Table III. C. 4. Soil Profile Description (profiles No. 1 - No. 51)

PROFILE NO. 1

Date of survey: 10 Feb. 1982

Location: Center, pilot farm No. 2

Physiographic position: Shifting sand dune

Surrounding land form: Nearly flat

Land use: Upland field, vegetables

Parent material: Aeolian sand originated alluvium

Great soil group: Dystric Regosols (Rd), deep sandy phase

Soil series: Md1, shifting sand dune

Profile description:

0∿100cm. No horizon development throughout 100 cm depth, texture S-LS, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, porosity P33.7 - 38.5%, three phases under PF1.5 are solid ratios Sv61.5 - 65.4%, water ratios Mv10.2 - 14.4% and air ratios A21.9 - 24.4%. Saturated percentage SP19.8 - 22.5%. Electric conductivity under PF1.5 $EC_{1.5}$ 3.1 - 3.7 m mhos /cm·25°C and under saturated condition ECe1.2 - 1.6 m mhos/cm·25°C.

PROFILE NO. 2

Date of survey: 10 Feb. 1982

Location: Center, 500m south site from pilot farm No. 2

Physiographic position: Shifting sand dunes

Surrounding land form: Nearly flat

Land use: Desert

Parent material: Aeolian sand originated alluvium

Great soil group Dystric Regosols (Rd), deep sandy phase

Soil series: Md1, shifting sand dunes

Profile description:

0∿100cm. No horizon development throughout 100cm depth, texture S-LS, no gravel, no humus, matrix color 10YR7/8 yellow orange, structureless single particle, no mottles, many fine pores, permeability free, somewhat compact.

PROFILE NO. 3

Date of survey: 11 Feb. 1982

Location: Center, 1000m south site from pilot farm No. 2

Physiographic position: Shifting sand dunes

Surrounding land form: Gently undulating

Land use: Desert

Parent material: Aeolian sand originated alluvium

Great soil grpup: Dystric Regosols (Rd), deep sandy phase

Soil series: Md1, shifting sand dunes

Profile description:

0∿100cm. No horizon development throughout 100cm depth, texture S-LS, no gravel, no humus, matrix color 7.5YR8/8 yellow orange, structureless single particle, no mottle, many fine pores, porosity P34.7 - 36.8%, three phases under PF1.5 are solid ratios Sv63.2 - 65.3%, water ratios Mv11.5 - 14.4% and air ratios 25.0 - 25.3%. Saturated percentage SP16.6 - 19.3%. Electric conductivity under PF1.5 $EC_{1.5}$ 3.9 - 4.5 m mhos/cm•25°C and under saturated condition ECe1.1 -1.8 m mhos/cm 25°C.

PROFILE NO. 4

Date of survey: 11 Feb. 1982

Location: Center, 500m west site from pilot farm No. 2

Physiographic position: Shifting sand dunes

Surrounding land from: Gently undulating

Land use: Desert

Parent material: Aeolian sand originated alluvium

Great soil group: Dystric Regosols (Rd), deep sandy phase

Soil series: Md1, shifting sand dunes

Profile Description:

0~100cm. No horizon development throughout 100cm depth, texture S-LS, no gravel, no humus, matrix color 10YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, permeability free, compactness loose.

PROFILE NO. 5

Date of survey: 11 Feb. 1982

Location: Center, 1000 m south west site from pilot farm No. 2

Physiographic position: Shifting sand dunes

Surrounding land form: Gently undulating

Land use: Desert

Parent material: Acolian sand originated alluvium

Great soil group: Dystric Regosols (Rd), deep sandy phase

Soil series: Md1, shifting sand dunes

Profile description:

0~100cm. No horizon development throughout 100cm depth, texture S-LS, no gravel, no humus, matrix color 10YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, permeability free, compactness loose.

PROFILE NO. 9

Date of survey: 13 Feb. 1982

Location: North east, 500m north site from Salhya road

Physiographic position: Shifting sand dunes

Surrounding land form: Gently undulating

Land use: Desert

Parent material: Aeolian sand originated alluvium

Great soil group: Dystric Regosols (Rd), deep sandy phase

Soil series: Md1, shifting sand dunes

Profile description:

0~100cm. No horizon development throughout 100cm depth, texture S, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, many fine pores, no mottle, permeability free, compactness loose.

PROFILE NO. 11

Date of survey: 13 Feb. 1982

Location: North east, 500m north site from Salhya road

Physiographic position: Shifting sand dunes

Surrounding land form: Gently undulating

Land use: Desert

Parent material: Aeolian sand originated alluvium

Great soil group: Dystric Regosols (Rd), deep sandy phase

Soil series: Md1, shifting sand dunes.

Profile description:

0~100cm. No horizon development throughout 100cm depth, texture S-LS, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, porosity P31.3 - 37.5%,

three phases under PF1.5 are solid ratios Sv62.5 - 68.7%, water ratios Mv8.9 - 12.4% and air ratios A18.9 - 25.8%. Saturated percentage SP17.8 - 19.4%. Electric conductivity under PF1.5 $EC_{1.5}$ 3.8 - 4.8 m mhos/cm·25°C and under saturated condition Ece 1.5 - 2.6 m mhos/cm·25°C. pH ($H_2O$) 7.0 - 7.5 +, CaO 0.15%, MgO 5- 10 mg/100g·soil, $K_2O$ 3- 15 mg/100g·soil and NaCl 0.01 - 0.15%.

PROFILE NO. 12

| | |
|---|---|
| Date of survey: | 13 Feb. 1982 |
| Location: | North east, 500m south site from Salhya road |
| Physiographic position: | Shifting sand dunes |
| Surrounding land form: | Gently undulating |
| Land use: | Desert |
| Parent material: | Aeolian sand originated alluvium |
| Great soil group: | Dystric Regosols (Rd), deep sandy phase |
| Soil series: | Md1, shifting sand dunes |

Profile description:

0∿100cm. No horizon development throughout 100cm depth, texture S-LS, common fine round gravells 5%, no humus, matrix color 7.5YR7/8 uellow orange, structureless single particle, no mottle, many fine pores, permeability free, compactness loose.

PROFILE NO. 13

| | |
|---|---|
| Date of survey: | 13 Feb. 1982 |
| Location: | North east, 500m south site from Salhya road |
| Physiographic position: | Shifting sand dunes |
| Surrounding land form: | Gently undulating |

Land use: Desert

Parent material: Aeolian sand originated alluvium

Great soil group: Dystric Regosols (Rd), deep sandy phase

Soil series: Md1, shifting sand dunes

Profile description:

0~100cm. No horizon development throughout 100cm depth, texture S-LS, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, permeability free, compactness loose.

PROFILE NO. 14

Date of survey: 13 Feb. 1982

Location: North east, 500m south site from pilot farm No. 3

Physiographic position: Shifting sand dunes

Surrounding land form: Nearly flat

Land use: Desert

Parent material: Aeolian sand originated alluvium

Great soil group: Dystric Regosols (Rd), deep sandy phase

Soil series: Md1, shifting sand dunes

Profile description:

0~ 100cm. No horizon development throughout 100cm depth, texture S-LS, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, permeability free, compactness loose.

PROFILE NO. 15

Date of survey: 14 Feb. 1982

Location: North east, pilot farm No. 3

Physiographic position: Shifting sand dunes

Surrounding land form: Nearly flat

Land use: Upland field (vegetables)

Parent material: Aeolian sand originated alluvium

Great soil group: Dystric Regosols (Rd), deep sandy phase

Soil series: Md1, shifting sand dunes

Profile description:

0∿100cm. No horizon development throughout 100cm depth, texture S, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structure-less single particle, no mottle, many fine pores, porosity 32.7 - 38.1%, three phases under PF 1.5 are solid ratios Sv 61.9 - 67.3%, water ratios Mv7.0 - 10.5% and air ratios A22.8 - 30.3%. 24 hrs moisture FC 3.1 - 5.5%, saturated percentage SP17.7 - 21.7%. Electric conductivity under PF1.5 $EC_{1.5}$ 3.1 - 4.5 m mhos/cm·25°C and under saturated condition ECe 2.0 - 3.6 m mhos/cm·25°C. pH ($H_2O$) 7.0 - 7.5, CaO 0.10 - 0.15%, MgO 5 - 10 mg/100g·soil, $K_2O$ 3 - 15 mg/100g·soil and NaCl 0.01 - 0.10%.

PROFILE NO. 16

Date of survey: 14 Feb. 1982

Location: North east, 500m west site from pilot farm No. 3

Physiographic postiion: Shifting sand dunes

Surrounding land form: Gently undulating

Land use: Upland field (Orange Orchard)

Parent material: Aeolian sand originated old alluvium

Great soil group: Dystric Regosols (Rd), deep sandy phase

Soil series: Md1, shifting sand dunes

Profile description:

0∿15cm. Very weakly developed A horizon, texture S, no gravel, few humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, porosity P35.5%, three phases under PF1.5 are solid ratio Sv65.0%, water ratio Mv7.0% and air ratio A28.0%. 24hrs moisture FC4.0%. Electric conductivity under PF1.5 $EC_{1.5}$ 4.5 m mhos/cm•25°C and under saturated condition Ece1.7 m mohs/cm•25°C.

15∿100cm. C horizon, texture S, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, many fine pores, porosity P34.4%, three phases under PF1.5 are solid ratios Sv63.9 - 65.7%, water ratios Mv9.0 - 10.4% and air ratios A24.1 - 27.1%. 24 hrs moisture FC4.3 - 9.0%, saturated percentage SP17.4%. Electric conductivity under PF1.5 $EC_{1.5}$ 3.3 - 4.5 m mhos/cm•25°C and under saturated condition ECe1.3 - 1.7 m mhos/-cm•25°C. pH ($H_2O$) 7.0 - 7.5, CaO 0.10 - 0.20%, MgO 5 - 20 mg/-100g•soil, $K_2O$ 8 - 15 mg/100g•soil and NaCl 0.01 - 0.15%.

PROFILE NO. 17

| | |
|---|---|
| Date of survey: | 15 Feb. 1982 |
| Location: | North (middle), 300m south site from Salhya road |
| Physiographic position: | Shifting sand dunes |
| Surrounding land form: | Gently undulating |
| Land use: | Upland field |
| Parent material: | Aeolian sand originated alluvium |
| Great soil group: | Dystric Regosols (Rd), deep sandy phase |
| Soil series: | Md1, shifting sand dunes |

Profile desctiption:

0∿20cm. Weakly developed A horizon, texture S, no gravel, no humus, matrix color 10YR6/8 bright yellow brown, structureless single particle, no mottle, many fine pores, porosity P34.1%, three phases under PF1.5 are solid ratio Sv65.9%, water ratio Mv10.2% and air ratio A23.9%. 24 hrs moisture FC7.8%, saturated percentage SP21.5%. Electric conductivity under PF1.5 $EC_{1.5}$ 5.2 m mohs/-cm•25°C and under saturated condition ECe 1.6 m mhos/cm•25°C. Smooth gradual boundary.

20∿100cm. C horizon, texture S-LS, no gravel, no humus, matrix color 7.5YR6/8 orange and 7.5YR5/8 yellow orange, structureless single particle, no mottle, many fine pores, porosity P34.4 - 36.2%, three phases under PF1.5 are solid ratios Sv63.8 - 65.6%, water ratios Mv 7.0 - 8.6% and air ratios A25.8 - 29.2%, 24 hrs moisture FC5.6 - 6.4%, saturated percentage SP18.7 - 21.5%. Electric conductivity under PF1.5 $EC_{1.5}$ 4.9 - 5.7 m mhos/cm•25°C and under saturated condition ECe1.6 m mohs/cm•25°C. pH ($H_2O$) 7.0 - 7.5+, CaO 0.15%, MgO 5- 20 mg/100g•soil, $K_2O$ 3 - 15 mg/-100g•soil and NaCl 0.10 - 0.15%.

PROFILE NO. 18

| | |
|---|---|
| Date of survey: | 15 Feb. 1982 |
| Location: | North west, 500m north site from Salhya road |
| Physiographic position: | Shifting sand dunes |
| Surrounding land form: | Nearly flat |
| Land use: | Upland field, vegetables |
| Parent material: | Aeolian sand originated alluvium |
| Great soil group: | Dystric Regosols (Rd), deep sand phase |

Soil series: Md1, shifting sand dunes

Profile description:

0∿20cm. Weakly developed A horizon, texture S, no gravel, no humus, matrix color 7.5YR6/8 orange, structureless single particle, no mottle, porosity P34.2 - 35.6%, three phases under PF1.5 are solid ratios Sv64.4 - 65.8%, water ratios Mv 7.7 - 9.2% and air ratio A25.0 - 27.9%. 24 hrs moisture FC 5.7 - 6.2%, saturated percentage SP20.1%. Electric conductivity under PF1.5 $EC_{1.5}$ 3.8 m mhos/-cm·25°C and under saturated condition ECe 2.0 m mhos/cm·25°C pH ($H_2O$) 7.0, CaO 0.20%, MgO 10 mg/100g·soil, $K_2O$ 3 mg/100g·soil and NaCl 0.05%. Smooth gradual boundary.

20∿100cm. C horizon, texture S, no gravel, no humus, matrix color 7.5YR6/8 orange, structureless single particle, no mottle, many fine pores, porosity P31.4 - 33.1%, three phases under PF1.5 are solid ratios Sv66.9 - 68.6%, water ratios Mv10.2 - 10.6% and air ratios A21.2 - 22.5%. 24 hrs moisture FC7.3 - 8.1%, saturated percentage SP18.9 - 20.2%. Electric conductivity under PF1.5 $EC_{1.5}$ 2.3 - 3.7 m mhos/cm·25°C and under saturated condition ECe 2.0 - 2.4 m mhos/cm·25°C. pH ($H_2O$) 7.5 +, CaO 0.15 - 0.20%, MgO 10 - 20 mg/100g·soil, $K_2O$ 8 - 15 mg/100g·soil and NaCl 0.05 - 0.10%.

PROFILE NO. 19

Date of survey: 15 Feb. 1982

Location: North (middle), 500m north site from Salhya road

Physiographic position: Shifting sand dunes

Surrounding land form: Gently rolling

Land use: Desert

Parent material: Aeolian sand originated alluvium

Great soil group: Dystric Regosols (Rd), deep sandy phase

Soil series: Md3, shifting sand dunes

Profile description:

0∿100cm. No horizon development throughout 100cm depth, texture S-LS, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, permeability free, compactness loose.

PROFILE NO. 20

Date of survey: 15 Feb. 1982

Location: North (middle), 500m south site from Salhya road

Physiographic position: Shifting sand dunes

Surrounding land form: Gently rolling

Land use: Desert

Parent material: Aeolian sand originated alluvium

Great soil group: Dystric Regosols (Rd), deep sandy phase

Soil series: Md3, shifting sand dunes

Profile description:

0∿100cm. No horizon development throughout 100cm depth, texture S-LS, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottles, many fine pores, porosity P32.2 - 36.4%, three phases under PF1.5 are solid ratios Sv63.6 - 67.8%, water ratios Mv6.2 - 12.5% and air ratios A23.9 - 26.0%. 24 hrs moisture FC5.4 - 6.1%, saturated percentage SP15.8 - 16.5%. Electric conductivity under PF1.5 EC1.5 2.8 - 5.5 m mhos/cm·25°C and under saturated condition ECe2.1 - 2.6 m mhos/cm·25°C. pH ($H_2O$) 7.0 - 7.5 +, CaO 0.07 - 0.15%, MgO 5 - 20 mg/100g·soil, $K_2O$ 3 - 15 mg/100g.soil and NaCl 0.05 - 0.10%.

PROFILE NO. 21

Date of survey: 16 Feb. 1982

Location: North (middle), 100m north site from Salhya road

Physiographic position: Shifting sand dunes

Surrounding land form: Gently undulating

Land use: Desert

Parent material: Aeolian sand originated alluvium

Great soil group: Dystric Regosols (Rd), deep sandy phase

Soil series: Md1, shifting sand dunes

Profile description:

0~100cm. No horizon development throughout 100 cm depth, texture S-LS, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottles, many fine pores, porosity P33.3 - 38.2%, three phases under PF1.5 are solid ratios Sv61.8 - 66.7%, water ratios Mv11.7 -14.3% and air ratios A19.2 - 26.5%, permeability free, 24 hrs moisture FC7.8 - 10.7%, saturated percentage SP17.9 - 21.6%. Electric conductivity under PF1.5 $EC_{1.5}$ 2.3 - 3.3 m mhos/cm·25°C and under sturated condition ECe1.4 - 1.6 m mhos/cm·25°C. pH ($H_2O$) 7.0 - 7.5+, CaO 0.07 - 0.20%, MgO 5 mg/100g·soil, $K_2O$ 3 - 8 mg/100g·soil and NaCl 0.05 - 0.10%.

PROFILE NO. 22

Date of survey: 16 Feb. 1982

Location: North east, 700m north east site from pilot farm No. 3

Physiographic position: Shifting sand dunes

Surrounding land from: Nearly flat

Land use: Desert

Parent material: Aeolian sand originated alluvium

Great soil group: Dystric Regosols (Rd), deep sandy phase

Soil series: Md1, shifting sand dunes

Profile description:

0~100cm. No horizon development throughout 100cm deptch, texture S-LS, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, porosity P34.9 - 37.8%, three phases under PF1.5 are solid ratios Sv62.2 - 65.1%, water ratios Mv9.7 - 14.9% and air ratios A21.8 -28.1%, permeability free. 24 hrs moisture FC5.4 - 10.8%, saturated percentage SP17.0 - 21.2%. Electric conductivity under PF1.5 $EC_{1.5}$ 3.1 - 4.4 m mhos/cm·25°C and under saturated condition ECe2.1 - 3.0 m mhos/cm·25°C. pH ($H_2O$) 7.0 - 7.5 +, CaO 0.10 - 0.15%, MgO 5 - 10 mg/100g·soil, $K_2O$ 3 - 15 mg/100g·soil and NaCl 0.01 - 0.10%.

PROFILE NO. 23

Date of survey: 17 Feb. 1982

Location: North west, 100m south site from Salhya road

Physiographic position: Shifting sand dunes

Surrounding land form: Gently rolling

Land use: Desert

Parent material: Aeolian sand originated alluvium

Great soil group: Dystric Regosols (d), deep sandy phase

Soil series: Md3, shifting sand dunes

Profile description:

0∿100cm. No horizon development throughout 100cm depth, texture S-LS, no gravel, no humus, matrix color 10YR7/8 yellow orange and 7.5 7.5YR7/8 yelloworange, structureless single particle, no mottle, many fine pores, porosity P28.2 - 33.5%, three phases under PF1.5 are solid ratios Sv66.5 - 71.8%, water ratios Mv9.9 - 12.3% and air ratios A17.3 - 23.6%, permeability free. 24 hrs moisture FC6.0 - 10.1%, saturated percentage SP14.5 - 18.7%. Electric conductivity under PF1.5 $EC_{1.5}$ 1.9 - 6.3 m mhos/cm•25°C and under sturated condition ECe 0.8 - 2.7 m mhos/cm•25°C. pH ($H_2O$) 6.5 - 7.5 +, CaO 0.15%, MgO 5 - 35 mg/100g•soil, $K_2O$ 3 - 15 mg/100g•soil and NaCl 0.01 - 0.10%.

PROFILE NO. 25

| | |
|---|---|
| Date of survey: | 17 Feb. 1982 |
| Location: | North (middle), 200m north site from Salhya road |
| Physiographic position: | Shifting sand dunes |
| Surrounding land form: | Gently undulating |
| Land use: | Desert |
| Parent material: | Aeolian sand originated alluvium |
| Great soil group: | Dystric Regosols (Rd), deep sandy phase |
| Soil series: | Md1, shifting sand dunes |

Profile description:

0∿100cm. No horizon development throughtout 100cm depth, no gravel, no humus, matrix color 7.5YR6/8 orange, structureless single particle, no mottle, many fine pores, porosity P32.1 - 35.3%, three phases under PF1.5 are solid ratios Sv64.7 - 67.9%, water ratios Mv5.6 - 9.5% and air ratios A22.6 - 28.1%, permeability free, 24 hrs moisture FC4.5 - 7.8%, saturated percentage SP19.7 - 21.9%.

Electric conductivity under PF1.5 $EC_{1.5}$ 1.1 - 2.6 m mhos/cm•25°C and under saturated condition ECe1.0 - 1.2 m mhos/cm•25°C.

pH ($H_2O$) 7.0 - 7.5 +, CaO 0.15%, MgO 5 - 10 mg/100g•soil, $K_2O$ 8 - 15 mg/100g•soil and NaCl 0.01 - 0.10%.

PROFILE NO. 26

| | |
|---|---|
| Date of survey: | 17 Feb. 1982 |
| Location: | North (middle), 700m north site from Salhya road |
| Physiographic position: | Shifting sand dunes |
| Surrounding land form: | Gently undulating |
| Land use: | Desert |
| Parent material: | Aeolian sand originated alluvium |
| Great soil group: | Dystric Regosols (Rd), deep sandy phase |
| Soil series: | Md1, shifting sand dunes |

Profile description:

0∿100cm. No horizon development throughout 100cm depth, texture S-LS, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, permeability free, compactness loose.

PROFILE NO. 31

| | |
|---|---|
| Date of survey: | 19 Feb. 1982 |
| Location: | South west |
| Physiographic position: | Shifting sand dunes |
| Surrounding land form: | Gently rolling |
| Land use: | Desert |
| Parent material: | Aeolian sand originated alluvium |
| Great soil group: | Dystric Regosols (Rd), deep sandy phase |
| Soil series: | Md3, shifting sand dunes |

Profile description:

0∿100cm. No horizon development throughout 100cm depth, texture S-LS, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, porosity P33.4 - 36.9%, three phases under PF1.5 are solid ratios SV63.1 - 66.6%, water ratios Mv 5.1 - 9.2% and air ratios A24.5 - 30.8%, permeability free. 24 hrs moisture FC3.2 - 5.8%, saturated percentage SP18.6 - 20.6%. Electric conductivity under PF1.5 $EC_{1.5}$ 3.6 - 4.4 m mhos/cm•25°C and under saturated condition ECe 0.9 - 1.4 m mhos/cm•25°C. pH ($H_2O$) 7.5 +, CaO 0.15 - 0.20%, MgO 5 - 20 mg/100g•soil, $K_2O$ 3 - 8 mg/100g•soil and NaCl 0.05 - 0.10%

PROFILE NO. 32

| | |
|---|---|
| Date of survey: | 19 Feb. 1982 |
| Location: | South west |
| Physiographic position: | Shifting sand dunes |
| Surrounding land for v: | Gnntly rolling |
| Land use: | Desert |
| Parent material: | Aeolian sand originated alluvium |
| Great soil group: | Dystric Regosols (Rd), deep sandy phase |
| Soil series: | Md3, shifting sand dunes |

Profile description:

0∿100cm. No horizon development throughout 100cm depth, texture S-LS, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, permeability free, compactness loose.

PROFILE NO. 40

| | |
|---|---|
| Date of survey: | 22 Feb. 1982 |
| Location: | South, 1500m north site from new village area |
| Physiographic position: | Shifting sand dune |
| Surrounding land form: | Nearly flat |
| Land use: | Desert |
| Parent material: | Aeolian sand overlying alluvium |
| Great soil group: | Dystric Regosols (Rd), deep sandy phase |
| Soil series: | Md2, shifting sand dunes |

Profile description:

0~65cm. Shifting sand S, no horizon differentiation, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, permeability free, compactness loose. Smooth clear boundary.

65~100cm. Sublayer II originated old alluvium, texture LS, few small round gravells 5%, no humus, matrix color 2.5YR4/4 dull reddish brown, weakly developed medium subangular structure, no mottle, many fine pores, permeability fairly free, very compact.

PROFILE NO. 46

| | |
|---|---|
| Date of survey: | 23 Feb. 1982 |
| Location: | Center of project area, 600m south site from pilot farm No. 2 |
| Physiographic position: | Shifting sand dunes |
| Surrounding land for m: | Nearly flat |
| Land use: | Desert |
| Parent material: | Aeolian sand oriented old alluvium |

Great soil group: Dystric Regosols (Rd), deep sandy phase

Soil series: Md1, shifting sand dunes

Profile description:

0~100cm. No horizen development throughout 100cm depth, texture S-LS, no gravel, no humus, matrix color 10YR7/6 yellow orange, no mottle, structureless single particle, many fine pores, porosity P30.7 - 36.8%, three phases under PF1.5 are solid ratios Sv63.2 - 69.3%, water ratios Mv5.6 - 9.6% and air ratios A25.0 - 27.9%. Permeability free, saturated percentage SP15.9 - 23.2%. Electric conductivity under PF1.5 $EC_{1.5}$ 1.0 - 6.3 m mhos/cm·25°C and under saturated condition ECe1.7 - 2.0 m mhos/cm·25°C. pH ($H_2O$) 6.5 - 7.5+, Cao 0.10 - 0.15%, MgO 5 mg/100g·soil, $K_2O$ 3 - 8 mg/100g·soil and NaCl 0.10 - 0.15%.

PROFILE NO. 49

Date of survey 3 Mar. 1982

Location: North west

Physiographis position: Shifting sand dune

Surrounding land form: Gently undulating

Land use: Desert

Parent material: Aeolian sand originated alluvium

Great soil group: Dystric Regosols (Rd), deep sandy phase

Soil series: Md1, shifting sand dunes

Profile description:

0~100cm. No horizon development throughout 100cm depth, texture S-LS, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, permeability free, compactness loose.

PROFILE NO. 6

Date of survey: 11 Feb. 1982

Location: East (middle), 500m north site from pilot farm No. 1

Physiographic position: Old riverine terrace

Surrounding land form: Nearly flat

Land use: Desert

Parent material: Old alluvium

Great soil group: Haplic Yermosols (Yh), gravelly phase

Soil series: Mo3, Mollak soil series

Profile description:

0∿30cm. No horizon development, texture S, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, porosity P35.5%, three phases under PF1.5 are solid ratios Sv64.5%, water ratios Mv9.4% and air ratios A26.1%. Saturated percentage SP18.4%. Electric conductivity under PF1.5 $EC_{1.5}$ 4.7 m mhos/cm 25°C and under saturated condition ECe 1.4 m mhos/cm 25°C. Smooth clear boundary.

30∿50cm. Texture S. profuse fine round gravells, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, porosity P34.6%, three phases under PF1.5 are solid ratios Sv65.4% water ratios Mv6.1% and air ratios A28.5%. Saturated percentage SP14.9%. Electric conductivity under PF1.5 $EC_{1.5}$ 5.1 m mhos/cm•25°C and under sturated condition ECe3.8 m mhos/cm•25°C. Smooth clear boundary.

50∿100cm. Texture S, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, porosity P38.0%, three phases under PF1.5 are solid ratios Sv62.0%,

water ratios Mv14.6% and air ratios A23.4%. Saturated percentage SP15.5%. Electric conductivity under PF1.5 $EC_{1.5}$ 4.0 m mhos/cm•25°C and under saturated condition Ece3.2 m mhos/cm•25°C.

PROFILE NO. 7

Date of survey: 11 Feb. 1982

Location: East (middle), 1000m south site from pilot farm No. 1

Physiographic position: Old riverine terrace

Surrounding land form: Gently undulating

Land use: Desert

Parent material: Alluvium

Great soil group: Haplic Yermosols (Yh), common phase

Soil series: Mo1, mollak soil series

Profile description:

0∿20cm. Weakly developed A horizon, texture LS, common fine round gravells 7%, no humus, matrix color 5YR5/4 dull reddish brown, weakly developed medium subangular blocky structure, many fine pores, no mottle, permeability fairly free, somewhat compact. Smooth abrupt boundary.

20∿100cm. C horizon, texture S, no gravel, no humus, matrix color 10YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, permeability free, compactness loose.

PROFILE NO. 8

Date of survey: 11 Feb. 1982

Location: East (middle), 1200m south site from pilot farm No. 1

Physiographic position: Old riverine terrace

Surrounding land form: Nearly flat

Land use: Desert

Parent material: Alluvium

Great soil group: Haplic Yermosols (Yh), common phase

Soil series: Mo1, mollak soil series

Profile description:

0~15cm. Weakly developed A horizon, texture LS, common fine to small round gravells 7%, no humus, matrix color 5YR7/8 orange, very weak medium subangular blocky structure, many fine pores, no mottle, permeability fairly free, somewhat compact. Smooth gradual boundary.

15~100cm. C horizon, texture S, few fine to small round gravells 3%, no humus, matrix color 2.5YR7/4 light yellow, structureless massive like, many fine pores, no mottle, permeability fairly free, somewhat compact.

PROFILE NO. 10

Date of survey: 13 Feb. 1982

Location: North east, 500m north site from Salhia road

Physiographic position: Shifting sand dunes

Surrounding land form: Gently undulating

Land use: Desert

Parent material: Old alluvium

Great soil group: Haplic Yermosols (Yh), gravelly phase

Soil series: Mo3, mollak soil series

Profile description:

0~100cm. No horizon development through 100cm depth, texture S, many fine round gravells 15%, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, fine many pores, no mottle,

porosity P36.7 - 37.9%, three phases under PF1.5 are solid ratios Sv62.1 - 63.3%, water ratios Mv14.9 - 15.6% and air ratios A21.1 - 23.0%. Permeability free, saturated percentage SP20.1 -22.8%. Electric conductivity under PF1.5 $EC_{1.5}$ 4.3 - 4.9 m mhos/cm•25°C and under saturated condition ECe 1.8 - 4.6 m mhos/cm•25°C. pH ($H_2O$) 7.0, CaO 0.20%, MgO 5 - 10 mg/100g•soil, $K_2O$ 3 - 15 mg/-100g•soil and NaCl 0.01 - 0.10%.

PROFILE NO. 27

Date of survey: 17 Feb. 1982

Location: East (middle)

Physiographic position: Old riverine terrace

Surrounding land form: Nearly flat

Land use: Orange orchard

Parent material: Alluvium

Great soil group: Haplic Yermosols (Yh), common phase

Soil series: Mo1, mollak soil series

Profile description:

0∿15cm. Weakly developed A horizon, texture S, few fine round gravells 3%, no humus, matrix color 10YR7/8 yellow orange, structureless single particle, no mottles, many fine pores, permeability free, compactness loose. Smooth clear boundary.

15∿30cm. B1 horizon, texture LS, common fine to small round gravells 7%, no humus, matrix color 7.5YR5/4 dull brown weakly developed medium subangular blocky structure, no mottle, many fine pores, permeability free, somewhat compact. Elctric conductivity under PF1.5 $EC_{1.5}$ 3.5 m mhos/cm•25°C and under saturated condition ECe 2.2 m mhos/cm•25°C. Smooth clear boundary.

30∿55cm. B2 horizon, texture LS, common fine to small round gravells 5%, no humus, matrix color 5YR5/4 dull reddish brown, weakly developed medium subangular blocky structure, no mottle, many fine pores, permeability free, somewhat compact. Electric conductivity under PF1.5 $EC_{1.5}$ 3.8 m mohs/cm•25°C and under saturated condition ECe 2.4 m mhos/cm•25°C. Smooth clear boundary.

55∿100cm. C horizon, texture S, few find round gravells 3%, no humus, matrix color 10YR7/6 bright yellowish brown and 5YR4/4 dull reddish brown, structureless single particle, no mottle, many fine pores, permeability free, somewhat compact. Electric conductivity under PF1.5 $EC_{1.5}$ 3.7 m mhos/cm•25°C and under saturated condition ECe 2.4 m mohs/cm•25°C.

PROFILE NO. 28

Date of survey: 18 Feb. 1982

Location: East (middle)

Physiographic position: Old riverine terrace

Surrounding land form: Nearly flat

Land use: Orange orchard

Parent material: Old alluvium

Great soil group: Haplic Yermosols (Yh), gravelly phase

Soil series: Mo1, mollak soil series

Profile description:

0∿30cm. Texture S, few fine round gravells 3%, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, porosity P35.0 - 36.3%, three phases under PF1.5 are solid ratios Sv63.7 - 65.2%, water ratios Mv 6.7 - 9.3% and air ratios A25.7 - 29.6%. 24 hrs moisture FC3.1 - 5.9%, saturated

percentage SP20.6%. Electric conductivity under PF1.5 $EC_{1.5}$ 1.4 - 1.7 m mhos/cm•25°C. pH ($H_2O$) 7.0, CaO 0.10%, MgO 5 mg/-100g•soil, $K_2O$ 3 mg/100g•soil and NaCl 0.05%. Smooth clear boundary.

30~65cm. Texture LS, many fine to small round gravells 15%, no humus, matrix color 5YR5/4 dull reddish brown, weakly developed medium subangular blocky structure, no mottle, many fine pores, porosity P33.2 - 34.8%, three phases under PF1.5 are solid ratios Sv65.2 - 66.8%, water ratios Mv11.8 - 13.3% and air ratios A19.9 - 23.0%. Permeability free, 24 hrs moisture FC6.9 - 10.5%, saturated percentage SP19.7%. Electric conductivity under PF1.5 $EC_{1.5}$ 1.2 - 1.4 m mhos/cm•25°C and under saturated condition ECe1.3 - 1.8 m mhos/cm•25°C. pH ($H_2O$) 7.5 +, CaO 0.15%, MgO 10 mg/100g•soil, $K_2O$ 8 mg/100g•soil and NaCl 0.10%. Smooth clear boundary.

65~100cm. Texture S, common fine to small round gravells 5%, no humus, matrix color 10YR7/6 bright yellowish brown, structureless single particle, no mottle, many fine pores, permeability free, somewhat compact.

PROFILE NO. 29

| | |
|---|---|
| Date of survey: | 18 Feb. 1982 |
| Location: | East (middle) |
| Physiographic position: | Old riverine terrace |
| Surrounding land form: | Nearly flat |
| Land use: | Upland field |
| Parent material: | Alluvium |
| Great soil group: | Haplic Yermosols (Yh), gravelly phase |
| Soil series: | Moi, mollak soil series |

Profile description:

0∿30cm. Weakly developed A horizon, texture LS, common fine to small round gravells 10%, no humus, matrix color 5YR5/4 dull reddish brown, weakly developed medium subangular blocky structure, no mottle, porosity P32.7 - 34.5%, three phases under PF1.5 solid ratios Sv65.5 - 67.3%, water ratios Mv12.6 - 13.8% and air ratios A18.9 - 21.9%. Permeability free, 24 hrs moisture FC9.6 - 10.5%, saturated percentage SP19.6%. Electric conductivity under PF1.5 EC1.5 3.2 - 5.4 m mhos/cm•25°C and under saturated condition ECe 3.9 m mhos/cm•25°C. pH ($H_2O$) 7.5 +, CaO 0.20%, MgO 10 mg/100g•soil, $K_2O$ 3 mg/100g•soil and NaCl 0.10%. Smooth clear boundary.

30∿100cm. B horizon (subhorizon B1 30 - 60cm and B2 60-100cm), texture LS, common fine to small round gravells 5 - 7%, no humus, matrix color 5YR5/3∿4/4 dull reddish brown, no mottle, porosity P35.4 - 39.3%, three phases under PF1.5 are solid ratios Sv60.7 - 64.6%, water ratios Mv13.5 - 15.3% and air ratios A21.9 - 24.0%. Permeability free, 24 hrs moisture FC9.9 - 12.0%, saturated percentage SP18.6 - 20.2%. Electric conductivity under PF1.5 $EC_{1.5}$ 4.1 - 5.8 m mhos/-cm•25°C and under saturated condition ECe 3.8 - 3.9 m mhos/cm.25°C. pH ($H_2O$) 7.0 - 7.5 +, Cao 0.10 - 0.15%, MgO 10 - 20 mg/- 100g•soil $K_2O$ 3 - 8 mg/100•soil and NaCl 0.05%.

PROFILE NO. 30

| | |
|---|---|
| Date of survey: | 18 Feb. 1982 |
| Location: | East (middle) |
| Physiographic position: | Old riverine terrace |
| Surrounding land form: | Nearly flat |
| Land use: | Desert |

Parent material: Alluvium

Great soil group: Haplic Yermosols (Yh), gravelly phase

Soil series: Mo1, mollak soil series

Profile description:

0~25 cm. Weakly developed A horizon, texture LS, common fine to small round gravells 10%, no humus, matrix color 5YR5/4 dull reddish brown, weakly developed medium subangular blocky structure, no mottle, many fine pores, permeability free, somewhat compact. Smooth celar boundary.

25~65cm. B horizon, texture LS, common fine round gravells 5%, no humus, matrix color 7.5YR7/4 dull orange, structureless single particle, no mottle, many fine pores, permeability free, somewhat compact. Smooth clear boundary.

65~90cm. C horizon, gravelly layer, profuse fine to small round gravells 40%, no humus, matrix color 5YR4/4 dull reddish brown, weakly developed fine subangular blocky structure, no mottle, many fine pores, permeability free, compact. Smooth clear boundary.

90~100cm. C horizon, texture S, common fine to small gravells 7%, no humus, matrix color 7.5YR7/4 dull orange, structureless single particle, no mottle, many fine pores, permeability free, compact.

PROFILE NO. 44

Date of survey: 22 Feb. 1982

Location: Center

Physiographic position: Weakly developed desert pavement

Surrounding land form: Nearly flat

Land use: Desert

Parent material: Alluvium

Great soil group: Haplic Yermosols (Yh), gravelly phase

Soil series: Mo1, mollak soil series

Profile description:

Desert pavement, profuse fine to small round gravells on the ground surface are 25% by area base.

0∿30cm. Upper layer I originated alluvial sand, texture S, many fine to small round gravells 15%, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, many fine pores, permeability free, compactness loose. Smooth gradual boundary.

30∿100cm. Sublayer II originated alluvium, texture LS, no humus, common fine to small round gravells 5%, matrix color 2.5YR4/6 reddish brown, weakly developed medium subangular blocky structure, no mottle, many fine pores, permeability fairly free, somewhat compact.

PROFILE NO. 45

Date of survey: 23 Feb. 1982

Location: East (middle), 1200m south site from pilot farm No. 1

Physiographic position: Old riverine terrace

Surrounding land form: Nearly flat

Land use: Desert

Parent material: Old alluvium

Great soil group: Haplic Yermosols (Yh), common phase

Soil series: Mo1, mollak soil series

Profile description:

0∿10cm. Weakly developed A horizon, texture SL, few fine round gravells 3%, no humus, matrix color 5Y6/8 orange, weak fine subangular blocky structure, many fine pores, porosity P33.7%, three phases under PF1.5 are solid ratios Sv66.3%, water ratios Mv19.2% and air ratios A14.5% Permeability free, 24 hrs moisture FC13.4%, saturated percentage SP20.1%. Electric conductivity under PF1.5 $EC_{1.5}$ 1.8 m mhos/cm•25°C. pH ($H_2O$) 7.5, CaO 0.20%, MgO 5 mg/100g•soil, $K_2O$ 8 mg/100g•soil, and NaCl 0.10%. Smooth clear boundary.

10∿40cm. B horizon, texture SL, few fine round gravells 3%, no humus, matrix color 10YR6/6 bright yellowish brown, weak medium subangular blocky structure, no mottle, many fine pores, porosity P36.8 - 38.7%, three phases under PF1.5 are solid ratios Sv61.3 - 63.2%, water ratios Mv16.3 - 17.7% and air ratios A20.5 - 21.0%. Permeability free, 24 hrs moisture FC13.7%, saturated percentage SP 20.1%. Electric conductivity under PF1.5 $EC_{1.5}$ 2.8 m mhos/-cm•25°C. pH ($H_2O$) 7.5, CaO 0.20%, MgO 5 mg/100g•soil, $K_2O$ 8 mg/100g•soil and NaCl 0.05%. Smooth gradual boundary.

40∿100cm. C horizon (subhorizon C1 40 - 75cm and C2 75 - 100cm), texture LS, no gravel, no humus, matrix color 2.5Y6/4 dull yellow (C1) and 5Y6/4 olive yellow (C2) structureless single particle, no mottle, porosity P38.2 - 38.8%, three phases under PF1.5 are solid ratios Sv61.2 - 61.8%, water ratios Mv13.8 - 15.7% and air ratios A23.1 - 24.5%. Permeability free, 24 hrs moisture FC 10.6 - 11.3%, saturated percentage SP21.4 - 21.5%. Electric conductivity under PF1.5 $EC_{1.5}$ 3.5 - 5.5 m mhos/cm•25°C and under saturated

condition ECe 2.5 - 3.7 m mhos/cm•25°C. pH ($H_2O$) 7.5, CaO 0.15%, MgO 10 mg/100g•soil, $K_2O$ 3 mg/100g•soil and NaCl 0.10%.

PROFILE NO. 47

Date of survey: 3 Mar. 1982

Location: North east, 500m south site from northern border

Physiographic position: Desert pavement, old riverine terrace

Surrounding land form: Genetly undulating

Land use: Desert

Parent material: Old alluvium

Great soil group: Haplic Yermosols (Yh), gravelly phase

Soil series: Mo3, mollk soil series

Profile description:

Desert pavement. Many fine to small round gravells on the ground surface 40% by area base.

0∿5cm. Weakly developed A horizon, texture LS, few fine round gravells 5%, no humus, matrix color 5YR3/4 dark reddish brown, weak fine subangular blocky structure, no mottle, porosity P33.5% three phases under PF1.5 are solid ratios Sv66.5%, water ratios Mv22.1% and air ratios A11.4%. Permeability fairly free, saturated percentage SP20.1%. Electric conductivity under PF1.5 $EC_{1.5}$ 5.2 m mhos/cm•25°C and under saturated condition ECe 3.2 m mhos/cm•25°C. Smooth clear boundary.

5∿40cm. Weakly developed B horizon, texture S, profuse fine to small round gravells 30%, no humus, matrix color 10YR7/4 dull yellow orange, structureless single particle, no mottle, many fine pores,

porosity P32.4%, three phases under PF1.5 are solid ratios Sv67.2%, water ratios Mv21.8% and air ratios A11.0%. Permeability fairly free, saturated percentage SP18.64. Electric conductivity under PF1.5 $EC_{1.5}$ 6.1 m mhos/cm•25°C and under saturated condition ECe3.5 m mhos/cm•25°C. Smooth gradual boundary.

40∿70cm. C horizon, texture S, many fine to small round gravells 15%, no humus, matrix color 10YR7/4 dull yellow orange, structureless single particle, no mottle, many fine pores, porosity P32.4%, three phases under PF1.5 are solid ratios Sv67.6% water ratios Mv22.7% and air ratios A9.7%. Permeability fairly free, saturated percentage SP19.2%. Electric conductivity under PF1.5 $EC_{1.5}$ 5.0 m mhos/-cm•25°C and under saturated condition ECe 2.7 m mhos/cm•25°C. Smooth abrupt boundary.

70∿100cm. Weakly consolidated sand stone, matrix color 5Y6/4 olive yellow.

PROFILE NO. 51

Date of survey: 3 Mar. 1982

Location: North (middle), 1000m north site from Salhya road

Physiographic position: Weakly developed desert pavement

Surrounding land form: Gently undulating

Land use: Desert

Parent material: Alluvium

Great soil group: Haplic Yermosols (Yh), gravelly phase

Soil Mo3, Mollak soil series

Profile description:

Desert pavement. Weakly developed desert pavement, many fine to small round gravells on the ground surface 15% by area base.

0∿20cm. Weakly developed A horizon, texture LS, common fine to small round gravells 10%, no humus, matrix color 5YR5/2 grayish brown,

structureless single particle, no mottle, many fine pores, permeability free, somewhat compact. Smooth clear boundary.

20∿100cm. C horizon, texture S, common fine to small round gravells 5%, no humus, matrix color 7.5Y7/1 light gray, structureless single particle, no mottle, many fine pores, porosity P40.7%, three phases under PF1.5 are solid ratios Sv59.3%, water ratios Mv12.2% and air ratios A28.5%. Permeability free, somewhat compact. Electric conductivity under PF1.5 $EC_{1.5}$ 5.5 m •25°C and under saturated condition ECe 3.3 m mhos/cm·25°C.

PROFILE NO. 33

Date of survey: 19 Feb. 1982

Location: South (middle), 300m north site from Zagagig road

Physiographic position: Old riverine terrace

Surrounding land form: Nearly flat

Land use: Desert

Parent material: Old alluvium

Great soil group: Calcic Yermosols (Yk), gravelly phase

Soil series: Mo2, mollak soil series

Profile description:

0∿30cm. Weakly developed A horizon, texture LS, few fine round gravells 3%, no humus, matrix color 5YR6/8 orange, weakly developed medium subangular blocky structure, no mottle, porosity P33.8 - 37.0%, three phases under PF1.5 are solid ratios Sv63.0 - 66.2%, water ratios Mv10.5 - 12.8% and air ratios A21.0 - 26.5%. 24 hrs moisture FC8.7 - 10.0%, saturated percentage SP17.8%. Electric conductivity under PF1.5 $EC_{1.5}$ 2.5 - 4.6 m mhos/cm•25°C and under saturated condition ECe1.2 - 1.4 m mhos/cm•25°C. Smooth clear boundary.

30~60cm. B horizon, texture LS, many small round gravells 10%, no humus, matrix color 2.5YR3/6 dark reddish brown, weakly developed coarse subangular blocky structure, many $CaCO_3$ segregation (7.5Y8/1 light gray), porosity P33.3 - 35.3%, three phases under PF1.5 are solid ratios Sv64.7 - 66.7%, water ratios Mv8.6 - 11.2% and air ratio A24.4%. 24 hrs moisture FC7.2 - 10.0%, saturated percentage SP15.7%. Electric conductivity under PF1.5 $EC_{1.5}$ 3.4 - 5.6 m mohs/cm•25°C and under saturated condition ECe 2.0 - 3.2 m mhos/cm•25°C. Smooth clear boundary.

60~100cm. C horizon (subhorizons C1 60 - 80cm, C2 80 - 100cm), contents of gravel C1 10% and C2 20% respectively, no humus, matrix color 2.5YR4/8 reddish brown and 5YR6/6 orange, porosity P33.9%, three phases under PF1.5 are solid ratios Sv66.1%, water ratios Mv9.5% and air ratops A24.4%. 24 hrs moisture FC6.4%, saturated percentage SP17.3%. Electric conductivity under PF1.5 $EC_{1.5}$ 5.6 m mhos/cm•25°C and under saturated condition ECe4.0 - 4.6 m mhos/-cm•25°C.

PROFILE NO. 34

| | |
|---|---|
| Date of survey: | 20 Feb. 1982 |
| Location: | South, 700, north site from new village area |
| Physiographic position: | Old riverine terrace |
| Surrounding land form: | Nearly flat |
| Land use: | Desert |
| Parent material: | Old alluvium |
| Great soil group: | Calcic Yermosols (Yk), gravelly phase |
| Soil series: | Mo2, mollak soil series |

Profile description:

0∿55cm. Upper layer I, no horizon differentiation, texture LS, many fine to small round gravells 15%, no humus, matrix color 2.5YR4/4 dull reddish brown, weak medium subangular blocky structure, no mottle, many fine pores, permeability free, somewhat compact. Smooth clear boundary.

55∿90cm. Sublayer II, texture S, common fine to small round gravells 10%, no humus, matrix color 10YR7/4 dull yellow orange, structureless single particle, no mottle, many fine pores, permeability free, compactness loose. Smooth clear boundary.

90∿100m. Sublayer III, texture LS, many fine to small round gravells 15%, no humus, matrix color 2.5YR4/4 dull reddish brown, weak medium subangular blocky structure, no mottle, many fine pores, permeability fairly free, somewhat compact.

PROFILE NO. 35

| | |
|---|---|
| Date of survey: | 20 Feb. 1982 |
| Location: | South, 700m north site from new village area |
| Physiographic position: | Old riverine terrace |
| Surrounding land for v: | Nearly flat |
| Land use: | Desert |
| Parent material: | Aeolian sand originated alluvium |
| Great soil group: | Calcic Yermosols (Yk), gravelly phase |
| Soil series: | Md2, shifting sand dunes |

Profile description:

0∿35cm. Weakly developed A horizon originated shifting sand dunes, texture S, few fine round gravells 3%, no humus, matrix color 10YR8/6 yellow orange, structureless single particle, no mottle,

many fine pores, permeability free, compactness loose. Smooth clear boundary.

35~75cm. Horizon IIB, texture LS, many fine to small round gravells 15%, no humus, matrix color 2.5YR4/4 dull reddish brown, weak medium subangular blocky structure, many powdery $CaCO_3$ segregation (7.5Y8/1 light gray), many fine pores, permeability fairly free, very compact. Smooth clear boundary.

75~100cm. Horizon IIC, texture S, common fine round gravells 5%, no humus, matrix color 7.5YR6/8 orange, structureless single particle, no mottle, many fine pores, somewhat compact.

PROFILE NO. 36

Date of survey: 20 Feb. 1982

Location: South, 1500m north site from new village area

Physiographic position: Dome-shape dune, desert pavement

Surrounding land form: Nearly flat

Land use: Desert

Parent material: Alluvium

Great soil group: Calcic Yermosols (Yk), common phase

Soil series: Md2, shifting sand dunes

Profile description:

0~25cm. Upper layer I, texture LS, common fine to small gravells 7%, no humus, matrix color 2.5YR4/4 dull reddish brown, weak medium subangular blocky structure, few powdery $CaCO_3$ segregation (7.5Y8/1 light gray), many fine pores, somewhat compact. Smooth clear boundary.

25~75cm. Sublayer II, texture S, no gravel, no humus, matrix color 10YR7/4 dull yellow orange, structureless single particle, no mottle, many fine pores, permeability free, compactness loose. Smooth clear boundary.

75∿100cm. Sublayer III, texture LS, common fine to small gravells 10%, no humus, matrix color 2.5YR4/4 dull reddish brown, weak medium subangular blocky structure, many powdery $CaCO_3$ segregation (7.5Y-8/1 light gray), many fine pores, permeability fairly free, very compact.

PROFILE No. 38

Date of survey: 21 Feb. 1982

Location: South, 200m north site from new village area

Physiographic position: Old riverine terrace

Surrounding land form: Nearly flat

Land use: Desert

Parent material: Alluvium

Great soil group: Calcic Yermosols (Yk), gravelly phase

Soil series: Mo2, mollak soil series

Profile description:

0∿30cm. Weakly developed A horizon, texture LS, common fine to small gravells 10%, no humus, matrix color 5YR5/4 dull reddish brown, weak medium subangular blocky structure, few powdery $CaCO_3$ segregation, porosity P30.9 - 32.8%, three phases under PF1.5 are solid ratios Sv67.2 - 69.1%, water ratios Mv 13.5 - 15.7% and air ratios A15.2 - 19.3%. 24 hrs moisture FC10.6 - 11.4%, saturated percentage SP20.6%. Electric conductivity under PF1.5 $EC_{1.5}$ 1.0 - 4.2 m mhos/cm•25°C and under saturated condition Ece 2.2 m mhos/cm•25°C. pH ($H_2O$) 7.0, CaO 0.15%, MgO 5 mg/100g•soil, $K_2O$ 3 mg/100g•soil and NaCl 0.10%. Smooth gradual boundary.

30∿70cm. B horizon, texture LS, many fine to small gravells 15%, no humus, matrix color 5YR5/6 bright reddish brown, weak medium

subangular blocky structure, no mottle, porosity P34.1 - 35.7%, three phases under PF1.5 are solid ratios Sv64.3 - 65.9%, water ratios Mv11.4% and air ratios A22.8 - 24.2%. 24hrs moisture FC8.5 - 9.5%, saturated percentage SP23.6%. Electric conductivity under PF1.5 $EC_{1.5}$ 3.0 - 4.2 m mhos/cm·25°C and under saturated condition Ece 2.5 m mhos/cm·25°C. pH ($H_2O$) 6.5, CaO 0.20%, MgO 5 mg/100g·soil, $K_2O$ 3 mg/100g·soil and NaCl 0.05%. Smooth gradual boundary.

70~100cm. Horizon C, texture S, common fine to small gravells 7%, no humus, matrix color 7.5YR5/6 bright brown, structureless single particle, no mottle, porosity P37.2%, three phases under PF1.5 are solid ratios Sv62.8%, water ratios Mv10.3% and air ratios A26.9%. Permeability free, 24 hrs moisture FC10.3%, saturated percentage SP23.7%. Electric conductivity under PF1.5 $EC_{1.5}$ 2.7 m mohs/-cm·25°C and under saturated condition Ece2.0 m mhos/cm·25°C. pH ($H_2O$) 7.0, CaO 0.20%, MgO 10mg/100g·soil, $K_2O$ 3 mg/100g·soil and NaCl 0.05%.

PROFILE NO. 39

| | |
|---|---|
| Date of survey: | 22 Feb. 1982 |
| Location: | South, 1 km north site from new village area |
| Physiographic position: | Desert pavement, old riverine terrace |
| Surrounding land form: | Nearly flat |
| Land use: | Desert |
| Parent material: | Dune sand originated old alluvium |
| Great soil group: | Calcic Yermosols (Yk), gravelly phase |
| Soil series: | Md2, shifting sand dunes |

Profile description:

Desert pavement. Fine to small round gravells on the ground surface 50% by area base.

0∿30cm. Weakly developed A horizon, texture LS, many fine to small gravells 15%, no humus, matrix color 2.5YR4/6 reddish brown, weak medium subangular blocky structure, many powdery $CaCO_3$ segregation (7.5Y8/1 light gray), porosity P33.6 - 35.8%, three phases under PF1.5 are solid ratios Sv65.0 - 66.4%, water ratios Mv16.8 - 17.9% and air ratios A15.7 - 18.7%. Permeability free, 24 hrs moisture FC11.4 - 15.9%, saturated percentage SP20.4%. Electric conductivity under PF1.5 $EC_{1.5}$ 1.6 - 3.4 m mhos/cm•25°C and under saturated condition ECe 2.2 m mhos/cm•25°C. pH ($H_2O$) 7.5 +, CaO 0.20%, MgO 5 mg/100g•soil, $K_2O$ 15mg/100g•soil and NaCl 0.10%. Smooth gradual boundary.

30 100cm. C horizon, texture LS, few fine round gravells 3%, matrix color 5YR5/6 bright reddish brown, structureless massive like, no mottle, porosity P34.8 - 35.8%, three phases under PF1.5 are solid ratios Sv64.2 - 65.2%, water ratios Mv17.1 - 17.9% and air ratios A16.9 - 18.7%. 24 hrs moisture FC9.2 - 9.6%, saturated percentage SP21.2%. Electric conductivity under PF1.5 $EC_{1.5}$ 3.0 - 4.3 m mhos/cm•25°C and under saturated condition Ece 3.8 m mhos/cm•25°C. pH ($H_2O$) 7.0, CaO 0.20%, MgO 5 mg/100g•soil, $K_2O$ 3 mg/100g•soil and NaCl 0.05%.

PROFILE NO. 41

Date of survey: 22 Feb. 1982

Location: South, 1km north site from new village area

Physiographic position: Old riverine terrace

Surrounding land form: Nearly flat

Land use: Desert

Parent material: Old alluvium

Great soil group: Calcic Yermosols (Yk), common phase

Soil series: Mo2, mollak soil series

Profile description:

0∿38cm. Weakly developed A horizon, texture S, no gravel, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, many fine pores, porosity P30.4 - 33.3%, three phases under PF1.5 are solid ratios Sv66.7 - 69.6%, water ratios Mv8.5 - 18.3% and air ratios A13.8 - 24.8%. Permeability free, 24 hrs moisture FC4.2 - 10.5%, saturated percentage SP19.8%. Electric conductivity under PF1.5 $EC_{1.5}$ 1.1 - 2.6 m mhos/cm•25°C and under saturated condition ECe 1.9 m mhos/cm•25°C. pH ($H_2O$) 7.5, CaO 0.15%, MgO 5 mg/100g•soil $K_2O$ 15 mg/100g•soil and NaCl 0.15%. Smooth clear boundary.

38∿70cm. IIB1 horizon, texture LS, few fine round gravells 3%, no humus, matrix color 5YR6/6 orange, weak medium subangular blocky structure, many fine pores, many powdery $CaCO_3$ segregation (7.5Y8/1 light gray), porosity P34.3%, three phases under PF1.5 are solid ratios Sv65.7%, water ratios Mv14.3% and air ratios A20.0%. Permeability free, 24 hrs moisture FC10%, saturated percentage SP18.8%. Electric conductivity under PF1.5 $EC_{1.5}$ 3.5 m mhos/cm•25°C and under saturated condition Ece 2.9 m mhos/cm•25°C. pH ($H_2O$) 6.5, CaO 0.20%, MgO 5 mg/100g•soil, $K_2O$ 8 mg/100g•soil and NaCl 0.05%. Smooth gradual boundary.

70∿100cm. IIB2 horizon, texture LS, no gravel, no humus, matrix color 7.5YR6/6 orange, weak medium subangular blocky structure, many

fine pores, no mottle, porosity P35.8%, three phases under PF1.5 are solid ratios Sv64.2%, water ratios Mv9.1% and air ratios A26.7%. Permeability free. 24 hrs moisture FC8.1%, saturated percentage SP21.6%. Electric conductivity under PF1.5 $EC_{1.5}$ 2.7 m mhos/cm•25°C and under saturated condition Ece 2.1 m mhos/cm•25°C. pH ($H_2O$) 7.5, CaO 0.20%, MgO 5 mg/100g•soil, $K_2O$ 15 mg/100g•soil and NaCl 0.05%.

PROFILE NO. 42

Date of survey: 22 Feb. 1982

Location: South, 300m south site from Zagajig road

Physiographic position: Old riverine terrace

Surrounding land form: Nearly flat

Land use: Orange orchard

Parent material: Old alluvium

Great soil group: Calcic Yermosols (Yk), common phase

Soil series: Mo2, mollak soil series

Profile description:

0∿15cm. Weakly developed A horizon, texture LS, common fine to small round gravells 7%, few humus, matrix color 5YR5/4 dull reddish brown, weak medium subangular blocky structure, no mottle, many fine pores, porosity P28.7%, three phases under PF1.5 are solid ratios Sv71.3%, water ratios Mv14.4% and air ratios A14.3%. permeability free, 24 hrs moisture FC14.0%. Electric conductivity under PF1.5 $EC_{1.5}$ 7.4 m mhos/cm•25°C. Smooth gradual boundary.

15∿35cm. Weakly developed B horizon, texture LS, common fine to small round gravells 5%, no humus, matrix color 5YR6.6 orange, weak medium subangular blocky structure, no mottle, many fine pores,

porosity P30.3 - 33.3%, three phases under PF1.5 are solid ratios Sv66.7 - 69.7%, water ratios Mv8.6 - 10.7% and air ratios A19.6 - 24.7%. Permeability free, 24 hrs moisture FC8.6 - 9.2%, saturated percentage SP21.1%. Electric conductivity under PF1.5 $EC_{1.5}$ 6.9 - 7.6 m mhos/cm•25°C and under saturated condition Ece 3.6 m mhos/cm•25°C. pH ($H_2O$) 7.5 +, CaO 0.20%, MgO 5 mg/100g•soil, $K_2O$ 3 mg/100g•soil and NaCl 0.05%. Smooth gradual boundary.

35~100cm. C horizon (subhorizon C1 35-90cm and C2 90-100cm), few fine round gravells 3% in C1 subhorizon and no gravells in C2 subhorizon, no humus, matrix color 7.5YR7/8 yellow orange, structureless single particle, no mottle, porosity P34.1 - 34.3%, three phases under PF1.5 are solid ratios Sv65.7 -65.9%, water ratios Mv6.2 - 8.2% and air ratios A25.9 - 28.1%. Permeability free, 24 hrs moisture FC5.9 - 6.9%, saturated percentage SP20.0 - 20.5%. Electric conductivity under PF1.5 $EC_{1.5}$ 7.2 - 7.4 m mhos/cm•25°C and under saturated condition Ece 3.5 - 3.7 m mhos/cm•25°C. pH ($H_2O$) 7.0, CaO 0.20%, MgO 10 mg/100g•soil, $K_2O$ 15 mg/100g•soil and NaCl 0.10%.

PROFILE NO. 43

| | |
|---|---|
| Date of survey: | 22 Feb. 1982 |
| Location: | South, 1 km north site from Zagjig road |
| Physiographic position: | Dome shape dune |
| Surrounding land form: | Gently undulating |
| Land use: | Desert |
| Parent material: | Old alluvium |
| Great soil group: | Calcic Yermosols (Yk), gravelly phase |
| Soil series: | Mo2, mollak soil series |

Profile description:

0∿35cm. Weakly developed A horizon, texture S, profuse fine to medium round gravells 25%, no humus, matrix color 5YR4/3 dull reddish brown, structureless single particle, many fine pores, few powdery $CaCO_3$ segregation (7.5Y8/1 light gray), permeability free, compactness loose. Smooth gradual boundary.

35∿70cm. Weakly developed B horizon, texture S, profuse fine to medium round gravells 30%, no humus, matrix color 5YR5/3 dull reddish brown, structureless single particle, many fine pores, few powdery $CaCO_3$ segregation (7.5Y8/1 light gray), permeability free, compactness loose. Smooth gradual boundary.

70∿100cm. C horizon, texture S, profuse fine to small round gravells 30%, no humus, matrix color 5YR5/4 dull reddish brown, structureless single particle, many fine pores, no mottle, permeability free, compactness loose.

PROFILE NO. 48

| | |
|---|---|
| Date of survey: | 3 Mar. 1982 |
| Location: | North (middle), 200m south site from northern border |
| Physiographic position: | Desert pavement, old riverine terrace |
| Surrounding land form: | Gently undulating |
| Land use: | Desert |
| Parent material: | Old alluvium |
| Great soil goup: | Calcic Yermosols (Yk), gravelly phase |
| Soil series: | Mo2, mollak soil series |

Profile description:

Desert pavement. Profuse fine to small round gravells on the ground surface 45% by area base.

0∿5cm. Weakly developed A horizon, texture LS, few fine round gravells 5%, no humus, matrix color 5YR3/4 dark reddish brown, weak fine subangular blocky structure, no mottle, porosity P32.6%, three phases under PF1.5 are solid ratios Sv67.4%, water ratios Mv18.0% and air ratios A14.6%. Permeability free, saturated percentage SP20.4%. Electric conductivity under PF1.5 $EC_{1.5}$ 7.1 m mhos/-cm•25°C and under saturated condition Ece 3.8 m mhos/cm•25°C. Smooth clear boundary.

5∿25cm. Weakly developed B horizon, texture LS, profuse fine to small round gravells 25%, no humus, matrix color 5YR4/4 dull reddish brown, weak medium subangular blocky structure, many powdery $CaCO_3$ segregation, many fine pores, porosity P33.1%, three phases under PF1.5 are solid ratios Sv66.9%, water ratios Mv17.9% and air ratios A15.2%. Permeability free, saturated percentage SP19.1%. Electric conductivity under PF1.5 $EC_{1.5}$ 7.8 m mhos/cm•25°C and under saturated condition Ece 4.3 m mhos/cm•25°C. Smooth clear boundary.

25∿55cm. C horizon, texture S, many fine to small round gravells 15%, no humus, matrix color 10YR6/2 grayish yellow brown, structureless single particle, some snail fossil, no mottle, many fine pores, porosity P36.2%, three phases under PF1.5 are solid ratios Sv63.8%, water ratios Mv16.7% and air ratios A19.5%. Permeability free, saturated percentage SP18.7%. Electric conductivity under PF1.5 $EC_{1.5}$ 8.0 m mhos/cm•25°C and under saturated condition ECe 4.5 m mhos/cm•25°C. Smooth abrupt boundary.

55∿100cm. Weakly consolidated sand stone, matrix color 5Y6/4 olive yellow, structureless massive like, porosity P31.3%, three phases under PF1.5 are solid ratios Sv68.7%, water ratios Mv21.1% and air ratios A10.2%. Saturated percentage SP17.6%. Electric conductivity under PF1.5 $EC_{1.5}$ 6.3 m mhos/cm•25°C and under saturated condition ECe 3.9 m mhos/cm•25°C.

PROFILE NO. 24

Date of survey: 17 Feb. 1982

Location: North west, 700m south site from Salhya road

Physiographic position: Old riverine terrace, dome shape dune

Surrounding land form: Gently rolling

Land use: Desert

Parent material: Gravells originated alluvium

Great soil group: Unknown (surrounding area Dystric Regosols Rd)

Soil series: Unknown (surrounding area Md3, shifting sand dune)

Profile description:

0∿100cm. Gravelly and coarse sandy layers are reciprocally accumulated in the profile throughout 100cm depth, gravelly layers are 0∿10cm, 35∿65cm and 85∿100cm, coarse sandy layers are 10∿35cm and 65∿85cm.

Gravelly layer: Profuse small to large round gravells 50%, matrix color 5YR5/4 reddish brown, structureless single particle, many fine pores, permeability free, compact.

Coarse sandy layer: Common fine to small round gravells 5%, no humus, matrix color 7.5YR6/4 dull orange, structureless single particle, no mottle, many fine pores, permeability free, compactness loose and somewhat compact. Electric conductivity under saturated condition ECe 2.7 m mhos/cm•25°C.

PROFILE NO. 37

| | |
|---|---|
| Date of survey: | 20 Feb. 1982 |
| Location: | South east |
| Physiographic position: | Old riverine terrace |
| Surrounding land form: | Nearly flat |
| Land use: | Desert |
| Parent material: | Old riverine alluvium |
| Great soil group: | Unknown (Calcic Yermosols Yk) |
| Soil series: | Unknown (Mo2, mollak soil series) |

Profile description:

Gravel layer about 100cm thick, relatively uniform small round gravells.

Soil Units and Soil Series of this site are unknown, but for surrounding area of this site, Soil Units and Soil Series are Calcic Yermosols (Yk) gravelly phase and Mollak soil series (Mo2) respectively.

PROFILE NO. 50

| | |
|---|---|
| Date of survey: | 3 Mar. 1982 |
| Location: | North weat |
| Physiographic position: | Old riverine terrace, many dome-shape dunes |
| Surrounding land form: | Gently rolling |
| Land use: | Desert |
| Parent material: | Gravells originated alluvium |
| Great soil group: | Unknown (surrounding area Dystric Regosols Rd) |
| Soil series: | Unknown (surrounding area Md3, shifting sand dune) |

Profile description:

0∿90cm. Gravel layer, no horizon differentiation, profuse small to medium mainly 10∿30mm diameter round gravells 50%, matrix color of interposed sandy fraction 7.5YR5/2 grayish brown.

90cm∿ . Weakly consolidated sand stone, matrix color 10Y6/2 olive gray, structureless massive like, no mottle, very compact.

Table III. C. 5. Physical Properties of Soil Profiles (1)

Soil Units: Rd　　Soil Series: Md1

| Profile Nos. & Depth | Under PF 1.5 Solid ratio Sv % | Water ratio Mv % | Air ratio A % | Poro-sity P % | Satur-ation H % | Unfilled percent. U % | Volume weight S g | Moist. con-tents Mo % | 24 hrs mois-ture (FC) % | Av. water capa-city AWC % | Satur-ated perc. SP % | $EC_{1.5}$ m mhos/-cm·25°C | ECe m mhos/-cm·25°C | Matrix color | Tex-ture | Gra-vells % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. 1 20cm | 65.4 | 10.2 | 24.4 | 34.4 | 29.7 | 70.3 | 173.3 | 5.9 | - | - | 21.6 | 3.7 | 1.2 | 7.5YR7/8 | LS | 0 |
| 50cm | 66.3 | 11.8 | 21.9 | 33.7 | 35.0 | 65.0 | 173.7 | 6.7 | - | - | 19.8 | 3.1 | 1.6 | " | " | " |
| 85cm | 61.5 | 14.4 | 24.1 | 38.5 | 37.4 | 62.6 | 162.9 | 8.8 | - | - | 22.5 | 3.4 | 1.3 | " | " | " |
| No. 3 20cm | 63.3 | 11.7 | 25.0 | 36.7 | 31.9 | 68.1 | 167.8 | 7.0 | - | - | 16.8 | 3.9 | 1.1 | 7.5YR8/8 | S | 0 |
| 50cm | 63.2 | 11.5 | 25.3 | 36.8 | 31.3 | 68.7 | 167.4 | 6.9 | - | - | 16.1 | 4.1 | 1.6 | " | " | " |
| 85cm | 65.3 | 14.4 | 25.3 | 34.7 | 41.5 | 58.5 | 166.1 | 8.7 | - | - | 19.3 | 4.5 | 1.8 | " | " | " |
| No.11 20cm | 68.7 | 12.4 | 18.9 | 31.3 | 39.6 | 60.4 | 182.0 | 6.8 | - | - | 19.4 | 3.8 | 1.5 | 7.5YR7/8 | S | 0 |
| 50cm | 67.9 | 8.9 | 23.2 | 32.1 | 27.7 | 72.3 | 180.0 | 4.9 | - | - | 17.8 | 4.8 | 2.3 | " | " | " |
| 85cm | 62.5 | 11.7 | 25.8 | 37.5 | 31.2 | 68.8 | 165.7 | 7.1 | - | - | 18.6 | 4.6 | 2.6 | " | " | " |
| No.15 0-5cm | 62.7 | 7.0 | 30.3 | 37.3 | 18.8 | 81.2 | 166.2 | 4.2 | 5.3 | 4.3 | - | 4.5 | - | 7.5YR7/8 | S | 0 |
| 10cm | 63.0 | 8.5 | 28.5 | 37.0 | 23.0 | 77.0 | 166.9 | 5.1 | 5.5 | 5.7 | - | 3.2 | - | " | " | " |
| 20cm | 61.9 | 9.1 | 29.0 | 38.1 | 23.9 | 76.1 | 164.0 | 5.5 | 4.6 | 6.8 | 21.7 | 4.5 | 3.6 | " | " | " |
| 30cm | 67.1 | 10.1 | 22.8 | 32.9 | 30.7 | 69.3 | 277.8 | 5.7 | 4.8 | 7.7 | - | 3.9 | - | " | " | " |
| 50cm | 62.2 | 10.5 | 27.3 | 37.8 | 27.8 | 72.2 | 164.9 | 6.4 | 4.5 | 8.2 | 20.6 | 3.2 | 2.0 | " | " | " |
| 85cm | 67.3 | 9.1 | 23.6 | 32.7 | 27.8 | 72.2 | 178.3 | 5.1 | 3.1 | 7.5 | 17.7 | 3.1 | 2.2 | " | " | " |
| No.16 0-5cm | 64.7 | 6.8 | 28.5 | 35.3 | 19.3 | 80.7 | 171.4 | 4.0 | 3.9 | 4.8 | - | 4.6 | - | 7.5YR7/8 | S | 0 |
| 10cm | 65.0 | 7.0 | 28.0 | 35.0 | 20.0 | 80.0 | 172.2 | 4.1 | 4.0 | 5.0 | - | 4.3 | - | " | " | " |
| 20cm | 65.6 | 9.7 | 24.7 | 34.4 | 28.2 | 71.8 | 173.9 | 5.6 | 4.3 | 7.5 | 17.4 | 3.3 | 1.7 | " | " | " |
| 30cm | 63.9 | 9.0 | 27.1 | 36.1 | 24.9 | 75.1 | 169.4 | 5.3 | 5.8 | 6.1 | - | 4.4 | - | " | " | " |
| 50cm | 65.7 | 9.9 | 24.4 | 34.3 | 28.9 | 71.1 | 174.1 | 5.7 | 7.0 | 6.4 | 17.6 | 4.1 | 1.3 | " | " | " |
| 85cm | 65.5 | 10.4 | 24.1 | 34.5 | 30.1 | 69.9 | 173.5 | 6.1 | 9.0 | 5.9 | 17.1 | 4.5 | 1.3 | " | " | " |

Table III. C. 5. Physical Properties of Soil Profiles (2)

Soil Units: Rd  Soil Series: Md1

| Items / Profile Nos.& Depth | Under PF 1.5 | | | | | | | | 24 hrs moisture | Av. water capacity | Saturated perc. | $EC_{1.5}$ | ECe | Matrix | Texture | Gravells |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Solid ratio Sv % | Water ratio Mv % | Air ratio A % | Porosity P % | Saturation H % | Unfilled percent. U % | Volume weight S g | Moist. contents Mo % | (FC) % | AWC % | SP % | m mhos/-cm•25°C | m mhos/-cm•25°C | color | | % |
| No.17 10cm | 65.9 | 10.2 | 23.9 | 34.1 | 29.9 | 70.1 | 174.6 | 5.8 | 7.8 | 6.3 | - | 5.5 | - | 10YR6/8 | S | 0 |
| 20cm | 63.8 | 7.0 | 29.2 | 36.2 | 19.3 | 80.7 | 169.1 | 4.1 | 6.0 | 4.0 | 21.5 | 4.9 | 1.6 | " | " | " |
| 50cm | 64.6 | 8.1 | 27.3 | 35.4 | 22.9 | 77.1 | 171.3 | 4.7 | 6.4 | 4.9 | 20.8 | 5.0 | 1.6 | 7.5YR6/8 | " | " |
| 85cm | 65.6 | 8.6 | 25.8 | 34.4 | 25.0 | 75.0 | 173.8 | 4.9 | 5.6 | 5.8 | 18.7 | 5.7 | 1.6 | 7.5YR5/8 | " | " |
| No.18 10cm | 64.4 | 7.7 | 27.9 | 35.6 | 21.6 | 78.4 | 170.7 | 4.5 | 5.7 | 4.8 | - | 3.8 | - | 7.5YR6/8 | S | 0 |
| 20cm | 65.8 | 9.2 | 25.0 | 34.2 | 26.9 | 73.1 | 174.4 | 5.3 | 6.2 | 6.1 | 20.1 | 3.7 | 2.0 | " | " | " |
| 50cm | 68.6 | 10.2 | 21.2 | 31.4 | 32.5 | 67.5 | 181.8 | 5.6 | 7.3 | 6.5 | 18.9 | 2.3 | 2.3 | " | " | " |
| 85cm | 66.9 | 10.6 | 22.5 | 33.1 | 32.0 | 68.0 | 177.3 | 6.0 | 8.1 | 6.5 | 20.2 | 3.0 | 2.4 | " | " | " |
| No.21 10cm | 65.6 | 13.8 | 20.6 | 34.4 | 40.1 | 59.9 | 173.8 | 7.9 | 8.5 | 9.5 | - | 3.2 | - | 7.5YR7/8 | S | 0 |
| 20cm | 61.8 | 11.7 | 26.5 | 38.2 | 30.6 | 69.4 | 163.7 | 7.1 | 7.8 | 7.8 | 17.9 | 3.3 | 1.6 | " | " | " |
| 30cm | 62.2 | 13.9 | 23.9 | 37.8 | 36.8 | 63.2 | 164.9 | 8.4 | 8.3 | 9.7 | - | 2.6 | - | " | " | " |
| 50cm | 62.4 | 14.3 | 23.3 | 37.6 | 38.0 | 62.0 | 165.3 | 8.7 | 9.0 | 9.8 | 21.6 | 2.7 | 1.4 | " | " | " |
| 85cm | 66.7 | 14.1 | 19.2 | 33.3 | 42.3 | 57.7 | 176.8 | 8.0 | 10.7 | 8.7 | 18.7 | 2.3 | 1.4 | " | " | " |
| No.22 10cm | 62.2 | 9.7 | 28.1 | 37.8 | 25.7 | 74.3 | 164.8 | 5.9 | 5.4 | 7.0 | - | 3.1 | - | 7.5YR7/8 | S | 0 |
| 20cm | 63.3 | 12.9 | 23.8 | 36.7 | 35.1 | 64.9 | 167.7 | 7.7 | 8.7 | 8.5 | 21.1 | 4.4 | 2.2 | " | " | " |
| 30cm | 65.1 | 12.0 | 22.9 | 34.9 | 34.4 | 65.6 | 172.5 | 7.0 | 7.5 | 8.2 | - | 4.2 | - | " | " | " |
| 50cm | 65.0 | 13.2 | 21.8 | 35.0 | 37.7 | 62.3 | 172.3 | 7.7 | 9.2 | 8.6 | 20.8 | 4.4 | 2.1 | " | " | " |
| 85cm | 62.5 | 14.9 | 22.6 | 37.5 | 39.7 | 60.3 | 165.6 | 9.0 | 10.8 | 9.5 | 17.0 | 4.4 | 3.0 | " | " | " |

Table III. C. 5. Physical Properties of Soil Profiles(3)

Soil Units: Rd Soil Series: Md1

| Profile Nos. & Depth | Items | Under PF 1.5 | | | | | | | | 24 hrs moisture (FC) % | Av. water capacity AWC % | Saturated perc. SP % | $EC_{1.5}$ m mhos/-cm·25°C | ECe m mhos/-cm·25°C | Matrix color | Texture | Gravells % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Solid ratio Sv % | Water ratio Mv % | Air ratio A % | Porosity P % | Saturation H % | Unfilled percent. U % | Volume weight S g | Moist. contents Mo % | | | | | | | | |
| No.25 | 10cm | 67.0 | 5.6 | 27.4 | 33.0 | 17.0 | 83.0 | 177.5 | 3.2 | 4.5 | 3.2 | - | 2.6 | - | 7.5YR6/8 | S | 0 |
| | 20cm | 67.9 | 9.5 | 22.6 | 32.1 | 29.6 | 70.4 | 179.9 | 5.3 | 7.8 | 5.6 | 21.8 | 1.5 | 1.2 | " | " | " |
| | 30cm | 67.6 | 7.9 | 24.5 | 32.4 | 24.4 | 75.6 | 179.2 | 4.4 | 5.8 | 5.0 | - | 1.1 | - | " | " | " |
| | 50cm | 66.4 | 8.5 | 25.1 | 33.6 | 25.3 | 74.7 | 176.0 | 4.8 | 7.0 | 5.0 | 21.9 | 2.1 | 1.0 | " | " | " |
| | 85cm | 64.7 | 7.2 | 28.1 | 35.3 | 20.4 | 79.6 | 171.4 | 4.2 | 6.2 | 4.0 | 19.7 | 2.3 | 1.0 | " | " | " |
| No.46 | 10cm | 65.5 | 9.5 | 25.0 | 34.5 | 27.5 | 72.5 | 173.6 | 5.5 | 8.0 | 5.5 | - | 1.0 | - | 10YR7/8 | S | 0 |
| | 20cm | 63.2 | 8.9 | 27.9 | 36.8 | 24.2 | 75.8 | 167.5 | 5.3 | 7.7 | 5.0 | 21.2 | 3.1 | 2.0 | " | " | " |
| | 30cm | 64.1 | 8.5 | 27.4 | 35.9 | 23.7 | 76.3 | 169.8 | 5.0 | 6.6 | 5.2 | - | 5.8 | - | " | " | " |
| | 50cm | 64.2 | 9.6 | 26.2 | 35.8 | 26.8 | 73.2 | 170.2 | 5.6 | 8.3 | 5.4 | 18.9 | 3.8 | 1.7 | " | " | " |
| | 85cm | 69.3 | 5.6 | 25.1 | 30.7 | 18.2 | 81.8 | 183.7 | 3.0 | 4.3 | 3.4 | 17.0 | 6.3 | 1.8 | " | " | " |

Table III. C. 5. Physical Properties of Soil Profiles (4)

Soil Units: Rd  Soil Series: Md3

| Items / Profile Nos. & Depth | Under PF 1.5 | | | | | | | | 24 hrs moisture | Av. water capacity | Saturated perc. | $EC_{1.5}$ | ECe | Matrix | Texture | Gravells |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Solid ratio | Water ratio | Air ratio | Porosity | Saturation | Unfilled percent. | Volume weight | Moist. contents | | | | | | color | | |
| | Sv % | Mv % | A % | P % | H % | U % | S g | Mo % | (FC) % | AWC % | SP % | m mhos/-cm·25°C | m mhos/-cm·25°C | | | % |
| No.23 10cm | 68.5 | 12.3 | 19.2 | 31.5 | 39.0 | 61.0 | 181.6 | 6.8 | 9.6 | 7.5 | - | 1.9 | - | 10YR7.8 | S | 0 |
| 20cm | 68.2 | 10.7 | 21.1 | 31.8 | 33.6 | 66.4 | 180.7 | 5.9 | 10.1 | 5.6 | 18.7 | 2.0 | 0.8 | " | " | " |
| 30cm | 68.7 | 12.0 | 19.3 | 31.3 | 38.3 | 61.7 | 182.1 | 6.6 | 6.0 | 9.0 | - | 4.3 | - | " | " | " |
| 50cm | 66.5 | 9.9 | 23.6 | 33.5 | 29.6 | 70.4 | 176.2 | 5.6 | - | - | 14.5 | 6.3 | 2.6 | " | " | " |
| 85cm | 71.8 | 10.9 | 17.3 | 28.2 | 38.7 | 61.3 | 190.2 | 5.7 | - | - | 17.3 | 6.2 | 2.7 | " | " | " |
| No.31 10cm | 66.6 | 7.4 | 26.0 | 33.4 | 22.2 | 77.8 | 176.5 | 4.2 | 3.6 | 5.6 | - | 4.1 | - | 7.5YR7/8 | S | 0 |
| 20cm | 66.3 | 9.2 | 24.5 | 33.7 | 27.3 | 72.7 | 175.7 | 5.2 | 5.8 | 6.3 | 20.3 | 3.9 | 0.9 | " | " | " |
| 30cm | 63.1 | 6.1 | 30.8 | 36.9 | 16.5 | 83.5 | 167.2 | 3.6 | 3.9 | 4.1 | - | 3.6 | - | " | " | " |
| 50cm | 65.2 | 5.1 | 29.7 | 34.8 | 14.7 | 85.3 | 172.7 | 3.0 | 3.2 | 3.5 | 20.6 | 4.4 | 0.9 | " | " | " |
| 85cm | 66.5 | 5.3 | 28.2 | 33.5 | 15.8 | 84.2 | 176.2 | 3.0 | 3.3 | 3.6 | 18.6 | 4.2 | 1.4 | " | " | " |
| No.20 20cm | 63.6 | 12.5 | 23.9 | 36.4 | 34.3 | 65.7 | 168.5 | 7.4 | 6.1 | 9.3 | 16.5 | 2.8 | 2.1 | 7.5YR7/8 | S | 0 |
| 50cm | 65.7 | 8.4 | 25.9 | 34.3 | 24.5 | 75.5 | 174.0 | 4.8 | 5.4 | 5.7 | 16.4 | 5.5 | 2.2 | " | " | " |
| 85cm | 67.8 | 6.2 | 26.0 | 32.2 | 19.3 | 80.7 | 179.7 | 3.5 | 5.4 | 3.5 | 15.8 | 4.1 | 2.6 | " | " | " |

Table III. C. 5. Physical Properties of Soil Profiles (5)

Soil Units: Yh Soil Series: Mo3

| Items / Profile Nos.& Depth | Under PF 1.5 Solid ratio Sv % | Water ratio Mv % | Air ratio A % | Poro-sity P % | Satur-ation H % | Unfilled percent. U % | Volume weight S g | Moist. con-tents Mo % | 24 hrs mois-ture (FC) % | Av. water capa-city AWC % | Satur-ated perc. SP % | $EC_{1.5}$ m mhos/-cm·25°C | ECe m mhos/-cm·25°C | Matrix color | Tex-ture | Gra-vells % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. 6 20cm | 64.5 | 9.1 | 26.1 | 35.5 | 26.5 | 73.5 | 171.0 | 5.5 | - | - | 18.4 | 4.7 | 1.4 | 7.5YR7/8 | S | 0 |
| 40cm | 65.4 | 6.1 | 28.5 | 34.6 | 17.6 | 82.4 | 173.3 | 3.5 | - | - | 14.9 | 5.1 | 3.8 | " | " | 30 |
| 85cm | 62.0 | 14.6 | 23.4 | 38.0 | 23.4 | 76.6 | 164.3 | 8.9 | - | - | 15.5 | 4.0 | 3.2 | " | " | 0 |
| No.10 20cm | 63.2 | 15.4 | 21.4 | 36.8 | 41.8 | 58.2 | 167.5 | 9.2 | - | - | 22.8 | 4.3 | 1.8 | 7.5YR7/8 | S | 15 |
| 50cm | 62.1 | 14.9 | 23.0 | 37.9 | 39.3 | 60.7 | 164.5 | 9.1 | - | - | 20.1 | 4.9 | 2.8 | " | " | 15 |
| 85cm | 63.3 | 15.6 | 21.1 | 36.7 | 42.5 | 57.5 | 167.8 | 9.3 | - | - | 21.6 | 4.5 | 2.6 | " | " | 15 |
| No.47 0-5cm | 66.5 | 22.1 | 11.4 | 33.5 | 66.0 | 34.0 | 176.2 | 12.5 | - | - | 20.1 | 5.2 | 3.2 | 5YR3/4 | LS | 5 |
| 20cm | 67.2 | 21.8 | 11.0 | 32.8 | 66.5 | 33.5 | 178.1 | 12.2 | - | - | 18.6 | 6.1 | 3.5 | 10YR7/4 | S | 30 |
| 50cm | 67.6 | 22.7 | 9.7 | 32.4 | 70.1 | 29.9 | 179.2 | 12.7 | - | - | 19.2 | 5.0 | 2.7 | " | " | 15 |

Table III. C. 5. Physical Properties of Soil Profiles(6)

Soil Units: Yh　　Soil Series: Mo1

| Items / Profile Nos. & Depth | | Under PF 1.5 | | | | | | | | 24 hrs moisture (FC) % | Av. water capacity AWC % | Saturated perc. SP % | $EC_{1.5}$ m mhos/cm·25°C | ECe m mhos/cm·25°C | Matrix color | Texture | Gravells % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Solid ratio Sv % | Water ratio Mv % | Air ratio A % | Porosity P % | Saturation H % | Unfilled percent. U % | Volume weight S g | Moist. contents Mo % | | | | | | | | |
| No.28 | 10cm | 63.7 | 6.7 | 29.6 | 36.3 | 18.5 | 81.5 | 168.8 | 4.0 | 3.1 | 5.1 | - | 1.5 | - | 7.5YR7/8 | S | 3 |
| | 20cm | 65.0 | 9.3 | 25.7 | 35.0 | 26.6 | 73.4 | 172.3 | 5.4 | 5.9 | 6.3 | 20.6 | 1.7 | 0.9 | " | " | 3 |
| | 30cm | 65.2 | 11.8 | 23.0 | 34.8 | 33.9 | 66.1 | 172.8 | 6.8 | 6.9 | 8.3 | 20.1 | 1.4 | 1.8 | 5YR5/4 | LS | 15 |
| | 50cm | 66.8 | 13.3 | 19.9 | 33.2 | 40.0 | 60.0 | 177.1 | 7.5 | 10.5 | 7.8 | 19.7 | 1.2 | 1.3 | " | " | 15 |
| No.29 | 10cm | 65.5 | 12.6 | 21.9 | 34.5 | 36.5 | 63.5 | 173.5 | 7.3 | 9.6 | 8.8 | - | 3.2 | - | 5YR5/4 | LS | 10 |
| | 20cm | 67.3 | 13.8 | 18.9 | 32.7 | 42.2 | 57.8 | 178.3 | 7.7 | 10.5 | 8.5 | 19.6 | 5.4 | 3.9 | " | " | 10 |
| | 30cm | 64.6 | 13.5 | 21.9 | 35.4 | 38.1 | 61.9 | 171.2 | 7.9 | 9.9 | 8.5 | - | 4.1 | - | 5YR5/3 | LS | 7 |
| | 50cm | 61.6 | 15.2 | 23.2 | 38.4 | 39.6 | 60.4 | 163.2 | 9.3 | 11.4 | 9.5 | 20.2 | 5.8 | 3.9 | " | " | 7 |
| | 85cm | 60.7 | 15.3 | 24.0 | 39.3 | 38.9 | 61.1 | 160.8 | 9.5 | 12.0 | 9.3 | 18.6 | 5.4 | 3.8 | 5YR4/4 | LS | 5 |
| No.45 | 10cm | 66.3 | 19.2 | 14.5 | 33.7 | 57.0 | 43.0 | 175.7 | 10.9 | 13.9 | 12.2 | - | 1.8 | - | 5YR6/8 | SL | 3 |
| | 20cm | 63.2 | 16.3 | 20.5 | 36.8 | 44.3 | 55.7 | 167.5 | 9.7 | 13.5 | 9.5 | 20.1 | 2.9 | 3.2 | 10YR6/6 | SL | 3 |
| | 30cm | 61.3 | 17.7 | 21.0 | 38.7 | 45.7 | 54.3 | 162.4 | 10.9 | 13.8 | 10.8 | - | 2.7 | - | " | " | 3 |
| | 50cm | 61.2 | 15.7 | 23.1 | 38.2 | 41.1 | 58.9 | 162.2 | 9.6 | 11.3 | 9.0 | 21.5 | 5.5 | 3.7 | 2.5YR6/4 | LS | 0 |
| | 85cm | 61.7 | 13.8 | 24.5 | 38.3 | 36.0 | 64.0 | 163.6 | 8.4 | 10.6 | 8.5 | 21.4 | 3.5 | 2.5 | 5Y6/4 | LS | 0 |

Table III. C. 5. Physical Properties of Soil Profiles(7)

Soil Units: Yk  Soil Series: Mo2

| Profile Nos. & Depth | Items | Under PF 1.5 | | | | | | | | 24 hrs moisture | Av. water capacity | Saturated perc. | $EC_{1.5}$ | ECe | Matrix color | Texture | Gravells |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Solid ratio Sv % | Water ratio Mv % | Air ratio A % | Porosity P % | Saturation H % | Unfilled percent. U % | Volume weight S g | Moist. contents Mo % | (FC) % | AWC % | SP % | m mhos/-cm·25°C | m mhos/-cm·25°C | | | % |
| No.33 | 10cm | 66.2 | 12.8 | 21.0 | 33.8 | 37.9 | 62.1 | 175.4 | 7.3 | 8.7 | 8.4 | - | 4.6 | - | 5YR6/8 | LS | 3 |
| | 20cm | 63.0 | 10.5 | 26.5 | 37.0 | 28.4 | 71.6 | 167.0 | 6.3 | 8.8 | 6.1 | 17.8 | 2.5 | 1.4 | " | " | 3 |
| | 30cm | 64.7 | 11.2 | 24.1 | 35.3 | 31.7 | 68.3 | 171.4 | 6.5 | 10.0 | 6.2 | - | 3.4 | - | 2.5YR3/6 | LS | 10 |
| | 50cm | 66.7 | 8.6 | 24.7 | 33.3 | 25.8 | 74.2 | 176.7 | 4.9 | 7.2 | 5.0 | 15.7 | 5.6 | 3.2 | " | " | 10 |
| | 85cm | 66.1 | 9.5 | 24.4 | 33.9 | 28.0 | 72.0 | 175.2 | 5.4 | 6.4 | 6.3 | 17.3 | 5.6 | 4.6 | 5YR6/6 | S | 40 |
| No.38 | 10cm | 69.1 | 15.7 | 15.2 | 30.9 | 50.8 | 49.2 | 183.1 | 8.6 | 11.4 | 10.0 | - | 1.0 | - | 5YR5/4 | LS | 10 |
| | 20cm | 67.2 | 13.5 | 19.3 | 32.8 | 41.2 | 58.8 | 178.2 | 7.6 | 10.6 | 8.2 | 20.6 | 2.6 | 2.2 | " | " | 10 |
| | 30cm | 65.9 | 11.3 | 22.8 | 34.1 | 33.1 | 66.9 | 174.6 | 6.5 | 8.5 | 7.0 | - | 4.2 | - | 5YR5/6 | LS | 15 |
| | 50cm | 64.3 | 11.5 | 24.2 | 35.7 | 32.2 | 67.8 | 170.4 | 6.7 | 9.5 | 6.7 | 23.6 | 3.0 | 2.5 | " | " | 15 |
| | 85cm | 62.8 | 10.3 | 26.9 | 37.2 | 27.7 | 72.3 | 166.4 | 6.2 | 10.3 | 5.1 | 23.7 | 2.7 | 2.0 | 7.5YR5/6 | S | 7 |
| No.48 | 0-5cm | 67.4 | 18.0 | 14.6 | 32.6 | 55.2 | 44.8 | 178.6 | 10.1 | - | - | 20.4 | 7.1 | 3.8 | 5YR3/4 | LS | 5 |
| | 20cm | 66.9 | 17.9 | 15.2 | 33.1 | 54.1 | 45.9 | 167.3 | 10.7 | - | - | 19.1 | 7.8 | 4.3 | 5YR4/4 | " | 25 |
| | 50cm | 63.8 | 16.7 | 19.5 | 36.2 | 46.1 | 53.9 | 169.1 | 9.9 | - | - | 18.7 | 8.0 | 4.5 | 10YR6/2 | S | 15 |
| | 85cm | 68.7 | 21.1 | 10.2 | 31.3 | 67.4 | 32.6 | 182.1 | 11.6 | - | - | 17.6 | 6.3 | 3.9 | 5Y6/4 | R | - |
| No.41 | 10cm | 66.7 | 8.5 | 24.8 | 33.3 | 25.5 | 74.5 | 176.9 | 4.8 | 7.3 | 4.8 | - | 1.1 | - | 7.5YR7/8 | S | 0 |
| | 20cm | 69.6 | 11.1 | 19.3 | 30.4 | 36.5 | 63.5 | 184.4 | 6.0 | 4.2 | 9.0 | 19.8 | 2.6 | 1.9 | " | " | " |
| | 30cm | 67.9 | 18.3 | 13.8 | 32.1 | 57.0 | 43.0 | 179.9 | 10.2 | 10.5 | 13.0 | - | 2.3 | - | " | " | " |
| | 50cm | 65.7 | 14.3 | 20.0 | 34.3 | 41.7 | 58.3 | 174.1 | 8.2 | 10.0 | 9.3 | 18.8 | 3.5 | 2.9 | 5YR6/6 | LS | 3 |
| | 85cm | 64.2 | 9.1 | 26.7 | 35.8 | 25.4 | 74.6 | 170.2 | 5.3 | 8.1 | 5.0 | 21.6 | 2.7 | 2.1 | 7.5YR6/6 | LS | 0 |

Table III. C. 5. Physical Properties of Soil Profiles (8)

Soil Units: Yk  Soil Series: Mo2

| Items / Profile Nos. & Depth | Under PF 1.5 | | | | | | | | 24 hrs moisture | Av. water capacity | Saturated perc. | $EC_{1.5}$ | ECe | Matrix color | Texture | Gravels |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Solid ratio | Water ratio | Air ratio | Porosity | Saturation | Unfilled percent. | Volume weight | Moist. contents | | | | | | | | |
| | Sv % | Mv % | A % | P % | H % | U % | S g | Mo % | (FC) % | AWC % | SP % | m mhos/-cm·25°C | m mhos/-cm·25°C | | | % |
| No.42 10cm | 71.3 | 14.4 | 14.3 | 28.7 | 50.2 | 49.8 | 189.0 | 7.6 | 14.0 | 7.4 | - | 7.4 | - | 5YR5/4 | LS | 7 |
| 20cm | 69.7 | 10.7 | 19.6 | 30.3 | 35.3 | 64.7 | 184.7 | 5.8 | 9.2 | 6.1 | 21.1 | 6.9 | 3.6 | 5YR6/6 | " | 5 |
| 30cm | 66.7 | 8.6 | 24.7 | 33.3 | 25.8 | 74.2 | 176.8 | 4.9 | 6.8 | 5.2 | - | 7.6 | - | " | " | 5 |
| 50cm | 65.9 | 8.2 | 25.9 | 34.1 | 24.0 | 76.0 | 174.7 | 4.7 | 6.9 | 4.7 | 20.0 | 7.4 | 3.7 | 7.5YR7/8 | S | 3 |
| 85cm | 65.7 | 6.2 | 28.1 | 34.3 | 18.1 | 81.9 | 174.1 | 3.6 | 5.9 | 3.2 | 20.5 | 7.2 | 3.5 | " | " | 0 |

Table III. C. 5. Physical Properties of Soil Profiles (9)

Soil Units: Yk Soil Series: Md2

| Profile Nos. & Depth | Items | Under PF 1.5 | | | | | | | | 24 hrs moisture | Av. water capacity | Saturated perc. | $EC_{1.5}$ | ECe | Matrix | Texture | Gravells |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Solid ratio | Water ratio | Air ratio | Porosity | Saturation | Unfilled percent. | Volume weight | Moist. contents | | | | | | | | |
| | | Sv % | Mv % | A % | P % | H % | U % | S g | Mo % | (FC) % | AWC % | SP % | m mhos/-cm·25°C | m mhos/-cm·25°C | color | | % |
| No.39 | 10cm | 66.4 | 17.9 | 15.7 | 33.6 | 53.3 | 46.7 | 175.9 | 10.2 | 15.9 | 9.9 | - | 1.6 | - | 2.5YR4/6 | LS | 15 |
| | 20cm | 65.0 | 16.8 | 18.2 | 35.0 | 48.0 | 52.0 | 172.3 | 9.8 | 11.4 | 11.1 | 20.4 | 3.4 | 2.2 | " | " | 15 |
| | 30cm | 64.2 | 17.1 | 18.7 | 35.8 | 47.8 | 52.2 | 170.1 | 10.1 | 9.6 | 12.3 | - | 3.0 | - | 5YR5/6 | LS | 3 |
| | 50cm | 65.2 | 17.9 | 16.9 | 34.8 | 51.4 | 48.6 | 172.8 | 10.4 | 9.2 | 13.3 | 21.2 | 4.3 | 3.8 | " | " | 3 |

Table III. C. 6 Textural Composition of Soil Profiles (1)

| Samples \ Items | | Total | Gravel > 2mm | Coarse Sand 2∿0.2mm | 2∿1mm | 1∿0.2mm | Fine Sand> 0.2mm > | Soil Unit |
|---|---|---|---|---|---|---|---|---|
| Profile No.24 | | | | | | | | |
| 20cm | kg | 3.39 | 1.55 | 1.34 | 0.14 | 1.20 | 0.50 | Unknown |
| | % | 100.0 | 45.7 | 39.5 | 4.1 | 35.4 | 14.7 | |
| Profile No.48 | | | | | | | | |
| 0-5cm | kg | 2.55 | 0.39 | 1.52 | 0.21 | 1.31 | 0.64 | Yk |
| | % | 100.0 | 15.3 | 59.6 | 8.2 | 51.4 | 25.1 | S.S.Mo3 |
| 20cm | kg | 1.03 | 0.33 | 0.58 | 0.20 | 0.38 | 0.12 | " |
| | % | 100.0 | 32.0 | 56.3 | 19.4 | 36.9 | 11.7 | |
| 50cm | kg | 1.40 | 0.30 | 1.03 | 0.43 | 0.60 | 0.07 | " |
| | % | 100.0 | 21.4 | 73.6 | 30.7 | 42.9 | 5.0 | |
| 85cm | kg | 1.23 | 0.02 | 1.06 | 0.13 | 0.93 | 0.15 | |
| | % | 100.0 | 1.6 | 86.2 | 10.6 | 75.6 | 12.2 | |
| Profile No.47 | | | | | | | | |
| 0-5cm | kg | 1.21 | 0.16 | 0.84 | 0.10 | 0.74 | 0.21 | Yh |
| | % | 100.0 | 13.2 | 69.5 | 8.3 | 61.2 | 17.4 | S.S.Mo3 |
| 20cm | kg | 1.48 | 0.17 | 1.12 | 0.21 | 0.91 | 0.19 | " |
| | % | 100.0 | 11.5 | 75.7 | 14.2 | 61.5 | 12.8 | |
| 50cm | kg | 1.37 | 0.10 | 1.09 | 0.10 | 0.99 | 0.18 | " |
| | % | 100.0 | 7.3 | 79.6 | 7.3 | 72.3 | 13.1 | |
| Profile No.50 | | | | | | | | |
| 50cm | kg | 2.40 | 1.21 | 1.06 | 0.09 | 0.97 | 0.13 | Unknown |
| | % | 100.0 | 50.4 | 44.2 | 3.8 | 40.4 | 5.4 | |

Table III. C. 6 Textural Composition of Soil Profiles (2)

| Samples \ Items | | Total | Gravel > 2mm | Coarse Sand 2∿0.2mm | Coarse Sand 2∿1mm | Coarse Sand 1∿0.2mm | Fine Sand> 0.2mm > | Soil Unit |
|---|---|---|---|---|---|---|---|---|
| Profile No.51 | | | | | | | | |
| | kg | 1.23 | 0.03 | 1.10 | 0.05 | 1.05 | 0.10 | Yh |
| | % | 100.0 | 2.4 | 89.4 | 4.1 | 85.4 | 8.1 | S.S.Mo3 |
| Profile No.16 | | | | | | | | |
| 20cm | kg | 1.04 | 0 | 0.87 | 0.01 | 0.86 | 0.17 | Rd |
| | % | 100.0 | 0 | 83.7 | 1.0 | 82.7 | 16.3 | S.S.Md1 |
| 50cm | kg | 0.88 | 0 | 0.73 | 0.02 | 0.71 | 0.15 | " |
| | % | 100.0 | 0 | 83.0 | 2.3 | 80.7 | 17.0 | |
| 85cm | kg | 0.85 | 0.01 | 0.71 | 0.04 | 0.67 | 0.13 | " |
| | | 100.0 | 1.2 | 83.5 | 4.7 | 78.8 | 15.3 | |
| Profile No.18 | | | | | | | | |
| 20cm | kg | 0.64 | 0.03 | 0.51 | 0.03 | 0.48 | 0.10 | Rd |
| | % | 100.0 | 4.7 | 79.7 | 4.7 | 75.0 | 15.6 | S.S.Md1 |
| 50cm | kg | 0.87 | 0.05 | 0.65 | 0.03 | 0.62 | 0.17 | |
| | % | 100.0 | 5.7 | 74.7 | 3.4 | 71.3 | 19.5 | " |
| 85cm | kg | 0.62 | 0.02 | 0.44 | 0.04 | 0.40 | 0.16 | |
| | % | 100.0 | 3.2 | 71.0 | 6.5 | 64.5 | 25.8 | " |
| Profile No.10 | | | | | | | | |
| 20cm | kg | 0.86 | 0.02 | 0.63 | 0.04 | 0.59 | 0.21 | Yh |
| | % | 100.0 | 2.3 | 73.3 | 4.7 | 68.6 | 24.4 | S.S.Mo3 |
| 50cm | kg | 1.00 | 0.04 | 0.72 | 0.09 | 0.63 | 0.24 | " |
| | % | 100.0 | 4.0 | 72.0 | 9.0 | 63.0 | 24.0 | |
| 85cm | kg | 0.94 | 0.07 | 0.58 | 0.18 | 0.40 | 0.29 | " |
| | % | 100.0 | 7.4 | 61.7 | 19.1 | 42.6 | 30.9 | |

Table III. C. 7 Distributional Range of Soil Physical Properties of Soil Units

| Items / Soil Units | 3 phases under PF 1.5 | | | | | 24 hours moisture | Available water capacity |
|---|---|---|---|---|---|---|---|
| | Solid ratio Sv % | Water ratio Mv % | Air ratio A % | Porosity P % | Volume Weight S g/100cc | (FC) % | AWC % |
| Dystric Regosols Rd | 61.5 - 71.8 | 5.1 - 14.9 | 17.3 - 30.8 | 28.2 - 38.5 | 162.9 - 183.7 | 3.1 - 10.8 | 3.2 - 9.8 |
| Haplic Yermosols Yh | 60.7 - 67.6 | 6.1 - 22.7 | 9.7 - 28.5 | 32.4 - 39.3 | 160.8 - 179.2 | 3.1 - 13.8 | 5.1 - 12.5 |
| Calcic Yermosols Yk | 62.8 - 71.3 | 6.2 - 21.1 | 10.2 - 28.1 | 28.7 - 37.2 | 166.4 - 189.0 | 3.7 - 15.9 | 3.2 - 13.0 |

| Items / Soil Units | Particle size distribution | | | | | Electric Conductivity m mhos/cm·25°C | | Saturated percentage |
|---|---|---|---|---|---|---|---|---|
| | Gravel % | Coarse Sand 2.0-0.2mm % | 2.0-1.0mm % | 1.0-0.2mm % | Fine Sand> % | $EC_{1.5}$ | ECe | SP % |
| Dystric Regosols Rd | 0 - 5.7 | 71.0-90.4 | 1.0 -6.5 | 64.5-75.0 | 9.2-25.8 | 1.0-6.3 | 0.8-3.6 | 14.5-22.5 |
| Haplic Yermosols Yh | 2.3-13.2 | 61.7-89.4 | 4.1-19.1 | 42.6-85.4 | 8.1-30.9 | 1.2-6.1 | 0.9-3.9 | 14.9-22.8 |
| Calcic Yermosols Yk | 1.6-32.0 | 56.3-86.2 | 8.2-30.7 | 36.9-75.6 | 5.0-25.1 | 2.5-8.0 | 1.2-4.6 | 15.7-23.7 |

Table III.C.8 Frequency of Soil Physical Properties

Soil Units: Dystric Regosols (Rd)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Solid Ratio Sv % | 60.0 | 62.0 | 64.0 | 66.0 | 68.0 | 70.0 | 72.0 | |
| Frequancy Number n | 0 | 3 | 16 | 21 | 15 | 6 | 1 | 0 |
| Frequancy % | 0 | 4.8 | 25.8 | 33.9 | 24.2 | 9.7 | 1.6 | 0 |
| Water Ratio Mv % | 4.0 | 6.0 | 8.0 | 10.0 | 12.0 | 14.0 | 16.0 | |
| Frequancy Number n | 0 | 4 | 10 | 20 | 14 | 9 | 5 | 0 |
| Frequancy % | 0 | 6.5 | 16.1 | 32.3 | 22.6 | 14.5 | 8.1 | 0 |
| Air Ratio A % | 18.0 | 20.0 | 22.0 | 24.0 | 26.0 | 28.0 | 30.0 | |
| Frequancy Number n | 1 | 4 | 5 | 13 | 17 | 11 | 9 | 2 |
| Frequancy % | 1.6 | 6.5 | 8.1 | 21.0 | 27.4 | 17.7 | 14.5 | 3.2 |
| Porosity P % | 28.0 | 30.0 | 32.0 | 34.0 | 36.0 | 38.0 | 40.0 | |
| Frequancy Number n | 0 | 1 | 6 | 15 | 21 | 16 | 3 | 0 |
| Frequancy % | 0 | 1.6 | 9.7 | 24.2 | 32.9 | 25.8 | 4.8 | 0 |
| Elec. Cond.EC m.mhos/cm.25°C | 2.0 | 3.0 | 4.0 | 5.0 | 6.0 | 7.0 | 8.0 | |
| Frequancy Number n | 4 | 9 | 20 | 21 | 5 | 3 | 0 | 0 |
| Frequancy % | 6.5 | 14.5 | 32.3 | 33.9 | 8.1 | 4.8 | 0 | 0 |
| Elec. Cond. ECe m.mhos/cm.25°C | 1.2 | 1.6 | 2.0 | 2.4 | 2.8 | 3.2 | 3.6 | |
| Frequancy Number n | 6 | 9 | 10 | 10 | 5 | 1 | 0 | 1 |
| Frequancy % | 14.3 | 21.4 | 23.8 | 23.8 | 11.9 | 2.4 | 0 | 2.4 |
| Sat. perc. SP % | 15.0 | 16.0 | 17.0 | 18.0 | 19.0 | 20.0 | 21.0 | 22.0 |
| Frequancy Number n | 1 | 1 | 4 | 9 | 7 | 4 | 7 | 8 | 1 |
| Frequancy % | 2.4 | 2.4 | 9.5 | 21.4 | 16.7 | 9.5 | 16.7 | 19.0 | 2.4 |

Soil Units: Calcic Yermosols (Yk)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Solid Ratio Sv | % | 62.0 | 64.0 | 66.0 | 68.0 | 70.0 | 72.0 | 74.0 | |
| Frequancy Number | n | 0 | 3 | 9 | 10 | 4 | 1 | 0 | 0 |
| Frequancy | % | 0 | 11.1 | 33.3 | 37.0 | 14.8 | 3.7 | 0 | 0 |
| Water Ratio A | % | 8.0 | 10.0 | 12.0 | 14.0 | 16.0 | 18.0 | 20.0 | |
| Frequancy Number | n | 1 | 6 | 7 | 2 | 3 | 5 | 2 | 1 |
| Frequancy | % | 3.7 | 22.1 | 25.9 | 7.4 | 11.1 | 18.5 | 7.4 | 3.7 |
| Air Ratio A | % | 12.0 | 14.0 | 16.0 | 18.0 | 20.0 | 22.0 | 24.0 | 26.0 | 28.0 |
| Frequancy Number | n | 1 | 1 | 5 | 0 | 6 | 2 | 1 | 7 | 3 |
| Frequancy | % | 3.7 | 3.7 | 18.5 | 0 | 22.2 | 7.4 | 3.7 | 25.9 | 11.1 |
| Porosity P | % | 28.0 | 30.0 | 32.0 | 34.0 | 36.0 | 38.0 | 40.0 | | |
| Frequancy Number | n | 0 | 1 | 4 | 10 | 9 | 3 | 0 | 0 | |
| Frequancy | % | 0 | 3.7 | 14.8 | 37.0 | 33.3 | 11.1 | 0 | 0 | |
| Elec.Cond.EC m.mhos/cm.25°C | | 2.0 | 3.0 | 4.0 | 5.0 | 6.0 | 7.0 | 8.0 | | |
| Frequancy Number | n | 2 | 3 | 4 | 2 | 2 | 1 | 2 | 1 | |
| Frequancy | % | 11.8 | 17.6 | 23.5 | 11.8 | 11.8 | 5.9 | 11.8 | 5.9 | |
| Elec.Cond.ECe m.mhos/cm.25°C | | 1.6 | 2.0 | 2.4 | 2.8 | 3.2 | 3.6 | 4.0 | 4.4 | 4.8 |
| Frequancy Number | n | 2 | 0 | 4 | 1 | 0 | 1 | 2 | 2 | 2 |
| Frequancy | % | 14.3 | 0 | 28.6 | 7.1 | 0 | 7.1 | 14.3 | 14.3 | 14.3 |
| Sat. perc. SP | % | 16.0 | 17.0 | 18.0 | 19.0 | 20.0 | 21.0 | 22.0 | 23.0 | |
| Frequancy Number | n | 1 | 0 | 3 | 1 | 1 | 3 | 0 | 0 | 2 |
| Frequancy | % | 9.1 | 0 | 27.3 | 9.1 | 9,1 | 27.3 | 0 | 0 | 18.2 |

Soil Units: Haplic Yermosols (Yr)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Solid Ratio | % | 60.0 | 62.0 | 64.0 | 66.0 | 68.0 | 70.0 | 72.0 | |
| Frequancy Number | n | 0 | 5 | 6 | 6 | 6 | 0 | 0 | 0 |
| Frequancy | % | 0 | 21.7 | 26.1 | 26.1 | 26.1 | 0 | 0 | 0 |
| Water Ratio Mv | % | 8.0 | 10.0 | 12.0 | 14.0 | 16.0 | 18.0 | 20.0 | 22.0 |
| Frequancy Number | n | 1 | 2 | 1 | 5 | 7 | 3 | 1 | 1 | 2 |
| Frequancy | % | 4.3 | 8.7 | 4.3 | 21.7 | 30.4 | 13.0 | 4.3 | 4.3 | 8.7 |
| Air Ratio A | % | 10.0 | 12.0 | 14.0 | 16.0 | 18.0 | 20.0 | 22.0 | 24.0 | |
| Frequancy Number | n | 1 | 2 | 0 | 1 | 0 | 2 | 6 | 5 | 3 |
| Frequancy | % | 4.3 | 8.7 | 0 | 4.3 | 0 | 8.7 | 26.1 | 21.7 | 13.0 |
| Porosity P | % | 28.0 | 30.0 | 32.0 | 34.0 | 36.0 | 38.0 | 40.0 | | |
| Frequancy Number | n | 0 | 0 | 0 | 6 | 6 | 5 | 6 | 0 | 0 |
| Frequancy | % | 0 | 0 | 0 | 26.1 | 26.1 | 21.7 | 26.1 | 0 | 0 |
| Elec.Cond.EC m.mhos/cm.25°C | | 1.0 | 2.0 | 3.0 | 4.0 | 5.0 | 6.0 | 7.0 | | |
| Frequancy Number | n | 0 | 5 | 2 | 2 | 6 | 7 | 1 | 0 | |
| Frequancy | | 0 | 21.7 | 8.7 | 8.7 | 26.1 | 30.4 | 4.3 | 0 | |
| Elec.Cond.Ece m.mhos/cm.25°C | | 1.2 | 1.6 | 2.0 | 2.4 | 2.8 | 3.2 | 3.6 | 4.0 | 4.8 |
| Frequancy Number | n | 1 | 2 | 2 | 0 | 3 | 1 | 4 | 2 | 2 |
| Frequancy | % | 5.9 | 11.8 | 11.8 | 0 | 17.7 | 5.9 | 23.5 | 11.8 | 11.8 |
| Sat. perc. SP | % | 15.0 | 16.0 | 17.0 | 18.0 | 19.0 | 20.0 | 21.0 | 22.0 | |
| Frequancy Number | n | 1 | 1 | 0 | 0 | 3 | 3 | 6 | 3 | 1 |
| Frequancy | % | 4.3 | 4.3 | 0 | 0 | 13.0 | 13.0 | 26.1 | 13.0 | 4.3 |

Tables III. C. 9 Chemical Properties of Soil Profiles (1)

| Soil Unit | Dystric Regosols Rd | | | | |
|---|---|---|---|---|---|
| Items / Profile Nos. & Depth | PH ($H_2O$) | CaO % | MgO mg/100g.s | $K_2O$ mg/100g.s | NaCl % |
| No.11 20 cm | 7.5 | 0.15 | 5 | 3 | 0.15 |
| 50 | 7.5 | 0.15 | 5 | 3 | 0.10 |
| 85 | 7.0 | 0.15 | 10 | 15 | 0.01 |
| No.15 20 | 7.5 | 0.15 | 5 | 15 | 0.10 |
| 50 | 7.0 | 0.10 | 5 | 3 | 0.10 |
| 85 | 7.0 | 0.10 | 10 | 8 | 0.01 |
| No.16 20 | 7.5 | 0.20 | 5 | 15 | 0.05 |
| 50 | 7.0 | 0.10 | 5 | 15 | 0.15 |
| 85 | 7.5 | 0.15 | 10 | 8 | 0.01 |
| No.17 20 | 7.0 | 0.15 | 20 | 3 | 0.10 |
| 50 | 7.5 | 0.15 | 5 | 3 | 0.15 |
| 85 | 7.5 | 0.15 | 5 | 15 | 0.15 |
| No.18 20 | 7.0 | 0.20 | 10 | 3 | 0.05 |
| 50 | 7.5 | 0.20 | 20 | 8 | 0.10 |
| 85 | 7.5 | 0.15 | 10 | 15 | 0.05 |
| No.20 20 | 7.0 | 0.07 | 20 | 3 | 0.05 |
| 50 | 7.5 | 0.15 | 5 | 8 | 0.10 |
| 85 | 7.5 | 0.15 | 10 | 15 | 0.05 |

| Soil Unit | Dystric Regosols Rd | | | | |
|---|---|---|---|---|---|
| Items / Profile Nos. & Depth | PH ($H_2O$) | CaO % | MgO mg/100g.s | $K_2O$ mg/100g.s | NaCl % |
| No.21 20 cm | 7.0 | 0.15 | 5 | 8 | 0.05 |
| 50 | 7.0 | 0.07 | 5 | 3 | 0.10 |
| 85 | 7.5 | 0.20 | 5 | 5 | 0.05 |
| No.22 20 | 7.0 | 0.10 | 10 | 15 | 0.05 |
| 50 | 7.5 | 0.15 | 5 | 3 | 0.10 |
| 85 | 7.0 | 0.15 | 5 | 3 | 0.01 |
| No.23 20 | 7.5 | 0.15 | 5 | 3 | 0.10 |
| 50 | 6.5 | 0.15 | 35 | 3 | 0.05 |
| 85 | 6.5 | 0.15 | 5 | 15 | 0.01 |
| No.25 20 | 7.0 | 0.15 | 10 | 15 | 0.01 |
| 50 | 7.0 | 0.15 | 10 | 8 | 0.10 |
| 85 | 7.5 | 0.15 | 5 | 15 | 0.05 |
| No.31 20 | 7.5 | 0.15 | 5 | 3 | 0.10 |
| 50 | 7.5 | 0.15 | 20 | 8 | 0.05 |
| 85 | 7.5 | 0.20 | 20 | 3 | 0.05 |
| No.46 20 | 7.5 | 0.10 | 5 | 3 | 0.10 |
| 50 | 6.5 | 0.15 | 5 | 8 | 0.10 |
| 85 | 7.0 | 0.15 | 5 | 3 | 0.15 |

Tables III. C. 9 Chemical Properties of Soil Profiles (2)

| Soil Unit | Haplic Yermosols Yh | | | | |
|---|---|---|---|---|---|
| Items / Profile Nos.& Depth | PH ($H_2O$) | CaO % | MgO mg/ 100g.s | MgO mg/ 100g.s | NaCl % |
| No.10 20 cm | 7.0 | 0.20 | 10 | 15 | 0.10 |
| 50 | 7.0 | 0.20 | 5 | 15 | 0.01 |
| 85 | 7.0 | 0.20 | 5 | 3 | 0.01 |
| No.27 20 | 7.0 | 0.15 | 5 | 3 | 0.01 |
| 40 | 7.0 | 0.20 | 10 | 3 | 0.01 |
| 70 | 7.5 | 0.20 | 5 | 8 | 0.05 |
| No.28 20 | 7.0 | 0.10 | 5 | 3 | 0.05 |
| 30 | 7.0 | 0.15 | 5 | 8 | 0.10 |
| 50 | 7.5 | 0.15 | 10 | 8 | 0.10 |
| No.29 20 | 7.5 | 0.20 | 10 | 3 | 0.10 |
| 50 | 7.5 | 0.15 | 20 | 8 | 0.05 |
| 85 | 7.0 | 0.10 | 10 | 3 | 0.05 |
| No.45 20 | 7.5 | 0.20 | 5 | 8 | 0.05 |
| 50 | 7.5 | 0.15 | 10 | 3 | 0.10 |
| 85 | 7.5 | 0.15 | 5 | 3 | 0.10 |
| No.47 0 - 5 | 7.5 | 0.15 | 5 | 3 | 0.05 |
| 20 | 7.5 | 0.15 | 5 | 8 | 0.10 |
| 50 | 7.0 | 0.15 | 5 | 3 | 0.05 |

| Soil Unit | Haplic Yermosols Yh | | | | |
|---|---|---|---|---|---|
| Items / Profile Nos.& Depth | PH ($H_2O$) | CaO % | MgO mg/ 100g.s | MgO mg/ 100g.s | NaCl % |
| No.33 20 cm | 7.5 | 0.15 | 5 | 3 | 0.10 |
| 50 | 7.6 | 0.20 | 10 | 3 | 0.15 |
| 85 | 7.6 | 0.15 | 10 | 8 | 0.15 |
| No.38 20 | 7.0 | 0.15 | 5 | 3 | 0.10 |
| 50 | 6.5 | 0.20 | 5 | 3 | 0.05 |
| 85 | 7.0 | 0.20 | 10 | 3 | 0.05 |
| No.39 20 | 7.5 | 0.20 | 5 | 15 | 0.10 |
| 50 | 7.0 | 0.20 | 5 | 3 | 0.05 |
| 85 | - | - | - | - | - |
| No.41 20 | 7.5 | 0.15 | 5 | 15 | 0.15 |
| 50 | 6.5 | 0.20 | 5 | 8 | 0.05 |
| 85 | 7.5 | 0.20 | 5 | 15 | 0.05 |
| No.42 20 | 7.5 | 0.20 | 5 | 3 | 0.05 |
| 50 | 7.0 | 0.20 | 10 | 15 | 0.10 |
| 85 | - | - | - | - | - |
| No.48 0 - 5 | 7.5 | 0.15 | 5 | 3 | 0.10 |
| 20 | 7.5 | 0.20 | 10 | 8 | 0.15 |
| 50 | 7.0 | 0.20 | 5 | 3 | 0.10 |
| 85 | 7.0 | 0.15 | 5 | 3 | 0.05 |

Table III.C.10 Distributional Range of Chemical Properties of Soil Units

| Items / Soil Units | PH ($H_2O$) | CaO % | MgO mg/ 100 g.Soil | $K_2O$ mg/ 100 g.Soil | NaCl % |
|---|---|---|---|---|---|
| Dystric Regosols Rd | 6.5 - 7.6 | 0.07 - 0.20 | 5 - 20 | 3 - 15 | 0.01 - 0.15 |
| Haplic Yermosols Yh | 7.0 - 7.8 | 0.10 - 0.20 | 5 - 20 | 3 - 15 | 0.01 - 0.10 |
| Colcic Yermosols Yie | 6.5 - 7.6 | 0.15 - 0.20 | 5 - 20 | 3 - 15 | 0.05 - 0.15 |

Table III. C. 11 Physical and Chemical Properties of Soil Profiles (Contract Analysis) (1)

Profile No. 1 Dystric Regosols Rd (Sundy Soil) True density = 2.66

| Items / Depth cm | Particle size distribution % | | | | | | Saturated Percentage SP % | Electric Conductivity ECe m.mhos/cm 25°C | PH meg/100g.soil | | | | | | Anions meg/100g.soil | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | gravel | Coarse Sand | Fine Sand | Silt | Clay | $CaCO_3$ | | | ($H_2O$) | (KCl) | $Na^+$ | $K^+$ | $Ca^{++}$ | $Mg^{++}$ | $Cl^-$ | $HCO_3^-$ | $SO_4^=$ |
| 20 | 0.08 | 90.4 | 9.2 | - | - | 0.28 | 14.5 | 1.2 | 7.6 | 6.3 | 0.13 | 0.09 | 0.04 | 0.02 | 0.15 | 0.01 | 0.006 |
| 50 | - | 73.9 | 24.9 | 0.08 | - | 0.38 | 14.0 | 1.6 | 7.2 | 6.3 | 0.17 | 0.13 | 0.03 | 0.02 | 0.18 | 0.01 | 0.03 |
| 85 | - | 79.7 | 18.9 | 1.25 | - | 0.19 | 17.9 | 1.3 | 7.2 | 6.2 | 0.18 | 0.11 | 0.04 | 0.03 | 0.14 | 0.02 | 0.05 |

Profile No. 3 Dystric Regosols Rd (Sundy Soil) True density = 2.65

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | - | 85.0 | 14.6 | - | - | 0.38 | 15.3 | 1.1 | 7.3 | 6.8 | 0.13 | 0.11 | 0.03 | 0.02 | 0.12 | 0.02 | 0.03 |
| 50 | - | 79.1 | 19.3 | 1.3 | - | 0.38 | 16.3 | 1.6 | 7.1 | 6.5 | 0.17 | 0.12 | 0.06 | 0.04 | 0.22 | 0.01 | 0.02 |
| 85 | - | 80.4 | 18.0 | 1.3 | - | 0.38 | 16.0 | 1.8 | 7.6 | 6.1 | 0.18 | 0.10 | 0.06 | 0.08 | 0.24 | 0.02 | 0.02 |

Profile No. 6 Haplit Yermosols Yh (Sundy SOil) True density = 2.63

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | - | 80.8 | 19.1 | - | - | 0.09 | 14.5 | 1.4 | 7.8 | 6.2 | 0.13 | 0.05 | 0.16 | 0.04 | 0.17 | 0.01 | 0.02 |
| 40 | - | 82.4 | 17.3 | - | - | 0.38 | 15.0 | 3.8 | 7.4 | 6.0 | 0.33 | 0.14 | 0.19 | 0.04 | 0.52 | 0.01 | 0.03 |
| 85 | - | 81.5 | 18.1 | - | - | 0.38 | 12.8 | 3.2 | 7.4 | 6.2 | 0.27 | 0.05 | 0.11 | - | 0.38 | 0.01 | 0.008 |

Profile No. 24 Soil Units Unknown (Sundy Soil) True density = 2.65

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 0.04 | 80.7 | 16.1 | 1.3 | - | 1.92 | 15.3 | 2.7 | 7.7 | 6.2 | 0.30 | 0.03 | 0.10 | 0.05 | 0.38 | 0.01 | 0.02 |
| 50 | 5.5 | 71.1 | 20.5 | 1.6 | 0.9 | 0.38 | 13.4 | 6.7 | 7.5 | 6.3 | 0.32 | 0.16 | 0.03 | 0.06 | 0.82 | 0.01 | 0.08 |

Table III. C. 11 Physical and Chemical Properties of SOil Profiles (Contract Analysis) (2)

Profile No. 28 Haplic Yermosols Yh (Sundy Soil) True density = 2.63

| Items / Depth cm | Particle size distrubution % | | | | | | Saturated Percentage SP % | Electric Conductivity ECe m.mhos/cm 25°C | PH meg/100g.soil | | | | | | Anions meg/100g.soil | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | gravel | Coarse Sand | Fine Sand | Silt | Clay | $CaCO_3$ | | | ($H_2O$) | (KC/) | $Na^+$ | $K^+$ | $Ca^{++}$ | $Mg^{++}$ | $C/^-$ | $HCO_3^-$ | $SO_4^=$ |
| 20 | 3.5 | 69.1 | 25.5 | 1.5 | 1.0 | 1.53 | 14.8 | 0.9 | 7.0 | 6.1 | 0.10 | 0.10 | 0.06 | 0.01 | 0.14 | 0.01 | 0.007 |
| 30 | 3.5 | 55.3 | 34.7 | 2.6 | 2.4 | 1.53 | 16.0 | 1.8 | 7.3 | 6.0 | 0.15 | 0.19 | 0.04 | 0.08 | 0.19 | 0.01 | 0.02 |
| 50 | 3.5 | 79.1 | 11.8 | 2.5 | 2.5 | 0.67 | 19.0 | 1.3 | 7.3 | 6.1 | 0.17 | 0.07 | 0.04 | 0.03 | 0.17 | 0.02 | 0.03 |

Profile No. 29 Haplic Yermosols Yh (Sundy Soil) True density = 2.66

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 19.9 | 60.1 | 13.3 | 5.0 | 2.0 | 1.73 | 16.5 | 4.9 | 7.0 | 6.0 | 0.18 | 0.10 | 0.04 | 0.09 | 0.70 | 0.01 | 0.05 |
| 50 | 15.0 | 72.8 | 12.0 | - | - | 0.19 | 19.0 | 4.9 | 7.2 | 6.0 | 0.48 | 0.23 | 0.11 | 0.02 | 0.81 | 0.02 | 0.08 |
| 85 | 4.8 | 84.6 | 10.5 | - | - | 0.09 | 16.3 | 4.8 | 7.5 | 6.0 | 0.40 | 0.08 | 0.03 | 0.03 | 0.68 | 0.03 | 0.04 |

Profile No. 33 Calcic Yermosols Yk (Sundy Soil) True density = 2.63

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 20.0 | 53.2 | 26.6 | 6.0 | 4.0 | 4.03 | 13.8 | 1.2 | 7.5 | 6.0 | 0.13 | 0.03 | 0.03 | 0.01 | 0.11 | 0.02 | 0.03 |
| 50 | 23.2 | 58.3 | 13.2 | 3.3 | 2.0 | 4.23 | 15.3 | 2.0 | 7.6 | 6.0 | 0.27 | 0.07 | 0.01 | 0.01 | 0.25 | 0.02 | 0.01 |
| 85 | 23.5 | 58.6 | 7.1 | 5.4 | 2.6 | 2.88 | 14.5 | 4.2 | 7.6 | 6.0 | 0.39 | 0.06 | 0.09 | 0.10 | 0.56 | 0.01 | 0.03 |

Table III. C. 12 Distributional Ranges of Physical and Chemical Properties of Soil Units

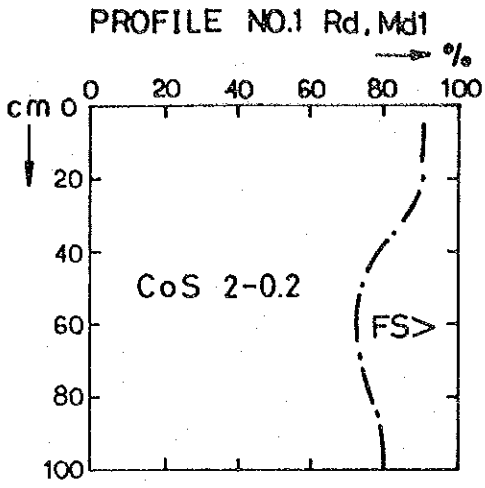
(Contract Analysis)

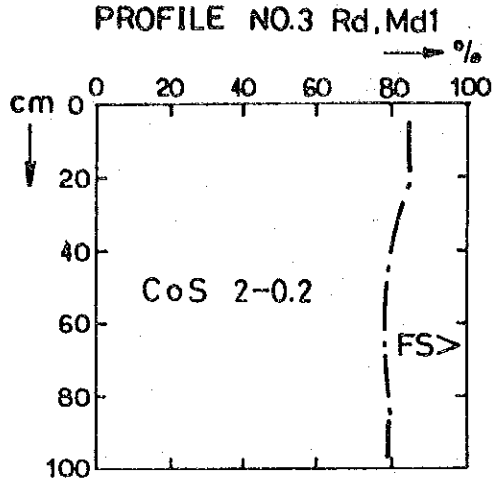
| Items / Soil Units | Particle size distribution % | | | | | | Saturated Percentage SP % | Electric Conductivity m.mhos/cm.25°C |
|---|---|---|---|---|---|---|---|---|
| | Gravel | Coarse Sand | Fine Sand | Silt | Clay | $CaCO_3$ | | |
| Dystric Regosols Rd | 0 - 0.08 | 73.9 - 90.4 | 9.2 - 24.9 | 0.08 - 1.3 | 0 - | 0.19 - 0.38 | 14.0 - 17.9 | 1.1 - 1.8 |
| Haplic Yermosols Yh | 0 - 19.9 | 55.3 - 84.6 | 10.5 - 34.7 | 1.5 - 5.0 | 1.0 - 2.5 | 0.09 - 1.73 | 12.8 - 19.0 | 0.9 - 4.9 |
| Calcic Yermosols Yk | 20.0 - 23.5 | 53.2 - 58.6 | 7.1 - 26.6 | 3.3 - 6.0 | 2.0 - 4.0 | 2.88 - 4.23 | 13.8 - 15.3 | 1.2 - 4.2 |

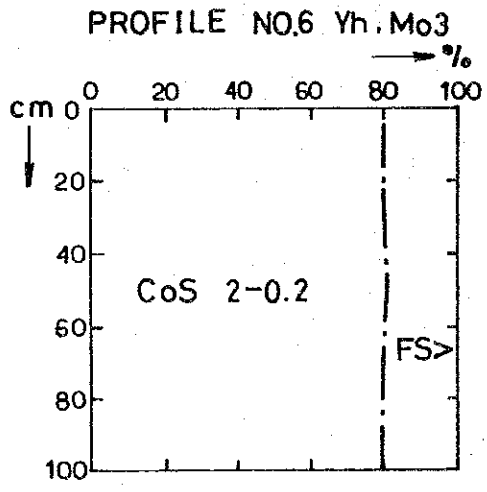
| Items / Soil Units | P H | | Cations meg/100g.soil | | | | Anions meg/100g.soil | | |
|---|---|---|---|---|---|---|---|---|---|
| | ($H_2O$) | (KCl) | $Na^+$ | $K^+$ | $Ca^{2+}$ | $Mg^{2+}$ | $Cl^-$ | $HCO_3^-$ | $SO_4^{2-}$ |
| Dystric Regosols Rd | 7.1 - 7.6 | 6.1 - 6.8 | 0.13 - 0.18 | 0.09 - 0.13 | 0.03 - 0.06 | 0.02 - 0.08 | 0.12 - 0.22 | 0.01 - 0.02 | 0.006 - 0.05 |
| Haplic Yermosols Yh | 7.0 - 7.8 | 6.0 - 6.2 | 0.13 - 0.48 | 0.03 - 0.23 | 0.03 - 0.19 | 0.01 - 0.09 | 0.14 - 0.81 | 0.01 - 0.03 | 0.007 - 0.08 |
| Calcic Yermosols Yk | 7.5 - 7.6 | 6.0 - | 0.13 - 0.39 | 0.03 - 0.07 | 0.01 - 0.09 | 0.01 - 0.10 | 0.11 - 0.56 | 0.01 - 0.02 | 0.01 - 0.03 |

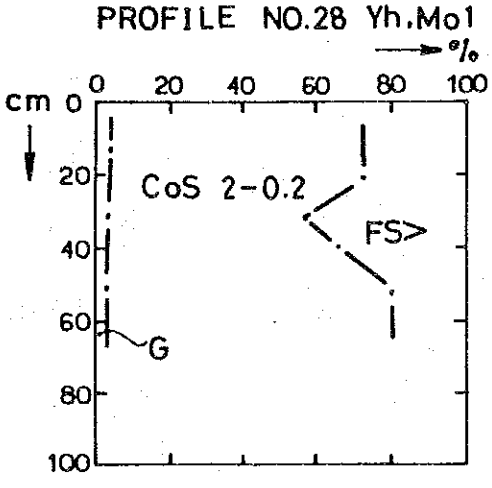
Fig. III.C.6 Textural Composition of soil profiles (contract analysis) (1)

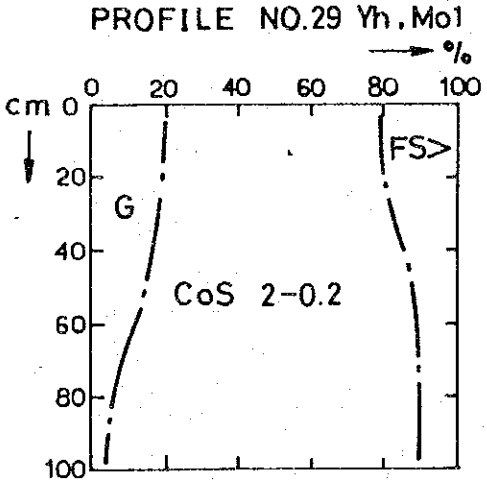
$CoS_{2-0.2}$: Coarse sand 2-0.2mm, FS>: fine sand + silt + clay

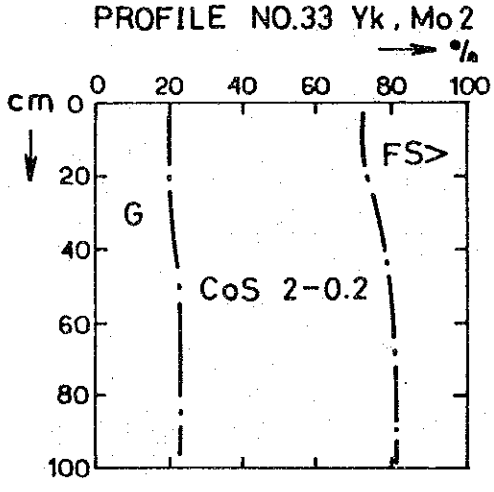


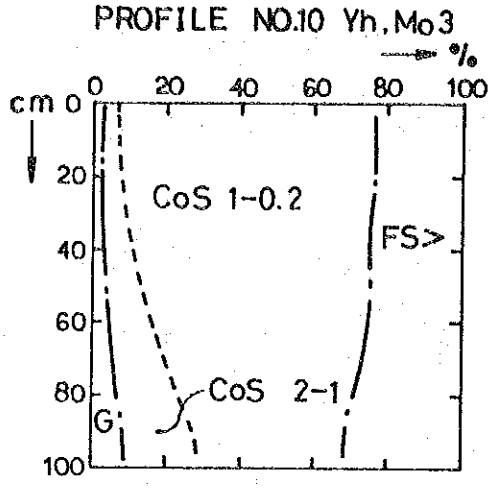



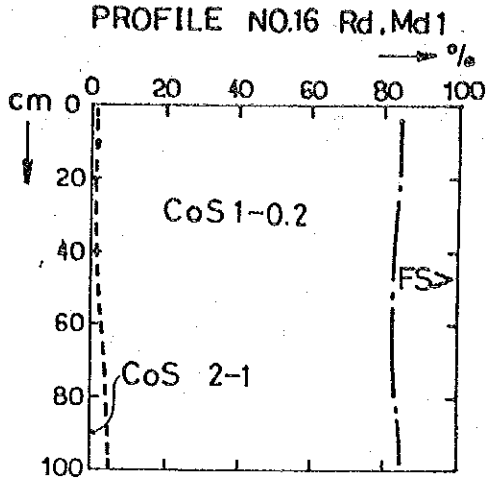



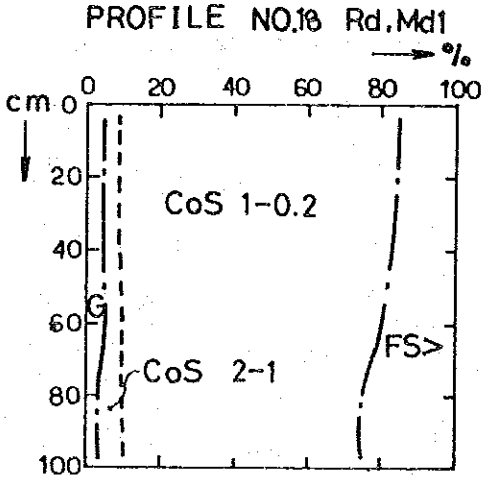



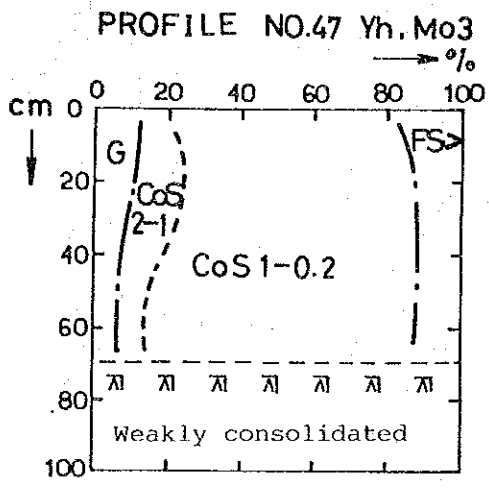



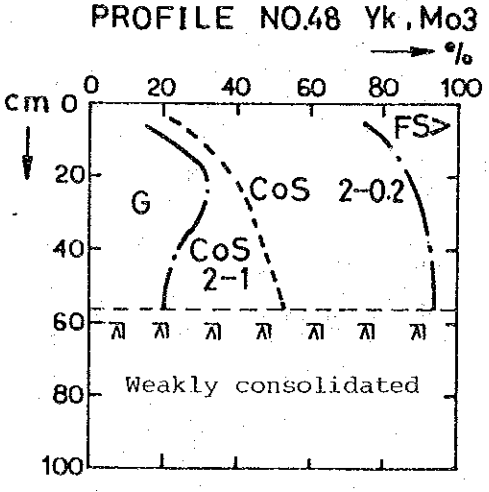
Textural composition of soil profiles (2)



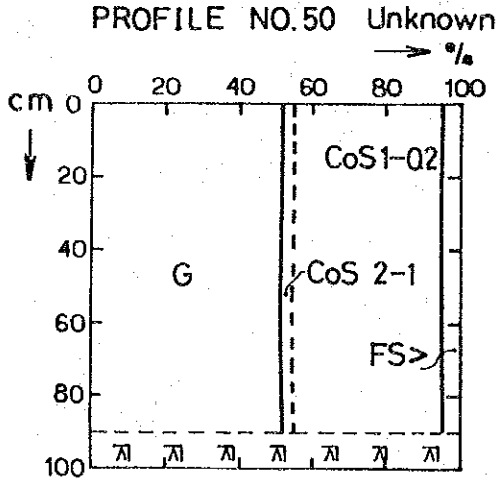
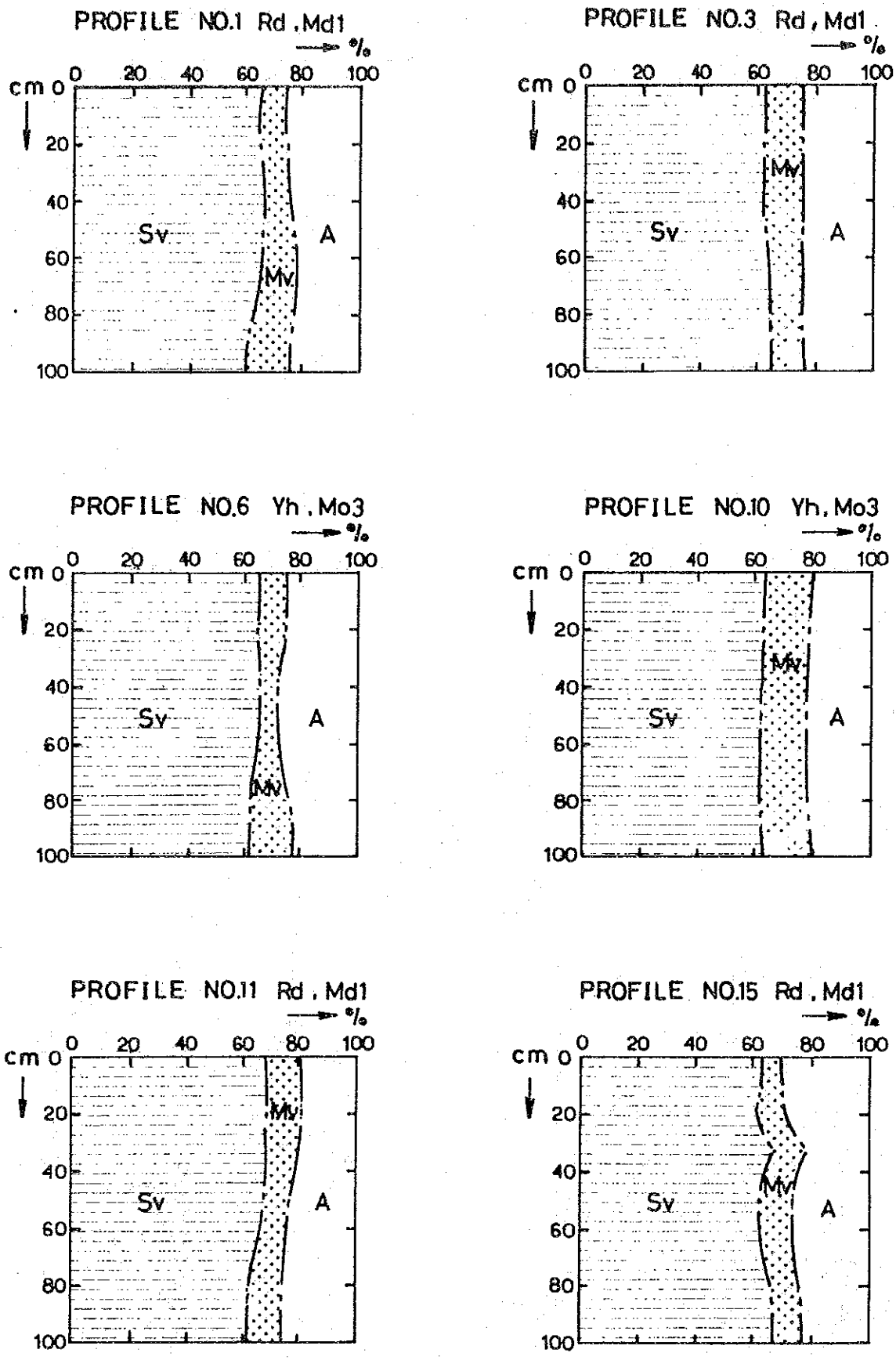
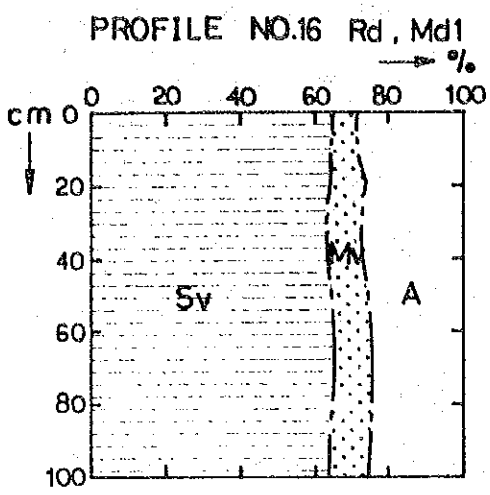
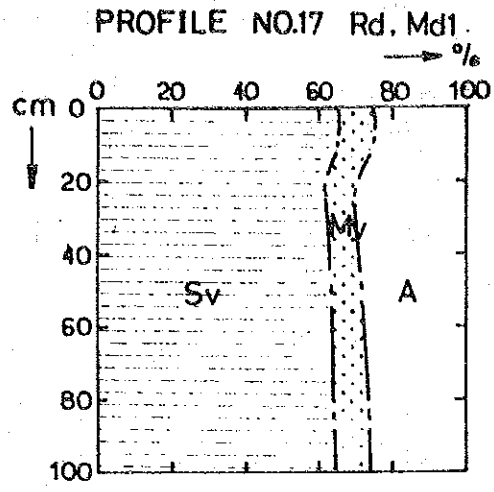



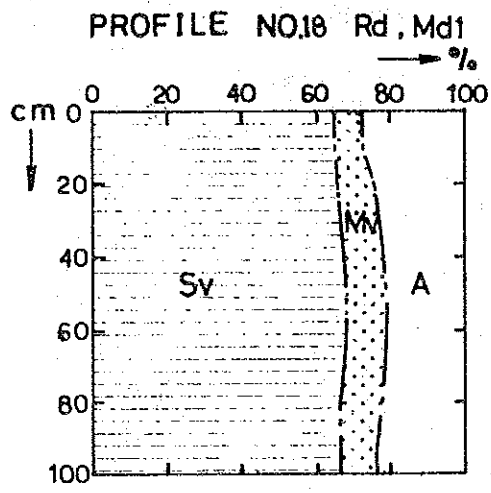
Fig. III.C.7 Three phase distribution of soil profiles under pF1.5 (1)

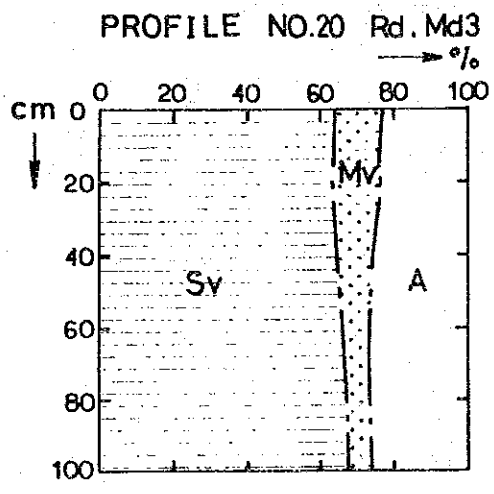


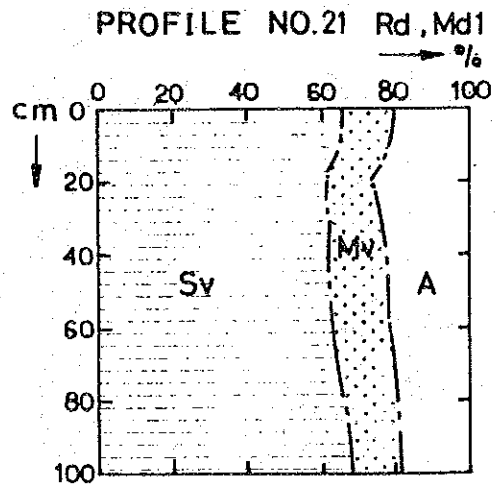
Three phase distribution of soil profiles under pF1.5 (2)

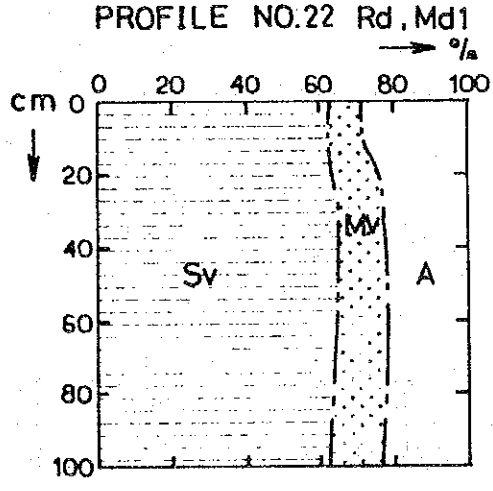


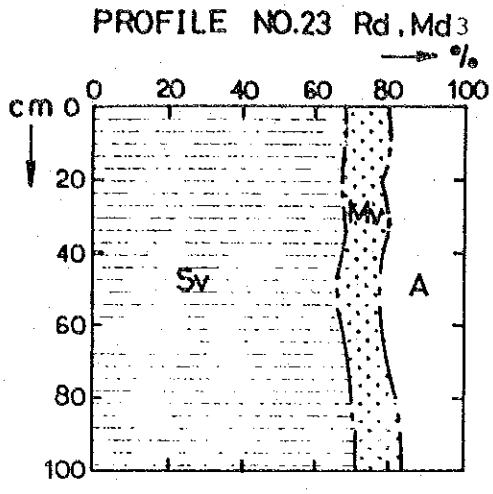



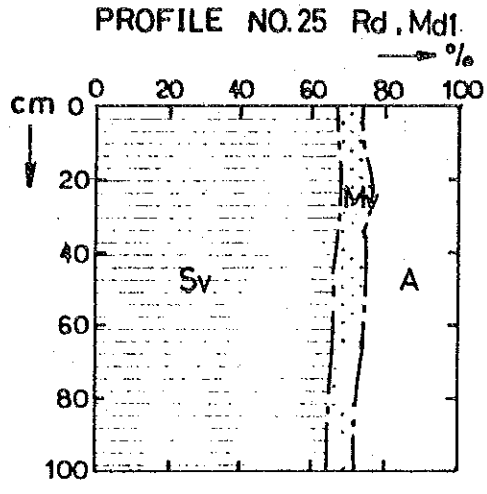



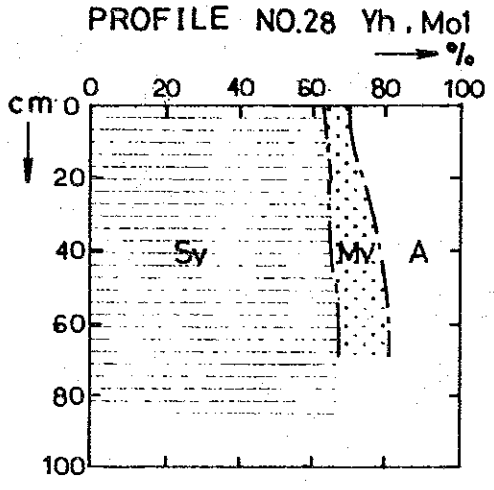



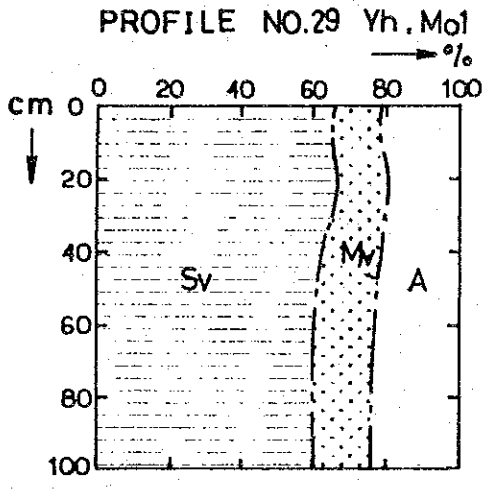



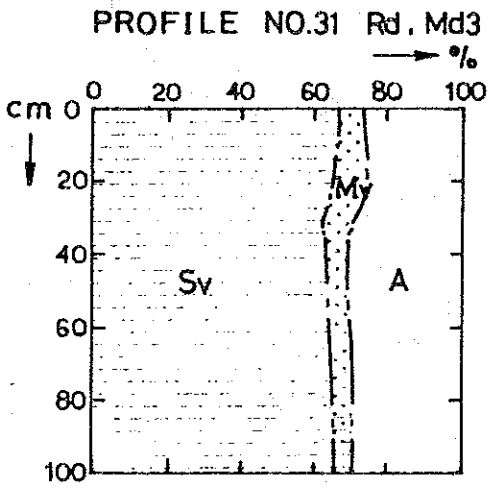
Three phase distribution of soil profiles under pF1.5 (3)

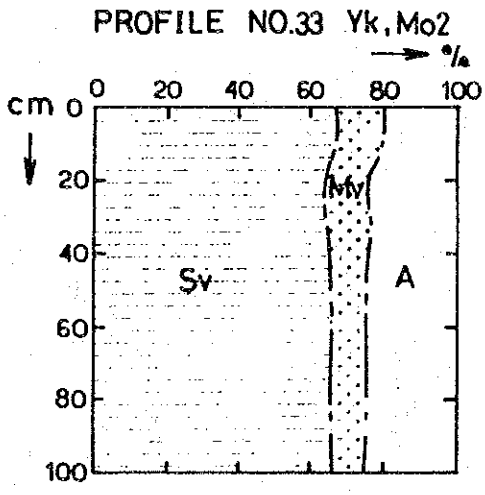


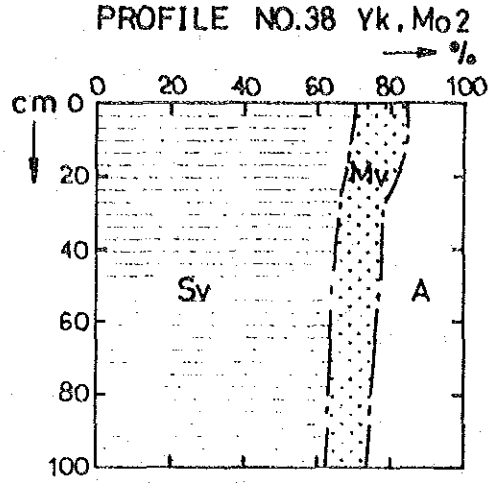



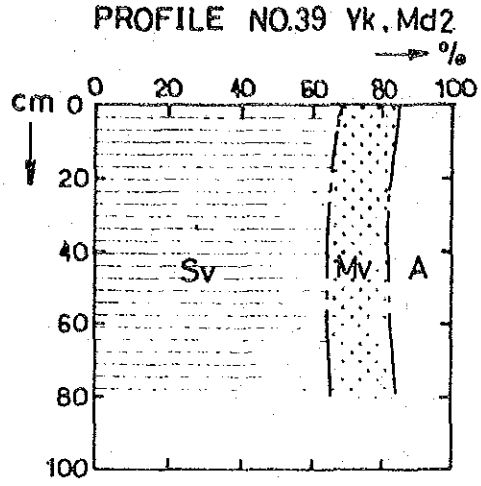




PROFILE NO.38 Yk, Mo2
%
cm 0
0 20 40 60 80 100
20
40
60
80
100
Mv
Sv
A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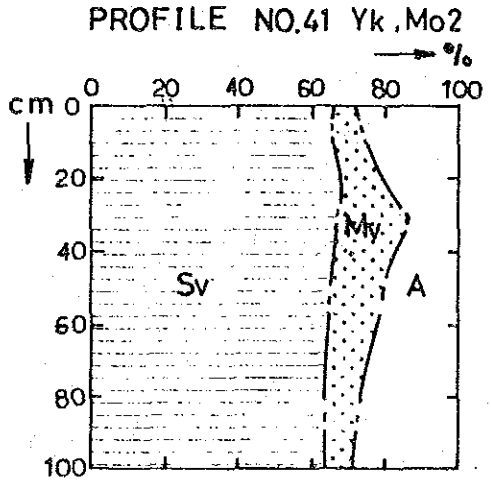
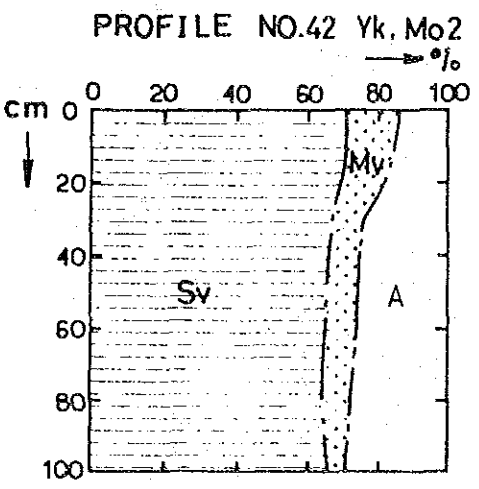
%
cm 0
0 20 40 60 80 100
20
40
60
80
100
Sv
Mv
A


PROFILE NO.41 Yk, Mo2
%
cm 0
0 20 40 60 80 100
20
40
60
80
100
Mv
Sv
A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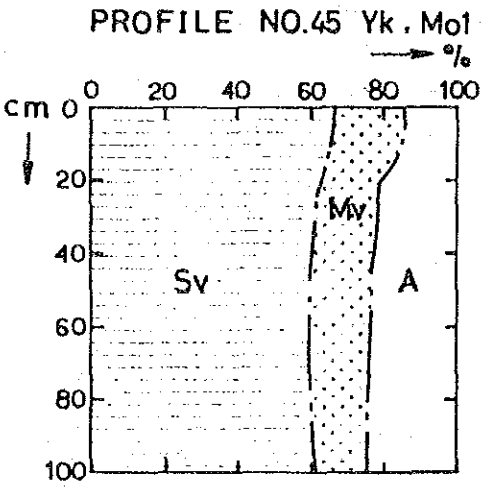
%
cm 0
0 20 40 60 80 100
20
40
60
80
100
Mv
Sv
A


PROFILE NO.45 Yk, Mo1
%
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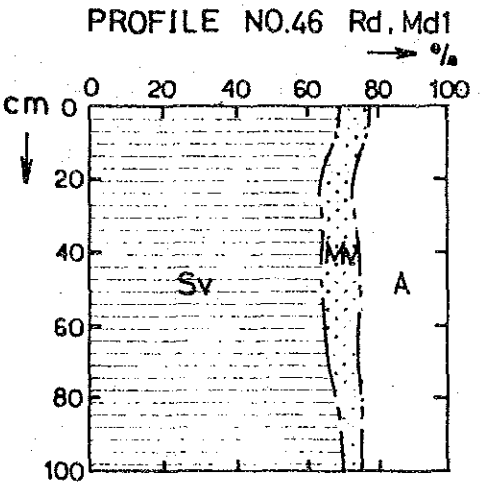
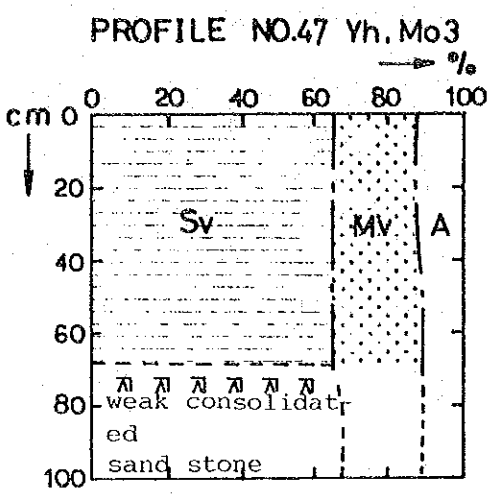
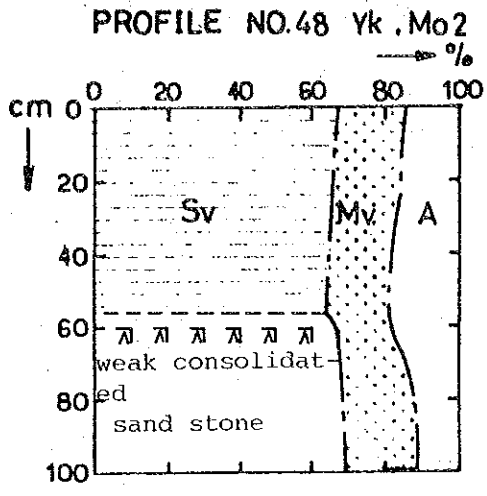
20
40
60
80
100
Mv
Sv
A

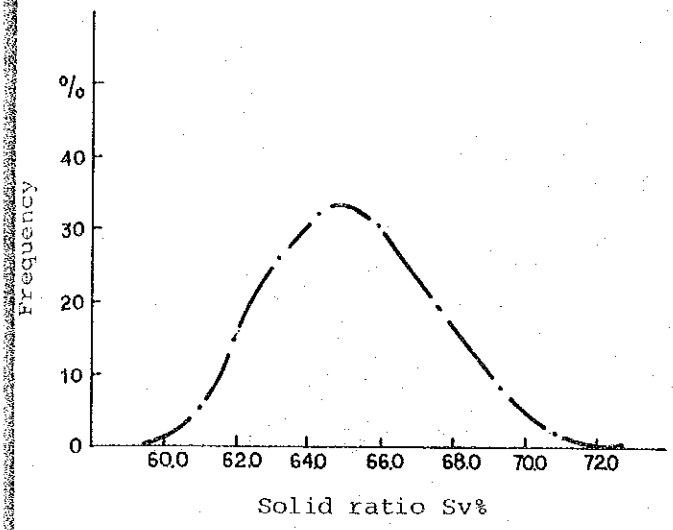

PROFILE NO.46 Rd, Md1
%
cm 0
0 20 40 60 80 100
20
40
60
80
100
Mv
Sv
A

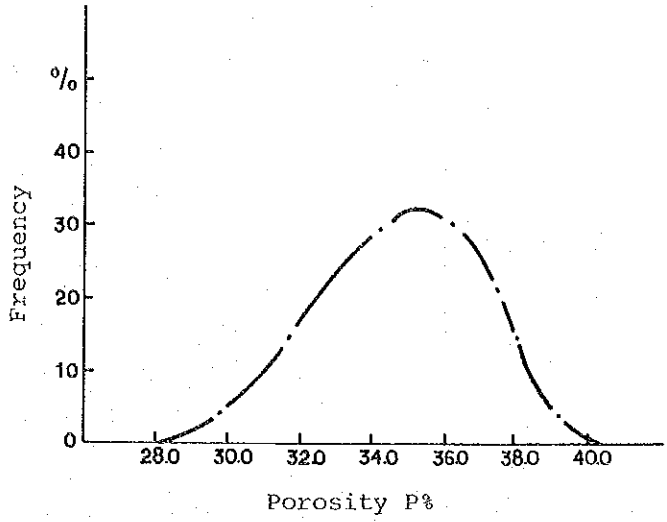


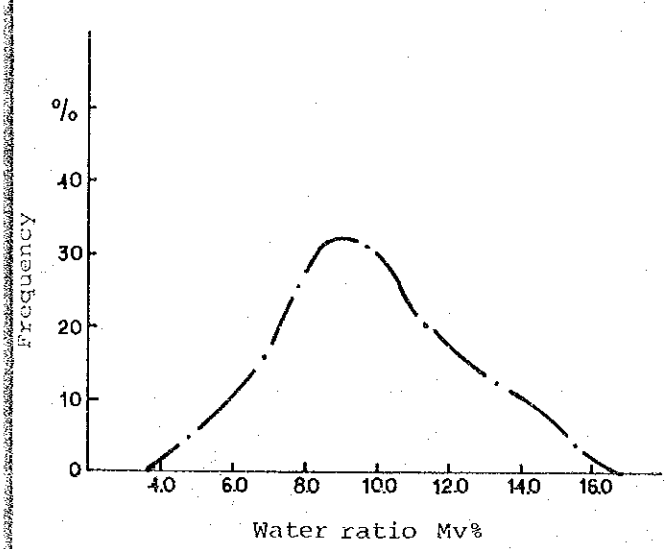



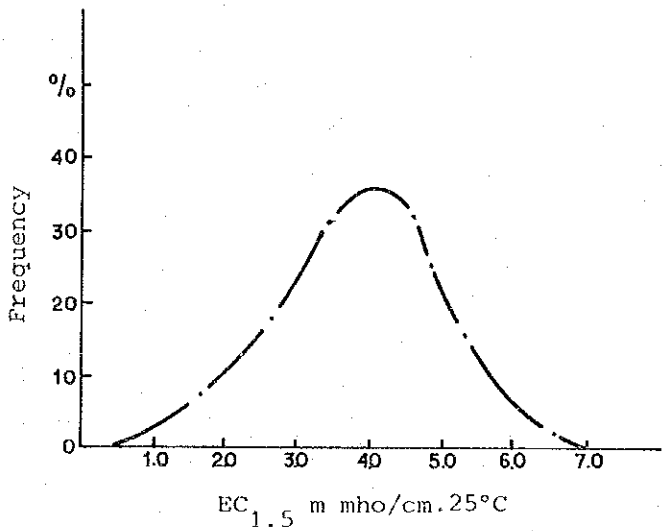

Note: Rd : Dystric Regosols
Yh : Haplic Yermosols
Yk : Calcic Yermosols
Sv : Solid phase
Mv : Liquid phase
A : Gasseous phase
Md1, Md3, Mo1, Mo2, Mo3: Soil Series

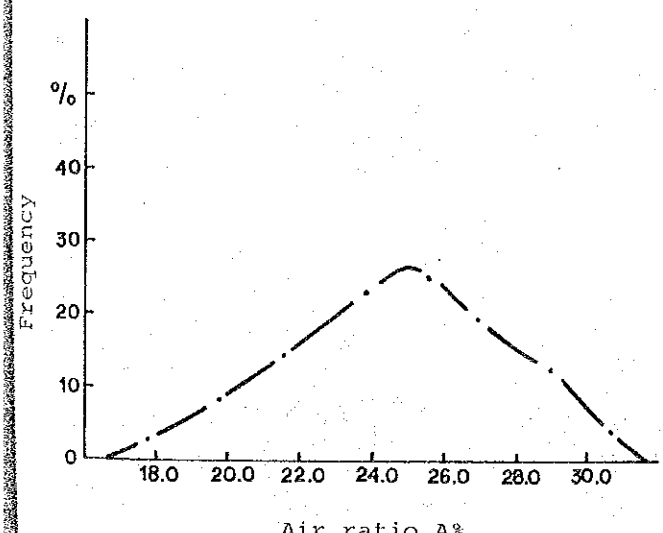
Fig. III.C.8 Frequency Curves of Soil Physical Property of Dystric Regosols (Rd)



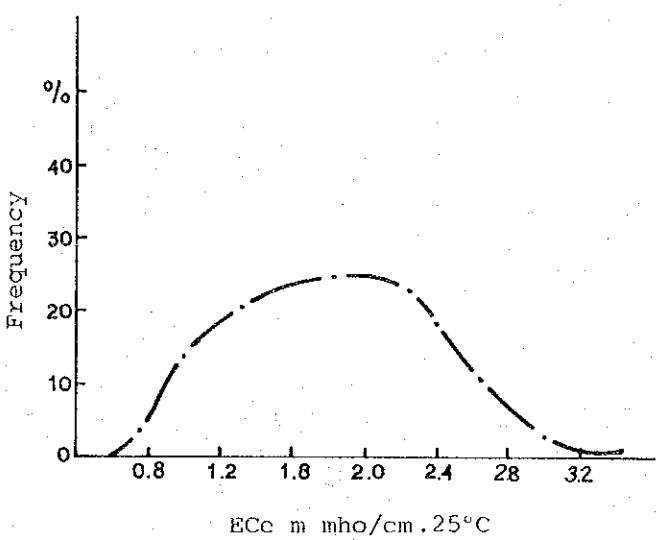
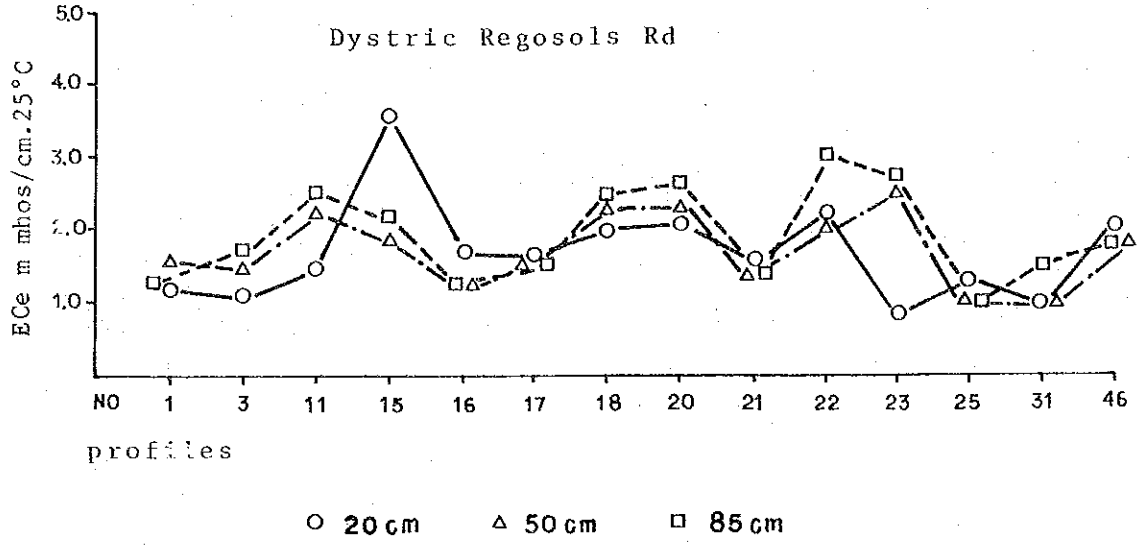
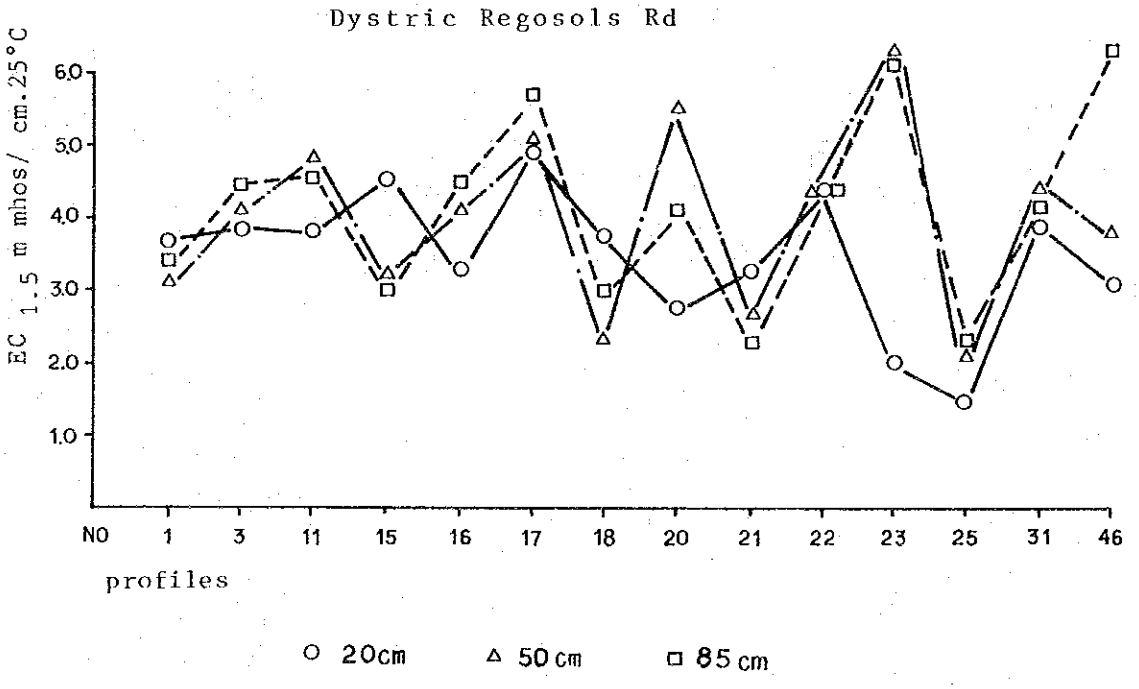



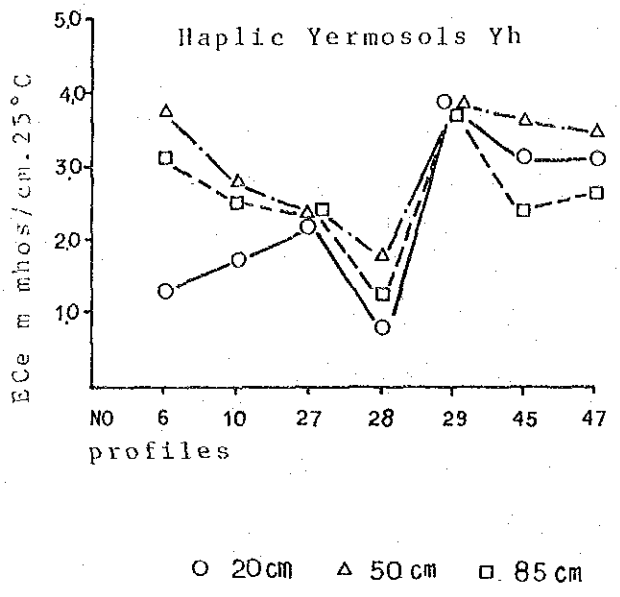
Fig. III.C.9

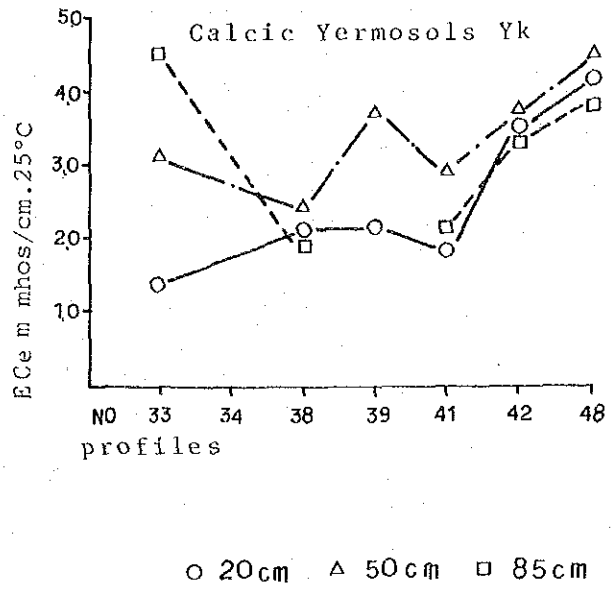
ELECTRIC CONDUCTIVITY OF SOIL PROFILES UNDER PF1.5 AND WATER SATURATED CONDITION (1)

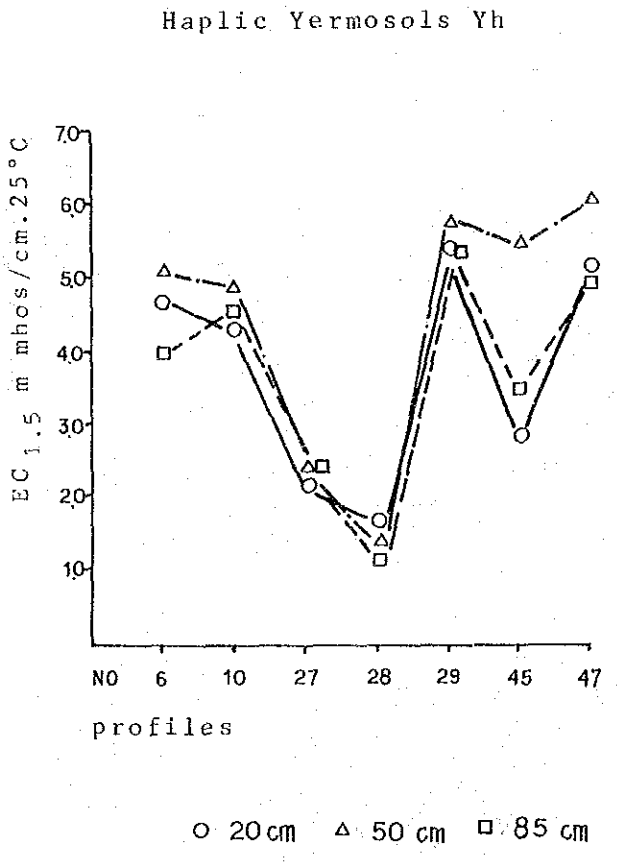


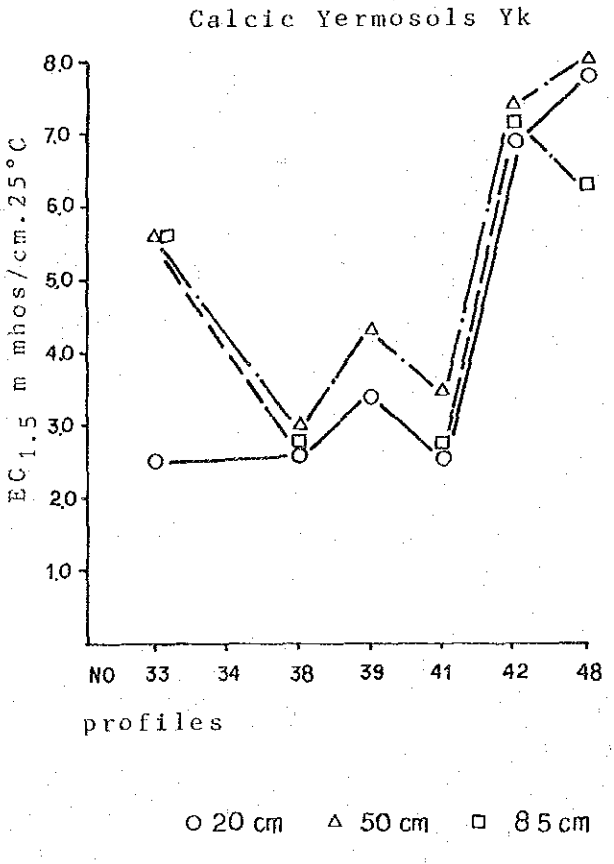



ELECTRIC CONDUCTIVITY OF SOIL PROFILES UNDER PF1.5 AND WATER SATURATED CONDITION (2)



## C-3 Comparative Study of Irrigation Water Sources.

Two cases are considered as the irrigation water sources. The comparative study of the construction costs for both cases is carried out as follows.

a) Case 1

In this case, the irrigation water is supplied from Tolonbaht Canal which is a branch canal of Salhya Canal. These canals are now being constructed by the Ministry of Irrigation.

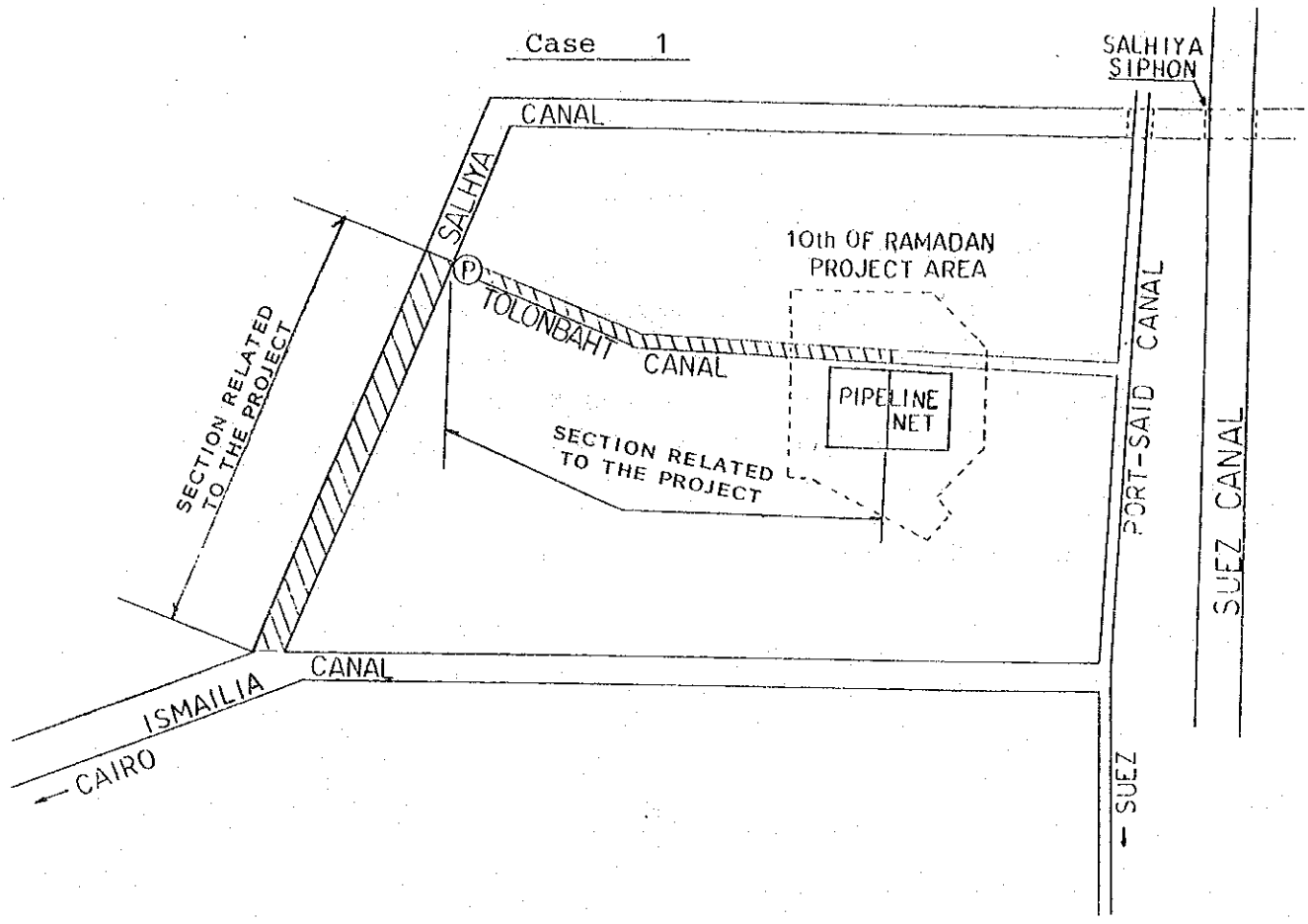
The construction cost was estimated with the condition that the construction cost of both canals is borne in proportion to its total Project area.

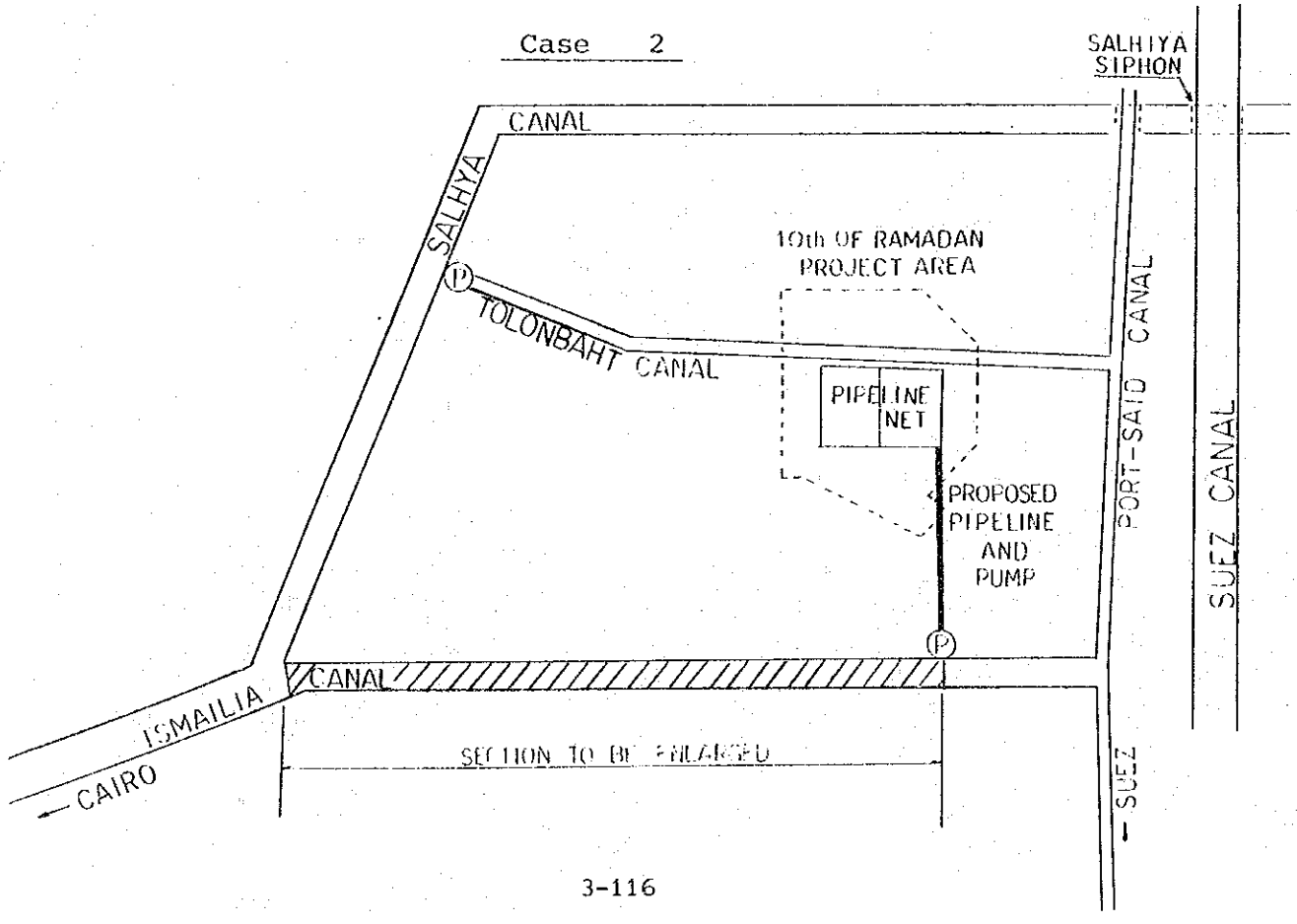
b) Case 2

In this case the irrigation water is supplied from the existing Ismailia Canal. The construction costs are estimated including the construction cost of the proposed pump and pipeline which convey the irrigation water from the Canal to the Project area as well as the enlargement of the Canal.

The result of the comparative study is shown below; and the conclusion is that Case 1 is preferable to be adopted by the Project

| | Construction Cost | Remarks |
|---|---|---|
| Case 1 | LE 4,535,000 | adopted |
| Case 2 | LE 5,800,000 | |
| Cost Difference | LE 1,265,000 | |


Case 1
SALHIYA SIPHON
CANAL
SALHYA
10th OF RAMADAN PROJECT AREA
TOLONBAHT CANAL
PIPELINE NET
SECTION RELATED TO THE PROJECT
SECTION RELATED TO THE PROJECT
PORT-SAID CANAL
SUEZ CANAL
CANAL
ISMAILIA
CAIRO
SUEZ

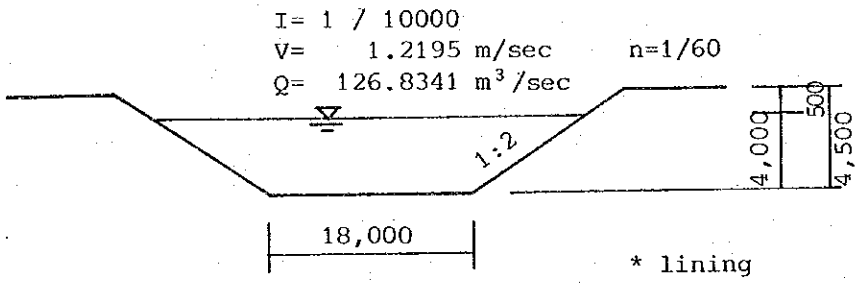

Case 2
SALHIYA SIPHON
CANAL
SALHYA
10th OF RAMADAN PROJECT AREA
TOLONBAHT CANAL
PIPELINE NET
PROPOSED PIPELINE AND PUMP
PORT-SAID CANAL
SUEZ CANAL
CANAL
ISMAILIA
CAIRO
SECTION TO BE RELAIGED
SUEZ

Case 1

The water system of Salhya Canal and Tolonbaht Canal is shown on the next page.

The cross-sectional design of the canals are shown below by section. The costs to be borne by the Project for each section and the proposed pump station which transfers water from Salhya Canal to Tolonbaht Canal are also estimated.

1) SECTION 1 (Salhya) L= 3,000 m




2) SECTION 2 (Salhya) L= 15,000 m

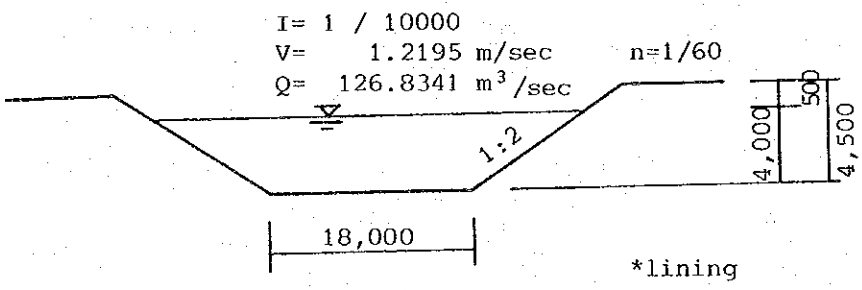
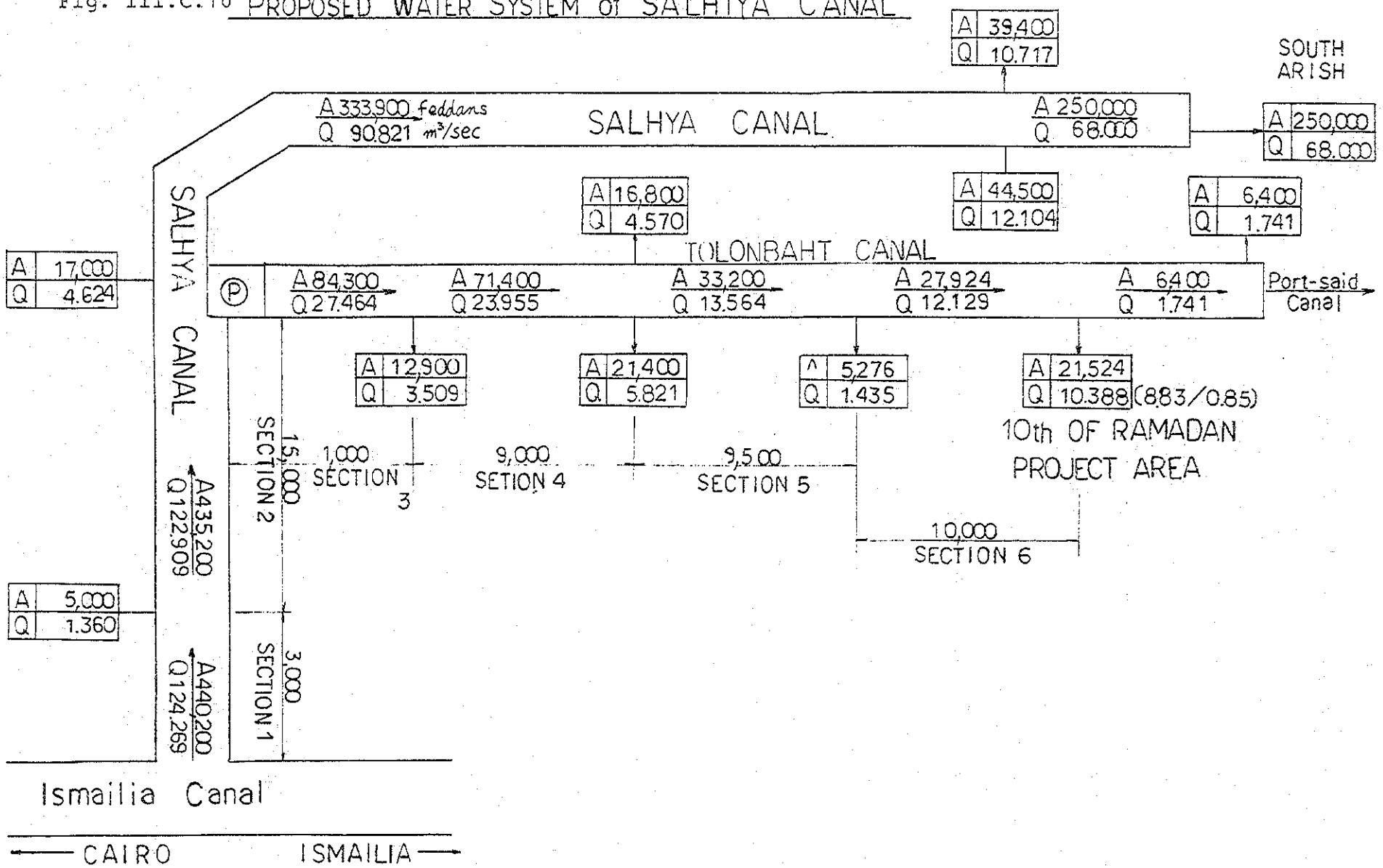


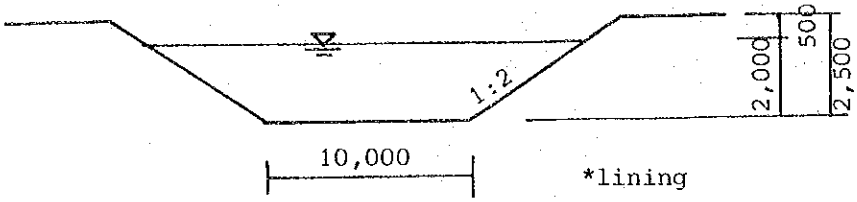
Fig. III.C.10 PROPOSED WATER SYSTEM of SALHIYA CANAL



3) SECTION 3 (Tolonbaht) L= 1,000 m

I= 1 / 6000
V= 1.0050 m/sec
Q= 28.1419 $m^3$/sec

n=1/60



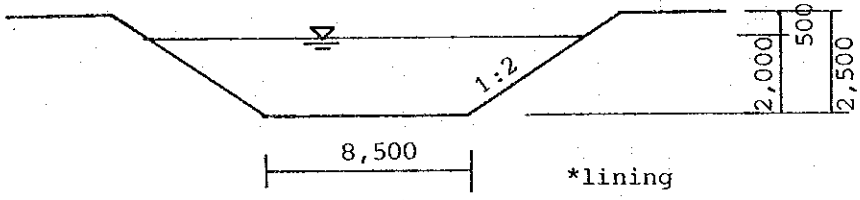

10,000

*lining

4) SECTION 4 (Tolonbaht) L= 9,000 m

I= 1 / 6000
V= 0.9846 m/sec
Q= 24.6154 $m^3$/sec

n=1/60



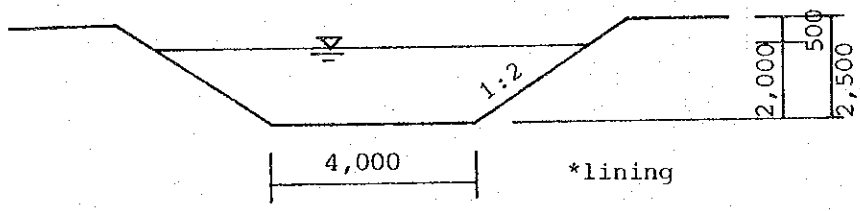

8,500

*lining

5) SECTION 5 (Tolonbaht) L= 9,500 m

I= 1 / 6000
V= 0.8921 m/sec
Q= 14.2743 $m^3$/sec

n=1/60



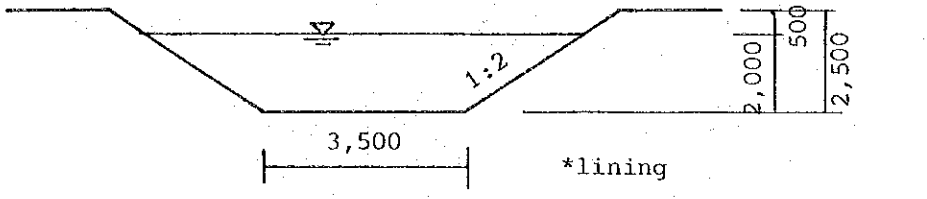

4,000

*lining

6) SECTION 6 (Tolonbaht) L= 10,000 m

I= 1 / 6000
V= 0.8773 m/sec
Q= 13.1597 $m^3$/sec

n=1/60




7) The Proposed Pump

As shown in Fig.III.C.10, a pump which has a maximum discharge of 27,464 $m^3$/sec is required.

- o Design Conditions

  Capacity: 27,464 $m^3$/sec = 1,647.84 $m^3$/min
  (Irrigation Area = 84,300 fed)

  Total Head: 5m

- o Dimensions of the pump

  Pump Type: Mixed flow pump
  Number of Sets: 3 sets
  Pump Diameter: ϕ 2,000 mm
  Total Discharge: 549.28 $m^3$/min/set x 3 sets
  = 1,647.84 $m^3$/min
  Total Output of Motors: 910 ps x 3 sets = 2,730 ps

List of the Quantity and the Cost of the Canals (1)

Unit: L E

| SECTION | 1 | | | 2 | | | 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| Cross Section Area ($m^2$) | 121.50 | | | 121.50 | | | 37.50 | | |
| Length (m) | 3,000 | | | 15,000 | | | 1,000 | | |
| | Quantity | Unit Price | Cost | Quantity | Unit Price | Cost | Quantity | Unit Price | Cost |
| Excavation Volume ($m^3$) | 364,500 | Man Power 10% 0.58<br>Machine 90% 0.65 | 21,141<br>213,233 | 1,822,500 | Man Power 10% 0.58<br>Machine 90% 0.65 | 105,705<br>1,066,163 | 37,500 | Man Power 10% 0.58<br>Machine 90% 0.65 | 2,175<br>21,938 |
| 10cm Lining ($m^2$) | 114,374 | 11.87 | 1,357,619 | 571,869 | 11.87 | 6,788,085 | 21,180 | 11.87 | 251,407 |
| Canal Area ($m^2$) | 108,000 | 0.04 | 4,320 | 540,000 | 0.04 | 21,600 | 20,000 | 0.04 | 800 |
| Total | | | 1,596,313 | | | 7,981,553 | | | 276,320 |

List of the Quantity and the Cost of the Canals (2)

| SECTION | 1 | | | 2 | | | 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| Cross Section Area (m ) | 33.75 | | | 22.50 | | | 21.25 | | |
| Length (m) | 9,000 | | | 9,500 | | | 10,000 | | |
| | Quantity | Unit Price | Cost | Quantity | Unit Price | Cost | Quantity | Unit Price | Cost |
| Excavation Volume (m ) | 303,750 | Man Power 10% 0.58<br>Machine 90% 0.65 | 17,618<br>177,694 | 213,750 | Man Power 10% 0.58<br>Machine 90% 0.65 | 12,398<br>125,044 | 212,500 | Man Power 10% 0.58<br>Machine 90% 0.65 | 12,325<br>124,313 |
| 10cm Lining (m ) | 177,123 | 11.87 | 2,102,450 | 144,213 | 11.87 | 1,711,808 | 146,803 | 11.87 | 1,742,552 |
| Canal Area (m ) | 166,500 | 0.04 | 6,660 | 133,000 | 0.04 | 5,320 | 135,000 | 0.04 | 5,400 |
| Total | | | 2,304,422 | | | 1,854,570 | | | 1,884,590 |

Cost to be Borne by the Project

Unit: LE

| SECTION | Total Area | Project Area | Proportion to Total Area | Total Cost | Allocated Cost | Remarks |
|---|---|---|---|---|---|---|
| 1 | 440,200 fed | 21,524 fed | 4.89 % | 1,596,313 | 78,060 | |
| 2 | 435,200 | " | 4.95 | 7,981,553 | 395,087 | |
| 3 | 84,300 | " | 25.53 | 276,320 | 70,544 | |
| 4 | 71,400 | " | 30,15 | 2,304,422 | 694,783 | |
| 5 | 33,200 | " | 64.83 | 1,854,570 | 1,202,318 | |
| 6 | 27,924 | " | 77.08 | 1,884,590 | 1,452,642 | |
| Pump | 84,300 | " | 25.53 | 2,694,134 | 642,412 | Refer to the Estimate |
| Total | | | | | LE 4,535,846 | |

Estimate of the pump construction cost

| | | | Total |
|---|---|---|---|
| Pump | 1 set | 78,000,000 | 234,000,000 (3 set ) |
| $\phi$ = 2,000 | | | |
| Q = 549.28 $m^3$/min | | | |
| Bulbs | | 30,000,000 | 90,000,000 |
| Diesel Motor | | 49,500,000 | 148,500,000 |
| Apparatus | | - | 2,600,000 |
| Crane (10t) | | | 23,000,000 |
| Generator | | | 6,500,000 |
| F.B. | | | 40,000,000 |
| | | Total | 544,600,000 |

544,600,000 x 1.4 = 762,440,000 Yen

LE 1 = JY 303

JY 762,440,000 ÷ 303 = L.E. 2,516,304

Case 2

The water system of Ismailia Canal is shown on the following pages.

The figures of the Canal are designed by each section which are shown in Fig. III.C.11 and Fig. III.C.12, and the cost of enlargement was estimated. Also, costs of the proposed pump and the pipeline are estimated.

1) Cross-section of the Canal

As shown in Fig. III.C.11 and Fig. III.C.12.

2) Pipeline

As shown in Fig. III.C.12, the discharge capacity of the pipeline is 8.830 $m^3$/sec.

° Dimensions of the Pipeline

| | | |
|---|---|---|
| Pipe Material | : | FRPM (Fiberglass-Reinforced Plastic Mortar Pipe) |
| Discharge | : | 4,415 $m^3$/sec |
| Velocity | : | 2,072 m/sec |
| Hydraulic Gradient | : | 1,368 ‰ |
| Head Loss | : | 8,210 m |
| Length | : | 6,000 m |

3) Pump

As shown in fig. III.C.12, a pump which has a maximum discharge of 8.830 $m^3$/sec is required.

° Dimensions of Pump

| | | |
|---|---|---|
| Capacity | : | 8.830 $m^3$/sec = 530.0 $m^3$/min |
| Total Head | : | Actual head + Remaining Pressure + Head Loss. (20 - 7.0) + 3.0 + (21 + 8.2) = 45.2 m ≒ 45 m |
| Pump type | : | Volute Pump |

Pump Diameter : ø 800 mm

Total Output of Motor: 1,000 KW

For construction cost of the pump, only the differences of motor output and generator capacity between the pump and the main pump in the Project area are estimated.

Cost Difference of Motor Output

(950 - 600) x 6 set x ($24,800,000^{Yen/kW}$ / 6000)

= 86,800,000 Yen .....(A)

Cost Difference of Generator Capacity

(2,500 - 2,000) x 3 set x ($398,000,000^{Yen/KW}$ /6000)

= 99,500,000 Yen .....(B)

(A) + (B) = 186,300,000 Yen

186,300,000 x 0.15 = 214,000,000 Yen
(F.B.)

Fig. III.C.11 PROPOSAL for WATER SYSTEM of ISMAILIA CANAL

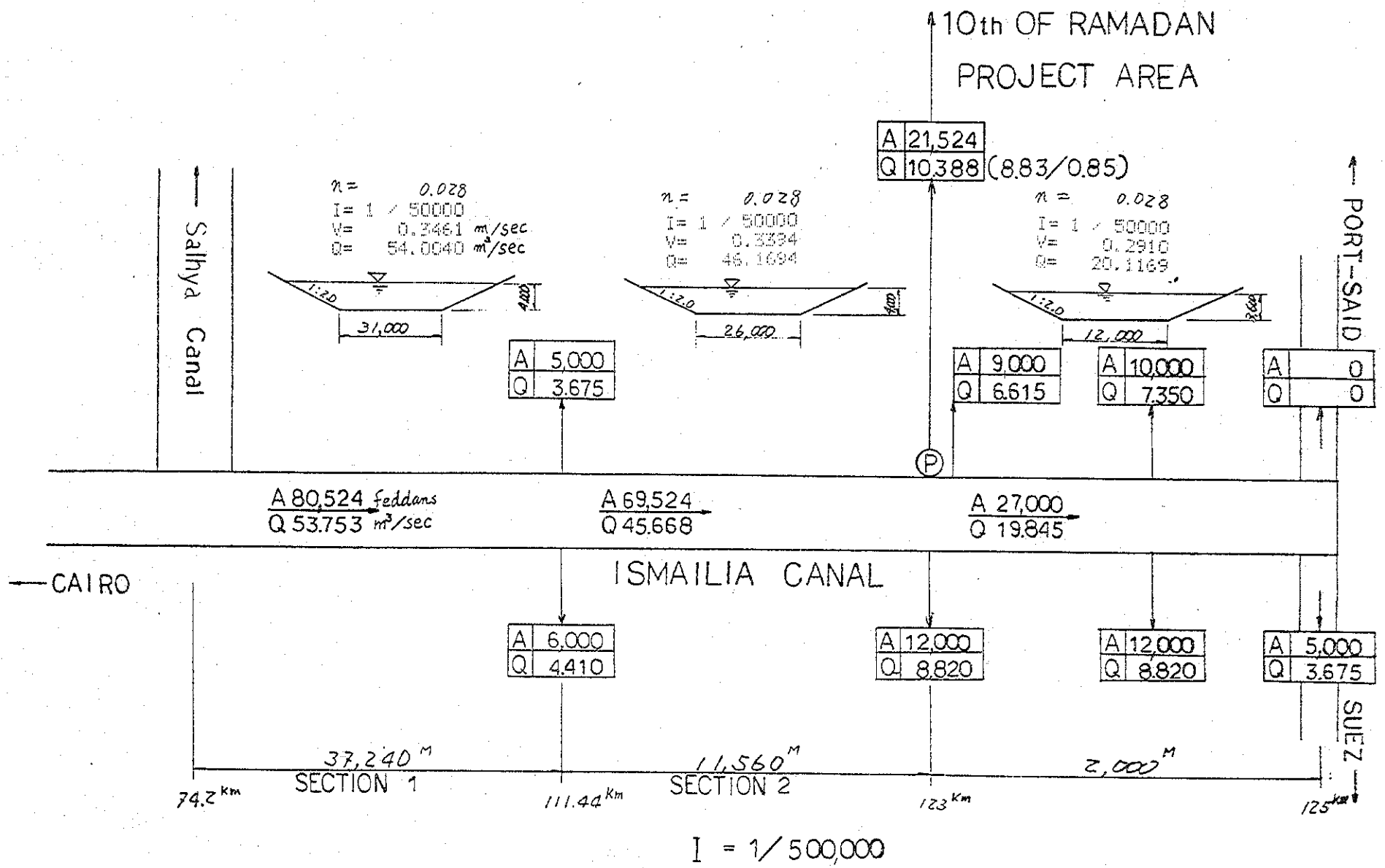
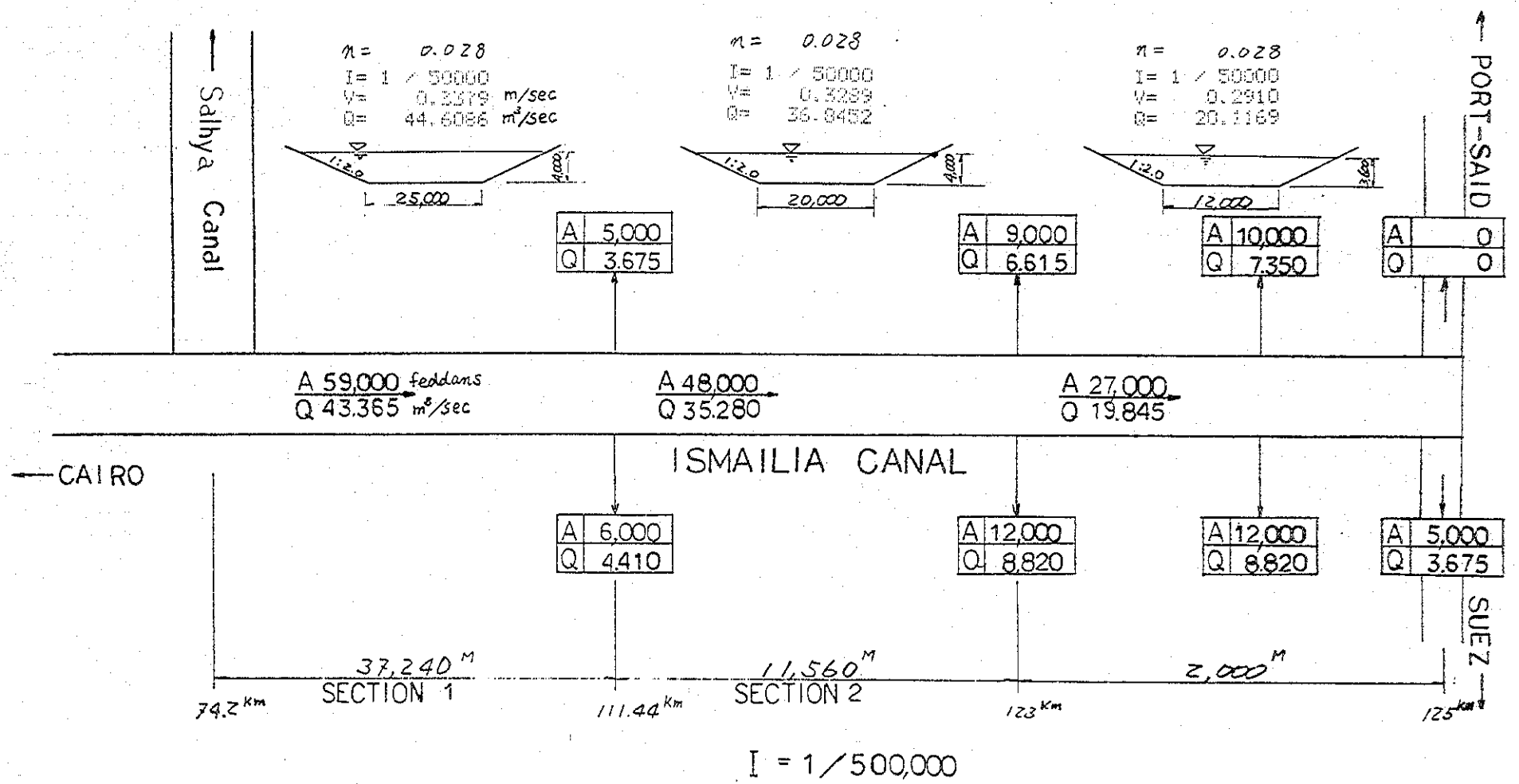


Fig. III.C.12 EXISTING WATER SYSTEM of ISMAILIA CANAL



Construction Cost

o Enlargement of the Canal

Unit: LE

| SECTION | 1 | | | 2 | | | Remarks |
|---|---|---|---|---|---|---|---|
| | Existing | | Proposed | Existing | | Proposed | |
| Cross Sectional Area ($m^2$) | 175.00 | | 205.00 | 150.00 | | 180.00 | |
| Enlarged Portion ($m^2$) | 30.00 | | | 30.00 | | | |
| Length (m) | 37,240 | | | 11,560 | | | |
| | Quantity | Unit Price | Cost | Quantity | Unit Price | Cost | |
| Excavation Volume ($m^2$) | 1,117,200 | (machine) 0.65 LE | LE 726,180 | 346,800 | (machine) 0.65 LE | LE 225,420 | |
| Enlarged Portion ($m^2$) | 223,440 | 1.19 | 265,894 | 69,360 | 1.19 | 82,538 | |
| Gravel for the Re-built Road | 44,688 | 9.01 | 402,639 | 13,872 | 9.01 | 124,987 | Width 4 m Thickness 30 cm |
| Total | | | 1,394,713 | | | 432,945 | |

o Pipeline ϕ 1,650 = 6,000 x 2 = 12,000 m 12,000 x 388.48 = 4,661,760 LE

388.48 LE /M

o Pump 214,000,000 Yen = 706,271 LE

Total 5,800,976 LE

PIPELINE ϕ 1650 FRPM Unit (M)

| Works | Unit | Q'ty | Unit Price | Foreign | Local | Remarks |
|---|---|---|---|---|---|---|
| 1. Excavation (machine) | $M^3$ | 10.3 | 0.65 | | 6.70 | |
| 2. Installation | | 1.0 | | | 5.16 | Crane is necessary |
| 3. Refill (Machine) | $M^3$ | 5.76 | 0.58 | | 3.34 | |
| Refill (Man power) | " | 2.35 | 0.40 | | 0.94 | |
| 4. Pipe | m | 1.0 | 359.30 | 359.30 | | |
| 5. Trans-portation | | 1.0 | | | 13.04 | Port-Said ↓ Site |
| Sub-Total | | | | LE 359.30 | LE 29.18 | |
| Total | | LE 388.48 | | | | |

# D. AGRICULTURAL CONDITIONS

Table III.D.1 Cultivated Areas in Egypt

('000 Fed )

| Seasons of Cultivation | 1952 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978* |
|---|---|---|---|---|---|---|---|
| Winter crops | 4364 | 4943 | 4980 | 5069 | 5042 | 4958 | 5025 |
| Summer crops | 3026 | 5075 | 5101 | 5084 | 5122 | 5082 | 4967 |
| Nile crops | 1824 | 648 | 667 | 723 | 734 | 750 | 824 |
| Orchards | 94 | 258 | 273 | 285 | 313 | 321 | 332 |
| Total | 9308 | 10924 | 11021 | 11161 | 11211 | 11111 | 11148 |

Source: Statistical year book, 1979

Table III.D.2 Number of Livestock in Egypt

('000 Head )

| Variety | 1973 | 1974 | 1975 | 1976 | 1977 | 1978* |
|---|---|---|---|---|---|---|
| Cows | 2127 | 2119 | 2102 | 2079 | 2048 | 2587 |
| Buffaloes | 2135 | 2170 | 2204 | 2236 | 2266 | 2542 |
| Sheep | 1994 | 1965 | 1926 | 1878 | 1821 | 2554 |
| Goats | 1264 | 1293 | 1321 | 1349 | 1375 | 1440 |
| Camels | 113 | 109 | 105 | 101 | 97 | 93 |
| Pigs | 14 | 15 | 15 | 15 | 15 | 15 |

Source: Statistical year book, 1979

Table III.D.3 Population in Ismailia Governorate

| Kind | Number | | | Percentage (%) | | |
|---|---|---|---|---|---|---|
| | Urban | Rural | Total | Urban | Rural | Total |
| Sex | | | | | | |
| Man | 90,162 | 90,975 | 181,137 | 25.5 | 25.7 | 51.2 |
| Woman | 83,583 | 88,617 | 172,200 | 23.7 | 25.1 | 48.8 |
| Total | 173,745 | 179,592 | 353,337 | 49.2 | 50.8 | 100 |
| Age group | | | | | | |
| Under 6 | 26,212 | 36,224 | 62,436 | 7.4 | 10.3 | 17.7 |
| 6 to 64 | 142,270 | 137,479 | 279,749 | 40.3 | 38.8 | 79.1 |
| Above 64 | 5,263 | 5,889 | 11,152 | 1.5 | 1.7 | 3.2 |
| Total | 173,745 | 179,592 | 353,337 | 49.2 | 50.8 | 100 |
| Religion | | | | | | |
| Moslem | 165,704 | 178,042 | 343,746 | 46.9 | 50.4 | 97.3 |
| Christian | 8,026 | 1,538 | 9,564 | 2.3 | 0.4 | 2.7 |
| Judaism or other | 15 | 12 | 27 | - | - | - |
| Total | 173,745 | 179,592 | 353,337 | 49.2 | 50.8 | 100 |
| Employment | | | | | | |
| Working | 51,911 | 49,879 | 101,790 | 17.8 | 17.2 | 35.0 |
| Not working | 95,622 | 93,489 | 189,111 | 32.9 | 32.1 | 65.0 |
| Total | 147,533 | 143,368 | 290,901 | 50.7 | 49.3 | 100 |
| Education | | | | | | |
| Uneducated | 49,609 | 81,835 | 131,444 | 19.2 | 31.8 | 51.0 |
| Can read and write | 33,643 | 23,038 | 56,681 | 13.1 | 8.9 | 22.0 |
| Holder of certificates | 44,472 | 15,447 | 59,919 | 17.2 | 6.0 | 23.3 |
| Unidentified | 5,140 | 4,663 | 9,803 | 2.0 | 1.8 | 3.8 |
| Total | 132,864 | 124,983 | 257,848 | 51.5 | 48.5 | 100 |

Table III.D.4 Population under Employment (6 - 64 years old)

| Sector | Number | | | Percentage (%) | | |
|---|---|---|---|---|---|---|
| | Man | Woman | Total | Man | Woman | Total |
| Agriculture, Fisheries | 34,652 | 538 | 35,190 | 39.6 | 10.9 | 38.1 |
| Mine | 238 | 15 | 253 | 0.3 | 0.3 | 0.3 |
| Industry | 4,543 | 390 | 4,933 | 5.2 | 7.9 | 5.3 |
| Electricity, Gas, Water | 764 | 34 | 798 | 0.9 | 0.7 | 0.9 |
| Building | 10,669 | 123 | 10,792 | 10.2 | 2.5 | 11.7 |
| Merchant, Hotel | 7,232 | 222 | 7,454 | 8.3 | 4.5 | 8.1 |
| Transportation, Communi-cation | 9,856 | 282 | 10,138 | 11.3 | 5.7 | 11.0 |
| Finance Service | 487 | 86 | 573 | 0.6 | 1.7 | 0.6 |
| Social Service | 16,613 | 2,817 | 19,430 | 19.0 | 57.2 | 21.0 |
| Others | 2,335 | 424 | 4,759 | 2.0 | 8.6 | 3.0 |
| Total | 87,389 | 4,931 | 92,320 | | | 100 |

Table III.D.5 Distribution of Land Ownerships in Egypt

1975 (1)

| Bracket | Land Owners '000 | Area Owned Fed '000 | Percentage | |
|---|---|---|---|---|
| | | | Land Owners % | Area Owned % |
| Less than 5 Fed. | 3190 | 2769 | 95 | 49.7 |
| 5 Fed. - | 92 | 617 | 2.7 | 11.1 |
| 10 Fed. - | 44 | 586 | 1.3 | 10.5 |
| 20 Fed. - | 23 | 682 | 0.7 | 12.2 |
| 50 Fed. - | 7 | 520 | 0.2 | 9.3 |
| 100 Fed. (2) | 2 | 398 | 0.1 | 7.1 |
| Total | 3358 | 5572 | 100 | 100 |

(1) State lands, desert prairie and land under distribution are not included.

(2) Includes Organizations, Companies and Individuals.

(3) Source: Statistical year book, 1979

Table III.D.6 Land Distribution by Size of Holdings in Ismailia

| | Number of Farms | Acreage of Farm Land | Distribution by size of holidings (Fed) | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1-5 | 5-10 | 10-20 | 20-50 | 50-100 |
| Ismailia | 8,424 | 27,972 | 14,290 | 6,015 | 5,660 | 1,887 | 120 |
| West Quantara | 3,886 | 16,717 | 7,429 | 5,125 | 3,123 | 1,040 | - |
| East Quantara | 28 | 323 | 9 | - | 314 | - | - |
| Fayed | 3,428 | 10,375 | 5,883 | 2,356 | 1,602 | 534 | - |
| Tel El Kebir | 5,072 | 11,247 | 7,189 | 1,733 | 1,744 | 581 | - |
| Total | 20,838 | 66,634 | 34,800 | 15,229 | 12,443 | 4,042 | 120 |
| Percentage % | | 100 | 52.2 | 22.9 | 18.7 | 6.1 | 0.1 |

# E. CONCERTED EFFORT FOR DESERT DEVELOPMENT IN ISMAILIA

Table III.E.1 Form of Interview Survey with Coop. Members

QUESTIONNAIR

Investigator _____

Name _____ Age _____ years

Living place _____

Number of family _____ persons

Present occupation _____ Monthly earning _____

Registered year _____ Capital paid £ _____

Owned farmland (except 10th of Ramadan area) _____ feddan

Emphasized production on the above land.

Fruits _____ Vegetables _____ Dairy _____

Beef cattle _____ Field Crops _____ Chickens _____

Living facilities

T.V. (Color _____ B&W _____) Sewing M. _____ Washing M. _____

Refrigerator _____ Car _____

Do you want to manage alotted farm land yourself, after construction of farm land on the 10th of Ramadan.

Yes _____ No _____

If Yes, what type of farming do you want on the area (final type -- 10 year later)

Fruits _____ Vegetables _____ Dairy _____

Beef cattle _____ Field Crops _____ Chickens _____

If No, how do you deal with your land

Entrust to Coop. _____ To Others _____

# C. IRRIGATION REQUIREMENTS

C. Irrigation Requirements

C.1 Irrigation Requirements

1-1 Calculation Procedures

Irrigation requirements are determined by multiplying crop water requirements (net irrigation requirements) by irrigation efficiency. The crop water requirements are calculated using the "Pan Evaporation Method[1]" on the basis of pan evaporation data, since this method is the most widely used in the world and values aquired by this method are very near to real evapotranspiration values. Climatic data, that is, evaporation, humidity and wind velocity used for study are from the nearest station located at Ismailia[2]. Calculation procedure is shown in Fig. IV.C.1 and major formulas are as follows:

(1) ETo = Kp x ET

(2) ETcrop = kc x ETo

where, ETo : reference crop evapotranspiration (mm/day)
Kp : pan coefficient
ET : pan evaporation (mm/day)
ETcrop: crop evapotranspiration (mm/day)
(Crop Water Requirements)
kc : crop factor

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1) FAO IRRIGATION AND DRAINAGE PAPER 24, "CROP WATER REQUIREMENTS", Rome 1977, p.30

2) "CLIMATOLOGICAL NORMALS for UNITED ARAB REPUBLIC, UP TO 1960" Ministry of Military Production - Meteorological Department, Cairo, p. 68, Mean value of 1946-1956

Fig. IV.C.1 Flow Chart of the Calculation for Irrigation Requirements

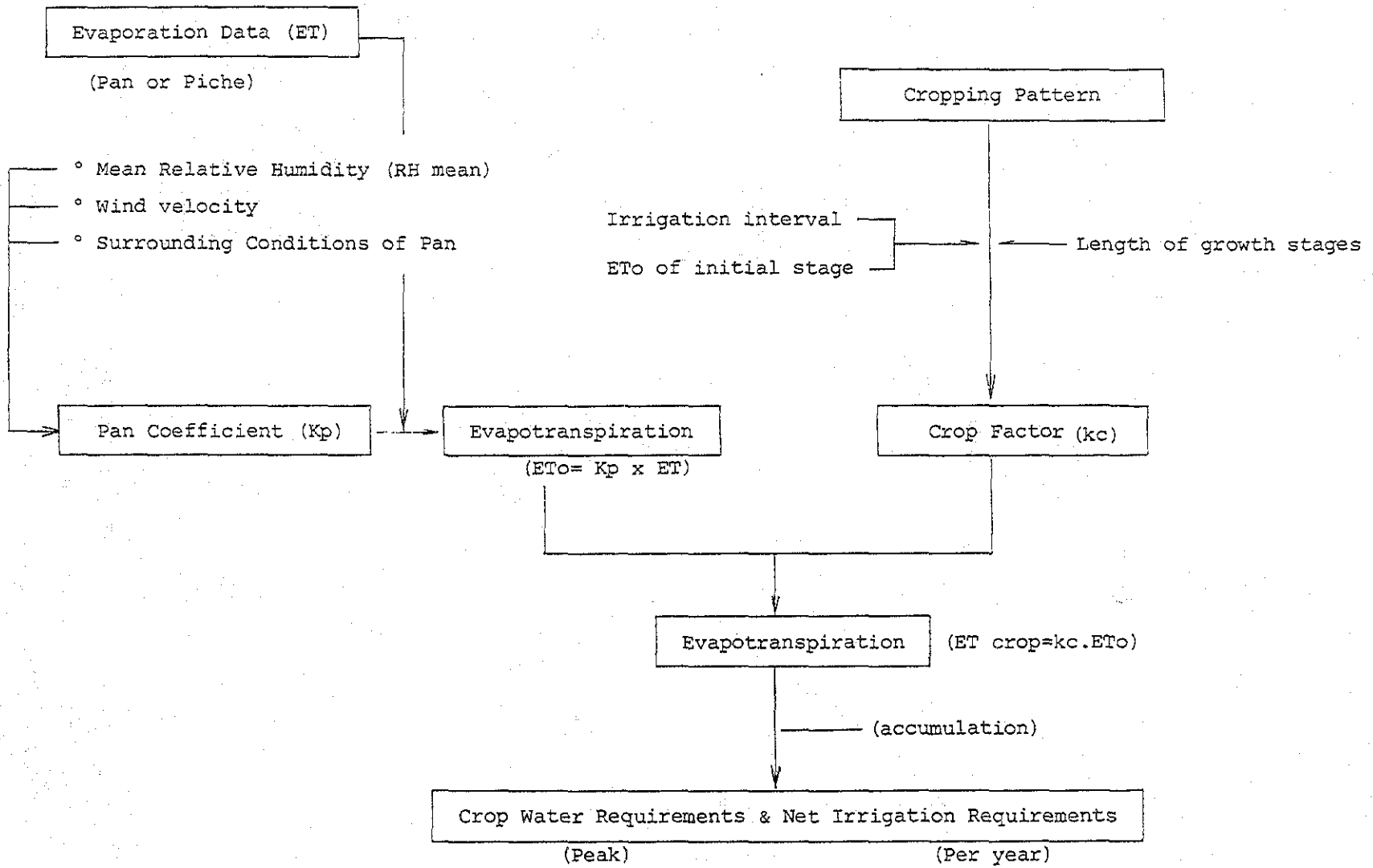


Table IV.C.1 Acreage of Crops

(Unit: Feddans)

| | Cropping Pattern / Crop | Type I | Type II | Type III | Type IV | Weighted Acreage | Total (%) |
|---|---|---|---|---|---|---|---|
| Winter | Berseem | 3.0 (2.1) | 3.0 (0.45) | 4.0 (0.3) | 6.0 0.45) | (3.3) | 17 |
| | Potatoes | 3.0 (2.1) | 3.0 (0.45) | 2.0 (0.15) | | (2.7) | 14 |
| | Tomatoes | 3.0 (2.1) | | 2.0 (0.15) | 6.0 (0.45) | (2.7) | 14 |
| | Barley | | | 4.0 (0.3) | | (0.3) | 2 |
| | Strawberry | | | | 1.0 (0.075) | (0.075) | 0.4 |
| | Beans | | | | 1.0 (0.075) | (0.075) | 0.4 |
| Summer | Sorghum | 2.0 (1.4) | 1.0 (0.15) | 4.0 (0.3) | 2.0 (0.15) | (2.0) | 10 |
| | Sesame | 1.0 (0.7) | 2.0 (0.30) | | 4.0 (0.30) | (1.3) | 7 |
| | Cucumber | 3.0 (2.1) | 3.0 (0.45) | 4.0 (0.3) | 1.0 (0.075) | (2.925) | 15 |
| | Water melon | 3.0 (2.1) | | 2.0 (0.15) | | (2.25) | 11 |
| | Groundnuts | | | 2.0 (0.15) | 6.0 (0.45) | (0.60) | 3 |
| | Tomatoes | | | | 1.0 (0.075) | (0.075) | 0.4 |
| Perennial | Alfalfa | 0.5 (0.35) | 0.5 (0.075) | 1.0 (0.075) | 1.0 (0.075) | (0.575) | 3 |
| | Nepia Grass | 0.5 (0.35) | 0.5 (0.075) | 1.0 (0.075) | 1.0 (0.075) | (0.575) | 3 |
| | Fruits | 10.0 (7.0) | 13.0 (1.95) | 6.0 (0.45) | 4.0 (0.30) | (9.70) | 49 |
| | Total (Fed) | 20.0 | 20.0 | 20.0 | 20.0 | | 100 |
| | (%) | (70.0) | (15.0) | (7.5) | (7.5) | (100) | |
| | Acreage (Fed) | 14.0 | 3.0 | 1.5 | 1.5 | 20.0 | |

Table IV.C.2 Evapotranspiration (ETo)

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. | Annual (mm/year) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (Case A: Pan placed in short green cropped area) | | | | | | | | | | | | | |
| ° Relative Humidity (RH mean) | Medium | | Low | | | | | | | | Medium | | |
| ° Wind | Moderate | | | | | | | | | | | | |
| ° Windward side distance of green crop | (1,000mm) | | | | | | | | | | | | |
| ° Pan coefficient (Kp) | 0.8 | 0.8 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.8 | 0.8 | |
| ° Evaporation (ET, mm/day) | 4.3 | 5.2 | 7.2 | 10.2 | 10.1 | 11.8 | 10.5 | 9.4 | 7.7 | 6.0 | 4.6 | 4.5 | 2,647 |
| ° Reference crop evapotranspiration (ETo, mm/day) | 3.4 | 4.2 | 5.0 | 7.1 | 7.1 | 8.3 | 7.4 | 6.6 | 5.4 | 4.2 | 3.7 | 3.6 | 2,000 |

Table IV.C.3 Climatic Data and Its Classification

| | | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ET [1] | (mm/day) | 4.3 | 5.2 | 7.2 | 10.2 | 10.1 | 11.8 | 10.5 | 9.4 | 7.7 | 6.0 | 4.6 | 4.5 | 2,647 |
| RH | (%) | 43 | 41 | 30 | 22 | 24 | 27 | 31 | 33 | 32 | 36 | 40 | 44 | 34 |
| (Classification) [2] | | Medium | Low ( <40% ) | | | | | | | | | Medium (40-70%) | | |
| Wind | (km/day) | 253 | 227 | 320 | 307 | 289 | 289 | 302 | 244 | 244 | 196 | 187 | 227 | 258 |
| (Classification) | | Moderate (175-425 km/day) | | | | | | | | | | | | |

1) Climatic data is quoted from "CLIMATOROGICAL NORMALS".

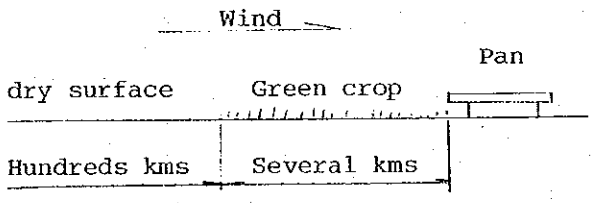
2) Classification is determined by Table IV.C.4.

Table IV.C.4 Pan Coefficient (Kp) [1]

| Class A pan | Case A: Pan placed in short green cropped area | | | |
|---|---|---|---|---|
| RH mean % | | low <40 | medium 40-70 | high >70 |
| Wind km/day | Windward side distance of green crop m | | | |
| Light <175 | 1 | .55 | .65 | .75 |
| | 10 | .65 | .75 | .85 |
| | 100 | .7 | .8 | .85 |
| | 1 000 | .75 | .85 | .85 |
| Moderate 175-425 | 1 | .5 | .6 | .65 |
| | 10 | .6 | .7 | .75 |
| | 100 | .65 | .75 | .8 |
| | 1 000 | .7 | .8 | .8 |
| Strong 425-700 | 1 | .45 | .5 | .6 |
| | 10 | .55 | .6 | .65 |
| | 100 | .6 | .65 | .7 |
| | 1 000 | .65 | .7 | .75 |
| Very strong >700 | 1 | .4 | .45 | .5 |
| | 10 | .45 | .55 | .6 |
| | 100 | .5 | .6 | .65 |
| | 1 000 | .55 | .6 | .65 |

1) Table is quoted from above mentioned FAO paper Pg. 34

2) Condition of Pan placed is as follows;




3) Wind direction is mostly north and notheast (47%).

1-2 Crop Water Requirements

Crop water requirements calculated by the Pan Evaporation Method are shown as Table IV.C.5 and Fig. IV.C.2 and are shown as Table IV.C.7 (1) to (2). These show that peak crop water requirements (weighted mean in June) reach 6.7 mm/day or 28.1 $m^3$/day/fed and the annual total is 5,900 $m^3$/year/fed. These amounts mean net irrigation requirements. The requirements by each cropping type are shown as Table IV.C.6 and they differ slightly both in peak period and in annual total. Each crop water requirements varies 3.9 mm/day of barley to 9.7 mm/day of summer tomatoes and 7.9 mm/day of perennial alfalfa comparatively. In the procedure of field irrigation facilities design the amount of 9.7 mm/day is adoptable for vegetable and fodder fields and the 6.3 mm/day for fruits field separately.

Table IV.C.5 Crop Water Requirements (Summary)

| Crop | Period | Crop Water Requirements (Peak) | Annual Total Requirements |
|---|---|---|---|
| | | mm/day | mm/year |
| Berseem | Winter | 6.8 | 896 |
| Potatoes | " | 6.5 | 564 |
| Tomatoes | " | 4.7 | 714 |
| Barley | " | 3.9 | 467 |
| Strawberry | " | 4.0 | 208 |
| Beans | " | 4.0 | 208 |
| Sorghum | Summer | 7.9 | 760 |
| Sesame | " | 7.9 | 843 |
| Cucumber | " | 6.9 | 711 |
| Watermelon | " | 6.8 | 705 |
| Groundnuts | " | 6.8 | 767 |
| Tomatoes | " | 9.7 | 1,012 |
| Alfalfa | Perennial | 7.9 | 1,729 |
| Nepia Grass | " | 7.5 | 1,794 |
| Citrus | " | 6.3 | 1,359 |
| (Weighted mean) | | 6.7 (in June) | 1,400 |

Fig. IV.C.2 Crop Water Requirements
(by Cropping Types)

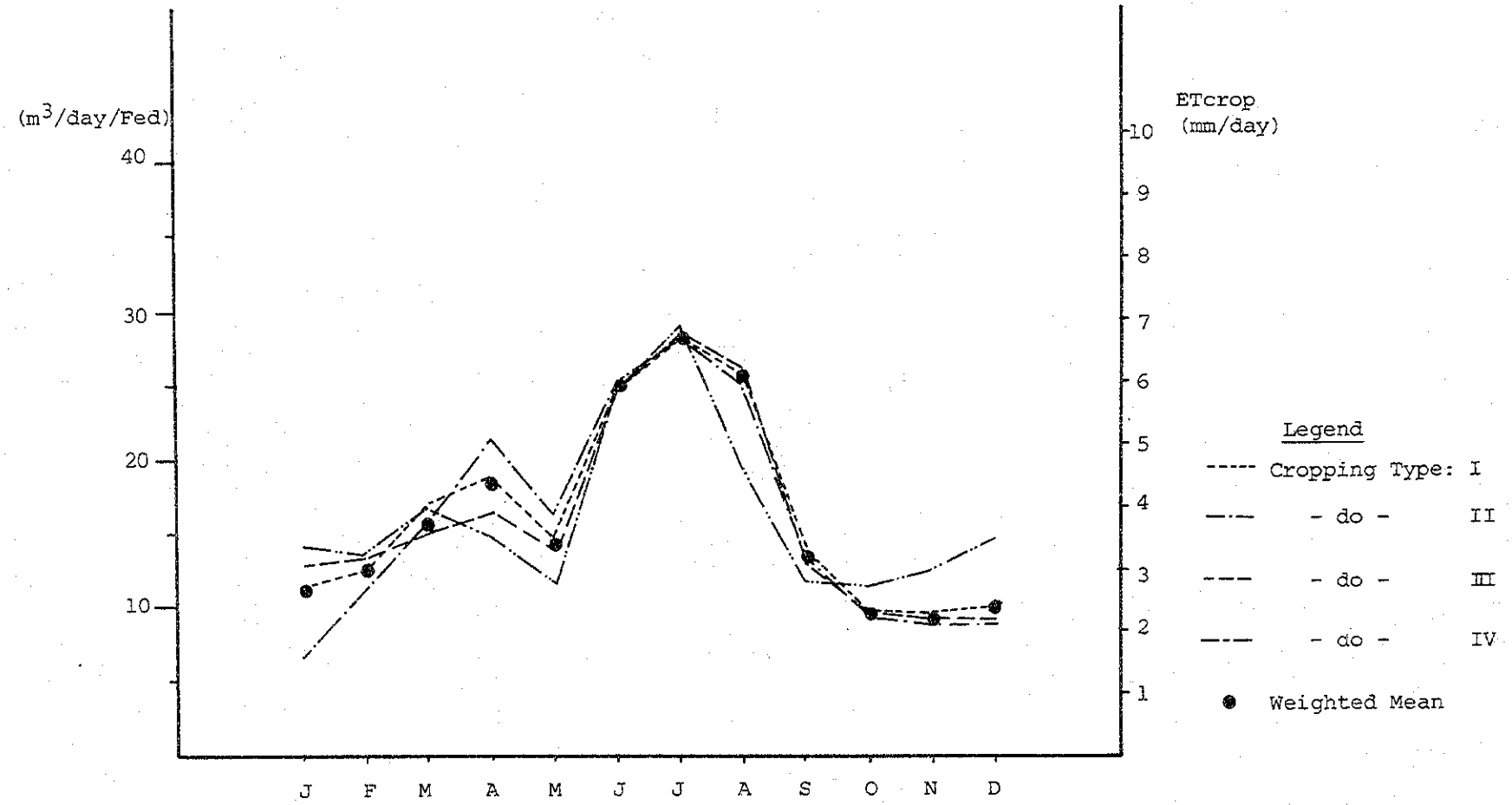


Table IV.C.6 Comparative Table of Net Irrigation Requirements by Cropping Type

(Unit: mm/day)

| Cropping Type | Acreage (%) | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. | Total (mm/year) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | 75 | 2.7 | 3.0 | 4.1 | 4.5 | 3.5 | 5.9 | 6.7 | 6.1 | 3.3 | 2.3 | 2.3 | 2.4 | 1,430 (102) |
| II | 15 | 1.6 | 2.7 | 3.8 | 5.1 | 3.9 | 6.0 | 6.7 | 5.9 | 3.5 | 2.2 | 2.1 | 2.1 | 1,390 (99) |
| III | 7.5 | 3.1 | 3.2 | 3.6 | 3.9 | 3.3 | 5.8 | 6.8 | 6.3 | 3.2 | 2.3 | 2.2 | 2.2 | 1,430 (102) |
| IV | 7.5 | 3.4 | 3.3 | 4.0 | 3.5 | 2.8 | 5.8 | 6.9 | 4.6 | 2.8 | 2.7 | 3.0 | 3.5 | 1,410 (101) |
| Total | 100 | 2.7 | 3.0 | 3.8 | 4.4 | 3.4 | 5.9 | 6.7 | 6.0 | 3.3 | 2.3 | 2.2 | 2.4 | 1,400 (100) |

Table IV.C.7 Crop Water Requirement (1)

| Vegetation | Period | Crop | Fed. % | Month | 1 Jan. | 2 Feb. | 3 Mar. | 4 Apr. | 5 May | 6 Jun | 7 Jul | 8 Aug. | 9 Sep. | 10 Oct. | 11 Nov. | 12 Dec. | Unit | NOTE (Peak) mm/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ETo | 3.4 | 3.6 | 5.0 | 7.1 | 7.1 | 8.3 | 7.4 | 6.6 | 5.4 | 4.2 | 3.7 | 3.6 | mm/day | |
| Fodder | Winter | Berseem | 17 | kc | 1.05 | 1.05 | 1.05 | 0.95 | | | | | | 0.71 | 0.88 | 1.05 | | |
| | | | | ET crop | 3.6 | 3.8 | 5.3 | 6.8 | | | | | | 3.0 | 3.3 | 3.8 | mm/day | 6.8 |
| Vegetable | | Potatoes | 14 | kc | 0.76 | 0.96 | 1.15 | 0.91 | | | | | | | | | | |
| | | | | ET crop | 2.6 | 3.5 | 5.8 | 6.5 | | | | | | | | | " | 6.5 |
| | | Tomato | 14 | kc | 1.20 | 1.20 | 0.93 | | | | | | | 0.71 | 0.83 | 1.11 | | |
| | | | | ET crop | 4.1 | 4.3 | 4.7 | | | | | | | 3.0 | 3.1 | 4.0 | " | 4.7 |
| Fodder | | Barley | 2 | kc | 1.15 | 1.03 | 0.22 | | | | | | | | 0.77 | 1.09 | | |
| | | | | ET crop | 3.9 | 3.7 | 1.1 | | | | | | | | 2.9 | 3.9 | " | 3.9 |
| Vegetable | | Straw-berry | 0.4 | kc | 1.15 | 0.50 | | | | | | | | | 0.79 | 1.12 | | |
| | | | | ET crop | 3.9 | 1.8 | | | | | | | | | 2.9 | 4.0 | " | 4.0 |
| | | Beans | 0.4 | kc | 1.15 | 0.50 | | | | | | | | | 0.79 | 1.12 | | |
| | | | | ET crop | 3.9 | 1.8 | | | | | | | | | 2.9 | 4.0 | " | 4.0 |
| | | | | kc | | | | | | | | | | | | | | |
| | | | | ET crop | | | | | | | | | | | | | | |
| | | | | kc | | | | | | | | | | | | | | |
| | | | | ET crop | | | | | | | | | | | | | | |
| | Weighted Mean (Sub-total) | | | ET crop | 1.5 | 1.7 | 2.2 | 2.0 | | | | | | 0.9 | 1.0 | 1.2 | mm/day | |

NOTE: Above factors were calculated by "Pan Evaporation Method" which was authorized by F.A.O. of THE UNITED NATIONS.

Crop Water Requirement (2)

| Vegitation | Period | Crop | Fed. % | Month | 1 Jan. | 2 Feb. | 3 Mar. | 4 Apr. | 5 May | 6 Jun | 7 Jul | 8 Aug. | 9 Sep. | 10 Oct. | 11 Nov. | 12 Dec. | Unit | NOTE (Peak) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ETo | 3.4 | 3.6 | 5.0 | 7.1 | 7.1 | 8.3 | 7.4 | 6.6 | 5.4 | 4.2 | 3.7 | 3.6 | mm/day | mm/day |
| | Summer | Sorghum | 10 | kc | | | | | 0.19 | 0.69 | 1.07 | 1.07 | 0.49 | | | | | |
| | | | | ET crop | | | | | 1.4 | 5.7 | 7.9 | 7.1 | 2.7 | | | | mm/day | 7.9 |
| | | Sesame | 7 | kc | | | | | 0.18 | 0.69 | 1.07 | 1.10 | 0.93 | 0.08 | | | | |
| | | | | ET crop | | | | | 1.3 | 5.7 | 7.9 | 7.3 | 5.0 | 0.3 | | | " | 7.9 |
| | | Cucum-ber | 15 | kc | | | | | 0.57 | 0.66 | 0.93 | 0.93 | 0.13 | | | | | |
| | | | | ET crop | | | | | 4.1 | 5.5 | 6.9 | 6.1 | 0.7 | | | | " | 6.9 |
| | | Water-melon | 11 | kc | | | | | 0.18 | 0.62 | 0.92 | 1.0 | 0.58 | | | | | |
| | | | | ET crop | | | | | 1.3 | 5.2 | 6.8 | 6.6 | 3.1 | | | | " | 6.8 |
| | | Ground Nuts | 3 | kc | | | | | 0.18 | 0.58 | 0.79 | 1.03 | 0.98 | 0.22 | | | | |
| | | | | ET crop | | | | | 1.3 | 4.8 | 5.9 | 6.8 | 5.3 | 0.9 | | | " | 6.8 |
| | | Tomatoes | 0.4 | kc | | | | | 0.57 | 0.81 | 1.17 | 1.19 | 0.73 | | | | | |
| | | | | ET crop | | | | | 4.0 | 5.8 | 9.7 | 8.8 | 4.8 | | | | " | 9.7 |
| | | | | kc | | | | | | | | | | | | | | |
| | | | | ET crop | | | | | | | | | | | | | " | |
| | | | | kc | | | | | | | | | | | | | | |
| | | | | ET crop | | | | | | | | | | | | | " | |
| Weighted Mean. (Sub-total) | | | | ET crop | | | | | 1.0 | 2.5 | 3.3 | 3.0 | 1.2 | 0.1 | | | mm/day | |

NOTE: Above factors were calculated by "Pan Evaporation Method" which was authorized by F.A.O. of THE UNITED NATIONS.

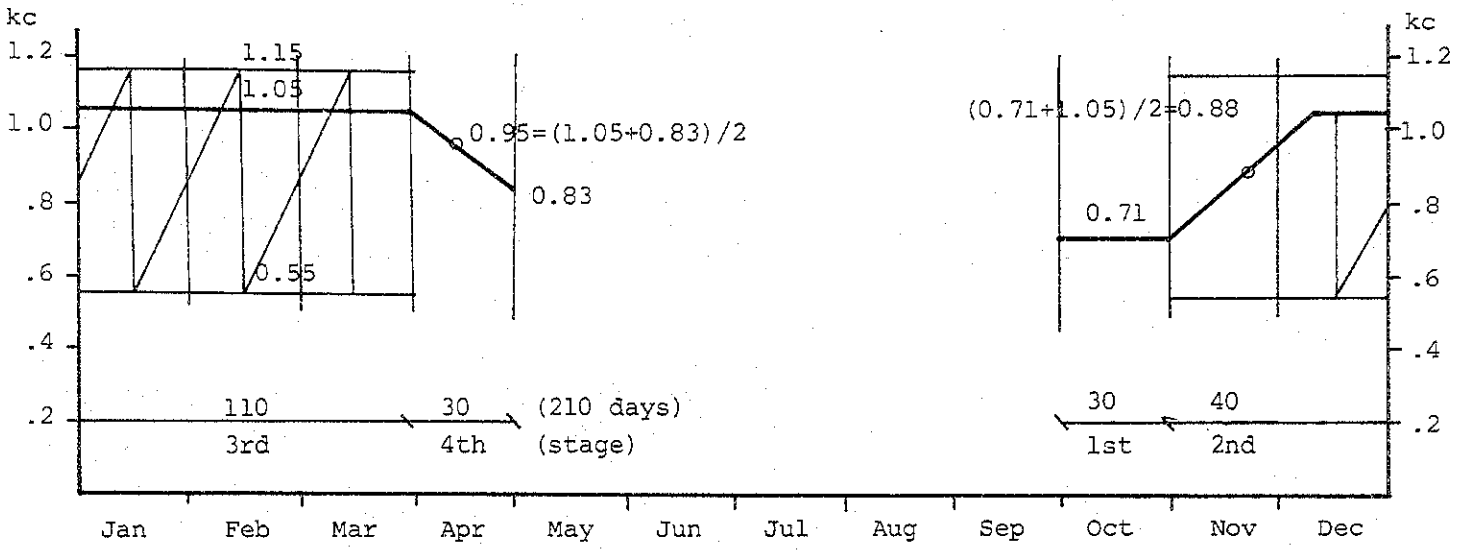
## Crop Water Requirements (3)

| Vegitation | Period | Crop | Fed. % | Month | 1 Jan. | 2 Feb. | 3 Mar. | 4 Apr. | 5 May | 6 Jun | 7 Jul | 8 Aug. | 9 Sep. | 10 Oct. | 11 Nov. | 12 Dec. | Unit | NOTE (Peak) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ETo | 3.4 | 3.6 | 5.0 | 7.1 | 7.1 | 8.3 | 7.4 | 6.6 | 5.4 | 4.2 | 3.7 | 3.6 | mm/day | mm/day |
| Fodder | Pere-nnial | Alfalfa | 3 | kc | 0.6 | 0.6 | 0.6 | 0.88 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 1.05 | 0.87 | 0.7 | | |
| | | | | ET crop | 2.0 | 2.2 | 3.0 | 6.3 | 6.8 | 7.9 | 7.0 | 6.3 | 5.1 | 4.4 | 3.2 | 2.5 | mm/day | 7.9 |
| | | Nepia Grass | 3 | kc | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | | |
| | | | | ET crop | 3.1 | 3.2 | 4.5 | 6.4 | 6.4 | 7.5 | 6.7 | 5.9 | 4.9 | 3.8 | 3.3 | 3.2 | | 7.5 |
| Fruits | | Citrus | 49 | kc | 0.65 | 0.65 | 0.60 | 0.60 | 0.60 | 0.73 | 0.85 | 0.85 | 0.70 | 0.55 | 0.60 | 0.60 | | |
| | | | | ET crop | 2.2 | 2.3 | 3.0 | 4.3 | 4.3 | 6.1 | 6.3 | 5.6 | 3.8 | 2.3 | 2.2 | 2.2 | | 6.3 |
| Weighted Mean (Sub-total) | | | | ET crop | 1.2 | 1.3 | 1.6 | 2.4 | 2.4 | 3.4 | 3.4 | 3.0 | 2.1 | 1.3 | 1.2 | 1.2 | mm/day | |
| Weighted Mean (Total) | | | | kc | | | | | | | | | | | | | | |
| | | | | ET crop | 2.7 | 3.0 | 3.8 | 4.4 | 3.4 | 5.9 | 6.7 | 6.0 | 3.3 | 2.3 | 2.2 | 2.4 | " | 1,400 mm/year |
| Net Water Demand ($m^3$/day/Fed.) | | | | | 11.3 | 12.6 | 16.0 | 18.5 | 14.3 | 24.8 | 28.1 | 25.2 | 13.9 | 9.7 | 9.2 | 10.1 | | 5,900$m^3$/year/Fed |

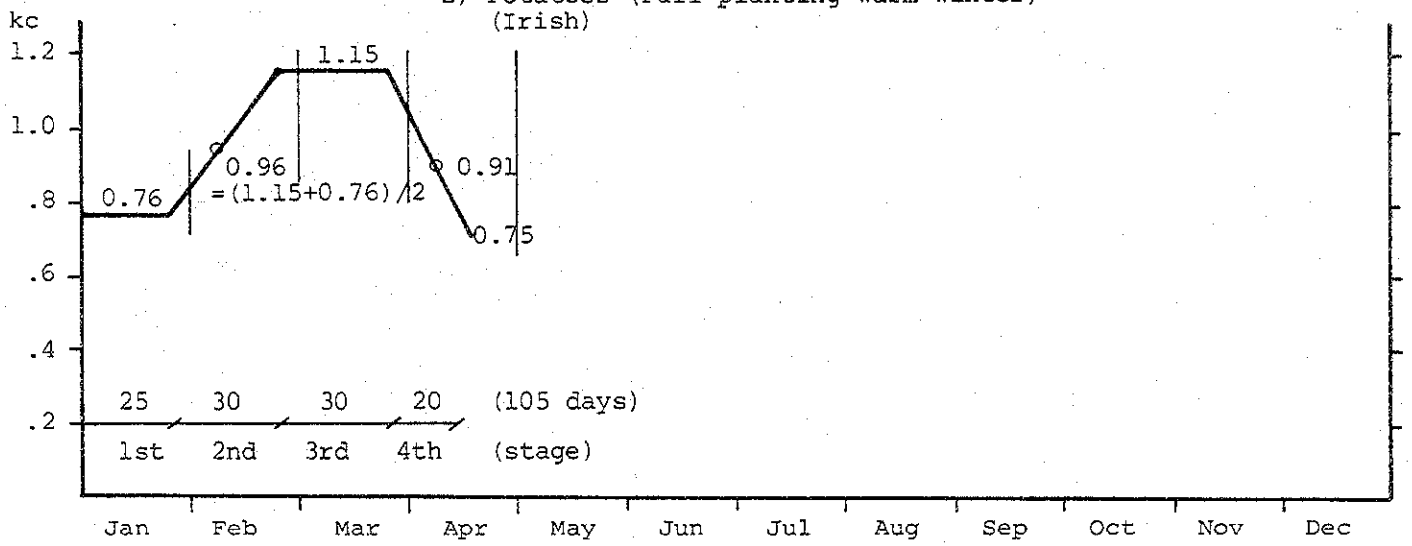
NOTE: Above factors were calculated by "Pan Evaporation Method" which was authorized by F.A.O. of THE UNITED NATIONS.

Fig. IV.C.3 Crop Factors (kc) (1)

1) Berseem (Pre-warm winter planting desert climate)

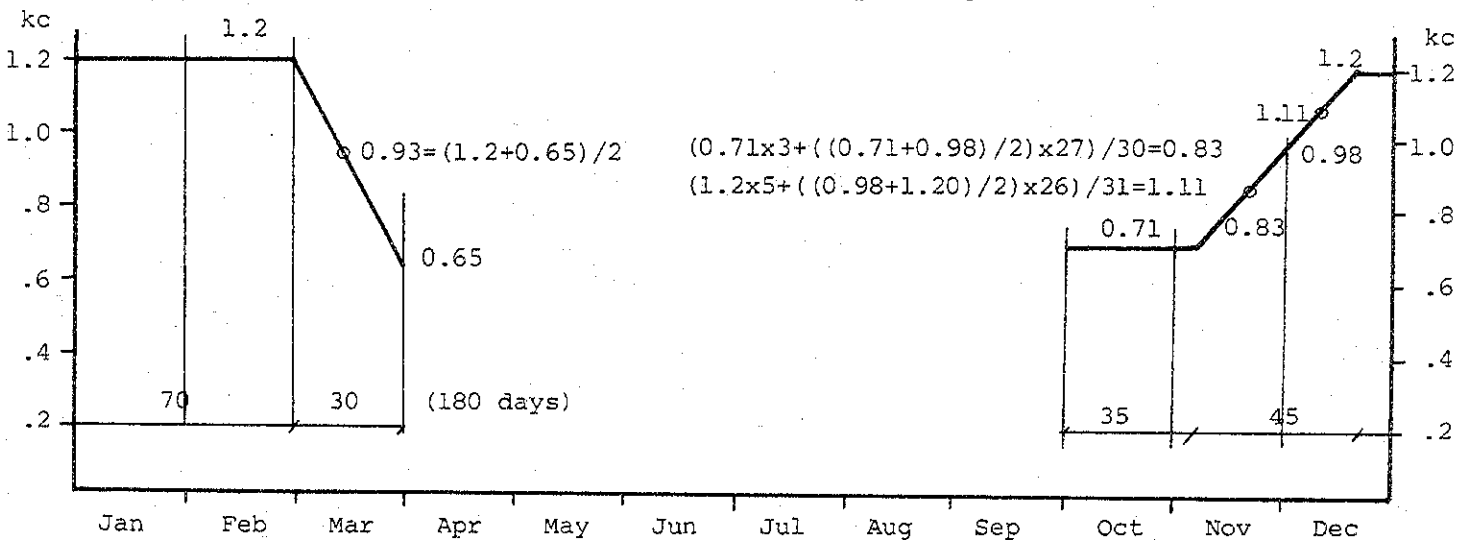



2) Potatoes (Full planting warm winter)
(Irish)

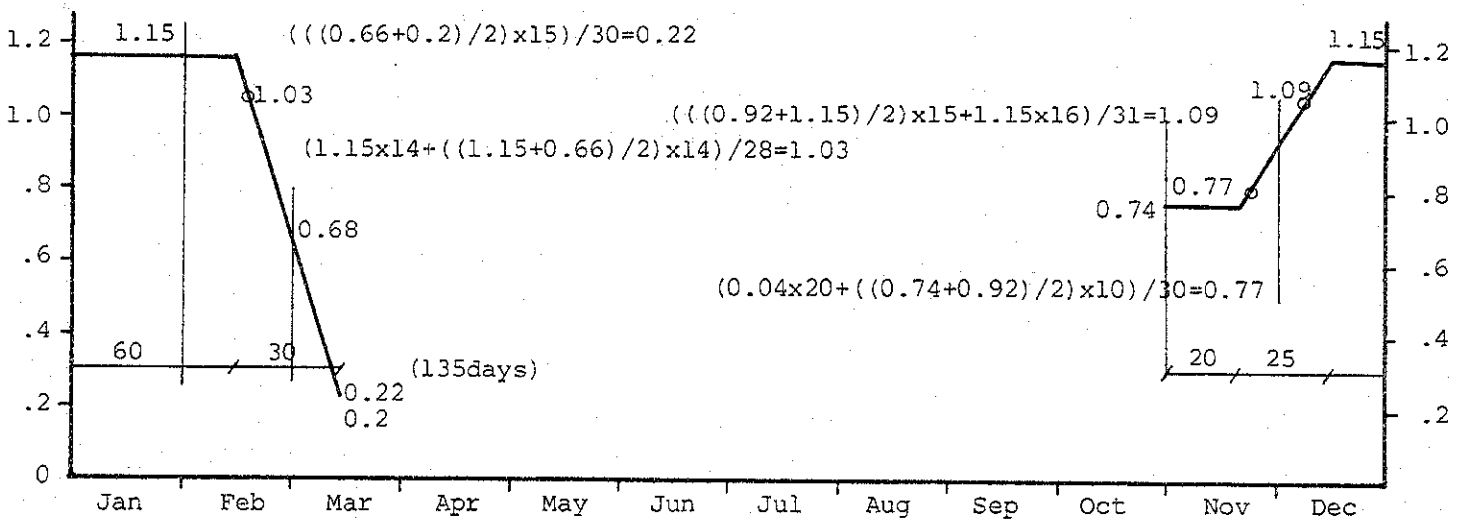


Crop Factors (kc) (2)

3) Tomatoes (late autumn planting)

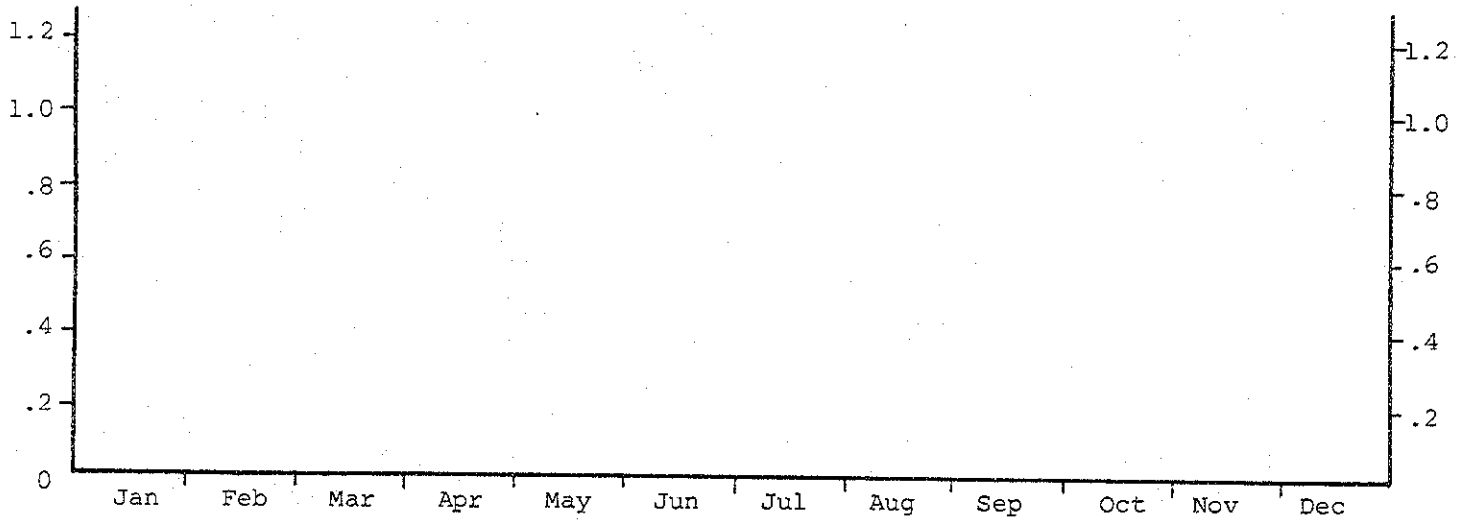



4) Barley (November planting)

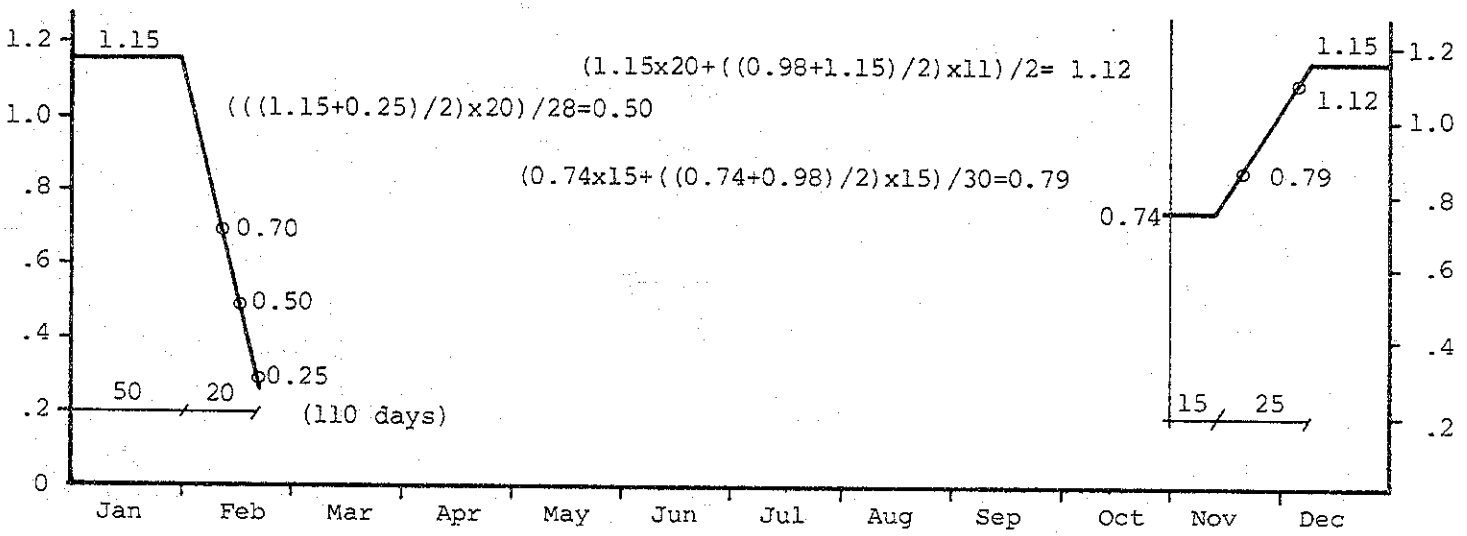


Crop Factors (kc) (3)

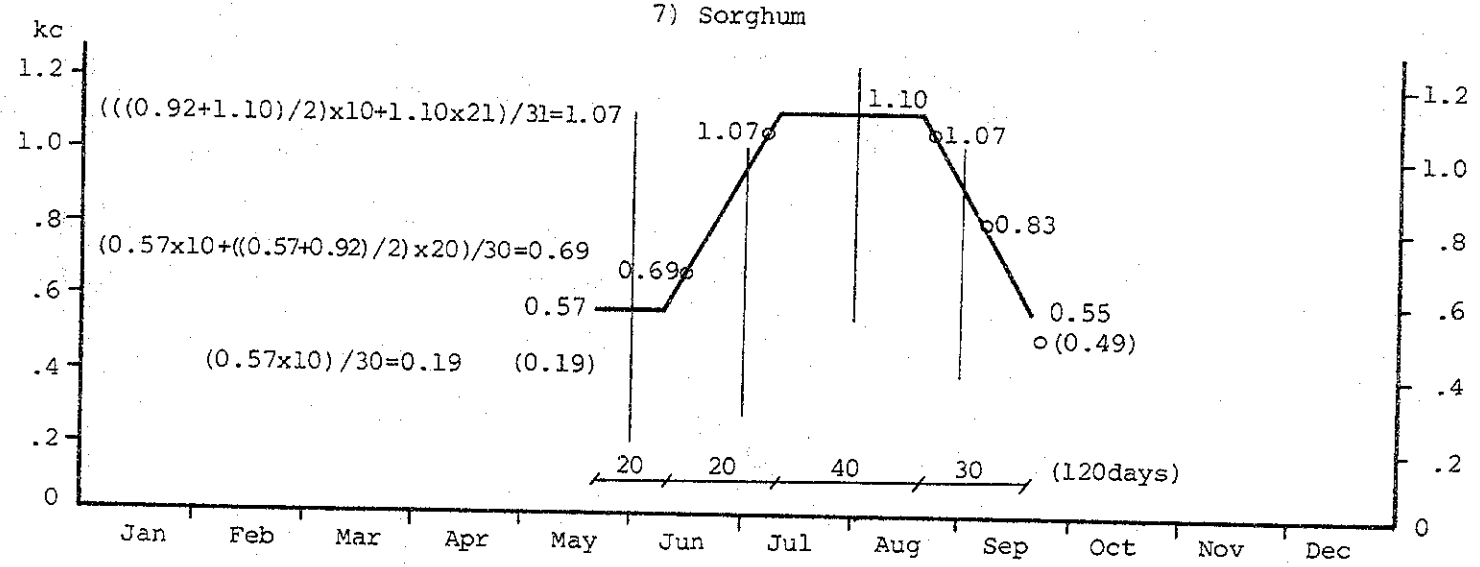
5) Strawberry (equal to dry beans)



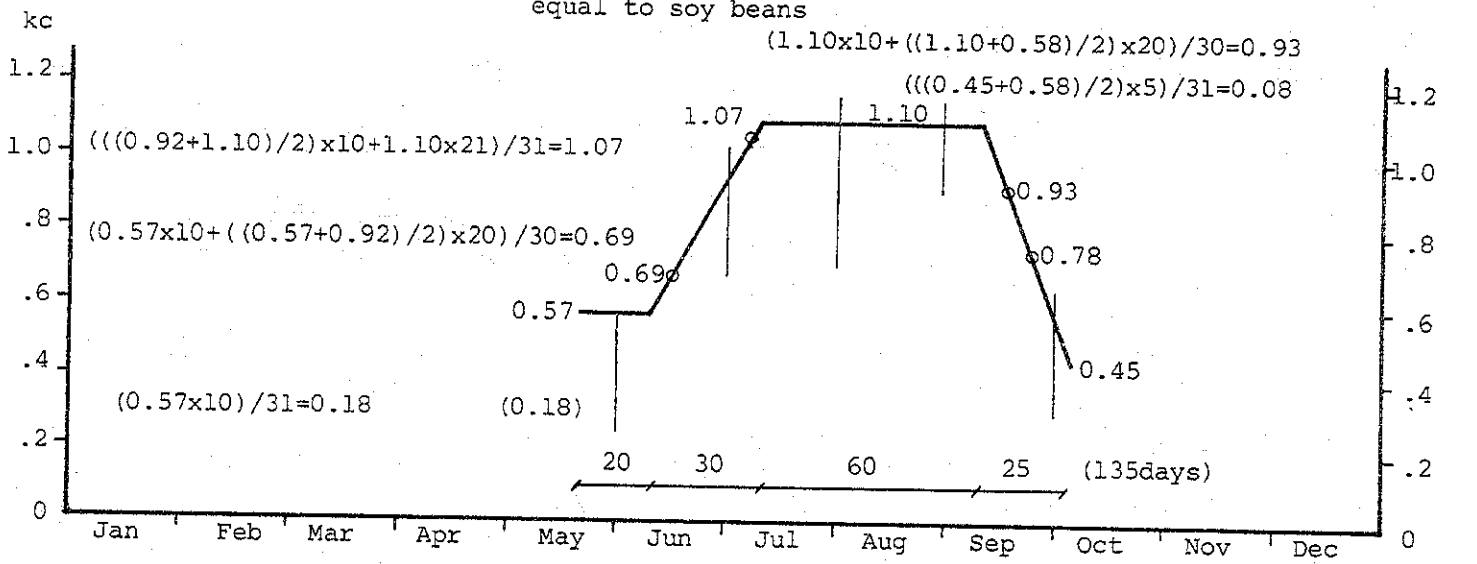

6) Beans (dry beans, November planting)

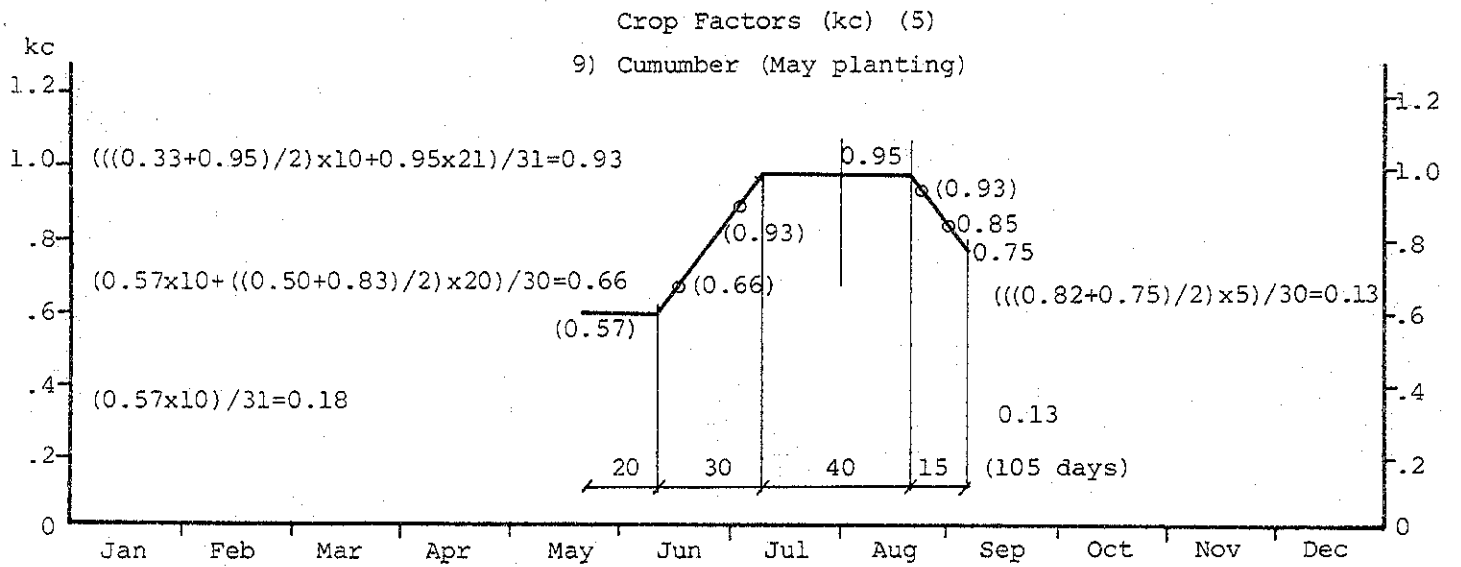


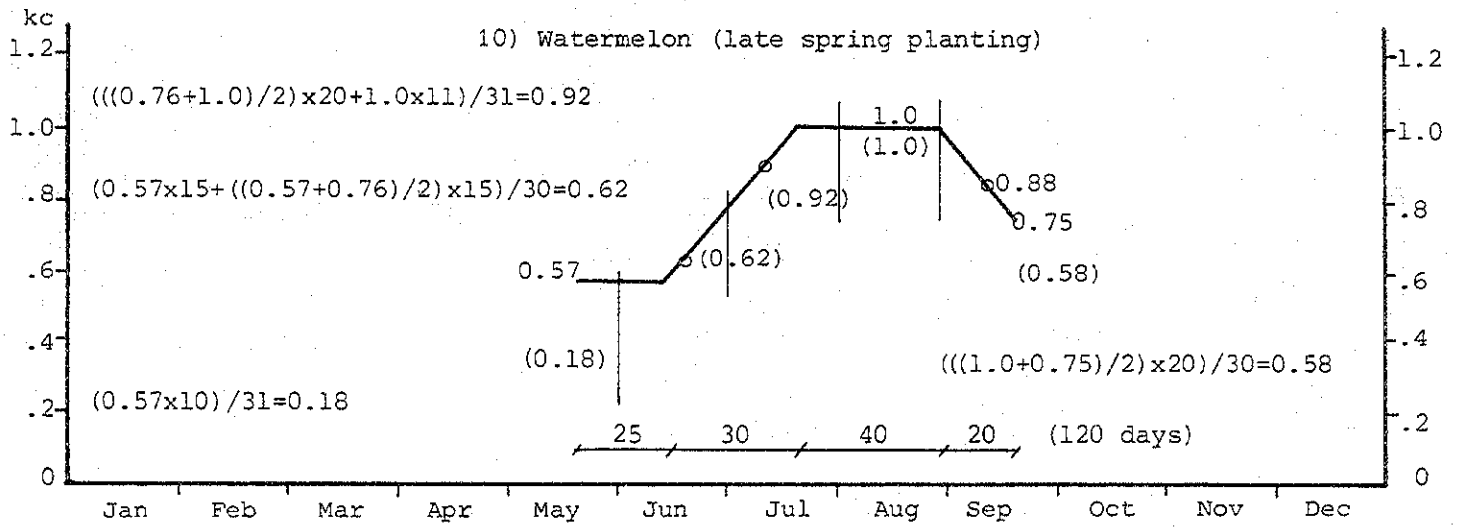
7) Sorghum




8) Sesame (late Spring planting)
equal to soy beans

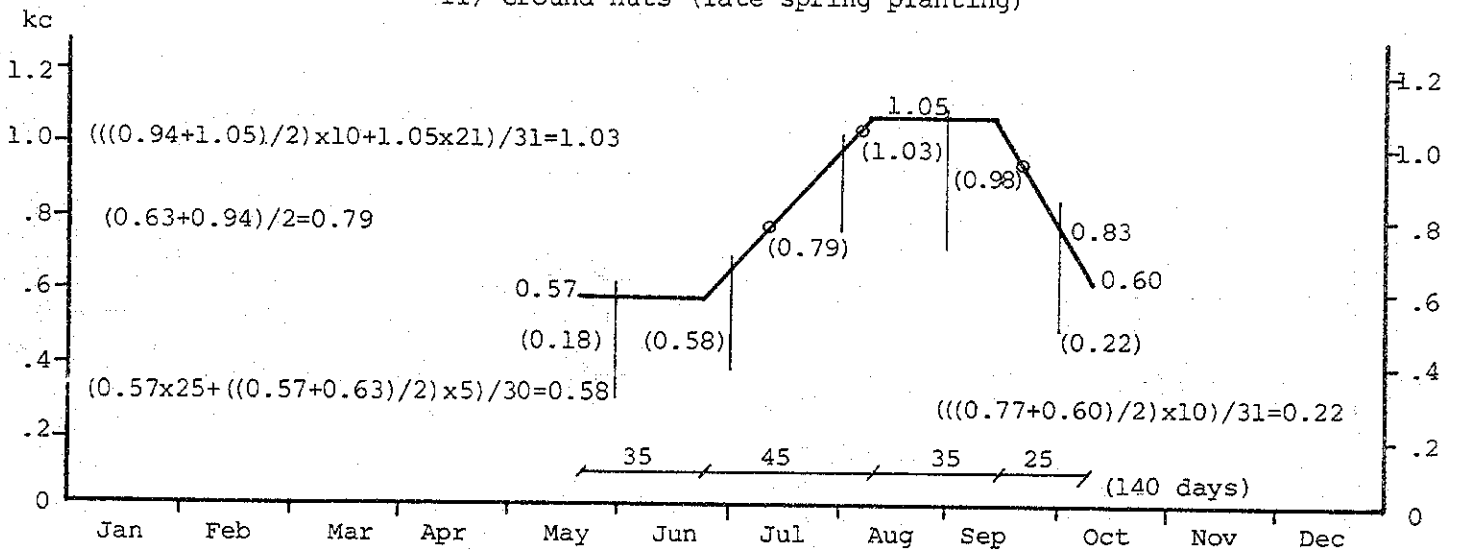



Crop Factors (kc) (5)
9) Cumumber (May planting)
kc
1.2
1.0
.8
.6
.4
.2
0
(((0.33+0.95)/2)x10+0.95x21)/31=0.93
(0.57x10+((0.50+0.83)/2)x20)/30=0.66
(0.57x10)/31=0.18
(0.57)
(0.66)
(0.93)
0.95
(0.93)
0.85
0.75
(((0.82+0.75)/2)x5)/30=0.13
0.13
20
30
40
15
(105 days)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

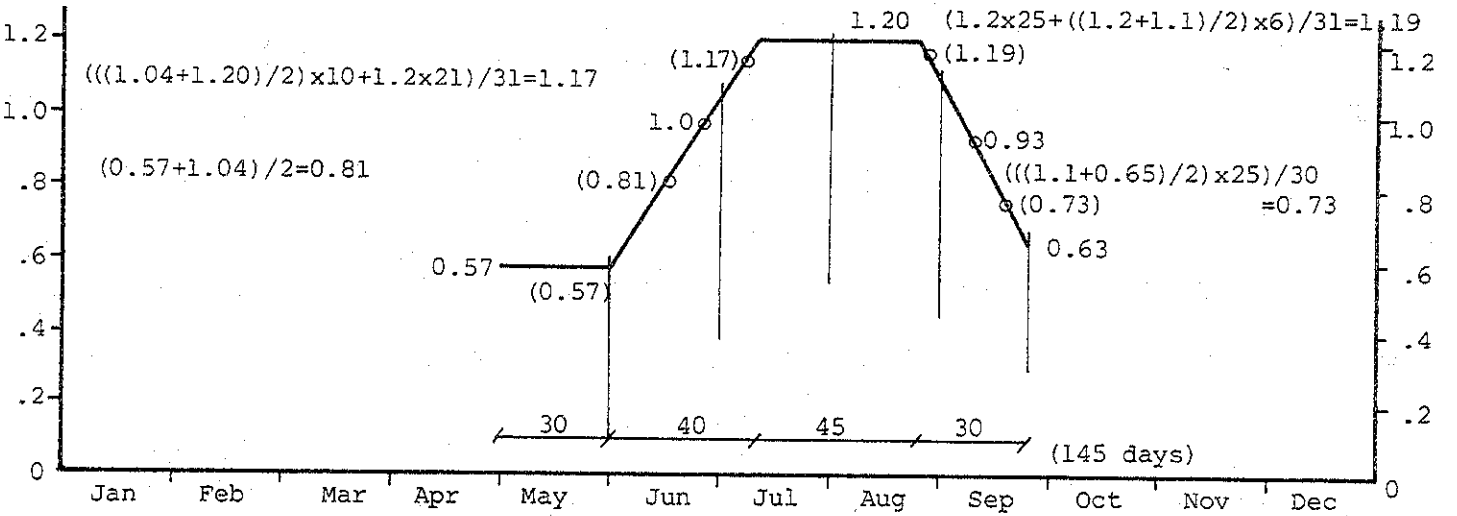

kc
1.2
1.0
.8
.6
.4
.2
0
10) Watermelon (late spring planting)
(((0.76+1.0)/2)x20+1.0x11)/31=0.92
(0.57x15+((0.57+0.76)/2)x15)/30=0.62
(0.57x10)/31=0.18
0.57
(0.18)
(0.62)
(0.92)
1.0
(1.0)
0.88
0.75
(0.58)
(((1.0+0.75)/2)x20)/30=0.58
25
30
40
20
(120 days)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Crop Factors (kc) (6)

11) Ground nuts (late spring planting)

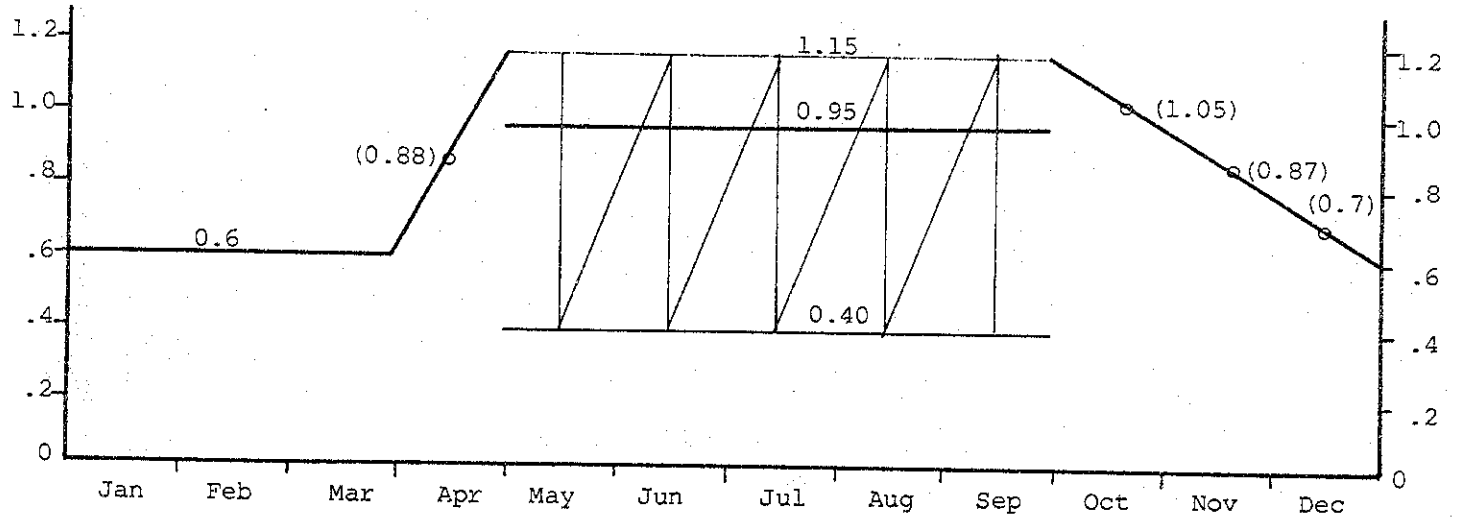



12) Tomato (spring planting)

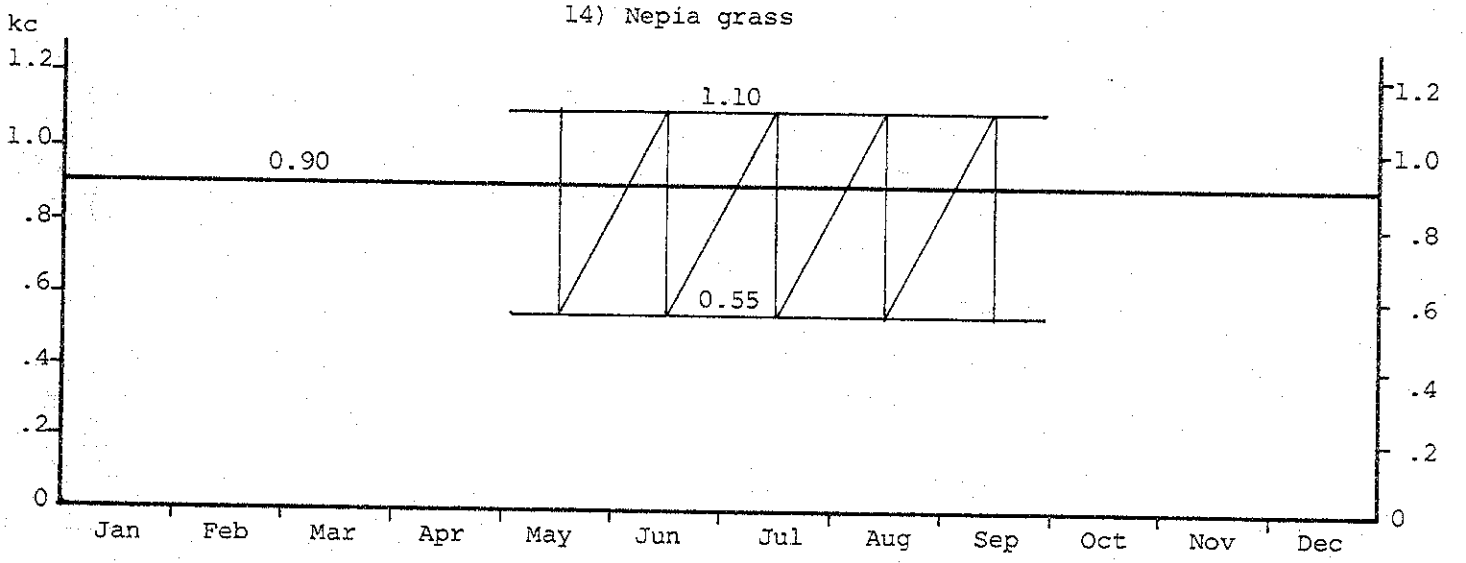


Crop Factors (kc) (7)

13) Alfalfa




14) Nepia grass



Crop Factors (kc) (8)

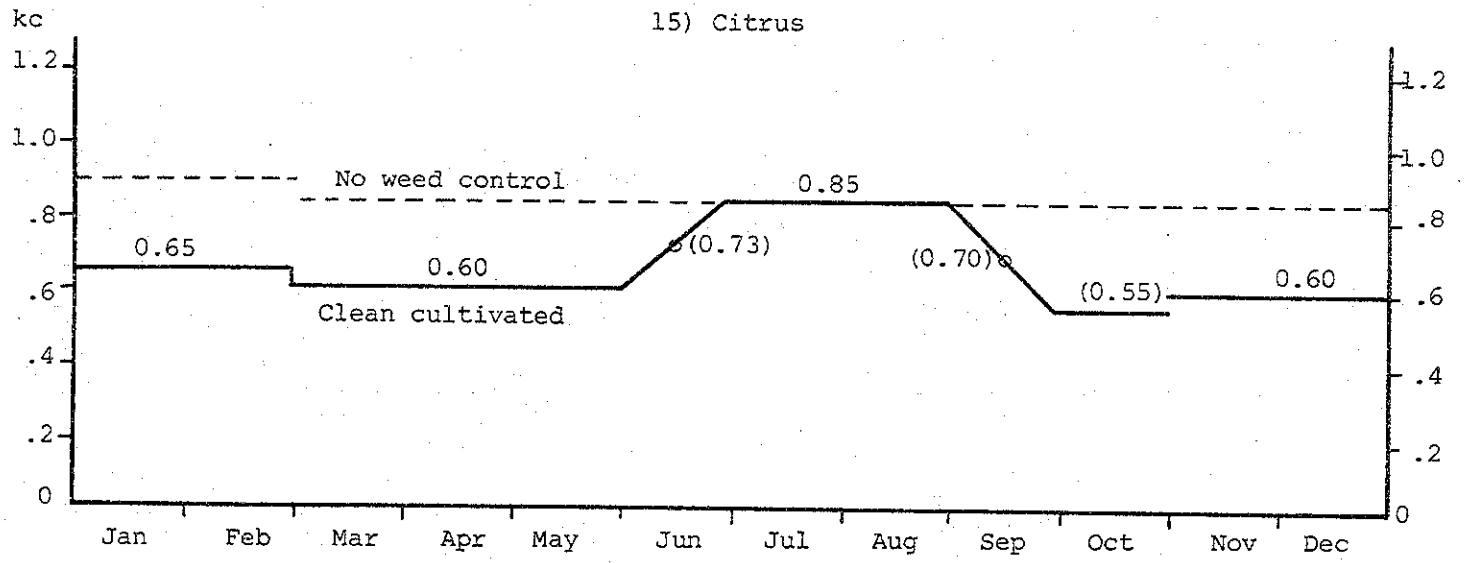
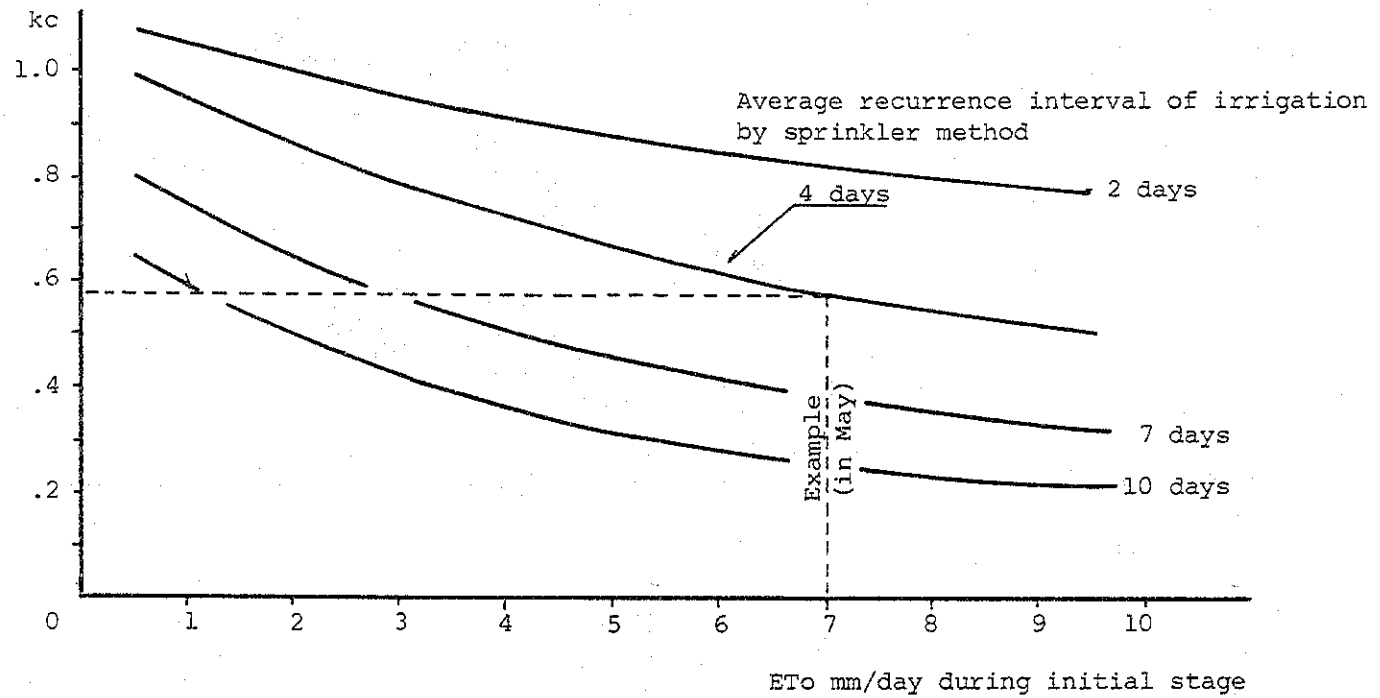


Fig. IV.C.4 (kc) Value for Initial Crop Development Stage



C-2 Leaching

(1) Salt accumulation

Development of salt accumulation due to water salinity is caused by irrigation water volume increasing electrical conductivity (ΔECe) in the root zone. The formula can be expressed as follows.

$$\frac{Diw}{Ds} = \frac{ds}{dw} \cdot \frac{SP}{100} \cdot \frac{\Delta ECe}{ECiw}$$

where, Diw: water capacity which increases electrical conductivity (ΔECe) of saturation sampling water.

Ds : leaching Crop root zone (cm)

Vegetable: 60cm

Fruits : 120cm

$\frac{ds}{dw}$ : apparent - specific gravity.
set at 1.7 from soil survey results (1.63-1.84)

Sp : water saturation degree (%)
set at 19% from soil survey results (15-23%)

ΔECe: electrical conductivity of saturation sampling water.
set at 200 ppm (= 0.4 mmho/cm) from soil survey results (170-190ppm)

therefore, $\frac{Diw}{Ds} = 1.7 \times \frac{19}{100} \times \frac{\Delta ECe}{0.4}$

However, ECe was calculated at 10% and 100% decline in crop yield and the initial value chosen is zero.
The number of years to reach the rate of decline in crop yield can be obtained by Diw/Annual irrigation water capacity. The 100% decline in crop yield takes from 4 to 20 years, the 10% decline takes from 1 to 7 years. (Table IV.C.9)

(2) Leaching water

The water capacity for leaching can be obtained from the following formula.

$$LR = \frac{ECiw}{2(\max ECe)}$$

$$Ri' = \frac{ET}{1-LR}$$

$$LW = Ri'-ET$$

where, LR : rate of discharge against irrigation water capacity.

ECiw : electrical conductivity of irrigation water (mmho/cm = 0.4 mmho/cm)

max ECe: electrical conductivity of saturation sampling water against a 100% decline in crop yield. (mmho/cm)

Ri' : amount of water to be applied (mm)

ET : consumptive use (mm)

LW : amount of water to be drained (mm)

The amount of water to be applied for each crop was obtained as shown in Table IV.C.10. The results show that the amount of water is estimated at about 2% of consumptive use. Leaching must be carried out once a year between April and May and after cultivation in order to prevent salinity damage as much as possible.

The amount of water to be applied for citrus in April can be obtained as follows.

Consumptive use

$4.3 \times 5 \div 0.9 = 23.9$ mm

Amount of water to be drained,

$35\text{mm} \div 0.9 = 38.9$ mm

Amount of water to be applied,

$23.9 + 38.9 = 62.8$ mm

Table IV.C.8 Salt Tolerance of Plants

ECe x $10^3$ (mmho/cm)

| Crops | | Decrease of Yield | | | | |
|---|---|---|---|---|---|---|
| | | 0% | 10% | 25% | 50% | 100% |
| Field Crops | Barley | 8.0 | 10.0 | 13.0 | 18.0 | 28.0 |
| | Cotton | 7.7 | 9.6 | 13.0 | 17.0 | 27.0 |
| | Sorghum | 4.0 | 5.1 | 7.2 | 11.0 | 18.0 |
| | Groundnuts | 3.2 | 3.5 | 4.1 | 4.9 | 6.5 |
| | Corn | 1.7 | 2.5 | 3.8 | 5.9 | 10.0 |
| | Flax | 1.7 | 2.5 | 3.8 | 5.9 | 10.0 |
| | Broad Bean | 1.6 | 2.6 | 4.2 | 6.8 | 12.0 |
| | Beans | 1.0 | 1.5 | 2.3 | 3.6 | 6.5 |
| Fruit Crops | Date Palm | 4.0 | 6.8 | 10.9 | 17.9 | 32.0 |
| | Fig. | 2.7 | 3.8 | 5.5 | 8.4 | 14.0 |
| | Olive | 2.7 | 3.8 | 5.5 | 8.4 | 14.0 |
| | Orange | 1.7 | 2.3 | 3.2 | 4.8 | 8.0 |
| | Lemon | 1.7 | 2.3 | 3.3 | 4.8 | 8.0 |
| | Apricot | 1.6 | 2.0 | 2.6 | 3.7 | 6.0 |
| | Grape | 1.5 | 2.5 | 4.1 | 6.7 | 12.0 |
| | Strawberry | 1.0 | 1.3 | 1.8 | 2.5 | 4.4 |
| Vegetagle Crops | Tomato | 2.5 | 3.5 | 5.0 | 7.6 | 12.5 |
| | Cucumber | 2.5 | 3.3 | 4.4 | 6.3 | 10.0 |
| | Melon | 2.2 | 3.6 | 5.7 | 9.1 | 16.0 |
| | Spinach | 2.0 | 3.3 | 5.3 | 8.6 | 15.0 |
| | Cabbage | 1.8 | 2.8 | 4.4 | 7.0 | 12.0 |
| | Potato | 1.7 | 2.5 | 3.8 | 5.9 | 10.0 |
| | Lettuce | 1.3 | 2.1 | 3.2 | 5.2 | 9.0 |
| | Radish | 1.2 | 2.0 | 3.1 | 5.0 | 9.0 |
| | Onion | 1.2 | 1.8 | 2.8 | 4.3 | 7.5 |
| | Carrot | 1.0 | 1.7 | 2.8 | 4.6 | 8.0 |
| Forage Crops | Barley (hay) | 6.0 | 7.4 | 9.5 | 13.0 | 20.0 |
| | Sudan Grass | 2.8 | 5.1 | 8.6 | 14.4 | 26.0 |
| | Alfalfa | 2.0 | 3.4 | 5.4 | 8.8 | 15.5 |
| | Corn (forage) | 1.8 | 3.2 | 5.2 | 8.6 | 15.5 |
| | Berseem | 1.5 | 3.2 | 5.9 | 10.3 | 19.0 |

Source: Kansas Exp. Sta.

Table IV.C.9 The Years and Amount of Water Against the Rate of Decline in Crop Yield

| Crops | | Amount of water ET | Root depth Ds | Decrease in production 10% (1) ΔECe | (2) Diw/Ds | Diw | Years | Decrease in production 100% ΔEce | Diw/Ds | Diw | Years |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | mm/year | cm | mm ho/cm | | mm | year | mm ho/cm | | mm | year |
| Fodder (Winter) | Berseem | 896 | 60 | 3.2 | 2.58 | 1548 | 1.7 | 19.0 | 15.34 | 9204 | 10.3 |
| Vegetable | Potatoes | 553 | " | 2.5 | 2.02 | 1212 | 2.2 | 10.0 | 8.08 | 4848 | 8.8 |
| " | Tomato | 703 | " | 3.5 | 2.83 | 1698 | 2.4 | 12.5 | 10.09 | 6054 | 8.6 |
| Fodder | Barley | 467 | " | 7.4 | 5.98 | 3588 | 7.7 | 20.0 | 16.15 | 9690 | 20.7 |
| Vegetable | Strawberry | 208 | " | 1.3 | 1.05 | 630 | 3.0 | 4.0 | 3.23 | 1938 | 9.3 |
| " | Beans | 208 | " | 1.5 | 1.21 | 726 | 3.5 | 6.5 | 5.25 | 3150 | 15.1 |
| Vegetable (Summer) | Sorghum | 760 | " | 5.1 | 4.12 | 2472 | 3.3 | 18.0 | 14.54 | 8724 | 11.5 |
| | Sesam | 843 | " | | | | | (10.0) | 8.08 | 4848 | 5.8 |
| | Cucumber | 711 | " | 3.3 | 2.66 | 1596 | 2.2 | 10.0 | 8.08 | 4848 | 6.8 |
| | Water Melon | 705 | " | | | | | (16.0) | 12.92 | 7752 | 11.0 |
| | Ground Nuts | 767 | " | 3.5 | 2.83 | 1698 | 2.2 | 6.5 | 5.25 | 3150 | 4.1 |
| | Tomato | 1012 | " | 3.5 | 2.83 | 1698 | 1.7 | 12.5 | 10.09 | 6054 | 6.0 |
| Fodder | Alfalfa | 1729 | "" | 3.4 | 2.75 | 1650 | 0.95 | 15.5 | 12.52 | 7512 | 4.3 |
| | Nepia Grass | 1794 | " | | | | | (22.5) | 18.17 | 10902 | 6.1 |
| Fruits | Citrus | 1359 | 120 | 1.7 | 1.37 | 1644 | 1.2 | 8.0 | 6.46 | 7752 | 5.7 |

Notes: (1) Initial value of saline density "O" is chosen.

(2) $$\frac{Diw}{Ds} = \frac{ds}{dw} \cdot \frac{sp}{100} \cdot \frac{ECe}{ECiw} = 1.7 \times \frac{19}{100} \times \frac{\Delta ECe}{0.4}$$

( ) estimated value

Table IV.C.10 Computation of Leaching Water Net Volume

| Crops | | Area | ECiw | Max. ECe | ET | LR | Ri' | LW (1) | LW (2) | LW Max. |
|---|---|---|---|---|---|---|---|---|---|---|
| Fodder (Winter) | Berseem | 17% | 0.4 mm ho/cm | 19.0 mm ho/cm | 896 mm/year | 0.011 | 906 mm/year | 10 mm | 20 mm | 103 mm |
| Vegetable | Potatoes | 14 | " | 10.0 | 553 | 0.020 | 564 | 11 | 22 | 97 |
| | Tomato | 14 | " | 12.5 | 703 | 0.016 | 714 | 11 | 22 | 95 |
| Fodder | Barley | 2 | " | 20.0 | 467 | 0.010 | 472 | 5 | 10 | 104 |
| Vegetable | Strawberry | - | " | 4.0 | 208 | 0.050 | 219 | 11 | 22 | 102 |
| | Beans | - | " | 6.5 | 208 | 0.031 | 215 | 7 | 14 | 106 |
| Vegetable (Summer) | Sorghum | 10 | " | 18.0 | 760 | 0.011 | 768 | 8 | 16 | 92 |
| | Sesam | 7 | " | (10.0) | 843 | 0.020 | 860 | 17 | 34 | 99 |
| | Cucumber | 15 | " | 10.0 | 711 | 0.020 | 726 | 15 | 30 | 102 |
| | Water Melon | 11 | " | (16.0) | 705 | 0.013 | 714 | 9 | 18 | 99 |
| | Ground Nuts | 3 | " | 6.5 | 767 | 0.031 | 792 | 25 | 50 | 103 |
| | Tomato | - | " | 12.5 | 1012 | 0.016 | 1028 | 16 | 32 | 96 |
| Fodder | Alfalfa | 3 | " | 15.5 | 1729 | 0.013 | 1751 | 23 | 46 | 99 |
| | Nepia Grass | 3 | " | (22.5) | 1794 | 0.009 | 1810 | 16 | 32 | 98 |
| Fruits | Citrus | 49 | " | 8.0 | 1359 | 0.025 | 1394 | 35 | 70 | 200 |
| Weighted mean | | | | | 1461 | | | 29.2 (2.0%) | 58.4 | |

Notes: (1) Leaching water against every year. (2) Leaching water against every other year

Max. Leaching water against decrease in production 100%

# D. IRRIGATION PROGRAM AND FACILITIES

D-1 Summary

-Comparative Study of Electric Power Sources-

The public electric power supply system and independent electric power by means of Diesel engine generator are considered as the electric power sources. The comparative study of both electric power sources is carried out as follows:

(1) Running Costs

The comparative study of both running costs of both Power sources carried out on one booster pump station.

| Public electric power | LE/year |
|---|---|
| Demand charge | 3,709 |
| Energy charge | 44,162 |
| Total | 47,871 |
| Independent electric power | |
| Light oil charge | 35,958 |
| Others (motor oil and etc.) | 1,797 |
| Total | 37,755 |

The result of the above comparison provides that the independent electric power by means of Diesel engine generator is lower in running cost than the public electric power supply system.

(2) Equipment Costs

The comparison of the equipment costs is as follows:

| Public electric power | LE/year |
|---|---|
| Power-transmission line and transformation boxes in the Project area | 215,000 |
| Independent electric power | |
| Diesel engine generators | 192,000 |

The result of the above comparison provides that independent electric power is lower also in equipment cost.

(3) Existing Situation of Public Electric Power Supply System

Electric power is now supplied by 800 km power-transmission line from Aswan High Dam through Cairo sub-station and Zagazig sub-station to the Ismailia area. However, the power supply from Aswan High Dam has already overpassed the limit. Since the efficiency of the hydro-electric power plant is decreasing and the maintenance of 800 km power-transmission line is difficult, various kinds of troubles are happening. Consequently, the voltage is inconstant and power stoppages happen very often in the area where the electric power is supplied. Therefore, constant electric power supply for the Project by the public electric power supply system is not reliable.

(4) Conclusion

The results of the above comparisons prove that the independent electric power by means of Diesel engine generator is better than the public electric power supply system as the electric power source of the Project area. And the conclusion of the comparative study of electric power sources is that the independent electric power is adopted.

Annex

1. Running Cost of Public Electric Power

Electrical charge calculation was carried out by means of the electrical rate schedule of Egypt.

(a) Pump operation hour for one station.

$$\frac{2160 \text{ fed} \times 7365 \text{ m}^3/\text{year/fed}}{0.85 \times 16.74 \text{ m}^3/\text{year/set} \times 3 \text{ set} \times 60} = 6211 \text{ hours}$$

(b) Condition

1) Installed capacity : 660 KW
2) Operation hour : 6,211 hr./year
3) Consumption charge : 4,099,260 KW hr./year

(c) Charge

1) Demand charge

660 KW x 5,620 LE = 3,709 LE

2) Energy charge

| | | KW hr/year | KW | | LE | LE |
|---|---|---|---|---|---|---|
| 0 - 1000 | 1st | 1,000 | x 660 | x | 0.010103 | = 6,667 |
| 1000 - 1500 | 2nd | 500 | x 660 | x | 0.009503 | = 3,136 |
| 1500 - 2500 | 3rd | 1,000 | x 660 | x | 0.008303 | = 5,479 |
| 2500 - 3500 | 4th | 1,000 | x 660 | x | 0.007103 | = 4,687 |
| 3500 - 5000 | 5th | 1,500 | x 660 | x | 0.005403 | = 5,348 |
| 5000 - | | (4,099,260 - 5000) | | x | 0.004603 | =18,845 |
| | | | | Total | | 44,162 LE |

2. Running Cost of Independent Electric Power

(a) Pump operation hour for one pump

$$\frac{2160 \text{ fed} \times 7365 \text{ m}^3/\text{year/fed}}{0.85 \times 16.74 \text{ m}^3/\text{year/set} \times 3 \text{ set} \times 60} = 6,211 \text{ hours}$$

(b) Oil charge

1) Light oil charge

| hr. | | KW | | ℓ/ps.hr. | | LE/ℓ | | LE |
|---|---|---|---|---|---|---|---|---|
| 6,211 | x | 3 | x | 220 x 1.36 | x | 0.215 | x | 0.03 = 35,958 |

2) Others (motor oil and etc.)

35,958 x 0.05 = 1,797 LE

Fig. IV.D.1 Main Pump Station

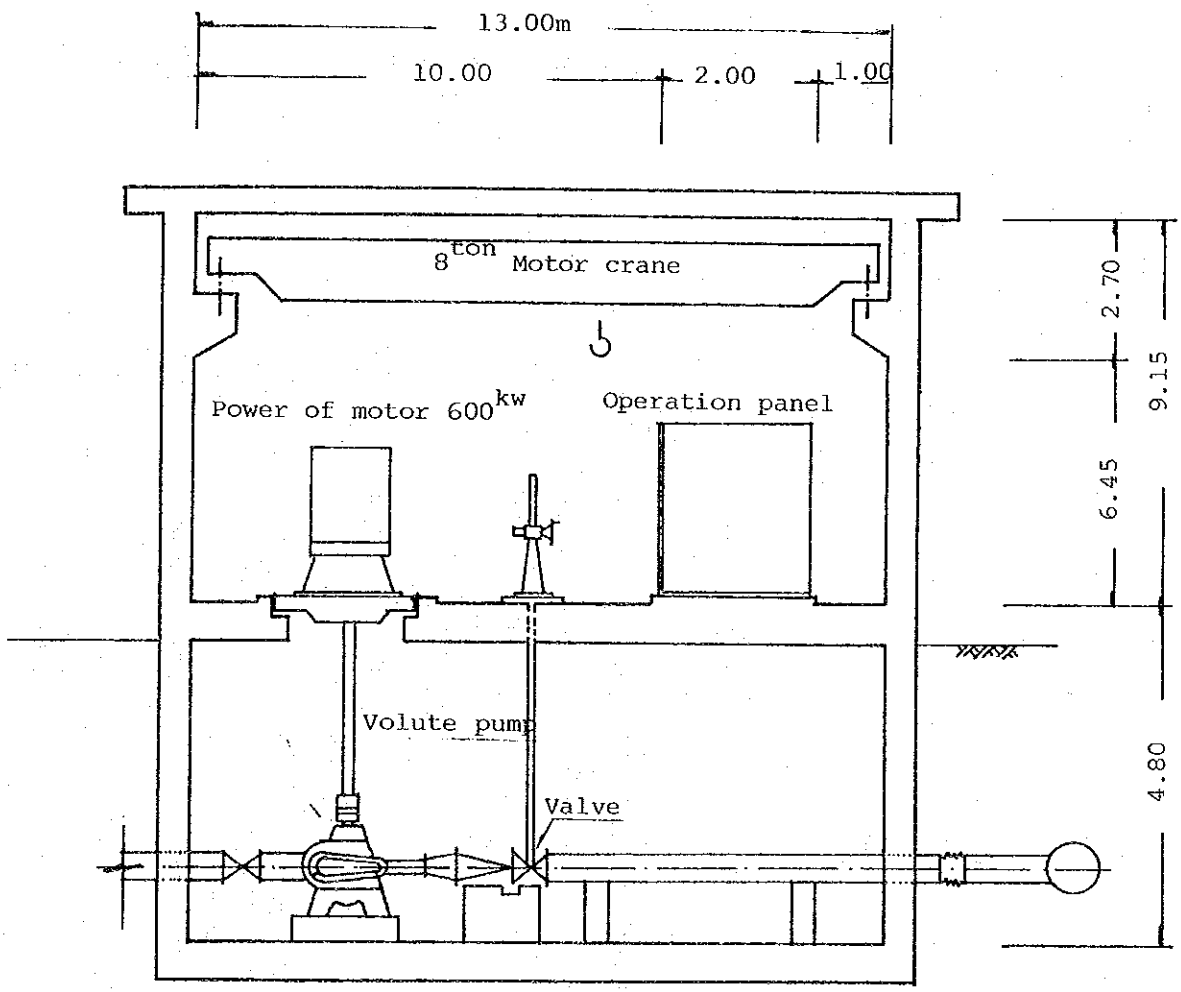


Fig. IV.D.2 Intake Structure for Main Pump Station

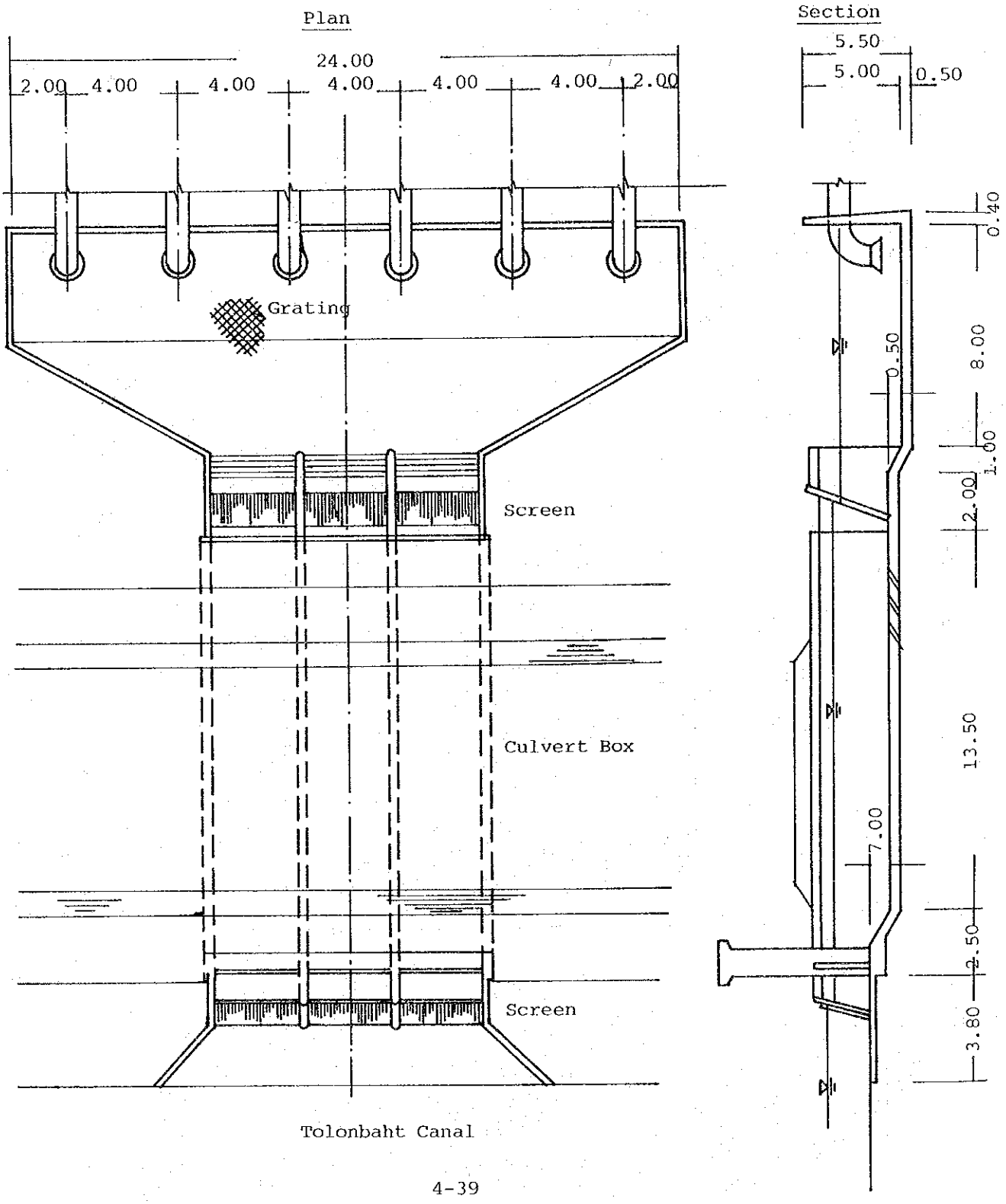
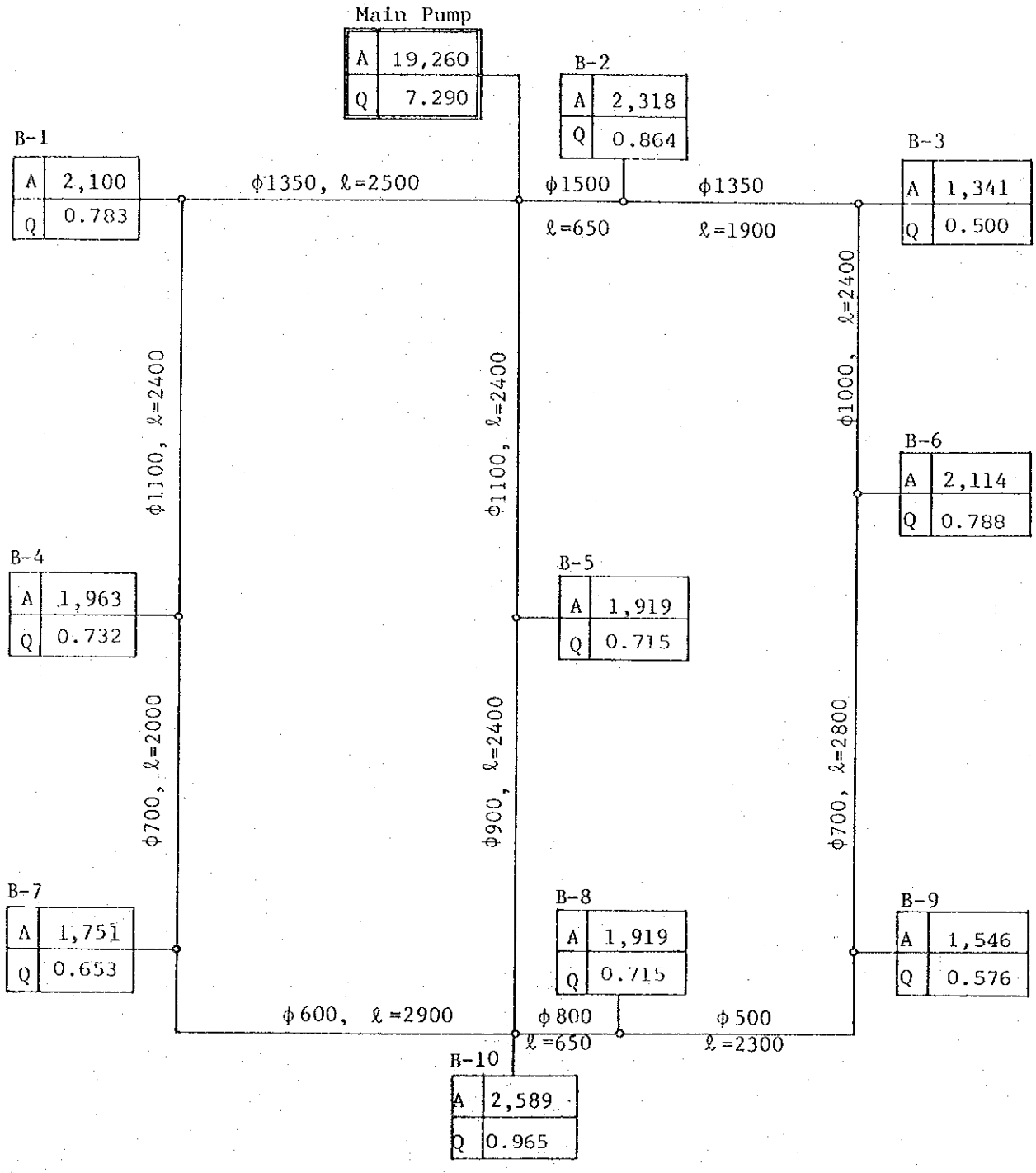


Fig. IV.D.3 Main Pipeline Distribution System (1)

Case 2 (adopted)

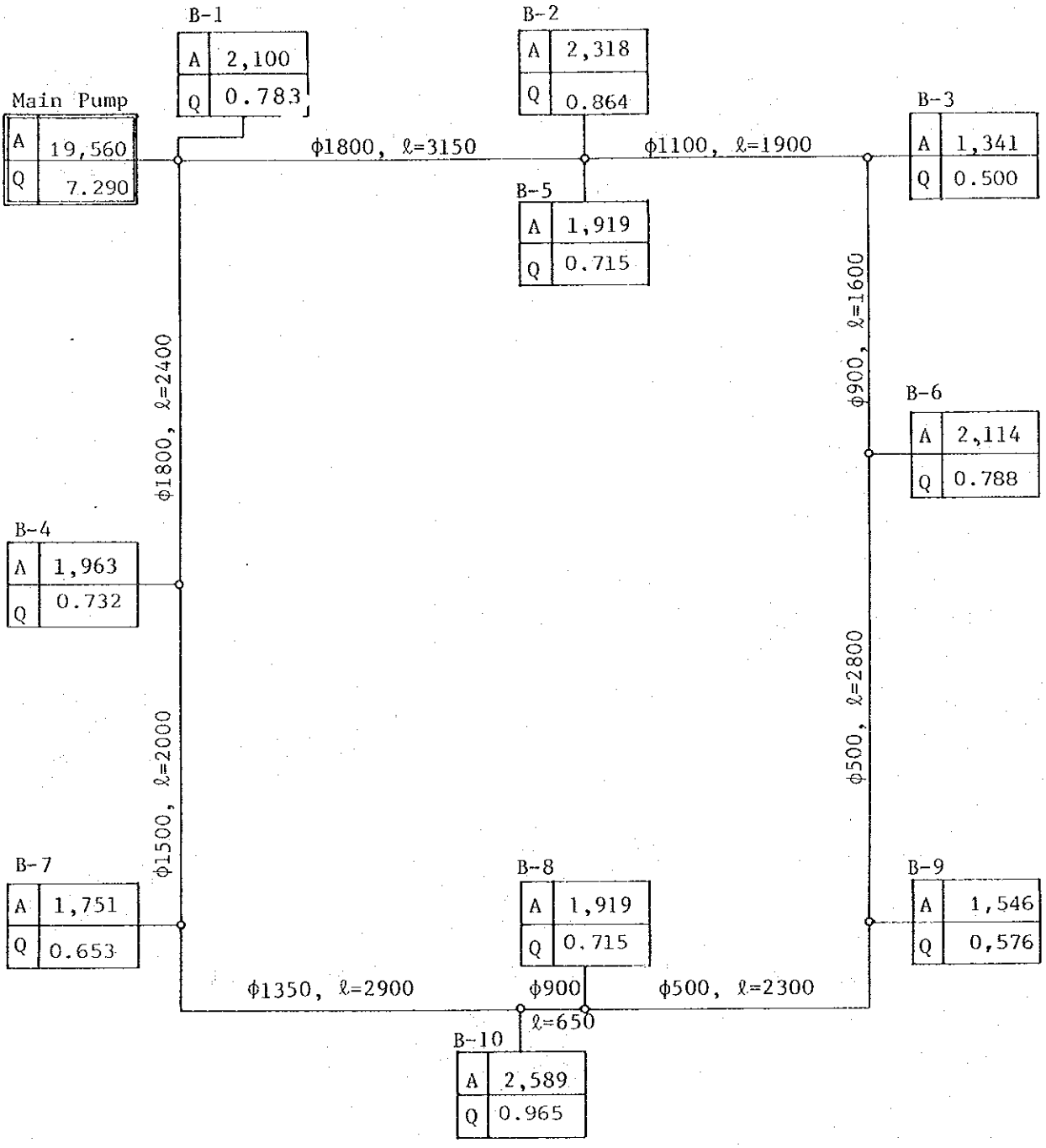



Unit: upper: Area (Feddan)

lower: Discharge ($m^3/s$)

## Main Pipeline Distribution System (2)

Case 3




Unit: upper: Area (Feddan)
lower: Discharge ($m^3/s$)