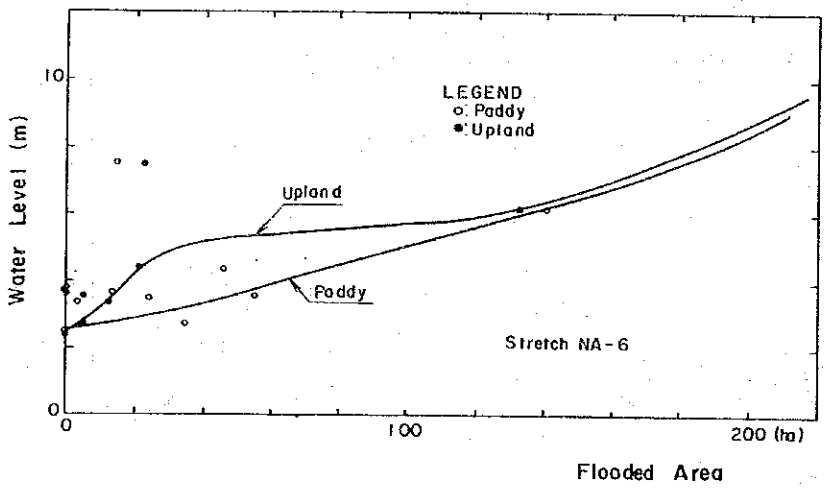


Fig. N 3 Continued (4)

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY





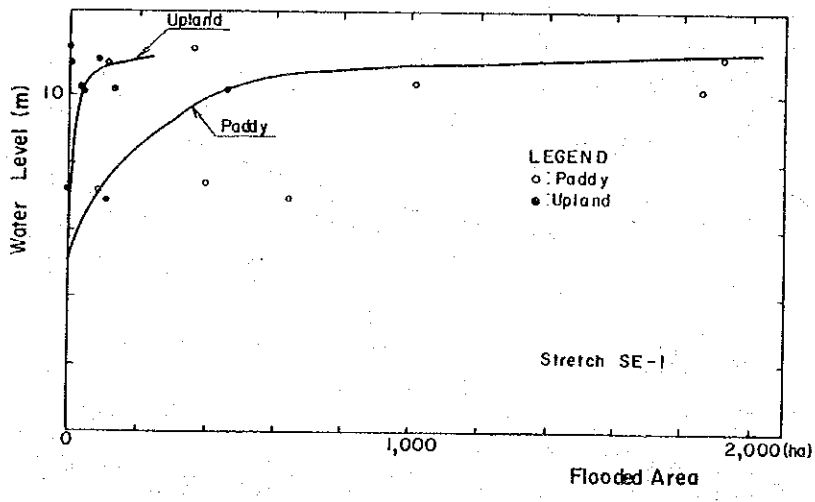
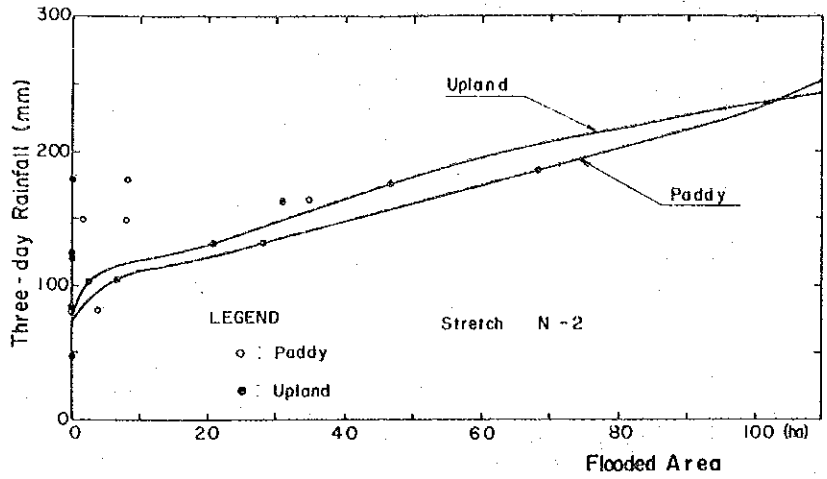
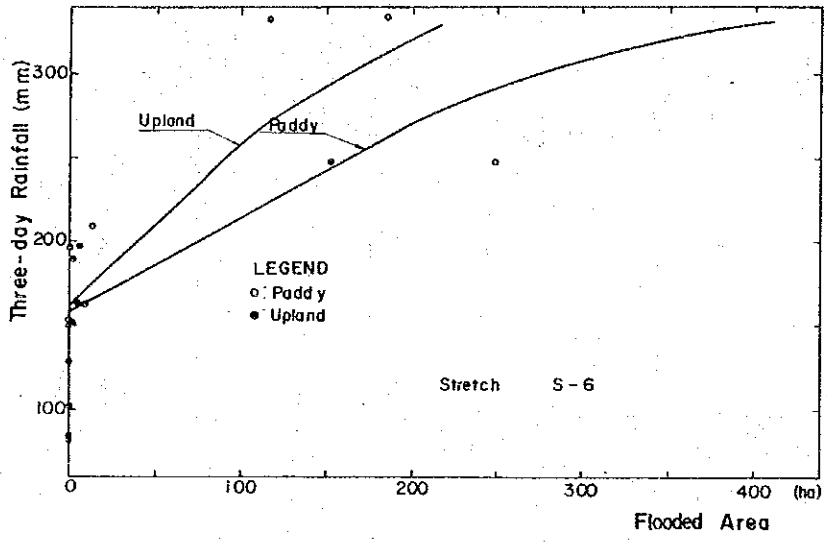


Fig. N 3 Continued (5)

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY





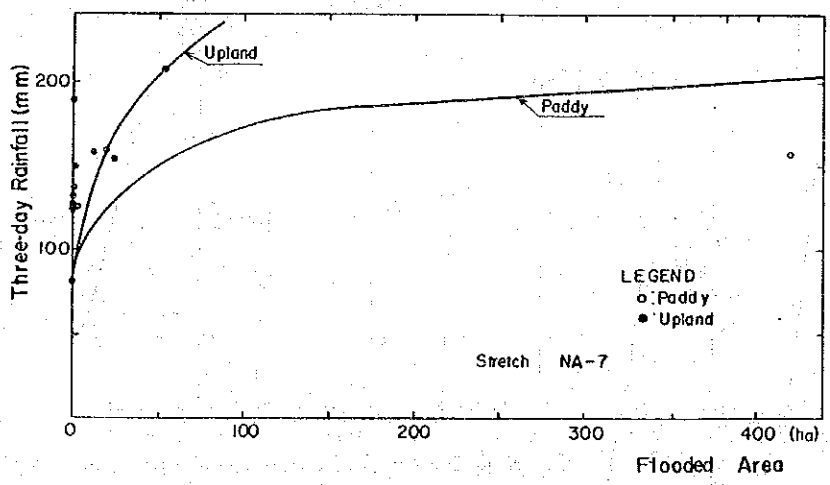


Fig. N 3 Continued (6)

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY

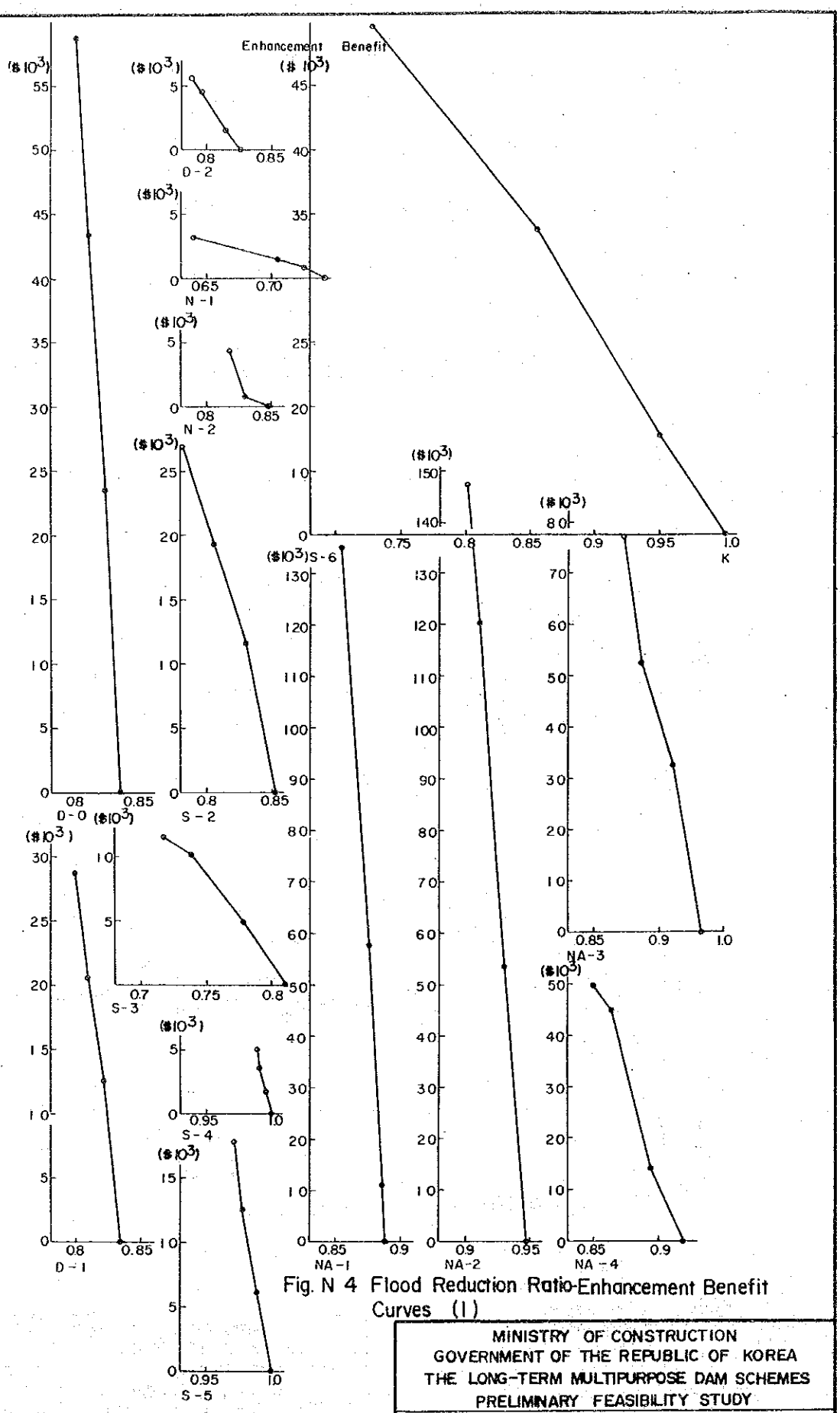


Fig. N 4 Flood Reduction Ratio-Enhancement Benefit Curves (1)

MINISTRY OF CONSTRUCTION
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JAPAN INTERNATIONAL COOPERATION AGENCY

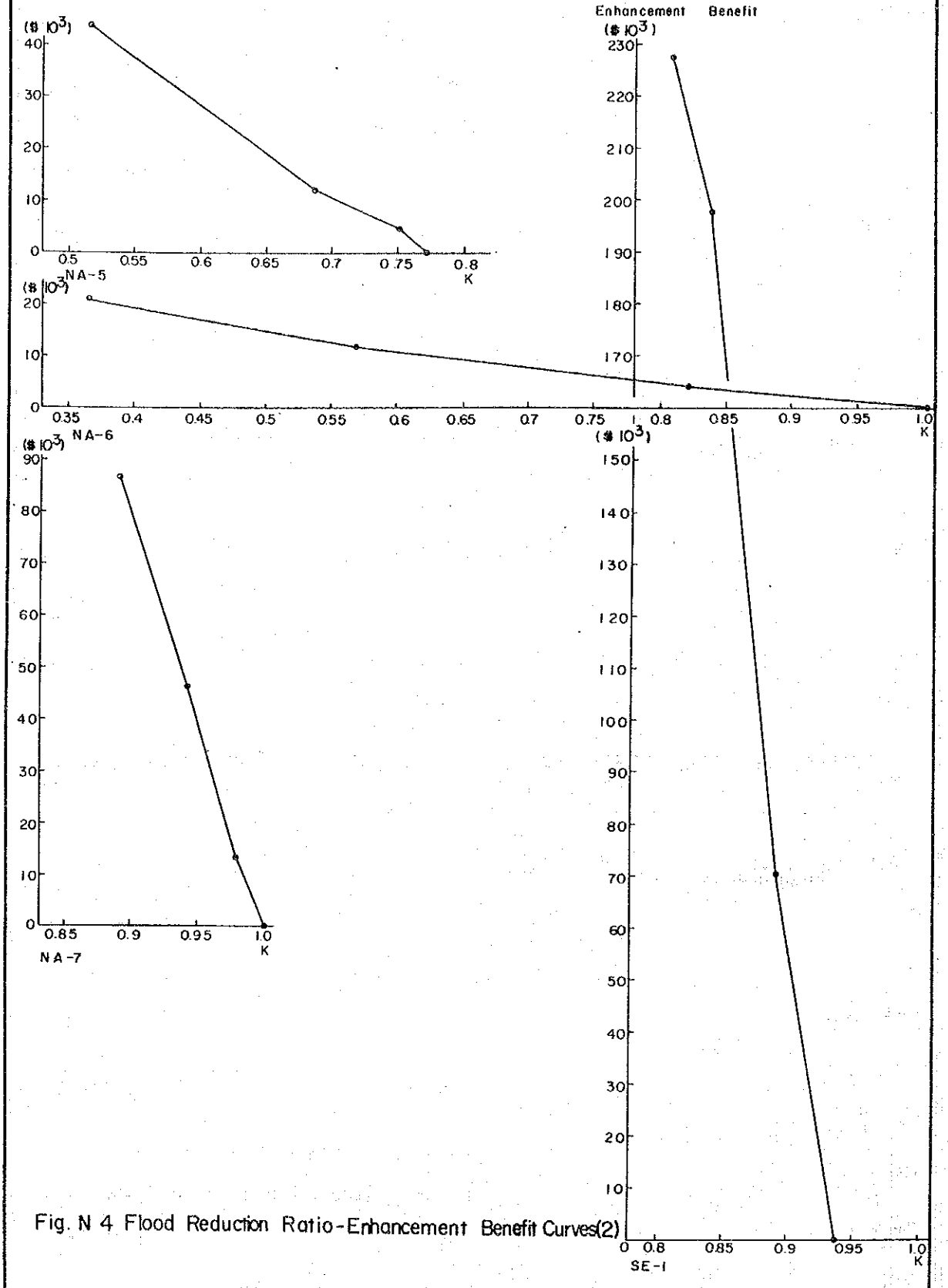

Fig. N 4 Flood Reduction Ratio-Enhancement Benefit Curves(2)

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY

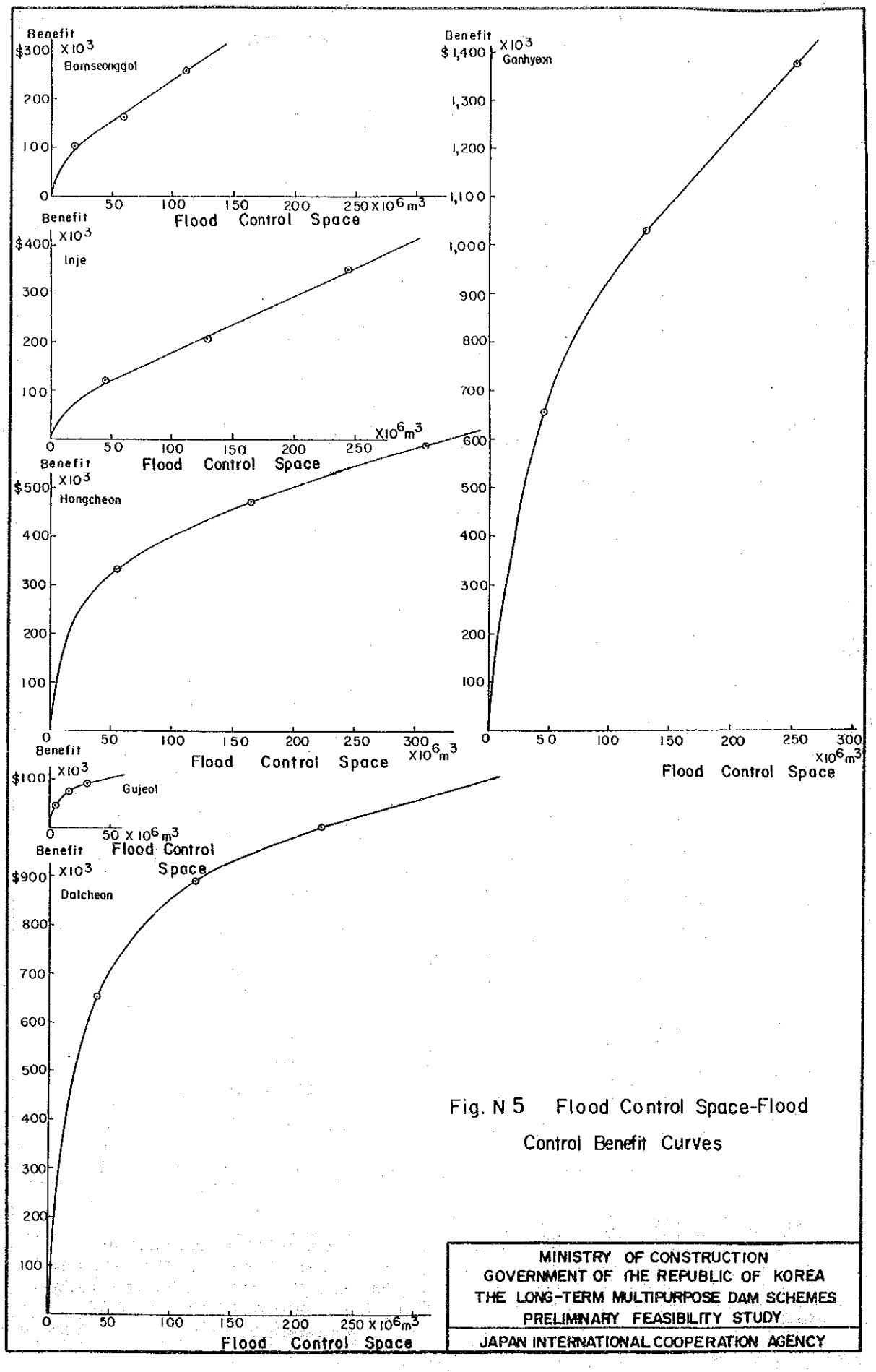

Fig. N 5 Flood Control Space-Flood Control Benefit Curves

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GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY

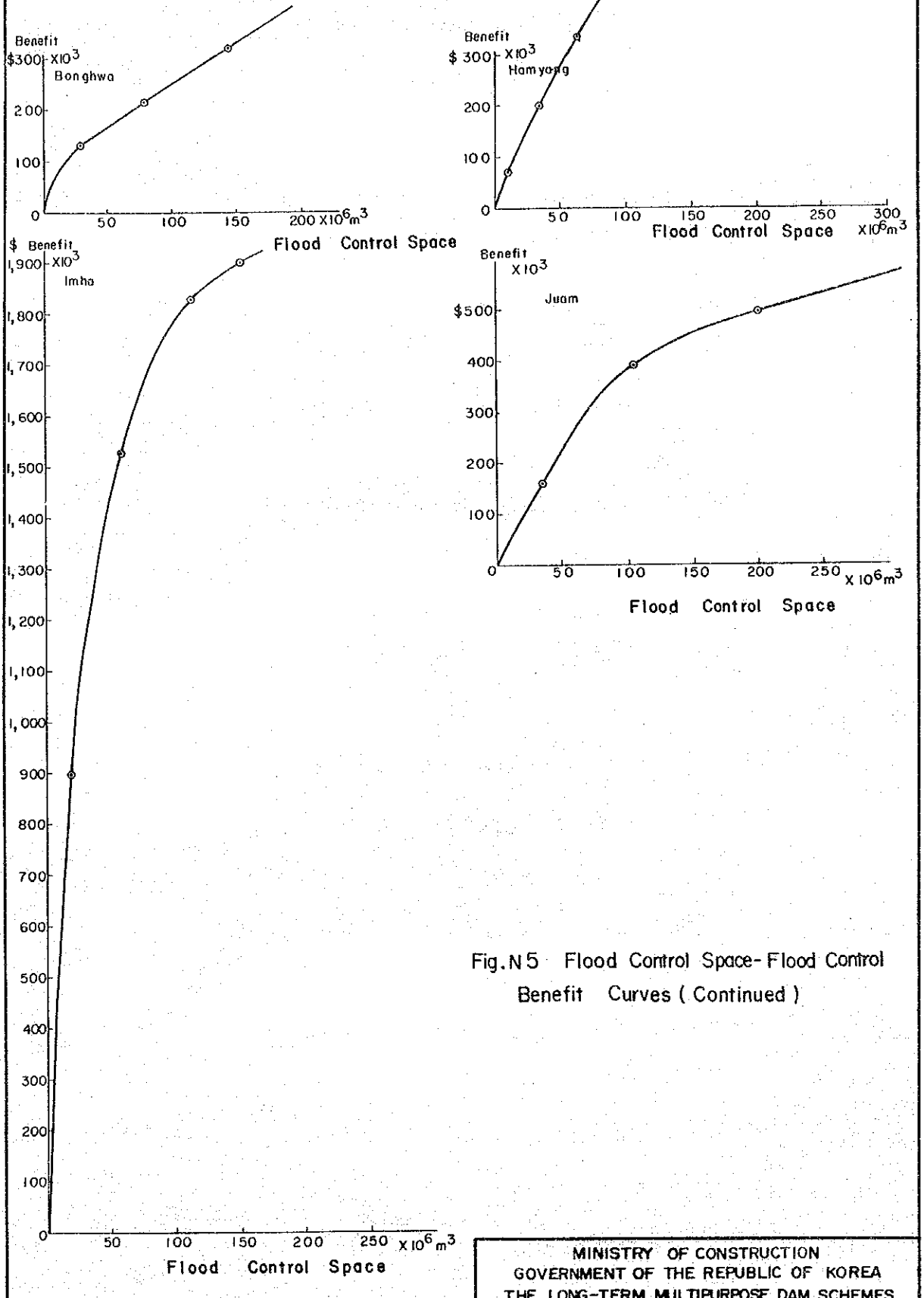

Fig. N 5 Flood Control Space-Flood Control Benefit Curves (Continued)

MINISTRY OF CONSTRUCTION
GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY
JAPAN INTERNATIONAL COOPERATION AGENCY

A N N E X O

COMPENSATION COST

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

O 1 INTRODUCTION

This ANNEX presents the results of the compensation cost survey carried out in September to November, 1978 by Saman Engineering Consultants Co. which was entrusted by MOC.

In the First Stage of the Project, compensation cost survey has already been carried out for 24 damsites in the Han, Seomjin, Nagdong and Geum river basins (Ref. O 1). The results were reviewed by the present study, which also involved additional survey supplementarily.

It is noted that the cost of ground facilities and others including road relocation is included in the compensation cost in this ANNEX, but it is separated from the compensation cost and counted as a component of construction cost estimate and economic analysis.

O 2 METHOD OF SURVEY

The survey was conducted for the possible range of reservoir high water surface (HWS) of each proposed dam scheme. The surveyed sites and ranges of HWS are given in Table O 1. In the field survey, data on area or number of each kind of assets to be compensated were collected from Gun and Myeon administrative offices and by inquiries. In addition, data on recent selling prices of real estate were collected. The map study was also carried out by delineating the survey areas at 5-m contour intervals on 1/25,000 topographic maps.

O 3 CLASSIFICATION OF ASSETS

To estimate the compensation cost, the assets to be compensated are divided into "land" and "ground facilities and others" in accordance with the regulations established by MOC (Ref. O 2).

"Land" covers five categories, i.e. paddy field, upland, housing lot, forest land and others. Public yard, road, river land, dike, etc., are included in "others", which, in this study, are considered out-of-the-objects of compensation.

"Ground facilities and others" comprise house, public facilities, grave, perennial crop, communication facilities, power distribution facilities, road, business right, transportation cost for resettlement and solatium for resettlement.

O 4 UNIT COST

O 4.1 Land

To estimate the unit costs, the area extent and prices of each category of land in the reservoir flooded areas were surveyed.

The current selling price data were collected and the surveyed data by National Agricultural Cooperative Federation (NACF) (Ref. O 3) were also referred to.

Each category of land were classified into three cadastral grades. The unit price of land was estimated by grade and category and were averaged to obtain a unit price of each category after weighted by the area of each grade at the highest HWS surveyed.

The unit costs per ha of each category are tabulated for each proposed scheme in Table O 2.

O 4.2 Ground Facilities and Others

(1) House

Houses were classified into main houses and appurtenants. The value of building was estimated taking into account such factors as purchasing cost and structure which is classified into wooden house with slate roof, wooden house with galvanized steel plate roof, wooden house with tile roof and brick house. The situation of utilization, floor space, durable year and possibility of relocation were considered as well.

To estimate the purchasing cost, the standard construction cost per 3.3 m^2 of each type of structure established by Korean Board of Judgement (Ref. O 4) was referred to.

(2) Public Facilities

Public facilities included administrative office buildings of Myeon, Dong and Ri, post office, police station, school buildings, public hall, church and temple.

The method of estimating the unit costs of the public facilities is the same as explained in O 4.2 (1).

(3) Perennial Crops

Perennial crops were classified by their species, i.e. apple, pear, grape, persimmon, chestnut, peach, walnut and jujube, and age of tree based on the evaluation standard for perennial crops established by MOC (Ref. O 2).

The fruit trees mentioned above were further classified in those cultivated in orchard and those in garden. Others than the above were excluded in the estimate.

The unit costs of perennial crops is tabulated in Table O 3.

(3) Grave

The unit costs of graves were estimated as their relocation costs, irrespective of the size, location and other conditions, as tabulated in Table O 4.

(5) Communication and Power Distribution Facilities

The communication and power distribution facilities in the reservoir flooded areas, in principle, shall be reutilized of their material after relocation.

The unit costs per km was estimated as shown in Table O 5 based on the information obtained from the Bureau of Construction, Telephone and Telegraph and Korea Electric Company (KECO).

(6) Road

Roads were classified into national road, local road and express highway.

The relocation costs of 1-km of each raod were estimated to be ₩ 13 x 10^6 for national road, ₩ 9 x 10^6 for local road and ₩ 300 x 10^6 for express highway based on their construction costs.

(7) Business Right

Business right was evaluated based on the loss incurred during the forced closing period and relocation costs of the facilities in accordance with the evaluation standard established by MOC (Ref. O 2).

The forced closing period was estimated at less than three months. The loss caused by relocation was estimated based on actual profit in past years.

In case of shutting up, compensation will be made according to the actual annual profit and compensatory period that is established by MOC (Ref. O 2).

The compensatory period of each type of business in case of shutting up is tabulated in Table O 6.

(8) Transportation Cost for Resettlement

The transportation costs for resettlement is payable to the inhabitants in the reservoir flooded areas to compensate the actual carriages necessary for moving the movable properties.

Usually, transportation costs for resettlement is estimated based on the number of households at the date of notification for the reservoir flooded areas. However, as notification has not yet announced at this time, the number of present existing households was applied for the estimation.

The transportation input per household for resettlement established by MOC (Ref. O 2) is tabulated in Table O 7.

(9) Solatium for Resettlement

The solatium for resettlement is payable for inhabitants in the reservoir flooded area at the date of notification as mentioned in O 4.2 (8).

The solatium is estimated at ₩ 20,000 per head per month

based on the monthly average living costs according to the information obtained from the Korea Productivity Center.

The monthly average living costs of a farm household of five persons are tabulated in Table 0 8.

O 5 STAGE-COMPENSATION COST RELATIONSHIP

The summary of relationship between assumed high water surface and compensation cost of the proposed dams are summarized in Table O 9 and Fig. O 1. The detailed compensation cost by item is tabulated in Table O 10.

O 6 PRODUCTION FOREGONE IN FLOODED AREA

The agricultural crop production in the reservoir area will be permanently lost. The production foregone was estimated as the net value of present agricultural production in the proposed reservoir area. The production foregone at each proposed damsite is shown in Table O 11 and Fig. O 2. The details of production foregone are discussed in ANNEX F.

REFERENCES

O 1 REPORT ON THE PLANNED DEVELOPMENT SITES OF THE LONG-TERM MULTIPURPOSE DAM SCHEMES, MOC, 1977

O 2 REGULATIONS FOR THE STANDARD COMPENSATORY APPRAISAL OF PUBLIC DOMAIN, ORDINANCE NO. 1845, MOC, 1977

O 3 SURVEYED DATA ON THE PRICES OF REAL ESTATE OVER THE COUNTRY, NACF, 1978

O 4 PRICE DATA ON NEW BUILDING, KOREAN BOARD OF JUDGEMENT, 1978

Table 0 1 SURVEYED HWS RANGE AND AREA

Damsite	HWS Range (m)	Surveyed Area (km^2)	Location
1. Bamseonggol (upstream)	260 - 310	15.19	Gangweon Do, Yanggu Gun
2. Bamseonggol (downstream)	240 - 310	16.10	- do -
3. Inje (upstream)	325 - 350	37.51	Gangweon Do, Inje Gun
4. Inje (downstream)	325 - 350	38.10	- do -
5. Hongcheon	114.8 - 134.8	65.10	Gangweon Do, Hongcheon Gun
6. Gujeol	720 - 750	7.37	Gangweon Do, Pyeong-chang Gun
7. Dalcheon	106.1 - 126.1	69.15	Chungcheong Bug Do, Jungweon Gun
8. Ganhyeon	70 - 120	47.47	Gangweon Do, Weongseong Gun
9. Bonghwa (upstream)	270 - 310	33.50	Gyeongsang Bug Do, Bonghwa Gun
10. Bonghwa (downstream)	250 - 310	43.10	- do -
11. Imha	180 - 200	61.45	Gyeongsang Bug Do, Andong Gun
12. Hamyang	350 - 390	7.56	Gyeongsang Nam Do, Hamyang Gun
13. Juam	107 - 130	82.58	Jeonla Nam Do, Seung-ju Gun

Table O 2 UNIT COST OF LAND

Unit : W 10^3/ha

	Paddy Field	Upland	Housing Lot	Forest Land
1. Bamseonggol	6,833	5,738	8,409	484
2. Inje	9,352	7,719	8,403	514
3. Hongcheon	8,212	6,337	11,541	747
4. Gujeol	9,018	6,893	13,564	293
5. Dalcheon	10,735	8,194	6,157	879
6. Ganhyeon	10,666	9,508	11,483	791
7. Bonghwa	9,530	6,594	7,093	756
8. Imha	9,915	6,900	7,366	756
9. Hamyang	9,619	6,957	7,048	786
10. Juam	9,634	5,853	8,806	573

Table O 3 UNIT COST OF PERENNIAL CROP

Unit : ₩ 10^3/stub

Species	Age of Tree (year)			
	1 - 5	6 - 10	11 - 20	20 -
Apple	1.0	20	200	200
Pear	1.0	15	80	150
Grape	0.8	10	30	40
Persimmon	0.7	10	40	50
Chestnut	1.0	10	40	50
Peach	0.8	10	40	50
Walnut	0.5	5	20	30
Jujube	0.6	4	20	30

Table O 4 RELOCATION COST OF GRAVE

Item	Quantity	Unit	Unit Cost (₩ 10^3)	Amount (₩ 10^3)
Board	L.S			4
Flax	2	m^2	2	4
Korean Paper	2	role	0.5	1
Labour	5	person	3	15
Memorial Service	L.S			5
Miscellaneous Cost	L.S			1
Total				30

Table O 5 ESTIMATE OF UNIT COST FOR COMMUNICATION FACILITIES AND POWER DISTRIBUTION FACILITIES

Communication Facilities (per km)

Construction Cost		
Telephone poles	20 poles x ₩ 30,000 =	₩ 600,000
Telephone wire	6 lines x 1,000 m x ₩ 500 =	₩ 3,000,000
Civil work	LS	₩ 1,400,000
Total		₩ 5,000,000
Compensation Cost (30 % of construction cost)		₩ 1,500,000

Power Distribution Facilities (per km)

Construction Cost		
Electric poles	20 poles x ₩ 180,000 =	₩ 3,600,000
Electric wire	2 lines x 1,000 m x ₩ 800 =	₩ 1,600,000
Civil work	LS	₩ 2,000,000
Total		₩ 7,200,000
Compensation Cost (30 % of construction cost)		₩ 2,000,000

Table O 6 COMPENSATORY PERIOD IN SHUTTING UP BUSINESS

Type of Business	Compensatory Period (year)
Brewing Industry	3
Rice Mill	2
Pharmacy	2
Manufacturing	2
Junk Shop	1
Warehousing	1.5
Grocery	1
Textile Industry	1
Inn	1
Others	1

Table O 7 TRANSPORTATION INPUT FOR RESETTLEMENT

Floor Space	Labour	4-ton Truck	Packing Charge
Less than 33 m^2	3 persons	1	(Labour charge + hiring charge of truck) x 15 %
33 - 49.5 m^2	4 persons	2	- do -
49.5 - 66 m^2	5 persons	2.5	- do -
66 - 99 m^2	6 persons	3	- do -
More than 99 m^2	8 persons	4	- do -

Table O 8 MONTHLY AVERAGE LIVING COST OF A FARM HOUSEHOLD

Unit: W/month

Food stuffs	Residence	Fuel & Light	Clothing	Miscella-neous	Total
73,000	7,000	6,000	8,000	10,000	104,000

Remarks: For a family of 5 persons

Table O 9 SUMMARY OF COMPENSATION COST

Elavation (m)	Flooded Area (ha)	Compensation Cost (₩ 10^3)	($ 10^3)
1. Bamseonggol (upstream) site			
260	490	3,337,821	6,882
265	588	3,661,128	7,549
270	685	4,013,506	8,275
275	781	4,341,176	8,951
280	867	4,823,807	9,946
285	963	5,165,870	10,651
290	1,064	5,412,237	11,159
295	1,166	6,008,157	12,388
300	1,258	6,518,324	13,440
305	1,348	6,847,892	14,119
310	1,519	7,094,377	14,628
2. Bamseonggol (downstream) site			
240	256	2,367,433	4,881
245	370	2,748,591	5,667
250	470	3,216,573	6,632
255	516	3,440,634	7,094
260	580	3,689,569	7,607
265	670	3,945,837	8,136
270	775	4,295,083	8,856
275	863	4,551,345	9,384
280	979	5,105,528	10,527
285	1,055	5,434,310	11,205
290	1,156	5,680,231	11,712
295	1,258	6,214,891	12,814
300	1,356	6,738,353	13,894
305	1,435	6,900,768	14,228
310	1,610	7,184,518	14,813

Table 0 9 Continued (2)

Elavation (m)	Flooded Area (ha)	Compensation Cost (₩ 10^3)	($ 10^3)
3. Inje (upstream) site			
325	2,250	10,071,734	20,766
330	2,529	11,156,269	23,003
335	3,040	11,942,681	24,624
340	3,240	12,549,134	25,875
345	3,450	13,639,986	28,124
350	3,751	14,583,158	30,068
4. Inje (downstream) site			
325	2,450	10,909,928	22,495
330	2,750	12,191,294	25,137
335	3,260	12,889,100	26,575
340	3,460	13,379,889	27,587
345	3,560	13,716,166	28,281
350	3,810	14,658,835	30,224
5. Hongcheon site			
114.8	4,100	21,197,181	43,706
119.8	4,885	23,867,839	49,212
124.8	5,440	26,423,344	54,481
129.8	5,995	30,409,440	62,699
134.8	6,510	32,454,671	66,917
6. Gujeol site			
720	88	378,351	780
725	143	652,630	1,346
730	209	1,042,046	2,149
735	275	2,675,811	5,517
740	375	3,233,252	6,666
745	517	4,035,890	8,321
750	737	4,695,164	9,681

Table O 9 Continued (3)

Elavation (m)	Flooded Area (ha)	Compensation Cost (W 10^3)	($ 10^3)
7. Dalcheon site			
106.1	2,700	20,858,578	43,007
111.1	3,650	27,568,393	56,842
116.1	4,850	35,621,407	73,446
121.1	6,050	42,443,614	87,513
126.1	6,915	47,308,872	97,544
8. Ganhyeon site			
70	242	886,427	1,828
75	385	1,991,778	4,107
80	583	3,684,727	7,597
85	957	6,489,724	13,381
90	1,485	8,736,779	18,014
95	2,059	12,432,824	25,635
100	2,430	15,812,118	32,602
105	3,090	20,708,315	42,698
110	3,750	24,367,388	50,242
115	4,250	27,981,267	57,693
120	4,747	31,185,256	64,299
9. Bonghwa (upstream) site			
270	1,390	5,340,893	11,012
275	1,470	5,705,089	11,763
280	1,629	6,318,630	13,028
285	1,876	7,087,726	14,614
290	2,129	7,611,970	15,695
295	2,407	8,321,625	17,158
300	2,732	9,186,596	18,941
305	3,080	10,403,421	21,450
310	3,350	11,591,834	23,901

Table 0 9 Continued (4)

Elavation (m)	Flooded Area (ha)	Compensation Cost (₩ 10^3)	($ 10^3)
10. Bonghwa (downstream) site			
250	876.3	3,393,204	6,996
255	996	4,024,734	8,298
260	1,124	4,730,747	9,754
265	1,350	5,073,095	10,460
270	1,550	5,903,531	12,172
275	1,650	6,460,309	13,320
280	1,930	7,294,076	15,039
285	2,220	7,912,672	16,315
290	2,420	8,721,312	17,982
295	2,640	9,823,010	20,254
300	3,250	11,056,948	22,798
305	3,610	12,253,324	25,265
310	4,310	13,495,942	27,827
11. Imha site			
180	1,985	14,673,855	30,255
185	3,305	17,996,040	37,105
190	4,625	22,064,930	45,495
195	5,385	24,008,554	49,502
200	6,145	26,193,534	54,007
12. Hamyang site			
350	362	2,624,930	5,412
355	418	2,959,476	6,102
360	473	3,257,415	6,716
365	533	3,692,838	7,614
370	584	3,917,305	8,077
375	629	4,137,316	8,531
380	674	4,415,771	9,105
385	715	4,608,190	9,501
390	756	4,824,271	9,947

Table 0 9 Continued (5)

Elavation (m)	Flooded Area (ha)	Compensation Cost ($\text{₩}\ 10^3$)	($\$\ 10^3$)
13. Juam site			
107	4,550	27,038,380	55,749
112	5,150	29,818,330	61,481
117	5,753	32,091,361	66,168
122	6,070	34,420,207	70,969
127	6,510	36,126,805	74,488
130	8,258	48,711,672	100,436