## *Replace by Coverpage*

*Disclaimer*

*The designations employed and the presentation of materials in this present document do not imply the expression of any opinion whatsoever on the part of the Nile Basin Initiative nor the Eastern Nile Technical Regional Office concerning the legal or development status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.*

# Table of Contents Field Investigations Study

VOLUME I: MAIN REPORT

VOLUME II: ANNEXES

ANNEX A: TOPOGRAPHY

Appendix A: Photographs of topographic activities

ANNEX B: SOILS AND LAND SUITABILITY

Appendix 5A: Description of Model Profile Pits & Laboratory Results

Appendix 5B: List of Infiltration Rate & Hydraulic Conductivity Test Results

Appendix 5B1: List of Infiltration Rates

Appendix 5B2: List of Hydraulic Conductivity Tests

Appendix 5C: Exchangeable Acidity Results of Selected Soil Samples

Appendix 5D: Description of All Profile Pits & Laboratory Results

Appendix 5D1: Descriptions of All Profile Pits

Appendix 5D2: Laboratory Results of All Profile Pits

Appendix 5E: In-Situ pH Measurement Results

Appendix 5F: Summary Criteria for Analytical Data Interpretation and Recommended Rating Ranges

Appendix 5G: Land Use Requirements for Irrigated Agricultural Development

Appendix 5H: Partial Suitability Classes for Dinger Bereha Irrigation Area

Appendix 5I: Auger Hole Descriptions (on CD-ROM)

Appendix 5J: Photographs

Appendix 5K: Abbreviations and Useful Codes & Data Base

ANNEX C: GEOTECHNICAL INVESTIGATIONS

Appendix A: Vertical Electrical Sounding

Appendix B: Rotary core drilling

Appendix C: Test pit logs

Appendix D: Permeability tests

Appendix E: Laboratory test results

VOLUME III: MAPS AND DRAWINGS

| | |
|---|---|
| Maps TM-1to8 | Topography of command area, scale 1:10,000 (8 A1 sheets) |
| Map TM-9 | General topography lay-out, scale 1:50,000 (1 A1 sheet) |
| Map TM-10 | Topography of diversion site, scale 1:1,500 (1 A3 sheet) |
| Map TM-11to12 | Topography of the Main Canal alignment and crosssections, scale 1:10,000 and 1:5,000 (2 A1 sheets) |
| Map TM-13to36 | Topography of command area, scale 1:5,000 (24 A1 sheets on soft copy only) |
| Map TM -37 | Detailed topography of pump station site (1 A3 sheet) |
| Map TM -38to40 | Detailed topography of sample blocks A&B (3 A1 sheets) |
| Map SO-1to8 | Soils and profile pits, scale 1:10,000 (8 A1 sheets) |
| Map SO-2 | Location of auger hole points and in-situ physical tests, scale 1:25,000 (1 A1 sheet) |
| Map LS-1Sto5O | Land suitability, scale 1:25,000 (10 A1 sheets) |
| Map GE-01 | Location of boreholes, test-pits and quarry sites, scale 1:50,000 |

# Table of contents Volume IIA

ANNEX A: TOPOGRAPHY

Appendix A: Photographs of topographic activities

ANNEX B: SOILS AND LAND SUITABILITY

Appendix 5A: Description of Model Profile Pits & Laboratory Results

Appendix 5B: List of Infiltration Rates & Hydraulic Conductivity Test Results

Appendix 5B1: List of Infiltration Rates

Appendix 5B2: List of Hydraulic Conductivity Tests

Appendix 5C: Exchangeable Acidity Result of Selected Soil Samples

Appendix 5D: Description of All Profile Pits & Laboratory Results

Appendix 5D1: Descriptions of All Profile Pits

Appendix 5D2: Laboratory Result of All Profile Pits

Appendix 5E: In-Situ pH Measurement Results

Appendix 5F: Summary Criteria for Analytical Data Interpretation and Recommended Rating Range

Appendix 5G: Land Use Requirements for Irrigated Agricultural Development

Appendix 5H: Partial Suitability Classes for Dinger Bereha Irrigation Area

Appendix 5I: Auger Hole Descriptions (on CD-ROM)

Appendix 5J: Photographs

Appendix 5K: Abbreviations and Useful Codes & Data Base

## LIST OF ABBREVIATIONS AND ACRONYMS

**Fiscal Year:**

Egypt: 01 July – 30 June

Ethiopia: 08 July – 07 July

Sudan: calendar year

**MEASURES**

| | | |
|---|---|---|
| Km | = | kilometre |
| $Km^2$ | = | square kilometre |
| m | = | metre |
| $m^3$ | = | cubic metre |
| mm | = | millimetre |
| $Mm^3$ | = | million cubic metres |
| BCM | = | billion cubic metres |
| 1 ha | = | 2.38 feddans |
| 1 feddan | = | 0.42 ha |

**ABBREVIATIONS**

| | |
|---|---|
| ADB/F | African Development Bank/Fund |
| AGS | Addis Geo Systems |
| ANRS | Amhara National Regional State |
| API | Aerial Photo Interpretation |
| ARBID/MPS | Abbay River Basin Integrated Development Master Plan |
| ASTM | American Society for Testing of Materials |
| BCM | Billion Cubic Meters = 1 $km^3$ |
| B/C ratio | Benefit Cost ratio |
| BH | Borehole |

| | |
|---|---|
| BS | British Standards |
| CEC | Caution Exchange Capacity |
| CS | Complementary Surveys |
| DC | Direct electrical current |
| DIU | Dams Implementation Unit (Sudan) |
| DOCS | Date of Commencement of Services |
| dS/m | deci-Siemens per meter |
| d/s | downstream |
| EC | Electrical conductivity |
| EIA | Environmental Impact Assessment |
| EIRR | Economic Internal Rate of Return |
| EMA | Ethiopian Mapping Agency |
| ENCOM | Eastern Nile Council of Ministers |
| ENPV | Economic Net Present Value |
| ENTRO | Eastern Nile Technical Regional Office |
| ENSAP | Eastern Nile Subsidiary Action Program |
| ENSAPT | Eastern Nile Subsidiary Action Program Team |
| ENCOM | Eastern Nile Council of Ministers |
| EPMS | Environmental Protection Monitoring Strategy |
| ESP | Exchangeable Sodium percentage |
| ESCP | Ethiopian Standard Code of Practice |
| EWA | Ethiopian Water Authority |
| FAO | Food and Agriculture Organization |
| FNPV | Financial Net Present Value |
| FIRR | Financial Economic Rate of Return |
| G | Gravity |
| GOE | Government of Egypt |
| GFDRE | Government of the Federal Democratic Republic of Ethiopia |
| GOS | Government of Sudan |

| | |
|---|---|
| GPS | Geographical Positioning System |
| GRP | Glass reinforced polyester |
| GTZ | German Technical Cooperation Agency |
| Ha | hectare |
| HDPE | high density poly ethylene |
| HP | hydro power |
| HQ | High Quality (classification for drilling core) |
| ICCON | International Consortium for Co-operation on the Nile |
| ICT | International Consultants and Technocrats Pvt LtD |
| IEE | Initial Environmental Examination |
| ISL | Isambert Salembier Lino Consultants |
| LUT | Land Utilisation Type |
| LUR | Land Use Requirement |
| masl | Meters above sea level |
| MC | Main Conveyor |
| MCA | multi-criteria analysis |
| mcm | Million Cubic Meters |
| MoIWR | Ministry of Irrigation and Water Resources (Sudan) |
| MoWR | Ministry of Water Resources (Ethiopia) |
| mS | micro Siemens |
| N1, N2 | Land suitability classes |
| NBI | Nile Basin Initiative |
| NEDECO | Netherlands Engineering Consultants (Consulting Firm) |
| NELSAP | Equatorial Lakes Subsidiary Action Programme |
| NELT | North East Lake Tana |
| NGO | Non-Governmental Organization |
| Nile-SEC | NBI Secretariat |
| Nile-COM | Nile Council of Ministers |
| NQ | Normal Quality (classification of drilling core) |

| | |
|---|---|
| OIDA | Oromiya Irrigation Development Authority |
| ONRS | Oromya National Regional State |
| O&M | Operation and Maintenance |
| P | Pumping |
| PA | Peasant Association |
| PF | Pre-feasibility |
| PFS | Pre-feasibility Study |
| PMO | Project Management Office |
| PS | Pump station |
| RfP | Request for Proposal |
| RQD | Rock Quality Designation |
| S1, S2, S3 | Land suitability classes |
| SAP | Subsidiary Action Programmes |
| SAR | Sodium Adsorption Ration |
| SEIA | Social and Environmental Impact Assessment |
| SDS | Small Disturbed Sample |
| SPT | Standard Penetration Test |
| SPT-N | Standard Penetration Test-Normal |
| SVP | the Shared Vision Programme |
| TAMS | Tippets-Abbett-McCarthy-Stratton Engineers and Architects |
| tc | ton of cane |
| $T_c$ | time of concentration (only used in hydrological calculations) |
| TCC | Technical Coordinating Committee |
| TDS | Total Dissolved Solids |
| TLU | Tropical Livestock Unit (metabolic weight equivalence) |
| TOR | Terms of Reference |
| TRBID/MPS | Abbay River Basin Integrated Development Master Plan |
| TTB2 | a set of geological formations |
| UA | Unit of Account |

| | |
|---|---|
| u/s | upstream |
| USBR | United States Bureau of Reclamation |
| UTM | Universal Trans Mercator |
| VES | Vertical Electric Sounding |
| WAPCOS | Water and Power Consultancy Services (India) Ltd. |
| WB | World Bank |
| WRMP | Water Resources Management Policy |
| WUA | Water Users Association |
| WWD&SE | Water Works Design and Supervision Enterprise |

CONVERSION FACTORS

0.42 ha = 1.00 feddan

# ANNEX A: TOPOGRAPHY

# APPENDIX A: PHOTOGRAPHS OF TOPOGRAPHIC ACTIVITIES

# APPENDIX A: PHOTOGRAPHS OF TOPOGRAPHIC ACTIVITIES

Command area survey in wooded area

Total station used to survey the command area

Survey of the command area in forest areas using total station equipment

Area in the command area with medium forest cover

Command area with undulating terrain

More open terrain speeds up surveying

Surveying crew traveling to the villages packing on donkey back due to access unavailability

Surveyors unloading their equipment and food items in villages to undertake canal route survey after traveling a difficult trip due to access problems

Setting of surveying equipment to take readings of the canal route topography

Chief Surveyor taking rest after traveling a long distance during the canal route survey

Surveyors traveling in the jungle by clearing the bush and burning the savannah grasses

Tukul where the surveying team was accommodated to undertake the topographic survey of the canal route

The surveying crew sanitizing in Didessa River

Rod-man helping surveyors in the canal route survey

# ANNEX B: SOIL SURVEY AND LAND EVALUATION

CONTENTS OF ANNEX B: SOILS AND LAND SUITABILITY

Appendix 5A: Description of Model Profile Pits & Laboratory Results

Appendix 5B: List of Infiltration Rates & Hydraulic Conductivity Test Results

Appendix 5B1: List of Infiltration Rates

Appendix 5B2: List of Hydraulic Conductivity Tests

Appendix 5C: Exchangeable Acidity Results of Selected Soil Samples

Appendix 5D: Descriptions of All Profile Pits & Laboratory Results

Appendix 5D1: Descriptions of All Profile Pits

Appendix 5D2: Laboratory Results of All Profile Pits

Appendix 5E: In-Situ pH Measurement Result

Appendix 5F: Summary Criteria for Analytical Data Interpretation and Recommended Rating Ranges

Appendix 5G: Land Use Requirements for Irrigated Agricultural Development

Appendix 5H: Partial Suitability Classes for Dinger Bereha Irrigation Area

Appendix 5I: Auger Hole Descriptions (on CD-ROM)

Appendix 5J: Photographs

Appendix 5K: Abbreviations and Useful Codes & Data Base

# APPENDIX 5A: DESCRIPTION OF 11 MODEL PROFILE PITS & LABORATORY RESULTS

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | **Field No: DP2** | Map Sheet: 0836A1 |
| Location: N-W of Illuharar town | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-2 | | |
| Author: Zelealem S/Mariam | Date: 07/05/09 | |
| FAO - Soil Type: Rhodic Nitisols (NTro) | Coordinate (UTM) | N: 989140 |
| Agro-Climatic Zone: Kolla | Elevation (m)1248 | E:186500 |
| Land form: Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Gently slope | Slope: Position: Medium |
| Slope Aspect: South-North direction | Slope Length: 1.5km | Slope Form: Uniform |
| Micro - Topography: Termite | Coverage%: | |
| Parent Material : | Soil depth cm.: 180 | Rocky outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm: > 180 | |
| Drainage - External Well | Internal: Well drained | |
| Human influence: vegetation disturbed/clearing | | Moisture condition: Moist |
| Land Cover: Predominantly cultivated land | | |
| Land Use: Rain fed arable cultivation | | |
| Major Crop Type: sorghum, maize, rice ,sesame | Fertilizer Type: Applies for maize | |
| Type of erosion: sheet & splash erosion | Area affected:10-25% | |
| Activity: Active at present | Degree of dissection: Slight | |
| Remarks: | | |

0-15cm: Dark reddish brown (5YR 3/4) color moist, loam texture, moderate, coarse, granular structure, slightly hard dry and slightly stick/slightly plastic consistency when wet, few, fines roots and many to common pores.
15-41cm: Red (2.5YR 4/6) color moist, clay texture, strong, medium to coarse, sub-angular blocky structure, firm moist and stick / plastic consistency when wet, few, fine roots and few, fine pores.
41-92cm: Dark red (2.5YR3/6) color moist, clay texture, strong, medium to coarse sub-angular blocky structure, sticky/ plastic consistency when wet, moderately cemented, platy, clay cementation, few, fine roots and few, fine pores.
92-180cm: Dark red (2.5YR3/6) color moist, clay loam texture, strong, coarse, sub-angular blocky structure, firm moist and stick/plastic consistency when wet, moderately cemented, platy, clay cementation.

| | Profile DP2 | | | | SMU : G2_d2 | | | | | | | | | Soil Type : Rhodic Nitisols (Ntro) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Texture <2 mm. fraction | | | | pH (1:2.5) | | | EC | T N | OC | C/N | Avail P | CaCO3 | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ |
| cm | Sand | Silt | Clay | Class | H2O | KCl | ΔpH | dS/m | % | % | | ppm | | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K |
| 0-15 | 36.7 | 23.6 | 39.7 | CL | 5.4 | 4.5 | -0.9 | 0.09 | 0.3 | 3.2 | 11 | 0.7 | | 0.2 | 0.3 | 9.0 | 2.7 | 12.2 | 40.8 | 30 | 0.5 | 3 | 39 |
| 15-41 | 17.9 | 17.1 | 65.0 | C | 5.1 | 4.2 | -0.9 | 0.02 | 0.2 | 1.7 | 7 | 0.3 | | 0.1 | 0.1 | 4.0 | 1.4 | 5.7 | 43.2 | 13 | 0.3 | 3 | 43 |
| 41-92 | 5.0 | 14.9 | 80.1 | C | 4.9 | 4.2 | -0.8 | 0.01 | 0.2 | 1.2 | 8 | Trace | | 0.2 | 0.1 | 4.5 | 3.6 | 8.4 | 24.1 | 35 | 0.7 | 1 | 88 |
| 92-180 | 2.3 | 12.7 | 84.9 | C | 7.8 | 4.9 | -2.9 | 0.02 | 0.2 | 1.4 | 7 | Trace | | 0.1 | 0.1 | 3.6 | 1.4 | 5.2 | 49.6 | 10 | 0.2 | 3 | 57 |

Micronutrients mg/kg soil (ppm)

| Depth (cm) | Fe | Mn | Cu | Zn |
|---|---|---|---|---|
| 0-15 | 37.2 | 78.8 | 2.1 | 1.2 |

Source: MCE laboratory analyses, 2009; DP = Dinger Profile Pit; SMU = Soil Mapping Unit. Note: Values have been rounded off for presentation;
Texture codes: SC - Sandy Clay; SL - Sandy Loam; SCL - Sandy Clay Loam; SiL - Silt Loam; L - Loam; CL - Clay Loam; SICl - Silty Clay Loam

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | **Field No:DP3** | Map Sheet: 0836A1 |
| Location: N-W of ILLUHARAR | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: 3 ( G2d-1) | | |
| Author: Zelealem S/Mariam | Date: 07/05/09 | |
| FAO - Soil Type: Orthidystric Nitisol (NTdyo) | Coordinate (UTM) | N: 987085 |
| Agro-Climatic zone: Kolla | Elevation (m): 1253 | E: 186469 |
| Land form: Upper part of gently undulating plain with convex interfluves | Slope Class: Strongly sloping | Slope: Position : Medium |
| Slope Aspect: West-East | Slope Length: 1km | Slope Form: Convex /Uniform |
| Micro - Topography: Termite | Coverage%: 3 | |
| Parent Material : Volcanic ash/Colluvial deposit | Soil depth cm.: 200 | Rock outcrop: |
| Surface Fragment coverage: | Surface Crack: | Sealing: |
| Flooding | Water table cm: >200 | |
| Drainage - External Well | Internal – Well drained | |
| Human influence: New settlement | | Moisture condition: Moist |
| Land Use: Rain fed arable cultivation; Land cover: Predominantly cultivated | | |
| Major crop Type : sorghum | Fertilizer Type | |
| Type of Erosion : Sheet & Splash erosion | Area Affected: 5-10% | |
| Activity: Active at present | Degree of dissection: Slight to medium | |
| Remarks: | | |

0-30cm: Dark reddish brown (5YR3/4) color, moist, loam texture, weak, medium to coarse, sub-angular blocky structure, firm moist and slightly stick /slightly plastic consistency when wet, patchy /broken, distinct, pressure faces cutanic feature, few to common, medium to fine roots, and many to medium pores.
30-113cm: Red (2.5YR4/6) color, moist, clay loam texture, moderate, medium to fine, sub-angular block structure, firm moist and stick / plastic consistency when wet, few, fine roots and very few, medium to coarse pores.
113-200cm: Dark reddish brown (5YR3/4) color moist, clay loam texture, moderate, medium to coarse, sub-angular blocky structure, firm moist and stick /plastic consistency when wet, few, fine roots and very few, coarse pores.

| | Profile DP3 | | | | SMU: *** (G2d_1) | | | | | | | | Soil Type:Orthidystric Nitisols (Ntdyo) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Texture <2 mm. fraction | | | | pH (1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ |
| cm | Sand | Silt | Clay | Class | H2O | KCl | ΔpH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K |
| 0-30 | 30.8 | 34.1 | 35.1 | CL | 5.3 | 4.7 | -0.6 | 0.07 | 0.3 | 2.6 | 9 | 3.6 | 0.2 | 0.4 | 10.8 | 2.7 | 14.2 | 35.4 | 40 | 0.5 | 4 | 33 |
| 30-113 | 25.0 | 4.2 | 70.8 | C | 4.7 | 4.5 | -0.2 | 0.02 | 0.1 | 0.9 | 8 | 0.3 | 0.6 | 0.2 | 4.5 | 0.9 | 6.1 | 34.4 | 18 | 1.7 | 5 | 36 |
| 113-200 | 10.6 | 10.5 | 78.9 | C | 4.9 | 4.2 | -0.7 | 0.01 | 0.1 | 1.4 | 10 | Trace | 0.2 | 0.2 | 3.6 | 1.8 | 5.8 | 21.6 | 27 | 0.8 | 2 | 31 |
| 200-300 | 8.8 | 8.4 | 82.9 | C | 5.2 | 4.4 | -0.8 | 0.01 | 0.2 | 1.3 | 7 | 0.3 | 0.2 | 0.2 | 7.2 | 0.9 | 8.5 | 19.7 | 43 | 0.9 | 8 | 44 |
| 300-337 | 10.5 | 8.4 | 81.0 | C | 4.9 | 4.2 | -0.7 | 0.01 | 0.2 | 1.4 | 9 | Trace | 0.2 | 0.1 | 3.6 | 0.9 | 4.8 | 22.1 | 22 | 0.7 | 4 | 33 |

Micronutrients mg/kg soil (ppm)

| Depth (cm) | Fe | Mn | Cu | Zn |
|---|---|---|---|---|
| 0-30 | 25.6 | 73.8 | 1.8 | 1.3 |

Source: MCE laboratory analyses, 2009; DP = Dinger Profile Pit; SMU = Soil Mapping Unit. Note: Values have been rounded off for presentation;
Texture codes: SC - Sandy Clay; SL - Sandy Loam; SCL - Sandy Clay Loam; SiL - Silt Loam; L - Loam; CL - Clay Loam; SICl - Silty Clay Loam

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:**DP15** | Map Sheet: 0836A1 |
| Location: W of village # 7 | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: 8 (U2f-9) | | |
| Author: Zelealem S/Mariam | Date:- 10/05/09 | |
| FAO -Soil Type : Hypereutric Cambisol (CMeuh) | Coordinate (UTM) | N: 992348 |
| Agro-Climatic zone: Kolla | Elevation (m): 1207/09 | E: 189879 |
| Land form : Strongly steep hill/ ridge side | Slope Class: Strongly slope | Slope: Position medium: |
| Slope Aspect: E-W | Slope Length: 600m | Slope Form: Convex |
| Micro- Topography: | Coverage %: | |
| Parent Material : Volcanic ash | Soil depth cm: 100 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. >100cm | |
| Drainage - External Slow | Internal – Rapid | |
| Human influence : New settlement area | | Moisture condition: Moist |
| Land Cover : Sparsely cultivated; Land use: Rain fed arable cultivation | | |
| Major crop Type : maize | Fertilizer Type | |
| Type of Erosion: Sheet & Splash erosion | Area Affected: 10-25% | |
| Activity: Active at present | Degree of dissection: Slight to moderate | |

Remarks: After 100cm stones and gravel is observed. The area is highly raged and irregular surface feature

0-15cm: Dark brown (10YR3/3) color, moist, clay loam texture, common, coarse to medium structure, slightly sticky and plastic when consistency when wet, many roots and coarse to medium pores.
15-52cm: Dark yellowish red (10YR3/4) color moist, clay loam texture, few, fine roots and many to common, fine medium pores.
52-100cm: Dark yellowish red (10YR3/4) color, moist, clay loam texture, many to common, fine to medium coarse fragment, strong to moderate, medium to coarse, sub-angular blocky structure, firm when moist and stick/plastic consistency when wet and few, fine pores.

| | Profile DP15 | | | | | | | SMU : U2f_9 | | | | | Soil Type : Hypereutric Cambisols (CMeuh) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Texture <2 mm. fraction | | | | pH (1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ |
| cm | Sand | Silt | Clay | Class | H2O | KCl | ΔpH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K |
| 0-15 | 37.8 | 35.4 | 26.8 | C | 6.7 | 5.9 | 0.1 | 0.13 | 0.6 | 7.8 | 14 | 112.0 | 0.1 | 1.7 | 27.4 | 6.8 | 36.0 | 37.7 | 96 | 0.3 | 4 | 20 |
| 15-52 | 33.9 | 24.5 | 41.6 | C | 6.4 | 5.7 | 0.1 | 0.14 | 0.2 | 1.5 | 7 | 42.9 | 0.1 | 0.9 | 21.7 | 14.5 | 37.2 | 30.5 | 122 | 0.5 | 2 | 41 |
| 52-100 | 24.3 | 21.3 | 54.4 | C | 6.6 | 5.8 | -0.8 | 0.05 | 0.1 | 1.1 | 7 | 7.9 | 0.1 | 0.8 | 16.3 | 11.3 | 28.5 | 31.4 | 91 | 0.3 | 1 | 34 |

Micronutrients mg/kg soil (ppm)

| Depth (cm) | Fe | Mn | Cu | Zn |
|---|---|---|---|---|
| 0-15 | 24.1 | 105.0 | 3.5 | 8.9 |

Source: MCE laboratory analyses, 2009; DP = Dinger Profile Pit; SMU = Soil Mapping Unit. Note: Values have ben rounded off for presentation;
Texture codes: SC - Sandy Clay; SL - Sandy Loam; SCL - Sandy Clay Loam; SiL - Silt Loam; L - Loam; CL - Clay Loam; SICl – Silty Clay Loam

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No :**DP56** | Map Sheet : 0836A1 |
| Location : N of Illuharar | Region : Oromiya, Zone : Illuababora, Wereda : Chewaka | |
| Mapping Unit : 5 (Sg-6) | | |
| Author :- Zelealem S/M | Date :- 08/05/09 | |
| FAO –Soil Type : Orthieutric Leptosol (Lpeou) | Coordinate (UTM) | N : 995602 |
| Agro-Climatic zone : Kolla | Elevation (m) :1187 | E : 187193 |
| Land form : Moderately steep side of hill / ridge. | Slope Class : Gently slope | Slope : Position : Medium |
| Slope Aspect : North –South | Slope Length : 70m | Slope Form : Uniform |
| Micro- Topography : Termite | Coverage % :2 | |
| Parent Material : Volcanic ash | Soil depth cm. : 60 | Rock outcrop : |
| Surface Fragment coverage : | Surface Crack : | Sealing : |
| Flooding | Water table cm. :> 60 | |
| Drainage -External rapid /medium | Internal –well | |
| Human influence :New settlement area | | Moisture condition : moist |
| Land Cover : Predominantly cultivated/ Intensively cultivated land ; Land Use : Rain fed arable cultivativation | | |
| Major Crop Type :sorghum ,maize ,rice ,haricot bean ,sesame | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 5-10% | |
| Activity : Active at present | Degree of dissection : Slight | |
| Remarks : Deforestation is high .After 60cm the oi lis stony & gravelly. | | |

0-23cm : Dark reddish brown (5YR3/2) color, moist, loam texture, few, fine coarse fragment, strong, coarse, angular block/ sub-angular blocky structure, hard dry, slightly stick /slightly plastic consistency when wet, common, fine to medium roots and common, medium to coarse pores.

23-60cm : Reddish brown (5YR4/3) color, moist, clay loam texture, common, fine to medium coarse fragment, strong, coarse sub-angular blocky structure, slightly stick/slight plastic consistency when wet, few, black, hard, manganese mineral nodules, few, fine roots and common, fine to medium pores.

| | Profile DP56 | | | | | | | SMU : Sg-6 | | | | | | Soil Type: Orthieutric Leptosols (Lpeoul) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Texture <2 mm. fraction | | | | pH (1:2.5) | | | EC | T N | OC | C/N | Avail P | CaCO3 | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ |
| cm | Sand | Silt | Clay | Class | H2O | KCl | ΔpH | dS/m | % | % | | ppm | | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K |
| 0-23 | 48.7 | 29.3 | 22.0 | L | 6.8 | 6.0 | -0.8 | 0.24 | 0.7 | 6.8 | 10 | 33.3 | 1.23 | 0.1 | 1.3 | 26.0 | 3.6 | 31.1 | 43.8 | 71 | 0.3 | 7 | 22 |
| 23-60 | 44.8 | 20.8 | 34.4 | CL | 6.8 | 6.0 | -0.8 | 0.06 | 0.2 | 1.6 | 7 | 5.6 | 0.56 | 0.2 | 0.6 | 16.1 | 5.4 | 22.3 | 25.8 | 86 | 0.7 | 3 | 37 |

Micronutrients mg/kg soil (ppm)

| Depth (cm) | Fe | Mn | Cu | Zn |
|---|---|---|---|---|
| 0-23 | 28.7 | 44.0 | 0.8 | 1.7 |

Source: MCE laboratory analyses, 2009; DP = Dinger Profile Pit; SMU = Soil Mapping Unit. Note: Values have ben rounded off for presentation;
Texture codes: SC - Sandy Clay; SL - Sandy Loam; SCL - Sandy Clay Loam; SiL - Silt Loam; L - Loam; CL - Clay Loam; SICl = Silty Clay Loam

SOIL PROFILE DESCRIPTION | Field No: **DP65** | Map Sheet: 0836A1

Location : 6.5 km NE of Illu Harer | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka

Mapping Unit: 11 ( V3c-8 )

Author:- Zelealem S/M | Date:- 08/05/09

| | | |
|---|---|---|
| FAO -Soil Type : Fluvic Cambisols (CMfv) | Coordinate (UTM) | N: 991896 |
| Agro-Climatic zone: Kolla | Elevation (m):1222 | E:191038 |
| Land form : Seasonally Wet Valley Floor | Slope Class : | Slope: Position : Low |
| Slope Aspect: West -East | Slope Length: 100m | Slope Form: Convex |
| Micro- Topography: Termite | Coverage 2% | |
| Parent Material : Volcanic ash | Soil depth cm.: 175 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. : >175 | |
| Drainage -External Rapid | Internal –Well drained | |
| Human influence: New settlement area | | Moisture condition: Moist |

Land Cover : Predominantly cultivated land; Land Use: Rain fed arable cultivate

Major Crop Type :sorghum, maize, sesame, rice, pepper | Fertilizer Type

Type of erosion : Sheet & Splash erosion | Area Affected : 10-25%

Activity :Active at present | Degree of dissection: Slight to Medium

Remarks: At the valley bottom there are large trees like bedessa , harabo local name, sample is taken from wet land.

0-21cm: Dusky red (2.5YR3/3) color, moist, loam texture, strong, coarse and sub-angular blocky structure, hard dry, and slightly stick/ plastic consistency when wet, common, fine to medium roots and many to common, medium to fine pores.
21-55cm: Dusky red(2.5YR3/3) color, moist, clay loam texture, few, fine coarse fragment, strong, medium to coarse, sub-angular blocky structure, stick/plastic consistency wet, common, red, slightly hard, iron mineral nodules, few, fine roots, and common, fine pores.
55-69cm: Dusky red(2.5YR3/3) color, moist, clay loam texture, few, fine coarse fragment, strong, medium to coarse, sub-angular blocky structure, stick/plastic consistency when wet, common, red, soft, iron mineral nodules, common, medium pores.
69-175cm: Reddish brown (2.5YR4/4) color, moist, clay loam texture.

| | Profile DP65 | | | | | | | SMU : V3c_8 | | | | | Soil Type:Fluvic Cambisols (CMfv) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Texture <2 mm. fraction | | | | pH (1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ |
| cm | Sand | Silt | Clay | Class | H2O | KCl | ΔpH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K |
| 0-21 | 47.6 | 24.7 | 27.8 | SCL | 6.6 | 6.3 | -0.2 | 0.41 | 0.5 | 4.5 | 10 | 23.9 | 0.2 | 1.4 | 15.7 | 4.0 | 21.3 | 24.8 | 86 | 0.8 | 4 | 14 |
| 21-55 | 44.3 | 15.5 | 40.2 | C | 6.4 | 5.2 | -1.2 | 0.18 | 0.2 | 1.8 | 7 | 3.4 | 0.1 | 0.8 | 9.8 | 2.2 | 12.9 | 15.9 | 81 | 0.8 | 4 | 15 |
| 55-69 | 44.3 | 9.3 | 46.4 | C | 6.6 | 5.7 | -0.8 | 0.39 | 0.2 | 1.3 | 8 | 5.4 | 0.1 | 3.3 | 6.3 | 1.3 | 11.1 | 16.6 | 67 | 0.8 | 5 | 2 |
| 69-175 | 32.7 | 14.5 | 52.8 | C | 6.4 | 5.9 | -0.5 | 0.17 | 0.1 | 1.0 | 8 | 9.8 | 0.1 | 1.2 | 6.3 | 2.7 | 10.3 | 15.1 | 68 | 1.0 | 2 | 8 |

Micronutrients mg/kg soil (ppm)

| Depth (cm) | Fe | Mn | Cu | Zn |
|---|---|---|---|---|
| 0-21 | 35.2 | 59.2 | 2.1 | 1.1 |

Source: MCE laboratory analyses, 2009; DP = Dinger Profile Pit; SMU = Soil Mapping Unit. Note: Values have ben rounded off for presentation;
Texture codes: SC - Sandy Clay; SL - Sandy Loam; SCL - Sandy Clay Loam; SiL - Silt Loam; L - Loam; CL - Clay Loam; SICl = Silty Clay Loam

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: **DP67** | Map Sheet: 0836A1 |
| Location : Barjk Anani | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: 6 (U1e-4) | | |
| Author:- Kumsa | Date:- 09/05/09 | |
| FAO -Soil Type : Hyperferric Acrisol (ACfrh) | Coordinate (UTM) | N: 995438 |
| Agro-Climatic Kolla | Elevation (m) :1237 | E:181318 |
| Land form : Strongly sloping valley side | Slope Class: Sloping | Slope: Position :Medium |
| Slope Aspect: North-South | Slope Length: >200m | Slope Form: Concave |
| Micro- Topography: Terracing /Termite | Coverage %:1 | |
| Parent Material : In suite weathered residual | Soil depth cm.: 160 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>160 | |
| Drainage -External Well | Internal –Well drained | |
| Human influence :Burring, clearing ,terracing; | Land Cover : Intensively cultivated Land | Moisture condition: Moist |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type :sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity : Active at present | Degree of dissection: Slight | |
| Remarks: Deep soil and 7% Slope | | |

0-14cm: Dark reddish brown (5YR3/2) color moist, clay loam texture, weak, fine to medium, sub-angular blocky structure, firm, stick/plastic consistency when wet, many, fine roots and many, fine pores.
14-45cm: Dark reddish brown (5YR3/4) color moist, clay texture, moderate, fine to medium, sub-angular blocky structure, firm moist and stick/plastic consistency when wet, common, fine to medium and roots many, fine pores.
45-80cm: Dark reddish brown (2.5YR3/4) color moist, clay texture, moderate, fine to medium, sub-angular blocky structure, firm, stick/plastic consistency when wet, few, fine to medium and roots, many, fine pores.
80-160cm: dark red (2.5YR3/6) color moist, clay texture, moderate, fine to medium, sub-angular blocky structure, firm moist and stick/plastic consistency when wet, few, fine roots, and many, fine pores.

| | Profile DP67 | | | | | | | SUM: Ue1_4 | | | | | Soil Type: Hyperferric Acrisols (Acrh) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Texture <2 mm. fraction | | | | pH (1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ |
| cm | Sand | Silt | Clay | Class | H2O | KCl | ΔpH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K |
| 0-14 | 45.6 | 28.2 | 26.2 | L | 5.4 | 4.4 | -1.0 | 0.10 | 0.3 | 4.0 | 12 | 4.6 | 0.2 | 0.4 | 9.1 | 4.6 | 14.3 | 34.7 | 41 | 0.6 | 2 | 35 |
| 14-45 | 46.8 | 18.8 | 34.5 | SCL | 5.1 | 4.3 | -0.8 | 0.02 | 0.2 | 2.8 | 13 | 1.9 | 0.2 | 0.1 | 4.6 | 1.8 | 6.7 | 22.3 | 30 | 0.8 | 3 | 46 |
| 45-80 | 28.0 | 25.0 | 47.0 | C | 5.1 | 4.3 | -0.8 | 0.01 | 0.2 | 1.5 | 8 | 1.9 | 0.2 | 0.1 | 4.6 | 1.8 | 6.6 | 17.3 | 38 | 0.9 | 3 | 61 |
| 80-160 | 25.8 | 14.6 | 59.5 | C | 5.0 | 4.3 | -0.7 | 0.01 | 0.1 | 1.1 | 7 | Trace | 0.2 | 0.1 | 4.5 | 1.8 | 6.6 | 14.7 | 45 | 1.1 | 3 | 55 |

Micronutrients mg/kg soil (ppm)

| Depth (cm) | Fe | Mn | Cu | Zn |
|---|---|---|---|---|
| 0-14 | 33.7 | 55.9 | 3.5 | 0.4 |

Source: MCE laboratory analyses, 2009; DP = Dinger Profile Pit; SMU = Soil Mapping Unit. Note: Values have ben rounded off for presentation;
Texture codes: SC - Sandy Clay; SL - Sandy Loam; SCL - Sandy Clay Loam; SiL - Silt Loam; L - Loam; CL - Clay Loam; SICl = Silty Clay Loam

SOIL PROFILE DESCRIPTION | Field No:**DP78** | Map Sheet: 0836A1

Location: 6 Km NW of Illu Harer | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka

Mapping Unit: : 1 (G1b-1)

Author:- Zelealem S/M | Date:- 06/05/09

| | | |
|---|---|---|
| FAO -Soil Type : Orthidystric Nitisol (NTdyo) | Coordinate (UTM) | N: 991975 |
| Agro-Climatic Zone: Kolla | Elevation (m): 1250 | E:184396 |
| Land form : Upper part of Gently undulating Plains with Convex Interfluves | Slope Class: Nearly level | Slope: Position : Medium |
| Slope Aspect: North -South | Slope Length: 400m | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage % : | |
| Parent Material : Volcanic ash | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. >200 | |
| Drainage -External Well | Internal – Well drained | |
| Human influence: Clearing | | Moisture condition: |

Land Cover : Predominantly cultivated land; Land Use : Rain fed arable cultivate

Major Crop Type : sorghum, sesame, haricot bean &Maize | Fertilizer Type

Type of Erosion : Sheet & splash erosion | Area Affected :5-10%

Activity : Active at present | Degree of dissection: Slight

Remarks : Scattered big trees occupy nearly 20% of the area

0-18cm: Dark reddish brown (5YR3/2) color moist, clay loam texture, moderate, medium/coarse, sub-angular blocky structure, stick/plastic consistency when wet, few, fine roots and many, coarse to medium pores.
18-43cm: Dark reddish brown (5YR3/4) color moist, clay loam texture, moderate, medium, sub-angular blocky structure, stick /plastic consistency when wet, very few roots and many, medium pores.
43-85cm: Dark reddish (2.5YR3/6) color moist, clay texture, moderate, very medium, sub-angular blocky structure, stick/plastic consistency when wet, many/few, medium to fine pores.
85-200cm: Dark reddish (2.5YR3/6) color moist, loam texture, moderate to weak, very medium, granular consistency when wet and few, fine pores.

| | Profile DP78 | | | | | | | | SMU : G1b_1 | | | | Soil Type:Orthidystric Nitisols (Ntdyo) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Texture <2 mm. fraction | | | | pH (1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ |
| cm | Sand | Silt | Clay | Class | H2O | KCl | ΔpH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K |
| 0-18 | 32.0 | 10.5 | 57.5 | C | 5.6 | 4.5 | -1.0 | 0.07 | 0.3 | 4.1 | 13 | 2.7 | 0.2 | 0.4 | 10.8 | 3.6 | 15.0 | 28.7 | 52 | 0.7 | 3 | 34 |
| 18-43 | 27.9 | 12.5 | 59.6 | C | 4.8 | 3.8 | -1.0 | 0.02 | 0.1 | 2.4 | 20 | 0.9 | 0.2 | 0.2 | 3.6 | 2.7 | 6.6 | 27.3 | 24 | 0.6 | 1 | 34 |
| 43-85 | 27.8 | 8.4 | 63.9 | C | 5.1 | 4.2 | -0.9 | 0.02 | 0.1 | 1.6 | 13 | 0.4 | 1.9 | 0.2 | 4.5 | 3.6 | 10.2 | 20.0 | 51 | 9.8 | 1 | 35 |
| 85-200 | 15.9 | 8.4 | 75.7 | C | 5.0 | 4.0 | -1.0 | 0.01 | 0.1 | 0.6 | 7 | 1.0 | 0.2 | 0.1 | 3.6 | 2.7 | 6.6 | 15.6 | 42 | 1.1 | 1 | 42 |
| 200-300 | | | | | 5.4 | 4.8 | -0.7 | 0.01 | | | | | | | | | | | | | | |
| 300-400 | | | | | 5.3 | 4.5 | -0.8 | 0.01 | | | | | | | | | | | | | | |

Micronutrients mg/kg soil (ppm)

| Depth (cm) | Fe | Mn | Cu | Zn |
|---|---|---|---|---|
| 0-18 | 50.3 | 58.4 | 1.2 | 1.5 |

Source: MCE laboratory analyses, 2009; DP = Dinger Profile Pit; SMU = Soil Mapping Unit. Note: Values have ben rounded off for presentation;
Texture codes: SC - Sandy Clay; SL - Sandy Loam; SCL - Sandy Clay Loam; SiL - Silt Loam; L - Loam; CL - Clay Loam; SIC - Silty Clay Loam

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: **DP83** | Map Sheet: 0836A1 |
| Location: Jegene | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: 9 (V1b_3) | | |
| Author:- Kumsa B | Date:- 06/05/09 | |
| FAO -Soil Type : Mesotrophic Vertisol (VRms) | Coordinate (UTM) | N: 992161 |
| Agro-Climatic Zone:Kolla | Elevation (m):1243m | E: 183590 |
| Land form: Seasonally Wet Valley Floor | Slope Class: Nearly level | Slope: Position : Medium |
| Slope Aspect: West-East | Slope Length: >300m | Slope Form: Uniform |
| Micro- Topography: Gilgai | Coverage % : 20 | |
| Parent Material: Fluvial deposition | Soil depth cm.: 160 | Rock outcrop: |
| Surface Fragment coverage: | Surface Crack: | Sealing: |
| Flooding | Water table cm. >160 | |
| Drainage - External Rapid | Internal – Imperfectly drained | |
| Human influence: | | Moisture condition: Moist |
| Land Cover: Grass land;; Land Use: Communal Grazing land | | |
| Major Crop Type | Fertilizer Type | |
| Type of Erosion | Area Affected | |
| Activity | Degree of dissection: | |

remarks: Deep soil, seasonal water logging, wide cracks, slope 2% formation of carbonic horizon in the lower layer

0-23cm: Very dark brown (10RY3/1) color moist, many, yellowish red, distinct mottle, clay texture, moderate, fine/medium, sub-angular blocky structure, firm moist, very stick/very plastic consistency when wet, many, fine roots and many, fine pores.
23-70cm: Dark gray (10YR4/1) color moist, many, yellowish red, distinct mottle, clay texture, moderate, medium/coarse, wedge–shaped structure, very firm moist, very stick /very plastic consistency when wet, many, fine roots and many, fine pores.
70-160cm: Dark gray (10YR4/1) color moist, few mottle, clay texture, common, medium coarse fragment, moderate, medium /coarse, wedge-shaped structure, very stick /very plastic consistency when wet, few, fine roots and common, fine pores.

| | Profile DP83 | | | | | | | SMU : V1b_3 | | | | | | Soil Type : Mesotrophic vertisols (VRsm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Texture <2 mm. fraction | | | | pH (1:2.5) | | | EC | T N | OC | C/N | Avail P | CaCO3 | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ |
| cm | Sand | Silt | Clay | Class | H2O | KCl | ΔpH | dS/m | % | % | | ppm | | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K |
| 0-23 | 31.5 | 21.1 | 47.4 | C | 5.5 | 4.2 | -1.3 | 0.05 | 0.3 | 4.6 | 14 | 9.2 | | 0.2 | 0.4 | 21.7 | 8.1 | 30.4 | 51.6 | 59 | 0.5 | 3 | 80 |
| 23-70 | 29.9 | 10.5 | 59.6 | C | 5.5 | 4.0 | -1.5 | 0.03 | 0.1 | 1.7 | 14 | 2.8 | | 0.3 | 0.2 | 19.0 | 9.0 | 28.6 | 42.3 | 68 | 0.7 | 2 | 121 |
| 70-160 | 28.9 | 5.2 | 65.9 | C | 7.9 | 7.1 | -0.8 | 0.30 | 0.0 | 0.5 | 18 | 0.6 | 2.24 | 0.8 | 0.3 | 52.0 | 10.4 | 63.5 | 57.0 | 111 | 1.4 | 5 | 215 |

Micronutrients mg/kg soil (ppm)

| Depth (cm) | Fe | Mn | Cu | Zn |
|---|---|---|---|---|
| 0-23 | 402.1 | 101.3 | 4.7 | 0.2 |

Source: MCE laboratory analyses, 2009; DP = Dinger Profile Pit; SMU = Soil Mapping Unit. Note: Values have ben rounded off for presentation;
Texture codes: SC - Sandy Clay; SL - Sandy Loam; SCL - Sandy Clay Loam; SiL - Silt Loam; L - Loam; CL - Clay Loam; SICl - Silty Clay Loam

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: **DP90** | Map Sheet: 0836A1 |
| Location: Burka Anani | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit : 2 (G1b_4) | | |
| Author:- Zeleam S/Mariam | Date:- 07/05/09 | |
| FAO -Soil Type: Hyperic Acrisol (ACfrh) | Coordinate (UTM) | N: 994577 |
| Agro-Climatic Zone: Kolla | Elevation (m): 1256 | E : 181927 |
| Land form: Upper part of Gently undulating Plains with Convex Interfluves | Slope Class: 06 | Slope: Position : Lowest |
| Slope Aspect: South -North | Slope Length: 200m | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage % : 0.2 | |
| Parent Material: In situ weathered | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding: | Water table cm. >200 | |
| Drainage - External Well | Internal – Well drained | |
| Human influence: Burning, Clearing, Terracing | | Moisture condition: |
| Land Cover: Intensively cultivated Land; Land Use: Rain fed arable cultivation | | |
| Major Crop Type: sorghum | | Fertilizer Type |
| Type of Erosion: Sheet & Splash erosion | | Area Affected: >50% |
| Activity: Active at present | | Degree of Dissection: Slight |
| Remarks: Deep soil >200cm, slope 7% | | |

0-12 cm:-Dark red ( 2.5YR3/2) color, clay loam texture, weak fine/medium, sub-angular blocky structure, firm moist and stick/plastic consistency when wet, patchy, distinct, clay cutanic, feature, common, fine and medium roots, many and fine/medium pores.
12-70cm:-Dark reddish brown (2.5YR3/4 ) color, clay texture, moderate fine/medium, sub-angular blocky structure, firm moist and stick/plastic consistency wet, patchy, distinct, clay cutanic feature few, fine and medium roots and many, fine/medium pores.
70-200cm:-Dark red (2.5YR3/6) color, clay texture, moderate fine/medium, sub-angular blocky structure, firm moist and stick/plastic consistency when wet, few, medium roots and common, fine pores.

| | Profile DP90 | | | | | | | SMU : G1b_4 | | | | | Soil Type : Hyperferric Acrisols (Acfrh) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Texture <2 mm. fraction | | | | pH (1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ |
| cm | Sand | Silt | Clay | Class | H2O | KCl | ΔpH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K |
| 0-12 | 48.6 | 23.1 | 28.3 | SCL | 5.1 | 4.2 | -0.9 | 0.10 | 0.3 | 3.9 | 14 | 6.1 | 0.2 | 0.3 | 5.4 | 1.8 | 7.6 | 31.7 | 24 | 0.5 | 3 | 23 |
| 12--70 | 25.4 | 50.4 | 24.2 | SiL | 4.6 | 4.2 | -0.5 | 0.03 | 0.2 | 2.7 | 16 | 2.1 | 0.1 | 0.1 | 1.8 | 0.9 | 2.9 | 27.8 | 11 | 0.5 | 2 | 23 |
| 70-200 | 35.8 | 6.3 | 57.9 | C | 4.5 | 4.2 | -0.3 | 0.05 | 0.1 | 1.8 | 14 | 0.8 | 0.1 | 0.1 | 2.7 | 1.8 | 4.7 | 18.0 | 26 | 0.6 | 2 | 39 |

Micronutrients mg/kg soil (ppm)

| Depth (cm) | Fe | Mn | Cu | Zn |
|---|---|---|---|---|
| 0-12 | 64.8 | 41.7 | 2.1 | 0.4 |

Source: MCE laboratory analyses, 2009; DP = Dinger Profile Pit; SMU = Soil Mapping Unit. Note: Values have ben rounded off for presentation;
Texture codes: SC - Sandy Clay; SL - Sandy Loam; SCL - Sandy Clay Loam; SiL - Silt Loam; L - Loam; CL - Clay Loam; SICl - Silty Clay Loam

SOIL PROFILE DESCRIPTION | Field No: **DP91** | Map Sheet: 0836A1

Location: N-W of Illuharar | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka

Mapping Unit: 10 (V2a-7)

Author:- Zeleam S/Mariam | Date:-

FAO -Soil Type: Gelic Gleysol (GLge) | Coordinate (UTM) | N: 9956634

Agro-Climatic Zone: Kolla | Elevation (m): 1244 | E : 182903

Land form: Permanently Wet Valley Floor | Slope Class: Gently slope | Slope: Position : Lowest

Slope Aspect: North- South | Slope Length: 1.5km | Slope Form: Irregular

Micro- Topography: gilgai | Coverage % :

Parent Material: Fluvial deposit | Soil depth cm. 184 | Rock outcrop:

Surface Fragment coverage : | Surface Crack: | Sealing:

Flooding: Annually | Water table cm. >184

Drainage - External Moderately drained | Internal – Poorly drained

Human influence: Vegetation disturbed | Moisture condition: Moist / Wet

Land Cover: Seasonal marsh; Land Use: Animal production

Major Crop Type: | Fertilizer Type

Type of Erosion: Gully erosion | Area Affected: 10-25%

Activity: Active at present | Degree of Dissection: Moderate/ Slight

Remarks: Profile pit is taken from gully cut, surrounding land is covered with hyperemia grasses along the stream & gully. Currently the area is used for grazing, it is communal land.

0-42cm: Black (10YR2/1) color moist, clay texture, moderate, medium, sub-angular blocky structure, firm moist and stick/ plastic consistency when wet, many, fine/medium roots, few, and fine/medium pores.

42-68cm: Very dark gray (10YR3/1) color moist, many, yellowish red, distinct mottle, Clay texture, few, fine coarse fragment, moderate, medium, sub-angular blocky structure, firm moist and stick/plastic consistency when wet, few, fine/medium roots and few, fine pores.

68-159cm: Dark grayish brown (10YR4/2) color moist, many, yellowish red, prominent mottle, clay texture, many fine coarse fragment, firm moist and stick /plastic consistency when wet, few, brownish, soft, moderate mineral nodules, few, fine roots.

159-184 cm: Very dark gray (10YR3/1) color moist, few, yellowish red, faint mottle, clay texture, many, fine coarse fragment, firm moist and stick/plastic consistency when wet.

| | Profile DP91 | | | | | | | SMU : V2b_7 | | | | | Soil Type : Gelic Gleysols (Glge) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Texture <2 mm. fraction | | | | pH (1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ |
| cm | Sand | Silt | Clay | Class | H2O | KCl | ΔpH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K |
| 0-42 | 31.5 | 19.0 | 49.5 | C | 5.2 | 3.9 | -1.3 | 0.04 | 0.3 | 4.6 | 15 | 3.4 | 0.2 | 0.3 | 11.6 | 4.5 | 16.6 | 35.5 | 47 | 0.5 | 3 | 59 |
| 42-68 | 26.8 | 15.7 | 57.5 | C | 5.3 | 3.9 | -1.5 | 0.02 | 0.1 | 1.7 | 16 | 1.4 | 0.2 | 0.2 | 12.4 | 3.6 | 16.4 | 27.0 | 61 | 0.6 | 4 | 83 |
| 68-159 | 27.9 | 10.5 | 61.7 | C | 5.3 | 4.0 | -1.4 | 0.02 | 0.1 | 1.0 | 13 | 1.1 | 0.3 | 0.2 | 14.3 | 2.7 | 17.6 | 28.2 | 62 | 1.1 | 5 | 78 |
| 159-184 | 59.2 | 8.4 | 32.5 | SCL | 5.4 | 3.8 | -1.6 | 0.02 | 0.0 | 0.9 | 61 | 21.8 | 0.2 | 0.1 | 5.4 | 2.7 | 8.4 | 20.0 | 42 | 1.2 | 2 | 59 |

Micronutrients mg/kg soil (ppm)

| Depth (cm) | Fe | Mn | Cu | Zn |
|---|---|---|---|---|
| 0-42 | 196.0 | 16.3 | 2.3 | 17.1 |

Source: MCE laboratory analyses, 2009; DP = Dinger Profile Pit; SMU = Soil Mapping Unit. Note: Values have ben rounded off for presentation;
Texture codes: SC - Sandy Clay; SL - Sandy Loam; SCL - Sandy Clay Loam; SiL - Silt Loam; L - Loam; CL - Clay Loam; SICl - Silty Clay Loam

SOIL PROFILE DESCRIPTION | Field No: **DP94** | Map Sheet: 0836A1

Location: 2 km NW of Sire Guda | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka

Mapping Unit: 7 (U1e_5 )

Author:- Zelealem S/Mariam

| | | |
|---|---|---|
| FAO -Soil Typ : Orthidystric Cambisol (CMdyo) | Coordinate : UTM | N: 996968 |
| Agro-Climatic Zone: kola | Elevation (m): 1253 | E : 181653 |
| Land form: Strongly sloping upper part of hill / ridges | Slope Class: Gently slope | Slope: Position : |
| Slope Aspect: East –West | Slope Length: 400m | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage % : 2 | |
| Parent Material: Volcanic ash/ In situ weathered | Soil depth cm: 70 | Rock /outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm.: >70cm | |
| Drainage - External Rapid | Internal – Well Drained | |
| Human influence Vegetation disturbed, clearing: | | Moisture condition: |

Land cover: Moderately Cultivated land; Land use: Rain fed arable cultivation

| | |
|---|---|
| Major crop Type: Sorghum, Sesame, Rice, Haricot bean | Fertilizer Type |
| Type of erosion: Sheet & splash erosion | Area Affected: 5-10% |
| Activity: Active at present | Degree of dissection: slight |

Remarks: Previously the area was under forest vegetation cover, now most of the vegetation is cleared, at the bottom the soil is gravelly & stony.

0-14cm: Brown (7.5YR4/4) color moist, loam texture, few, fine coarse fragment, moderate, medium, angular blocky structure, hard dray, slightly stick/ slight plastic consistency when wet , very few, fine roots, many, medium to fine pores.
14-38cm: Strong brown (7.5YR4/6) color moist, clay loam texture, few, fine coarse fragment, moderate, medium/coarse, sub-angular blocky structure, very firm moist and stick/plastic consistency when wet, cemented, prominent cementation, common, yellowish brown, soft, iron/manganese mineral nodules and common, medium to fine pores.
38-70cm: Strong brown (7.5YR4/6) color moist, clay loam texture, many, fine & medium coarse fragment, moderate, medium, sub-angular blocky structure, very firm moist and stick /plastic consistency when wet, cemented, prominent cementation, many, yellowish brown, soft, manganese mineral nodules.

| | Profile DP94 | | | | SMU : U1e_5 | | | | | | | | Soil Type:Orthidystric Cambisols (Cmdyo) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Texture <2 mm. fraction | | | | pH (1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ |
| cm | Sand | Silt | Clay | Class | H2O | KCl | ΔpH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K |
| 0-14 | 48.5 | 14.7 | 36.8 | SC | 5.3 | 4.3 | -1.0 | 0.12 | 0.6 | 3.9 | 7 | 77.9 | 0.2 | 0.5 | 2.7 | 2.7 | 6.1 | 16.7 | 37 | 1.1 | 1 | 10 |
| 14-38 | 36.1 | 18.3 | 45.6 | C | 4.6 | 4.0 | -0.6 | 0.03 | 0.2 | 2.0 | 8 | 27.6 | 0.1 | 0.1 | 1.8 | 0.9 | 2.9 | 14.2 | 21 | 0.8 | 2 | 23 |
| 38-70 | 43.6 | 16.4 | 40.0 | CL | 4.8 | 4.0 | -0.8 | 0.02 | 0.1 | 1.4 | 12 | 4.4 | 0.1 | 0.1 | 1.8 | 0.9 | 3.0 | 13.8 | 22 | 1.0 | 2 | 23 |

Micronutrients mg/kg soil (ppm)

| Depth (cm) | Fe | Mn | Cu | Zn |
|---|---|---|---|---|
| 0-14 | 35.2 | 31.8 | 2.1 | 37.4 |

Source: MCE laboratory analyses, 2009; DP = Dinger Profile Pit; SMU = Soil Mapping Unit. Note: Values have been rounded off for presentation;
Texture codes: SC - Sandy Clay; SL - Sandy Loam; SCL - Sandy Clay Loam; SiL - Silt Loam; L - Loam; CL - Clay Loam; SICl = Silty Clay Loam

# APPENDIX 5B: LIST OF INFILTRATION RATES & HYDRAULIC CONDUCTIVITY TEST RESULTS

## APPENDIX 5B1: INFILTRATION RATES TEST RESULTS

EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile No. DP2 | | Date:- 040609 | | Replication 1 | | Author: Dr Tesfaye Ertebo | | |
| Soil Type: Rhodic Nitisols (NTro) | | | | | | | UTM Reading | |
| Water Source: From Dursitu River Tributary of Dedessa River. | | | | | | | E:186500 | |
| | | | | | | | N:989140 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 8:25 | | | 16.0 | | | | | |
| Am | 5 | | | 14.2 | 1.8 | 1.8 | 21.6 | 21.6 |
| | 5 | 10 | | 13.1 | 1.1 | 2.9 | 13.2 | 17.4 |
| | 5 | 15 | 15.5 | 11.6 | 1.0 | 3.9 | 12.0 | 15.6 |
| | 5 | 20 | | 14.6 | 0.9 | 4.8 | 10.8 | 14.4 |
| | 5 | 25 | | 13.6 | 1.0 | 5.8 | 12.0 | 13.9 |
| | 5 | 30 | 15.8 | 12.8 | 0.8 | 6.6 | 9.6 | 13.2 |
| | 5 | 35 | | 15.2 | 0.6 | 6.3 | 7.2 | 12.3 |
| | 5 | 40 | 15.3 | 14.8 | 0.4 | 6.7 | 4.8 | 11.4 |
| | 5 | 45 | | 14.9 | 0.2 | 7.3 | 2.4 | 10.4 |
| | 5 | 50 | | 14.6 | 0.3 | 7.6 | 3.6 | 9.7 |
| | 5 | 55 | | 14.4 | 0.2 | 8.3 | 2.4 | 9.1 |
| | 5 | 60 | | 14.2 | 0.2 | 8.5 | 2.4 | 8.5 |
| | 5 | 70 | 15.5 | 13.9 | 0.3 | 9.3 | 3.6 | 8.1 |
| | 10 | 80 | | 12.4 | 1.5 | 10.8 | 9.0 | 8.2 |
| | 10 | 90 | | 11.2 | 1.2 | 10.3 | 7.2 | 8.1 |
| | 15 | 105 | 17.0 | 9.2 | 2.0 | 12.3 | 8.0 | 8.1 |
| | 15 | 120 | | 15.1 | 2.9 | 11.3 | 11.6 | 8.3 |
| | 15 | 135 | | 13.4 | 1.7 | 13.0 | 6.8 | 8.2 |
| | 15 | 150 | 15.8 | 12.6 | 0.8 | 12.3 | 3.2 | 8.0 |
| | 20 | 170 | | 13.9 | 1.9 | 14.2 | 5.7 | 7.9 |
| | 20 | 190 | 15.2 | 12.4 | 1.5 | 13.3 | 4.5 | 7.7 |
| | 20 | 210 | | 13.4 | 1.8 | 15.1 | 5.4 | 7.6 |
| | 20 | 230 | 15.6 | 11.7 | 1.7 | 14.3 | 5.1 | 7.5 |
| | 20 | 250 | | 12.2 | 1.5 | 15.8 | 4.5 | 7.4 |
| 12:55 | 20 | 270 | | 10.6 | 1.6 | 15.3 | 4.8 | 7.3 |

REMARKS: 2 days back there was rain in the area. It is intensively cultivated land Started 6years ago. Moisture penetration up to100cm depth

EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile No. DP2 | | Date:- 040609 | | Replication 2 | | Author: Dr Tesfaye Ertebo | | |
| Soil Type: Rhodic Nitisols (NYro | | | | | | | UTM Reading | |
| Water Source: From Dursitu River tributary of Dedessa River. | | | | | | | E:186500 | |
| | | | | | | | N:989140 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 8:35 | | | 15.8 | | | | | |
| | 5 | 5 | | 14.3 | 1.5 | 1.5 | 18.0 | 18.0 |
| | 5 | 10 | 14.5 | 13.1 | 1.2 | 2.7 | 14.5 | 16.3 |
| | 5 | 15 | | 13.4 | 1.1 | 3.8 | 13.3 | 15.3 |
| | 5 | 20 | | 12.4 | 1.0 | 4.8 | 12.1 | 14.5 |
| | 5 | 25 | 15.0 | 11.3 | 1.1 | 5.9 | 13.3 | 14.3 |
| | 5 | 30 | | 14.1 | 0.9 | 6.9 | 10.9 | 13.7 |
| | 10 | 40 | | 13.4 | 0.7 | 7.6 | 4.3 | 12.4 |
| | 10 | 50 | | 12.9 | 0.5 | 8.1 | 3.1 | 11.2 |
| | 10 | 60 | 14 | 12.6 | 0.3 | 8.4 | 1.9 | 10.2 |
| | 10 | 70 | | 12.2 | 0.4 | 8.8 | 2.5 | 9.4 |
| | 10 | 80 | | 11.9 | 0.3 | 9.1 | 1.9 | 8.7 |
| | 10 | 90 | 14.9 | 11.6 | 0.3 | 9.4 | 1.9 | 8.1 |
| | 10 | 100 | | 14.5 | 0.4 | 9.8 | 2.5 | 7.7 |
| | 15 | 115 | | 12.9 | 1.6 | 11.4 | 6.4 | 7.6 |
| | 15 | 130 | 15.7 | 11.6 | 1.3 | 12.7 | 5.2 | 7.4 |
| | 15 | 145 | | 14.6 | 1.1 | 13.8 | 4.4 | 7.3 |
| | 15 | 160 | | 13.4 | 1.2 | 15.0 | 4.8 | 7.1 |
| | 20 | 180 | 15.5 | 11.6 | 1.8 | 16.9 | 5.4 | 7.0 |
| | 20 | 200 | | 10.7 | 0.9 | 17.8 | 2.7 | 6.8 |
| | 20 | 220 | | 9.9 | 0.8 | 18.6 | 2.4 | 6.6 |
| | 20 | 240 | 15.0 | 9.3 | 0.6 | 19.2 | 1.8 | 6.3 |
| | 20 | 260 | | 14.3 | 0.7 | 19.9 | 2.1 | 6.2 |
| | 20 | 280 | | 13.8 | 0.5 | 20.4 | 1.5 | 6.0 |
| | 20 | 300 | | 13.4 | 0.4 | 20.8 | 1.2 | 5.8 |
| | 20 | 320 | | 13.0 | 0.4 | 21.2 | 1.2 | 5.6 |

REMARKS:
2 days ago rain started in the area cultivation started 6 years back, currently intensively cultivated land prepared for sowing Maize.

EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT

INFILTRATION RATE MEASUREMENT FORM

| Profile No. DP2 | Date:- 040609 | Replication 3 | Author: Dr Tesfaye Ertebo |
|---|---|---|---|
| Soil Type: Rhodic Nitisols (NYro) | | | UTM Reading |
| Water Source: From Dursitu River Tributary of Dedessa River. | | | E:186500 |
| | | | N:989140 |

| Local | Interval (min) | Cumulative time (min) | Depth of Water (cm) Initial | Final | Intake (cm) | Cumulative Intake (cm) | Infiltration rate (cm/hr) Immediate | Mean |
|---|---|---|---|---|---|---|---|---|
| 9:10 | | | 14.0 | | | | | |
| | 5 | | 15.1 | 6.5 | 3.26 | 3.3 | 39.12 | 39.12 |
| | 5 | 10 | | 11.1 | 1.06 | 4.36 | 12.72 | 25.92 |
| | 5 | 15 | | 8.7 | 0.96 | 5.32 | 11.52 | 21.12 |
| | 5 | 20 | 16.4 | 5.6 | 0.86 | 6.18 | 10.32 | 18.42 |
| | 5 | 25 | | 12.7 | 0.96 | 7.14 | 11.52 | 17.0 |
| | 5 | 30 | | 10.2 | 0.76 | 7.9 | 9.12 | 15.72 |
| | 5 | 35 | | 7.4 | 0.56 | 8.46 | 6.72 | 14.4 |
| | 5 | 40 | 16.9 | 5.3 | 0.36 | 8.82 | 4.32 | 13.2 |
| | 5 | 45 | | 13.9 | 0.16 | 8.98 | 1.92 | 11.9 |
| | 5 | 50 | | 11.9 | 0.26 | 9.24 | 3.12 | 11.0 |
| | 5 | 60 | 16.8 | 8.6 | 0.16 | 9.4 | 1.92 | 10.2 |
| | 10 | 70 | | 10.8 | 0.16 | 9.56 | 0.96 | 9.4 |
| | 10 | 80 | 17.0 | 6.4 | 0.26 | 9.82 | 1.56 | 8.8 |
| | 10 | 90 | | 12.2 | 1.46 | 11.28 | 8.76 | 8.8 |
| | 15 | 105 | 16.5 | 8.2 | 1.16 | 12.44 | 4.64 | 8.5 |
| | 15 | 120 | | 10.0 | 1.96 | 14.4 | 7.84 | 8.5 |
| | 15 | 135 | 16.9 | 5.4 | 2.86 | 17.26 | 11.44 | 8.7 |
| | 20 | 155 | | 9.5 | 1.66 | 18.92 | 6.64 | 8.6 |
| | 20 | 175 | 17.5 | 4.0 | 0.76 | 19.68 | 3.04 | 8.3 |
| | 20 | 195 | | 10.7 | 1.86 | 21.54 | 7.44 | 8.2 |
| | 20 | 215 | 17.5 | 5.9 | 1.46 | 23 | 5.84 | 8.1 |
| | 20 | 235 | | 12.1 | 1.76 | 24.76 | 7.04 | 8.1 |
| | 20 | 255 | | 8.2 | 1.66 | 26.42 | 6.64 | 8.0 |
| | | | | 6.7 | 1.46 | 27.88 | 5.84 | 7.9 |
| | | | | | | | | |
| | | | | | | | | |

REMARKS:
2 days back rain was started in the area the soil is wet. Intensively cultivated land currently Sorghum / Maize are sown cultivation started 6 years ago. Moisture penetration 110cm.

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile No. DP3 | | Date:- 050609 | | Replication 2 | | Author: Dr.Tesfaye Ertebo | | |
| Soil Type: Orthidystric Nitisols (NTdyo) | | | | | | | UTM Reading | |
| Water Source: From Demesa River, Tributary of Dedessa River | | | | | | | E:0186469 | |
| | | | | | | | E: 987092 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 8:14 | 0 | | 16.8 | 0.0 | | | | |
| | 5 | 5 | | 15.0 | 1.8 | 1.8 | 21.6 | 21.6 |
| | 5 | 10 | | 13.4 | 1.6 | 3.4 | 19.2 | 20.4 |
| | 5 | 15 | | 9.8 | 1.7 | 5.1 | 20.4 | 20.4 |
| | 5 | 20 | 16.8 | 8.2 | 1.6 | 6.7 | 19.2 | 20.1 |
| | 5 | 25 | | 15.0 | 1.8 | 8.5 | 21.6 | 20.4 |
| | 5 | 30 | | 13.5 | 1.5 | 10.0 | 18.0 | 20.0 |
| | 5 | 35 | | 11.9 | 1.6 | 11.6 | 19.2 | 19.9 |
| | 10 | 45 | | 10.5 | 1.4 | 13.0 | 8.4 | 18.5 |
| | 10 | 55 | | 9.4 | 1.1 | 14.1 | 6.6 | 17.1 |
| | 10 | 65 | 16.3 | 8.3 | 0.9 | 15.0 | 5.4 | 16.0 |
| | 10 | 75 | | 15.5 | 0.8 | 15.8 | 4.8 | 14.9 |
| | 10 | 85 | | 14.8 | 0.7 | 16.5 | 4.2 | 14.1 |
| | 10 | 95 | | 13.9 | 0.9 | 17.4 | 5.4 | 13.4 |
| | 15 | 110 | 16.2 | 12.2 | 1.7 | 19.1 | 6.8 | 12.9 |
| | 15 | 125 | | 10.4 | 1.8 | 20.9 | 10.8 | 12.8 |
| | 15 | 140 | 15.9 | 8.9 | 1.5 | 22.4 | 9.0 | 12.5 |
| | 15 | 155 | | 14.6 | 1.3 | 23.7 | 7.8 | 12.3 |
| | 20 | 175 | | 13.5 | 1.1 | 24.8 | 3.3 | 11.8 |
| | 20 | 195 | | 12.5 | 1.0 | 25.8 | 3.0 | 11.3 |
| | 20 | 215 | | 11.6 | 0.9 | 26.7 | 2.7 | 10.9 |
| | 20 | 235 | | 10.8 | 0.8 | 27.5 | 2.4 | 10.5 |
| | 20 | 255 | | 9.9 | 0.9 | 28.4 | 2.7 | 10.1 |
| | | | | | | | | |
| | | | | | | | | |

**REMARKS:**
**Pre-wetting made 2 days earlier. The land is farm land & prepared for sowing sorghum**
**Farming activity has been started in the area 6 years back.**
**High disturbance of vegetation is clearly seen.**

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

**INFILTRATION RATE MEASUREMENT FORM**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Profile No. DP3** | | **Date:- 050609** | | **Replication 2** | | **Author: Dr.Tesfaye Ertebo** | | |
| **Soil Type: Orthidystric Nitisols (NTdyo)** | | | | | | | **UTM Reading** | |
| **Water Source: From Demesa River, Tributary of Dedessa River** | | | | | | | **E:0186469** | |
| | | | | | | | **E: 987092** | |
| **Local** | **Interval** | **Cumulative** | **Depth of** | | **Intake** | **Cumulative** | **Infiltration rate** | |
| | **(min)** | **time** | **Water (cm)** | | **(cm)** | **Intake** | **(cm/hr)** | |
| | | **(min)** | **Initial** | **Final** | | **(cm)** | **Immediate** | **Mean** |
| **8:18** | **0** | | **16.4** | **0.0** | | | | |
| | **5** | | | **14.1** | **2.3** | **2.3** | **27.6** | **27.6** |
| | **5** | **10** | | **13.2** | **0.9** | **3.2** | **10.8** | **19.2** |
| | **5** | **15** | | **12.3** | **0.9** | **3.3** | **10.8** | **16.4** |
| | **5** | **20** | | **11.5** | **0.8** | **4.1** | **9.6** | **14.7** |
| | **5** | **25** | | **11.0** | **0.5** | **4.3** | **6.0** | **13.0** |
| | **5** | **30** | | **10.3** | **0.7** | **5.0** | **8.4** | **12.2** |
| | **5** | **35** | | **9.9** | **0.4** | **5.3** | **4.8** | **11.1** |
| | **5** | **40** | | **9.4** | **0.5** | **5.8** | **6.0** | **10.5** |
| | **5** | **45** | | **9.0** | **0.4** | **6.3** | **4.8** | **9.9** |
| | **5** | **50** | **17.2** | **8.5** | **0.5** | **6.8** | **6.0** | **9.5** |
| | **10** | **60** | | **16.0** | **1.2** | **7.3** | **7.2** | **9.3** |
| | **10** | **70** | | **15.0** | **1.0** | **8.3** | **6.0** | **9.0** |
| | **10** | **80** | | **14.2** | **0.8** | **8.3** | **4.8** | **8.7** |
| | **10** | **90** | | **13.6** | **0.6** | **8.9** | **3.6** | **8.3** |
| | **10** | **100** | | **12.9** | **0.7** | **9.3** | **4.2** | **8.0** |
| | **10** | **110** | | **12.3** | **0.6** | **9.9** | **3.6** | **7.8** |
| | **10** | **120** | **17.3** | **11.5** | **0.8** | **10.3** | **4.8** | **7.6** |
| | **20** | **140** | | **16.0** | **1.3** | **11.6** | **3.9** | **7.4** |
| | **20** | **160** | | **15.2** | **0.8** | **11.3** | **2.4** | **7.1** |
| | **20** | **180** | | **14.0** | **1.2** | **12.5** | **3.6** | **6.9** |
| **8:18** | **0** | | **16.4** | **0.0** | | | | |
| | | | | | | | | |

**REMARKS:**

**Pre-wetting was made 2 days earlier. The land is farm land & prepared for sowing.**
**Farming activity has been started in the area 6 years back. High disturbance of vegetation is clearly seen.**

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile No. DP3 | | Date:- 050609 | | Replication 3 | | Author: Dr.Tesfaye Ertebo | | |
| Soil Type: Orthidystric Nitisols (NTdyo) | | | | | | | UTM Reading | |
| Water Source: From Demesa River, Tributary of Dedessa River | | | | | | | E:0186469 | |
| | | | | | | | E: 987092 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 8:25 | 0 | 0 | 13.50 | | 0.0 | | | |
| | 5 | 5 | | 11.30 | 2.2 | 2.2 | 26.4 | 26.40 |
| | 5 | 10 | | 10.0 | 1.3 | 3.5 | 15.6 | 21.00 |
| | 5 | 15 | | 8.5 | 1.5 | 3.2 | 18.0 | 20.00 |
| | 5 | 20 | | 7.2 | 1.3 | 4.5 | 15.6 | 18.90 |
| | 5 | 25 | | 6.3 | 1.9 | 4.2 | 22.8 | 19.68 |
| | 5 | 30 | | 5.4 | 0.9 | 5.1 | 10.8 | 18.20 |
| | 10 | 0 | 14.3 | 4.6 | 0.8 | 5.2 | 4.8 | 16.29 |
| | 10 | 40 | | 12.2 | 2.1 | 7.3 | 12.6 | 15.83 |
| | 10 | 50 | | 10.5 | 1.7 | 6.2 | 10.2 | 15.20 |
| | 10 | 60 | | 8.5 | 2.0 | 8.2 | 12.0 | 14.88 |
| | 10 | 70 | | 7.0 | 1.5 | 7.2 | 9.0 | 14.35 |
| | 10 | 80 | | 5.5 | 1.5 | 8.7 | 9.0 | 13.90 |
| | 15 | 95 | 14.8 | 4.1 | 1.4 | 8.2 | 5.6 | 13.26 |
| | 15 | 110 | | 12.1 | 2.70 | 10.9 | 10.8 | 13.09 |
| | 15 | 125 | | 10.0 | 2.1 | 9.2 | 8.4 | 12.77 |
| | 15 | 140 | | 8.00 | 2.0 | 11.2 | 8.0 | 12.48 |
| | 15 | 145 | | 6.4 | 1.6 | 10.2 | 6.4 | 12.12 |
| | 15 | 160 | | 4.6 | 1.8 | 12.0 | 7.2 | 11.84 |
| | 15 | 175 | | 3.4 | 1.20 | 11.2 | 4.8 | 11.47 |

**REMARKS:**

**Pre-wetting is made 2 days earlier. The land is farm land & prepared for sowing**

**Farming activity has been started 6 years back. High disturbance of vegetation is clearly seen**

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Profile No. DP9** | | **Date:- 060609** | | **Replication 1** | | **Author: Dr.Tesfaye Ertebo** | | |
| **Soil Type: Mesotrophic Vertisiols VRsm)** | | | | | | | **UTM Reading** | |
| **Water Source: From Shimel Tokeye River** | | | | | | | **E: 188525** | |
| | | | | | | | **N: 985407** | |
| **Local** | **Interval** | **Cumulative** | **Depth of** | | **Intake** | **Cumulative** | **Infiltration rate** | |
| | **(min)** | **time** | **Water (cm)** | | **(cm)** | **Intake** | **(cm/hr)** | |
| | | **(min)** | **Initial** | **Final** | | **(cm)** | **Immediate** | **Mean** |
| | | | 16.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 8.35 | 5 | 5 | | 15.0 | 1.8 | 3.0 | 21.6 | 21.6 |
| | 5 | 10 | | 13.7 | 1.3 | 4.3 | 15.6 | 18.6 |
| | 5 | 15 | | 12.9 | 0.8 | 4.0 | 9.6 | 15.6 |
| | 5 | 20 | | 12.2 | 0.7 | 4.7 | 8.4 | 13.8 |
| | 5 | 25 | | 11.7 | 0.5 | 5.0 | 6.0 | 12.2 |
| | 5 | 30 | | 11.4 | 0.3 | 5.3 | 3.6 | 10.8 |
| | 5 | 35 | | 11.1 | 0.3 | 6.0 | 3.6 | 9.8 |
| | 10 | 45 | | 8.8 | 2.3 | 8.3 | 13.8 | 10.3 |
| | 10 | 55 | | 7.1 | 1.7 | 7.0 | 10.2 | 10.3 |
| | 10 | 65 | 18.2 | 6.1 | 1.0 | 8.0 | 6.0 | 9.8 |
| | 10 | 75 | | 17.2 | 1.0 | 8.0 | 6.0 | 9.5 |
| | 10 | 85 | | 16.5 | 0.7 | 8.7 | 4.2 | 9.1 |
| | 10 | 95 | | 15.9 | 0.6 | 9.0 | 3.6 | 8.6 |
| | 15 | 110 | | 15.2 | 0.7 | 9.7 | 2.8 | 8.2 |
| | 15 | 125 | | 14.6 | 0.6 | 10.3 | 2.4 | 7.8 |
| | 15 | 140 | | 14.1 | 0.5 | 10.8 | 2.0 | 7.5 |
| | 15 | 155 | | 13.5 | 0.6 | 10.0 | 2.4 | 7.2 |
| | 20 | 175 | | 13.0 | 0.5 | 10.5 | 1.5 | 6.9 |
| | 20 | 195 | | 12.6 | 0.4 | 10.9 | 1.2 | 6.6 |
| | 20 | 215 | | 12.3 | 0.3 | 11.2 | 0.9 | 6.3 |
| | 20 | 235 | | 12.0 | 0.3 | 11.0 | 0.9 | 6.0 |

**REMARKS:**

**Grass land, during Rainy season gets wet /Marsh has big gilgai and cracks. One day before Pre-wetting was undertaken. Moisture penetration 90cm.**

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile No. DP9 | | Date:- 060609 | | Replication 2 | | Author: Dr.Tesfaye Ertebo | | |
| Soil Type: Mesotrophic Vertisiols VRsm) | | | | | | | UTM Reading | |
| Water Source: From Shimel Tokeye River | | | | | | | E: 188525 | |
| | | | | | | | N: 985407 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 8:45 | | | 19 | | | 0 | | |
| | 5 | 5 | | 16.1 | 1.6 | 1.6 | 19.2 | 19.2 |
| | 5 | 10 | | 14.9 | 1.2 | 2.8 | 14.4 | 16.8 |
| | 5 | 15 | | 13.1 | 1.8 | 4.6 | 21.6 | 18.4 |
| | 5 | 15 | | 12.8 | 0.3 | 4.9 | 3.6 | 14.7 |
| | 5 | 20 | | 12.4 | 0.4 | 5.3 | 4.8 | 12.7 |
| | 5 | 26 | | 12.2 | 0.2 | 5.5 | 2.4 | 11 |
| | 10 | 35 | 18.0 | 10.7 | 1.5 | 7.0 | 9.0 | 10.7 |
| | 10 | 45 | | 16.6 | 1.4 | 8.4 | 8.4 | 10.4 |
| | 10 | 55 | | 15.4 | 1.2 | 9.6 | 7.2 | 10.1 |
| | 10 | 65 | | 14.3 | 1.1 | 10.7 | 6.6 | 9.7 |
| | 10 | 75 | | 13.5 | 0.8 | 11.5 | 4.8 | 9.3 |
| | 10 | 85 | | 12.9 | 0.6 | 12.1 | 3.6 | 8.8 |
| | 10 | 95 | | 12.2 | 0.7 | 12.8 | 4.2 | 8.4 |
| | 15 | 110 | | 11.3 | 0.9 | 13.7 | 3.6 | 8.1 |
| | 15 | 125 | | 10.5 | 0.8 | 14.5 | 3.2 | 7.8 |
| | 15 | 140 | | 9.8 | 0.7 | 15.2 | 2.8 | 7.5 |
| | 20 | 160 | 21.6 | 9.2 | 0.6 | 15.8 | 1.8 | 7.1 |
| | 20 | 180 | | 21.2 | 0.4 | 16.2 | 1.2 | 6.8 |
| | 20 | 200 | | 20.9 | 0.3 | 16.5 | 0.9 | 6.5 |
| | 20 | 220 | | 20.7 | 0.2 | 16.7 | 0.6 | 6.2 |
| | 20 | 240 | | 20.5 | 0.2 | 16.9 | 0.6 | 5.9 |

**REMARKS:**

Grass land, during Rainy season gets wet /Marsh has big gilgai and cracks. One day before Pre-wetting was undertaken. Moisture penetration 80cm.

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile No. DP9 | | Date:- 060609 | | Replication 3 | | Author: Dr.Tesfaye Ertebo | | |
| Soil Type: Mesotrophic Vertisiols VRsm) | | | | | | | UTM Reading | |
| Water Source: From Shimel Tokeye River | | | | | | | E: 188525 | |
| | | | | | | | N: 985407 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 8:50 | 0 | 0 | 17.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 5 | 5 | | 14.3 | 3.2 | 3.2 | 38.40 | 38.4 |
| | 5 | 10 | | 11.2 | 3.1 | 6.3 | 37.20 | 37.8 |
| | 5 | 15 | | 8.7 | 2.5 | 8.8 | 30.00 | 35.2 |
| | 5 | 20 | | 6.6 | 2.1 | 10.9 | 25.20 | 32.7 |
| | 10 | 30 | 18.0 | 4.6 | 2.0 | 12.9 | 12.00 | 28.6 |
| | 10 | 40 | | 16.3 | 1.7 | 14.6 | 10.20 | 25.5 |
| | 10 | 50 | | 14.8 | 1.5 | 16.1 | 9.00 | 23.1 |
| | 10 | 60 | | 13.7 | 1.1 | 17.2 | 6.60 | 21.1 |
| | 10 | 70 | | 12.8 | 0.9 | 18.1 | 5.40 | 19.3 |
| | 10 | 80 | | 12.0 | 0.8 | 18.9 | 4.80 | 17.9 |
| | 15 | 95 | | 11.1 | 0.9 | 19.8 | 3.60 | 16.6 |
| | 15 | 110 | | 10.3 | 0.8 | 20.6 | 3.20 | 15.5 |
| | 15 | 125 | | 9.7 | 0.6 | 21.2 | 2.40 | 14.5 |
| | 15 | 140 | | 9.2 | 0.5 | 21.7 | 2.00 | 13.6 |
| | 15 | 155 | 17.0 | 8.5 | 0.7 | 22.4 | 2.80 | 12.9 |
| | 20 | 175 | | 16.4 | 0.6 | 23.0 | 1.8 | 12.2 |
| | 20 | 195 | | 15.9 | 0.5 | 23.5 | 1.5 | 11.5 |
| | 20 | 215 | | 15.2 | 0.7 | 24.2 | 2.1 | 11.0 |
| | 20 | 235 | | 14.8 | 0.4 | 24.6 | 1.2 | 10.5 |
| | 20 | 255 | | 14.2 | 0.6 | 25.2 | 1.8 | 10.1 |
| | 20 | 275 | | 13.7 | 0.5 | 25.7 | 1.5 | 9.7 |
| | 20 | 295 | | 13.2 | 0.5 | 26.2 | 1.5 | 9.3 |
| | 20 | 315 | | 12.7 | 0.5 | 26.7 | 1.5 | 8.9 |
| | 20 | 335 | | 12.3 | 0.4 | 27.1 | 1.2 | 8.6 |
| | 20 | 355 | | 11.8 | 0.5 | 27.6 | 1.5 | 8.3 |

**REMARKS:**

**Grass land, during Rainy season gets wet /Marsh has big gilgai and cracks. One day before Pre-wetting was undertaken. Moisture penetration 80cm.**

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile no. DP12 | | Date:- 070609 | | Replication 1 | | Author: Dr.Tesfaye Ertebo | | |
| Soil Type: Orthidystric Nitisols (NTdyo) | | | | | | | UTM Reading | |
| Water Source: From Shimel Tokye River | | | | | | | E: 190251 | |
| | | | | | | | N: 985914 | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 8:25 | 0 | 0 | 16.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| AM | 5 | 5 | | 12.8 | 3.7 | 3.7 | 44.4 | 44.4 |
| | 5 | 10 | | 10.6 | 2.2 | 5.9 | 26.4 | 35.4 |
| | 5 | 15 | | 8.8 | 1.8 | 7.7 | 21.6 | 30.8 |
| | 10 | 25 | | 7.5 | 1.3 | 9.0 | 10.8 | 25.8 |
| | 10 | 35 | 19.0 | 5.5 | 2.0 | 11.0 | 7.8 | 22.2 |
| | 10 | 45 | | 17.6 | 1.4 | 12.4 | 12.0 | 20.5 |
| | 10 | 55 | | 16.3 | 1.3 | 13.7 | 8.4 | 18.8 |
| | 15 | 70 | | 15.3 | 1.0 | 14.7 | 4.0 | 16.9 |
| | 15 | 85 | | 14.4 | 0.9 | 15.6 | 3.6 | 15.4 |
| | 15 | 100 | | 13.5 | 0.9 | 16.5 | 3.6 | 14.3 |
| | 15 | 115 | | 12.8 | 0.7 | 17.2 | 2.8 | 13.2 |
| | 15 | 130 | | 11.9 | 0.9 | 18.1 | 3.6 | 12.4 |
| | 20 | 150 | | 10.8 | 1.1 | 19.2 | 3.3 | 11.7 |
| | 20 | 170 | | 10.1 | 0.7 | 19.9 | 2.1 | 11.0 |
| | 20 | 190 | | 9.3 | 0.8 | 20.7 | 2.4 | 10.5 |
| | 20 | 210 | 18.6 | 8.7 | 0.6 | 21.3 | 1.8 | 9.9 |
| | 20 | 230 | | 18.1 | 0.5 | 21.8 | 1.5 | 9.4 |
| | 20 | 250 | | 17.5 | 0.6 | 22.4 | 1.8 | 9.0 |
| | 20 | 270 | | 16.8 | 0.7 | 23.1 | 2.1 | 8.6 |
| | 20 | 290 | | 16.2 | 0.6 | 23.7 | 1.8 | 8.3 |
| | 20 | 310 | | 15.6 | 0.6 | 24.3 | 1.8 | 8.0 |

**REMARKS:** Cultivated land currently the land is prepared for sorghum cultivation.
Cultivation started in the area 6 years ago. Moisture penetration 90cm.

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile no. DP12 | | Date:- 070609 | | Replication 2 | | Author: Dr.Tesfaye Ertebo | | |
| Soil Type: Orthidystric Nitisols (NTdyo) | | | | | | | UTM Reading | |
| Water Source: From Shimel Tokye River | | | | | | | E: 190251 | |
| | | | | | | | N: 985914 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 8:35 | 0 | 0 | 17.2 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Am | 5 | 5 | | 15.3 | 1.9 | 1.9 | 22.8 | 22.8 |
| | 5 | 10 | | 13.6 | 1.7 | 3.6 | 20.4 | 21.6 |
| | 5 | 15 | | 12.1 | 1.5 | 5.1 | 18.0 | 20.4 |
| | 5 | 20 | | 10.5 | 1.6 | 6.7 | 19.2 | 20.1 |
| | 5 | 25 | | 8.9 | 1.6 | 8.3 | 19.2 | 19.9 |
| | 5 | 30 | | 7.5 | 1.4 | 9.7 | 16.8 | 19.4 |
| | 5 | 35 | | 6.2 | 1.3 | 11.0 | 15.6 | 18.9 |
| | 5 | 40 | 19.3 | 5.0 | 1.2 | 12.2 | 14.4 | 18.3 |
| | 5 | 45 | | 18.0 | 1.3 | 13.5 | 15.6 | 18.0 |
| | 10 | 55 | | 16.1 | 1.9 | 15.4 | 11.4 | 17.3 |
| | 10 | 65 | | 14.3 | 1.8 | 17.2 | 10.8 | 16.7 |
| | 10 | 75 | | 12.8 | 1.5 | 18.7 | 9.0 | 16.1 |
| | 10 | 85 | | 11.6 | 1.2 | 19.9 | 7.2 | 15.4 |
| | 10 | 95 | | 10.5 | 1.1 | 21.0 | 6.6 | 14.8 |
| | 10 | 105 | | 9.2 | 1.3 | 22.3 | 7.8 | 14.3 |
| | 15 | 120 | | 8.0 | 1.2 | 23.5 | 4.8 | 13.7 |
| | 15 | 135 | | 6.6 | 1.4 | 24.9 | 5.6 | 13.2 |
| | 15 | 150 | 18.5 | 5.1 | 1.5 | 26.4 | 6.0 | 12.8 |
| | 15 | 165 | | 17.2 | 1.3 | 27.7 | 5.2 | 12.4 |
| | 15 | 180 | | 16.0 | 1.2 | 28.9 | 3.6 | 12.0 |
| | 20 | 200 | | 14.9 | 1.1 | 30.0 | 3.3 | 11.6 |
| | 20 | 220 | | 14.0 | 0.9 | 30.9 | 2.7 | 11.2 |
| | 20 | 240 | | 13.2 | 0.8 | 31.7 | 2.4 | 10.8 |
| | 20 | 260 | | 12.7 | 0.5 | 32.2 | 1.5 | 10.4 |
| | 20 | 280 | | 12.3 | 0.4 | 32.6 | 1.2 | 10.0 |
| | 20 | 300 | | 12.0 | 0.3 | 32.9 | 0.9 | 9.7 |
| | 20 | 320 | | 11.7 | 0.3 | 33.2 | 0.9 | 9.4 |
| **REMARKS:** Cultivated land. Moisture penetration 90cm | | | | | | | | |

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

**INFILTRATION RATE MEASUREMENT FORM**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Profile no. DP12** | | **Date:- 070609** | | **Replication 3** | | **Author: Dr.Tesfaye Ertebo** | | |
| **Soil Type: Orthidystric Nitisols (NTdyo)** | | | | | | | **UTM Reading** | |
| **Water Source: From Shimel Tokye River** | | | | | | | **E: 190251** | |
| | | | | | | | **N: 985914** | |
| **Local** | **Interval** | **Cumulative** | **Depth of** | | **Intake** | **Cumulative** | **Infiltration rate** | |
| | **(min)** | **time** | **Water (cm)** | | **(cm)** | **Intake** | **(cm/hr)** | |
| | | **(min)** | **Initial** | **Final** | | **(cm)** | **Immediate** | **Mean** |
| **8:33** | | | **17.50** | | | | | |
| **Am** | **5** | **5** | | **14.4** | **3.1** | **3.1** | **37.2** | **37.2** |
| | **5** | **10** | | **11.4** | **3.0** | **6.1** | **36.0** | **36.6** |
| | **5** | **15** | **18.3** | **8.5** | **2.9** | **9.0** | **34.8** | **36** |
| | **5** | **20** | | **15.5** | **2.8** | **11.8** | **33.6** | **35.4** |
| | **5** | **25** | | **12.8** | **2.7** | **14.5** | **32.4** | **34.8** |
| | **5** | **30** | | **10.4** | **2.4** | **16.9** | **28.8** | **33.8** |
| | **10** | **40** | **17.9** | **8.3** | **2.1** | **19.0** | **12.6** | **30.8** |
| | **10** | **50** | | **16.0** | **1.9** | **20.9** | **11.4** | **28.4** |
| | **10** | **60** | | **14.2** | **1.8** | **22.7** | **10.8** | **26.4** |
| | **10** | **70** | | **12.8** | **1.4** | **24.1** | **8.4** | **24.6** |
| | **10** | **80** | | **11.4** | **1.4** | **25.5** | **8.4** | **23.1** |
| | **15** | **95** | | **9.2** | **2.2** | **27.7** | **8.8** | **21.9** |
| | **15** | **110** | **18.5** | **7.2** | **2.0** | **29.7** | **8.0** | **20.9** |
| | **15** | **125** | | **16.90** | **1.6** | **31.3** | **6.4** | **19.8** |
| | **15** | **140** | | **15.7** | **1.2** | **32.5** | **4.8** | **18.8** |
| | **15** | **155** | | **14.6** | **1.1** | **33.6** | **4.4** | **17.9** |
| | **20** | **175** | | **13.9** | **0.7** | **34.3** | **2.1** | **17.0** |
| | **20** | **195** | | **13.5** | **0.4** | **34.7** | **1.2** | **16.1** |
| | **20** | **215** | | **13.0** | **0.5** | **35.2** | **1.5** | **15.3** |
| | **20** | **235** | | **12.5** | **0.5** | **35.7** | **1.5** | **14.7** |
| | **20** | **255** | | **12.1** | **0.4** | **36.1** | **1.2** | **14.0** |
| | **20** | **275** | | **11.9** | **0.2** | **36.3** | **0.6** | **13.4** |
| | **20** | **295** | | **11.7** | **0.2** | **36.5** | **0.6** | **12.8** |
| | **20** | **315** | | **11.4** | **0.3** | **36.8** | **0.9** | **12.4** |
| | **20** | **335** | | **11.2** | **0.2** | **37.0** | **0.6** | **11.9** |
| **8:33** | | | **17.50** | | | | | |

**REMARKS:** **Cultivated land currently the land is prepared for sorghum cultivation. Cultivation started 6 years ago. Moisture penetration 85cm.**

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile No. 18 | | Date:- 080609 | | Replication 1 | | Author: Dr.Tesfaye Ertebo | | |
| Soil Type: Orthidystric Nitisols (NTdyo) | | | | | | | UTM Reading | |
| Water Source: Shemel Toke River , Tributary of Dedessa River | | | | | | | N: 189379 | |
| | | | | | | | E: 984892 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 8:36 | 5 | 5 | 18.50 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Am | 5 | 10 | | 15.4 | 3.1 | 3.1 | 37.2 | 37.2 |
| | 5 | 15 | | 12.2 | 3.2 | 6.3 | 38.4 | 37.8 |
| | 5 | 20 | | 9.2 | 3.0 | 9.3 | 36.0 | 37.2 |
| | 5 | 25 | 19.3 | 6.6 | 2.6 | 11.9 | 31.2 | 35.7 |
| | 5 | 30 | | 17.0 | 2.3 | 14.2 | 27.6 | 34.1 |
| | 5 | 35 | | 14.8 | 2.2 | 16.4 | 26.4 | 32.8 |
| | 5 | 40 | | 12.7 | 2.1 | 18.5 | 25.2 | 31.7 |
| | 10 | 50 | | 9.9 | 2.8 | 21.3 | 16.8 | 29.9 |
| | 10 | 60 | 18.7 | 7.7 | 2.2 | 23.5 | 13.2 | 28.0 |
| | 10 | 70 | | 16.6 | 2.1 | 25.6 | 12.6 | 26.5 |
| | 10 | 80 | | 14.7 | 1.9 | 27.5 | 11.4 | 25.1 |
| | 10 | 90 | | 13.2 | 1.5 | 29.0 | 9.0 | 23.8 |
| | 10 | 100 | | 11.9 | 1.3 | 30.3 | 7.8 | 22.5 |
| | 15 | 115 | | 10.0 | 1.9 | 32.2 | 7.6 | 21.5 |
| | 15 | 130 | | 8.6 | 1.4 | 33.6 | 5.6 | 20.4 |
| | 15 | 145 | 18.8 | 7.5 | 1.1 | 34.7 | 4.4 | 19.4 |
| | 15 | 160 | | 17.9 | 0.9 | 35.6 | 3.6 | 18.5 |
| | 20 | 180 | | 16.7 | 1.2 | 36.8 | 3.6 | 17.6 |
| | 20 | 200 | | 15.7 | 1.0 | 37.8 | 3.0 | 16.9 |
| | 20 | 220 | | 14.9 | 0.8 | 38.6 | 2.4 | 16.2 |
| | 20 | 240 | | 14.3 | 0.6 | 39.2 | 1.8 | 15.5 |
| | 20 | 260 | | 14.0 | 0.3 | 39.5 | 0.9 | 14.8 |
| | 20 | 280 | | 13.6 | 0.4 | 39.9 | 1.2 | 14.2 |
| | 20 | 300 | | 13.3 | 0.3 | 40.2 | 0.9 | 13.7 |

**REMARKS:**
Cultivated land previously used for sorghum cultivation, 1 day back pre-wetting was under taken.
Moisture penetration 85

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

**INFILTRATION RATE MEASUREMENT FORM**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Profile No. 18** | | **Date:- 080609** | | **Replication 2** | | **Author: Dr.Tesfaye Ertebo** | | |
| **Soil Type: Orthidystric Nitisols (NTdyo)** | | | | | | | **UTM Reading** | |
| **Water Source: Shemel Toke River , Tributary of Dedessa River** | | | | | | | **N: 189379** | |
| | | | | | | | **E: 984892** | |
| **Local** | **Interval** | **Cumulative** | **Depth of** | | **Intake** | **Cumulative** | **Infiltration rate** | |
| | **(min)** | **time** | **Water (cm)** | | **(cm)** | **Intake** | **(cm/hr)** | |
| | | **(min)** | **Initial** | **Final** | | **(cm)** | **Immediate** | **Mean** |
| **9:12** | | | **16.40** | | | | | |
| **Am** | **5** | **5** | | **13.8** | **2.6** | **2.6** | **31.2** | **31.2** |
| | **5** | **10** | | **11.4** | **2.4** | **5.0** | **28.8** | **30** |
| | **5** | **15** | | **9.0** | **2.4** | **7.4** | **28.8** | **29.6** |
| | **5** | **20** | **17.8** | **6.9** | **2.1** | **9.5** | **25.2** | **28.5** |
| | **5** | **25** | | **16.0** | **1.8** | **11.3** | **21.6** | **27.1** |
| | **5** | **30** | **17.2** | **14.3** | **1.7** | **13.0** | **20.4** | **26** |
| | **5** | **35** | | **12.7** | **1.6** | **14.6** | **19.2** | **25.0** |
| | **10** | **45** | | **10.6** | **2.1** | **16.7** | **12.6** | **23.5** |
| | **10** | **55** | | **8.8** | **1.8** | **18.5** | **10.8** | **22.1** |
| | **10** | **65** | **17** | **7.7** | **1.1** | **19.6** | **6.6** | **20.5** |
| | **10** | **75** | | **16.2** | **0.8** | **20.4** | **4.8** | **19.1** |
| | **10** | **85** | | **15.6** | **0.6** | **21.0** | **3.6** | **17.8** |
| | **10** | **95** | | **15.1** | **0.5** | **21.5** | **3.0** | **16.7** |
| | **10** | **105** | | **14.4** | **0.7** | **22.2** | **4.2** | **15.8** |
| | **15** | **120** | | **13.2** | **1.2** | **23.4** | **4.8** | **15.0** |
| | **15** | **135** | | **12.3** | **0.9** | **24.3** | **3.6** | **14.3** |
| | **15** | **150** | | **11.7** | **0.6** | **24.9** | **2.4** | **13.6** |
| | **15** | **165** | | **11.2** | **0.5** | **25.4** | **2.0** | **13.0** |
| | **15** | **180** | | **10.8** | **0.4** | **25.8** | **1.6** | **12.4** |
| | **15** | **195** | **19.0** | **10.3** | **0.5** | **26.3** | **2.0** | **11.9** |
| | **15** | **210** | | **18.8** | **0.2** | **26.5** | **0.8** | **11.3** |
| | **15** | **225** | | **18.5** | **0.3** | **26.8** | **1.2** | **10.9** |
| | **15** | **240** | | **18.3** | **0.2** | **27.0** | **0.8** | **10.4** |
| | **20** | **260** | | **17.7** | **0.6** | **27.6** | **1.8** | **10.1** |
| | **20** | **280** | | **17.3** | **0.4** | **28.0** | **1.2** | **9.7** |
| | **20** | **300** | | **17.0** | **0.3** | **28.3** | **0.9** | **9.4** |
| | **20** | **320** | | **16.7** | **0.3** | **28.6** | **0.9** | **9.1** |
| | **20** | **340** | | **16.5** | **0.2** | **28.8** | **0.6** | **8.8** |

**REMARKS:**
**Cultivated land previously used for sorghum cultivation, 1 day back pre-wetting was undertaken and moisture penetration 70cm**

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile No. 52 | | Date:-060609 | | Replication 1 | | Author: Dr.Tesfaye Ertebo/Zelealem | | |
| Soil Type: Hyperferric Acrisols (ACfrh) | | | | | | | UTM Reading | |
| Water Source: From Burka Ananee River | | | | | | | E:184833 | |
| | | | | | | | N:996427 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 0.38 | 0 | 5 | 15.00 | 0.0 | | | | |
| Am | 5 | 5 | | 12.7 | 2.3 | 3.3 | 27.6 | 27.6 |
| | 5 | 10 | | 11.1 | 1.6 | 4.9 | 19.2 | 23.4 |
| | 5 | 15 | | 9.7 | 1.4 | 6.3 | 16.8 | 21.2 |
| | 5 | 20 | 17.0 | 8.3 | 1.4 | 7.7 | 16.8 | 20.1 |
| | 5 | 25 | | 15.1 | 1.9 | 9.6 | 22.8 | 20.6 |
| | 5 | 30 | | 13.4 | 1.7 | 11.3 | 20.4 | 20.6 |
| | 5 | 35 | | 11.9 | 1.5 | 12.8 | 18.0 | 20.2 |
| | 5 | 40 | 15.9 | 10.6 | 1.3 | 14.1 | 15.6 | 19.7 |
| | 10 | 50 | | 13.8 | 2.1 | 16.2 | 12.6 | 18.9 |
| | 10 | 60 | | 11.8 | 2.0 | 18.2 | 12.0 | 18.2 |
| | 10 | 70 | | 10.2 | 1.6 | 19.8 | 9.6 | 17.4 |
| | 10 | 80 | 15.7 | 8.5 | 1.7 | 21.5 | 10.2 | 16.8 |
| | 15 | 95 | | 13.7 | 2.0 | 23.5 | 8.0 | 16.1 |
| | 15 | 110 | | 12.0 | 1.7 | 25.2 | 6.8 | 15.5 |
| | 15 | 125 | | 10.4 | 1.6 | 26.8 | 6.4 | 14.9 |
| | 15 | 140 | 14.80 | 8.7 | 1.7 | 28.5 | 6.8 | 14.4 |
| | 20 | 160 | | 12.8 | 2.0 | 30.5 | 6.0 | 13.9 |
| | 20 | 180 | | 11.5 | 1.3 | 31.8 | 3.9 | 13.3 |
| | 20 | 200 | | 10.3 | 1.2 | 33.0 | 3.6 | 12.8 |
| | 20 | 220 | 15.0 | 9.2 | 1.1 | 34.1 | 3.3 | 12.3 |
| | 20 | 240 | | 14.3 | 0.7 | 34.8 | 2.1 | 11.8 |
| | 20 | 260 | | 13.5 | 0.8 | 35.6 | 2.4 | 11.4 |
| | 20 | 280 | | 12.9 | 0.6 | 36.2 | 1.8 | 11.0 |
| | | | | | | | | |

**Remarks**
**Intensively cultivated land. Cultivation in the area started 6 years back. Moisture penetration is 90cm. Pre-wetting was done one day ago**

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Profile No. 52** | | **Date:-060609** | | **Replication 2** | | **Author: Dr.Tesfaye Ertebo/Zelealem** | | |
| **Soil Type: Hyperferric Acrisols (ACfrh)** | | | | | | | **UTM Reading** | |
| **Water Source: From Burka Ananee River** | | | | | | | **E:184833** | |
| | | | | | | | **N:996427** | |
| **Local** | **Interval** | **Cumulative** | **Depth of** | | **Intake** | **Cumulative** | **Infiltration rate** | |
| | **(min)** | **time** | **Water (cm)** | | **(cm)** | **Intake** | **(cm/hr)** | |
| | | **(min)** | **Initial** | **Final** | | **(cm)** | **Immediate** | **Mean** |
| | **0** | **0** | **17.20** | | | | | |
| **9:08** | **5** | **5** | | **14.9** | **2.3** | **3.7** | **27.6** | **27.6** |
| | **5** | **10** | | **12.8** | **2.1** | **5.8** | **25.2** | **26.4** |
| | **5** | **15** | | **10.9** | **1.9** | **7.7** | **22.8** | **25.2** |
| | **5** | **20** | **17.3** | **9.4** | **1.5** | **9.2** | **18.0** | **23.4** |
| | **5** | **25** | | **16.1** | **1.2** | **10.4** | **14.4** | **21.6** |
| | **5** | **30** | | **15.0** | **1.1** | **11.5** | **13.2** | **20.2** |
| | **5** | **35** | | **14.1** | **0.9** | **12.4** | **10.8** | **18.9** |
| | **5** | **40** | | **13.3** | **0.8** | **13.2** | **9.6** | **17.7** |
| | **10** | **50** | | **12.0** | **1.3** | **14.5** | **7.8** | **16.6** |
| | **10** | **60** | | **10.8** | **1.2** | **15.7** | **7.2** | **15.7** |
| | **15** | **75** | **17.5** | **9.6** | **1.2** | **16.9** | **4.8** | **14.7** |
| | **15** | **90** | | **16.7** | **0.8** | **17.7** | **3.2** | **13.7** |
| | **15** | **105** | | **16.0** | **0.7** | **18.4** | **2.8** | **12.9** |
| | **15** | **120** | | **15.4** | **0.6** | **19.0** | **2.4** | **12.1** |
| | **20** | **140** | | **14.5** | **0.9** | **19.9** | **2.7** | **11.5** |
| | **20** | **160** | | **13.8** | **0.7** | **20.6** | **2.1** | **10.9** |
| | **20** | **180** | | **13.0** | **0.8** | **21.4** | **2.4** | **10.4** |
| | **20** | **200** | | **12.5** | **0.5** | **21.9** | **1.5** | **9.9** |
| | **20** | **220** | | **11.9** | **0.6** | **22.5** | **1.8** | **9.5** |
| | **20** | **240** | | **11.5** | **0.4** | **22.9** | **1.2** | **9.1** |
| | **20** | **260** | | **11.1** | **0.4** | **23.3** | **1.2** | **8.7** |
| | **20** | **280** | | **10.8** | **0.3** | **23.6** | **0.9** | **8.3** |
| | **20** | **300** | | **10.6** | **0.2** | **23.8** | **0.6** | **8.0** |

**Remarks :**
**Intensively cultivated land. Cultivation in the area started 6 years back. Moisture penetration is 85cm. Pre-wetting was done one day ago**

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile No. 52 | | Date:-060609 | | Replication 2 | | Author: Dr.Tesfaye Ertebo/Zelealem | | |
| Soil Type: Hyperferric Acrisols (ACfrh) | | | | | | | UTM Reading | |
| Water Source: From Burka Ananee River | | | | | | | E:184833 | |
| | | | | | | | N:996427 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| | | | | | | | | |
| 9:15 | | | 16.20 | 0.0 | | | | |
| Am | 5 | 5 | | 12.9 | 3.3 | 3.3 | 39.6 | 39.6 |
| | 5 | 10 | | 11.0 | 1.9 | 5.2 | 22.8 | 31.2 |
| | 5 | 15 | | 9.5 | 1.5 | 6.7 | 18.0 | 26.8 |
| | 5 | 20 | 17.2 | 8.2 | 1.3 | 8.0 | 15.6 | 24.0 |
| | 5 | 25 | | 15.7 | 1.5 | 9.5 | 18.0 | 22.8 |
| | 5 | 30 | | 13.8 | 1.9 | 11.4 | 22.8 | 22.8 |
| | 5 | 35 | | 12.8 | 1.0 | 12.4 | 12.0 | 21.3 |
| | 5 | 40 | | 11.6 | 1.2 | 13.6 | 14.4 | 20.4 |
| | 5 | 45 | | 10.5 | 1.1 | 14.7 | 13.2 | 19.6 |
| | 5 | 50 | | 9.5 | 1.0 | 15.7 | 12.0 | 18.8 |
| | 5 | 55 | 16.5 | 8.5 | 1.0 | 16.7 | 12.0 | 18.2 |
| | 10 | 65 | | 14.4 | 1.8 | 18.5 | 10.8 | 17.6 |
| | 10 | 75 | | 12.1 | 1.5 | 20.0 | 9.0 | 16.9 |
| | 10 | 85 | | 10.3 | 1.3 | 21.3 | 7.8 | 16.3 |
| | 10 | 95 | 17.50 | 8.5 | 1.2 | 22.5 | 7.2 | 15.7 |
| | 15 | 110 | | 14.5 | 0.8 | 23.3 | 4.8 | 15.0 |
| | 15 | 125 | | 12.0 | 0.7 | 24.0 | 4.2 | 14.4 |
| | 15 | 140 | | 9.5 | 0.8 | 24.8 | 4.8 | 13.8 |
| | 15 | 155 | 17.7 | 7.2 | 0.6 | 25.4 | 2.4 | 13.2 |
| | 20 | 175 | | 14.4 | 0.9 | 26.3 | 2.7 | 12.7 |
| | 20 | 195 | | 11.1 | 0.7 | 27.0 | 2.1 | 12.2 |
| | 20 | 215 | | 8.6 | 0.6 | 27.6 | 1.8 | 11.7 |
| | 20 | 235 | | 5.9 | 0.5 | 28.1 | 1.5 | 11.3 |
| | 20 | 255 | | 3.3 | 0.4 | 28.5 | 1.2 | 10.9 |

**Remarks :**
**Intensively cultivated land. Cultivation in the area started 6 years back. Moisture penetration is 80cm. Pre-wetting was done one day ago.**

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile no. DB 65 | | Date:- 100609 | | Replication 1 | | Author: Dr.Tesfaye Ertebo | | |
| Soil Type: Fluvic Cambisols (CMfv) | | | | | | | UTM Reading | |
| Water Source: From River Sebatagna | | | | | | | N:991896 | |
| | | | | | | | E: 191038 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| | | 0 | 18.0 | 0.0 | | | | |
| 9:25 | 5 | 5 | | 15.9 | 2.1 | 2.1 | 25.2 | 25.2 |
| | 5 | 10 | | 13.6 | 2.3 | 4.4 | 27.6 | 26.4 |
| | 5 | 15 | | 11.5 | 2.1 | 6.5 | 25.2 | 26 |
| | 5 | 20 | | 9.5 | 2.0 | 8.5 | 24.0 | 25.5 |
| | 5 | 25 | 16.3 | 7.7 | 1.8 | 10.3 | 21.6 | 24.7 |
| | 10 | 35 | | 14.0 | 2.3 | 12.6 | 13.8 | 22.9 |
| | 10 | 45 | | 11.9 | 2.1 | 14.7 | 12.6 | 21.4 |
| | 10 | 55 | | 10.1 | 1.8 | 16.5 | 10.8 | 20.1 |
| | 10 | 65 | | 8.4 | 1.7 | 18.2 | 10.2 | 19.0 |
| | 10 | 75 | | 6.8 | 1.6 | 19.8 | 9.6 | 18.1 |
| | 15 | 90 | 16.7 | 4.7 | 2.1 | 21.9 | 8.4 | 17.2 |
| | 15 | 105 | | 14.7 | 2.0 | 23.9 | 8.0 | 16.4 |
| | 15 | 120 | | 12.8 | 1.9 | 25.8 | 7.6 | 15.7 |
| | 15 | 135 | | 11.0 | 1.8 | 27.6 | 7.2 | 15.1 |
| | 20 | 155 | | 9.7 | 1.3 | 28.9 | 3.9 | 14.4 |
| | 20 | 175 | | 8.9 | 0.8 | 29.7 | 2.4 | 13.6 |
| | 20 | 195 | | 8.3 | 0.6 | 30.3 | 1.8 | 12.9 |
| | 20 | 215 | | 7.8 | 0.5 | 30.8 | 1.5 | 12.3 |
| | 20 | 235 | | 7.4 | 0.4 | 31.2 | 1.2 | 11.7 |
| | 20 | 255 | | 7.1 | 0.3 | 31.5 | 0.9 | 11.2 |
| | 20 | 275 | | 6.8 | 0.3 | 31.8 | 0.9 | 10.7 |

**REMARKS:**
Penetration of moist up to 125cm. Intensively cultivated land, currently prepared for sowing
3-4 days back there was rain, pre-wetting was not under taken since it is wet soil

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile no. DB 65 | | Date:- 100609 | | Replication 2 | | Author: Dr.Tesfaye Ertebo | | |
| Soil Type: Fluvic Cambisols (CMfv) | | | | | | | UTM Reading | |
| Water Source: From River Sebatagna | | | | | | | N:991896 | |
| | | | | | | | E: 191038 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| | | | 16.5 | | | | | |
| 9:18 | 5 | 5 | | 13.9 | 2.6 | 2.6 | 31.2 | 31.2 |
| | 5 | 10 | | 11.6 | 2.3 | 4.9 | 27.6 | 29.4 |
| | 5 | 15 | | 9.6 | 2.0 | 6.9 | 24.0 | 27.6 |
| | 5 | 20 | | 7.5 | 2.1 | 9.0 | 25.2 | 27 |
| | 5 | 25 | 14.0 | 5.2 | 2.3 | 11.3 | 27.6 | 27.1 |
| | 10 | 35 | | 11.4 | 2.6 | 13.9 | 15.6 | 25.2 |
| | 10 | 45 | | 9.0 | 2.4 | 16.3 | 14.4 | 23.7 |
| | 10 | 55 | | 6.9 | 2.1 | 18.4 | 12.6 | 22.3 |
| | 10 | 65 | 17.0 | 4.9 | 2.0 | 20.4 | 12.0 | 21.1 |
| | 10 | 75 | | 15.2 | 1.8 | 22.2 | 10.8 | 20.1 |
| | 15 | 90 | | 13.7 | 1.5 | 23.7 | 6.0 | 18.8 |
| | 15 | 105 | 16.3 | 12.5 | 1.2 | 24.9 | 4.8 | 17.7 |
| | 15 | 120 | | 11.7 | 0.8 | 25.7 | 3.2 | 16.5 |
| | 15 | 135 | 16.9 | 11.0 | 0.7 | 26.4 | 2.8 | 15.6 |
| | 20 | 155 | | 10.3 | 0.7 | 27.1 | 2.1 | 14.7 |
| | 20 | 175 | 17.0 | 9.8 | 0.5 | 27.6 | 1.5 | 13.8 |
| | 20 | 195 | | 16.4 | 0.6 | 28.2 | 1.8 | 13.1 |
| | 20 | 215 | | 16.0 | 0.4 | 28.6 | 1.2 | 12.5 |
| | 20 | 235 | | 15.7 | 0.3 | 28.9 | 0.9 | 11.9 |
| | 20 | 255 | | 15.5 | 0.2 | 29.1 | 0.6 | 11.3 |
| | 20 | 275 | | 15.3 | 0.2 | 29.3 | 0.6 | 10.8 |

**REMARKS:**
Penetration of moist up to 125cm. Intensively cultivated land, currently prepared for sowing

3-4 days back there was rain, pre-wetting was not under taken since it is wet soil

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile no. DB 65 | | Date:- 100609 | | Replication 3 | | Author: Dr.Tesfaye Ertebo | | |
| Soil Type: Fluvic Cambisols (CMfv) | | | | | | | UTM Reading | |
| Water Source: From River Sebatagna | | | | | | | N:991896 | |
| | | | | | | | E: 191038 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| | 0 | 0 | 19.0 | | | | | |
| 9:10 | 5 | 5 | | 16.9 | 2.1 | 2.1 | 25.2 | 25.2 |
| | 5 | 10 | | 14.7 | 2.2 | 4.3 | 26.4 | 25.8 |
| | 5 | 15 | | 12.7 | 2.0 | 6.3 | 24.0 | 25.2 |
| | 15 | 30 | | 10.4 | 2.3 | 8.6 | 9.2 | 21.2 |
| | 15 | 45 | | 8.3 | 2.1 | 10.7 | 8.4 | 18.6 |
| | 15 | 60 | 18.9 | 6.7 | 1.6 | 12.3 | 6.4 | 16.6 |
| | 15 | 75 | | 17.5 | 1.4 | 13.7 | 5.6 | 15.0 |
| | 15 | 90 | 18.8 | 16.2 | 1.3 | 15.0 | 5.2 | 13.8 |
| | 20 | 110 | | 14.1 | 2.1 | 17.1 | 6.3 | 13.0 |
| | 20 | 130 | | 12.3 | 1.8 | 18.9 | 5.4 | 12.2 |
| | 20 | 150 | | 10.9 | 1.4 | 20.3 | 4.2 | 11.5 |
| | 20 | 170 | | 10.1 | 0.8 | 21.1 | 2.4 | 10.7 |
| | 20 | 190 | | 9.4 | 0.7 | 21.8 | 2.1 | 10.1 |
| | 20 | 210 | | 8.8 | 0.6 | 22.4 | 1.8 | 9.5 |
| | 20 | 230 | 19.7 | 8.3 | 0.5 | 22.9 | 1.5 | 8.9 |
| | 20 | 250 | | 19.4 | 0.3 | 23.2 | 0.9 | 8.4 |
| | 20 | 270 | | 19.2 | 0.2 | 23.4 | 0.6 | 8.0 |
| | 20 | 290 | | 18.9 | 0.3 | 23.7 | 0.9 | 7.6 |

**REMARKS:**
Penetration of moist up to 125cm. Intensively cultivated land, currently prepared for sowing

3-4 days back there was rain, pre-wetting was not under taken since it is wet soil

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile No. Db 78 | | Date:-110609 | | Replication 1 | | Author: Dr.Tesfaye Ertebo/Zelealem | | |
| Soil Type: Orthidystric Nitisols (NTdyo) | | | | | | | UTM Reading | |
| Water Source: From Burka Annane | | | | | | | E:184396 | |
| | | | | | | | N: 991975 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 0.39 | | | 17.5 | | | | | |
| | 5 | 5 | | 15.5 | 2.0 | 6.9 | 24.0 | 24.0 |
| | 5 | 10 | 17.1 | 13.4 | 2.1 | 10.4 | 25.2 | 24.6 |
| | 5 | 15 | | 12.1 | 1.3 | 13.6 | 15.6 | 21.6 |
| | 5 | 20 | | 11.0 | 1.1 | 16.4 | 13.2 | 19.5 |
| | 5 | 25 | 18.4 | 9.7 | 1.3 | 19.0 | 15.6 | 18.7 |
| | 5 | 30 | | 17.4 | 1.4 | 21.8 | 16.8 | 18.4 |
| | 5 | 35 | | 16.7 | 0.7 | 24.7 | 8.4 | 17.0 |
| | 5 | 40 | | 16.3 | 0.4 | 26.9 | 4.8 | 15.5 |
| | 5 | 45 | 17.1 | 8.4 | 0.3 | 28.8 | 3.6 | 14.1 |
| | 10 | 55 | | 15.0 | 2.1 | 33.6 | 12.6 | 14.0 |
| | 10 | 65 | 17.5 | 13.1 | 1.9 | 37.2 | 11.4 | 13.7 |
| | 10 | 75 | | 11.5 | 1.6 | 41.6 | 9.6 | 13.4 |
| | 15 | 90 | 17.7 | 10.0 | 1.5 | 45.7 | 6.0 | 13.1 |
| | 15 | 105 | | 19.80 | 0.9 | 49.7 | 3.6 | 12.5 |
| | 15 | 120 | 17.8 | 13.7 | 3.1 | 53.1 | 12.4 | 12.9 |
| | 20 | 140 | | 15.3 | 2.5 | 58.7 | 10.0 | 12.7 |
| | 20 | 160 | 18.2 | 12.4 | 2.9 | 63.7 | 11.6 | 12.7 |
| | 20 | 180 | | 10.3 | 2.1 | 69.1 | 8.4 | 12.4 |
| | 20 | 200 | 17.5 | 7.40 | 2.9 | 73.7 | 11.6 | 12.2 |
| | 20 | 220 | | 5.20 | 2.1 | 79.1 | 8.4 | 11.9 |
| | 20 | 240 | 17.8 | 3.4 | 1.8 | 83.7 | 7.2 | 11.6 |
| | 20 | 260 | | 15.0 | 1.8 | 88.9 | 7.2 | 11.3 |
| | 20 | 280 | 17.8 | 12.8 | 2.2 | 93.2 | 8.8 | 11.1 |
| | 20 | 300 | | 10.9 | 1.9 | 95.1 | 7.6 | 10.9 |
| | 20 | 320 | 18.3 | 8.5 | 1.4 | 96.5 | 5.6 | 10.6 |
| | 20 | 340 | | 17.0 | 1.3 | 97.8 | 5.2 | 10.4 |
| | 20 | 360 | | 15.0 | 1.5 | 99.3 | 6.0 | 10.2 |
| | 20 | 380 | | 13.6 | 1.4 | 100.7 | 5.6 | 10.0 |

**Remarks:**
Intensively cultivated land currently prepared for sowing. Cultivation started in the area 6years back
Moisture penetration 125cm.

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**
**INFILTRATION RATE MEASUREMENT FORM**

| Profile No. Db 78 | | Date:-110609 | | Replication 2 | | Author: Dr.Tesfaye Ertebo/Zelealem | | |
|---|---|---|---|---|---|---|---|---|
| Soil Type: Orthidystric Nitisols (NTdyo) | | | | | | | UTM Reading | |
| Water Source: From Burka Annane | | | | | | | E:184396 | |
| | | | | | | | N: 991975 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 0.39 | | | 15.8 | | | | | |
| | 5 | 5 | | 13.9 | 1.9 | 1.9 | 22.4 | 22.4 |
| | 5 | 10 | 16.6 | 11.9 | 2.0 | 3.9 | 23.6 | 23.1 |
| | 5 | 15 | | 10.7 | 1.2 | 5.0 | 14.0 | 20.0 |
| | 5 | 20 | | 9.7 | 1.0 | 6.0 | 11.6 | 17.9 |
| | 5 | 25 | | 8.5 | 1.2 | 7.2 | 14.0 | 17.2 |
| | 5 | 30 | 16.3 | 7.2 | 1.3 | 8.5 | 15.2 | 16.8 |
| | 5 | 35 | | 15.7 | 0.6 | 9.0 | 6.8 | 15.4 |
| | 5 | 40 | | 15.4 | 0.3 | 9.3 | 3.2 | 13.9 |
| | 5 | 45 | | 15.2 | 0.2 | 9.5 | 2.0 | 12.6 |
| | 10 | 55 | 17.1 | 13.2 | 2.0 | 11.4 | 11.8 | 12.5 |
| | 10 | 65 | | 11.4 | 1.8 | 13.2 | 10.6 | 12.3 |
| | 10 | 75 | | 9.9 | 1.5 | 14.7 | 8.8 | 12.0 |
| | 15 | 90 | 17.6 | 8.5 | 1.4 | 16.0 | 5.5 | 11.5 |
| | 15 | 105 | | 16.8 | 0.8 | 16.8 | 3.1 | 10.9 |
| | 15 | 120 | 17.5 | 13.8 | 3.0 | 19.8 | 11.9 | 11.0 |
| | 15 | 135 | | 15.1 | 2.4 | 22.2 | 9.5 | 10.9 |
| | 15 | 150 | 17.2 | 12.3 | 2.8 | 24.9 | 11.1 | 10.9 |
| | 15 | 165 | | 10.3 | 2.0 | 26.9 | 7.9 | 10.7 |
| | 15 | 180 | 16.9 | 7.5 | 2.8 | 29.7 | 11.1 | 10.8 |
| | 15 | 195 | | 14.9 | 2.0 | 31.6 | 7.9 | 10.6 |
| | 20 | 215 | 17.0 | 13.2 | 1.7 | 33.3 | 5.0 | 10.3 |
| | 20 | 235 | | 11.5 | 1.7 | 35.0 | 5.0 | 10.1 |
| | 20 | 255 | | 9.4 | 2.1 | 37.0 | 6.2 | 9.9 |
| | 20 | 275 | 17.0 | 7.6 | 1.8 | 38.8 | 5.3 | 9.7 |
| | 20 | 295 | | 15.7 | 1.3 | 40.1 | 3.8 | 9.5 |
| | 20 | 315 | | 14.5 | 1.2 | 41.3 | 3.5 | 9.3 |
| | 20 | 335 | | 13.1 | 1.4 | 42.6 | 4.1 | 9.1 |

**Remarks:**
**Intensively cultivated land currently prepared for sowing. Cultivation started in the area 6years back due to settlement. Moisture penetration 100cm. The soil texture is loam.**

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile No. Db 78 | | Date:-110609 | | Replication 3 | | Author: Dr.Tesfaye Ertebo/Zelealem | | |
| Soil Type: Orthidystric Nitisols (NTdyo) | | | | | | | UTM Reading | |
| Water Source: From Burka Annane | | | | | | | E:184396 | |
| | | | | | | | N: 991975 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 9:.02 | | | 17.5 | | | | | |
| | 5 | 5 | | 15.60 | 1.9 | 1.9 | 22.4 | 22.4 |
| | 5 | 10 | 14.8 | 13.6 | 2.0 | 3.9 | 23.6 | 23.0 |
| | 5 | 15 | | 12.4 | 1.2 | 5.0 | 14.0 | 20.0 |
| | 5 | 20 | 16.2 | 11.4 | 1.0 | 6.0 | 11.6 | 17.9 |
| | 5 | 25 | | 10.2 | 1.2 | 7.2 | 14.0 | 17.2 |
| | 5 | 30 | 16.0 | 8.9 | 1.3 | 8.5 | 15.2 | 16.8 |
| | 5 | 35 | | 15.4 | 0.6 | 9.0 | 6.8 | 15.4 |
| | 5 | 40 | | 15.1 | 0.3 | 9.3 | 3.2 | 13.9 |
| | 5 | 45 | 16 | 14.9 | 0.2 | 9.5 | 2.0 | 12.6 |
| | 10 | 55 | | 14.0 | 2.0 | 11.4 | 11.8 | 12.5 |
| | 10 | 65 | | 12.2 | 1.8 | 13.2 | 10.6 | 12.3 |
| | 10 | 75 | 16.5 | 10.7 | 1.5 | 14.7 | 8.8 | 12.0 |
| | 10 | 85 | | 15.1 | 1.4 | 16.0 | 8.2 | 11.7 |
| | 10 | 95 | 15.5 | 14.3 | 0.8 | 16.8 | 4.6 | 11.2 |
| | 15 | 110 | | 12.5 | 3.0 | 19.8 | 11.9 | 11.3 |
| | 15 | 125 | | 10.10 | 2.4 | 22.2 | 9.5 | 11.2 |
| | 15 | 140 | 16.5 | 7.3 | 2.8 | 24.9 | 11.1 | 11.2 |
| | 15 | 155 | | 14.5 | 2.0 | 26.9 | 7.9 | 11.0 |
| | 15 | 170 | 17.1 | 11.7 | 2.8 | 29.7 | 11.1 | 11.0 |
| | 15 | 185 | | 9.7 | 2.0 | 31.6 | 7.9 | 10.8 |
| | 20 | 205 | 16.1 | 8.0 | 1.7 | 33.3 | 5.0 | 10.6 |
| | 20 | 225 | | 14.4 | 1.7 | 35.0 | 5.0 | 10.3 |
| | 20 | 245 | | 12.3 | 2.1 | 37.0 | 6.2 | 10.1 |
| | 20 | 265 | | 10.5 | 1.8 | 38.8 | 5.3 | 9.9 |
| | 20 | 285 | 16.9 | 9.2 | 1.3 | 40.1 | 3.8 | 9.7 |
| | 20 | 305 | | 8.0 | 1.2 | 41.3 | 3.5 | 9.4 |
| | 20 | 325 | 17.3 | 6.6 | 1.4 | 42.6 | 4.1 | 9.2 |
| | 20 | 345 | | 16.1 | 1.2 | 43.8 | 3.6 | 9.0 |
| | 20 | 365 | | 14.8 | 1.3 | 45.1 | 3.9 | 8.9 |
| | 20 | 385 | | 13.7 | 1.1 | 46.2 | 3.3 | 8.7 |
| **Remarks:** Moisture pentration90cm. The soil texture is loam. Intensively cultivated land currently prepared for sowing. | | | | | | | | |

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**
**INFILTRATION RATE MEASUREMENT FORM**

| Profile No. 83 | | Date:-50609 | | Replication 1 | | Author: Dr.Tesfaye Ertebo/Zelealem | | |
|---|---|---|---|---|---|---|---|---|
| Soil Type : Mesotrphic Vertisols (VRSm) | | | | | | | UTM Reading | |
| Water Source: From Burka Ananne River | | | | | | | E:183590 | |
| | | | | | | | N:992161 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 8:38 | | | | | | | | |
| | | | 18.50 | | | | | |
| | 5 | 5 | | 16.5 | 2.0 | 2.0 | 24.0 | 24 |
| | 5 | 10 | | 15.1 | 1.4 | 3.4 | 16.8 | 20.4 |
| | 5 | 15 | | 14.0 | 1.1 | 4.5 | 13.2 | 18 |
| | 10 | 25 | | 12.6 | 1.4 | 5.9 | 8.4 | 15.6 |
| | 10 | 35 | | 11.6 | 1.0 | 6.9 | 6.0 | 13.68 |
| | 10 | 45 | | 10.9 | 1.5 | 8.4 | 9.0 | 12.9 |
| | 15 | 60 | 19.4 | 9.0 | 1.9 | 10.3 | 7.6 | 12.1 |
| | 15 | 75 | | 17.0 | 2.4 | 12.7 | 9.6 | 11.8 |
| | 15 | 90 | | 15.0 | 2.0 | 14.7 | 8.0 | 11.4 |
| | 20 | 110 | | 12.9 | 2.1 | 16.8 | 8.4 | 11.1 |
| | 20 | 130 | | 11.9 | 1.0 | 17.8 | 4.0 | 10.5 |
| | 20 | 150 | 18.5 | 10.9 | 1.0 | 18.8 | 4.0 | 9.9 |
| | 20 | 170 | | 17.80 | 0.8 | 19.6 | 3.2 | 9.4 |
| | 20 | 190 | | 17.1 | 0.7 | 20.3 | 2.8 | 8.9 |
| | 20 | 210 | 19.40 | 10.4 | 0.7 | 21.0 | 2.8 | 8.5 |
| | 20 | 230 | | 9.8 | 0.6 | 21.6 | 2.4 | 8.1 |
| | 20 | 250 | | 9.3 | 0.5 | 22.1 | 2.0 | 7.8 |
| | 20 | 270 | | 8.90 | 0.4 | 22.5 | 1.6 | 7.4 |
| | 20 | 290 | 18.3 | 10.50 | 0.3 | 22.8 | 1.2 | 7.1 |
| | 20 | 310 | | 18.0 | 0.3 | 23.1 | 1.2 | 6.8 |
| | 20 | 330 | | 17.8 | 0.2 | 23.3 | 0.8 | 6.5 |
| | 20 | 350 | | 17.4 | 0.4 | 23.7 | 1.6 | 6.3 |

**Remarks:**
**Grass land used for extensive grazing. Since it is rainy season pre-wetting was not undertaken. The field has big & Medium gilgai. Moisture penetration 55cm**

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

**INFILTRATION RATE MEASUREMENT FORM**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Profile No. 83** | | **Date:-50609** | | **Replication 2** | | **Author: Dr.Tesfaye Ertebo/Zelealem** | | |
| **Soil Type : Mesotrphic Vertisols (VRSm)** | | | | | | | **UTM Reading** | |
| **Water Source: From Burka Ananne River** | | | | | | | **E:183590** | |
| | | | | | | | **N:992161** | |
| **Local** | **Interval** | **Cumulative** | **Depth of** | | **Intake** | **Cumulative** | **Infiltration rate** | |
| | **(min)** | **time** | **Water (cm)** | | **(cm)** | **Intake** | **(cm/hr)** | |
| | | **(min)** | **Initial** | **Final** | | **(cm)** | **Immediate** | **Mean** |
| **3.10** | | | **18.00** | | | | | |
| | **5** | **5** | | **15.1** | **3.0** | **3.0** | **36.0** | **36** |
| | **5** | **10** | | **13.0** | **2.1** | **5.1** | **25.2** | **30.6** |
| | **5** | **15** | | **11.1** | **1.9** | **7.0** | **22.8** | **28** |
| | **5** | **20** | **17.9** | **10.0** | **1.1** | **8.1** | **13.2** | **24.3** |
| | **10** | **30** | | **16.0** | **1.9** | **10.0** | **11.4** | **21.7** |
| | **10** | **40** | | **15.2** | **0.8** | **10.8** | **4.8** | **18.9** |
| | **10** | **50** | | **14.5** | **0.7** | **11.5** | **4.2** | **16.8** |
| | **10** | **60** | **17.6** | **13.0** | **0.7** | **12.2** | **4.2** | **15.2** |
| | **15** | **75** | | **17.0** | **0.6** | **12.8** | **2.4** | **13.8** |
| | **15** | **90** | | **16.5** | **0.5** | **13.3** | **2.0** | **12.6** |
| | **15** | **105** | **18.1** | **16.1** | **0.4** | **13.7** | **1.6** | **11.6** |
| | **20** | **125** | | **17.7** | **0.4** | **14.1** | **1.2** | **10.8** |
| | **20** | **145** | | **17.3** | **0.4** | **14.5** | **1.2** | **10.0** |
| | **20** | **165** | | **17.10** | **0.2** | **14.7** | **0.6** | **9.3** |
| | **20** | **185** | | **16.9** | **0.2** | **14.9** | **0.6** | **8.8** |
| | **20** | **205** | | **16.7** | **0.2** | **15.1** | **0.6** | **8.3** |
| | **20** | **225** | | **16.5** | **0.2** | **15.3** | **0.6** | **7.8** |
| | **20** | **245** | | **16.4** | **0.1** | **15.4** | **0.3** | **7.4** |
| | **20** | **265** | | **16.30** | **0.1** | **15.5** | **0.3** | **7.0** |
| | **20** | **285** | | **16.20** | **0.1** | **15.6** | **0.3** | **6.7** |

**Remarks:**
**Grass land used for extensive grazing. Since it is rainy season pre-wetting was not under Taken.**
**The field has big & Medium gilgai. Moisture penetration 50cm**

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile No. 83 | | Date:-50609 | | Replication 3 | | Author: Dr.Tesfaye Ertebo/Zelealem | | |
| Soil Type : Mesotrphic Vertisols (VRSm) | | | | | | | UTM Reading | |
| Water Source: From Burka Ananne River | | | | | | | E:183590 | |
| | | | | | | | N:992161 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 3.30 | | | 17.30 | | | | | |
| | 5 | 5 | | 15.1 | 2.2 | 2.2 | 26.4 | 26.4 |
| | 5 | 10 | | 13.2 | 1.9 | 4.1 | 22.8 | 24.6 |
| | 5 | 15 | | 11.9 | 1.3 | 5.4 | 15.6 | 21.6 |
| | 10 | 25 | | 10.6 | 1.3 | 6.7 | 7.8 | 18.15 |
| | 10 | 35 | 18.8 | 9.5 | 1.1 | 7.8 | 6.6 | 15.8 |
| | 10 | 45 | | 18.8 | 1.0 | 8.8 | 6.0 | 14.2 |
| | 15 | 60 | | 18.0 | 0.8 | 9.6 | 3.2 | 12.6 |
| | 15 | 75 | | 17.1 | 0.9 | 10.5 | 3.6 | 11.5 |
| | 15 | 90 | | 16.5 | 0.6 | 11.1 | 2.4 | 10.5 |
| | 20 | 110 | | 16.1 | 0.5 | 11.6 | 1.5 | 9.6 |
| | 20 | 130 | | 15.7 | 0.4 | 12.0 | 1.2 | 8.8 |
| | 20 | 150 | | 15.2 | 0.5 | 12.5 | 1.5 | 8.2 |
| | 20 | 170 | | 14.8 | 0.4 | 12.9 | 1.2 | 7.7 |
| | 20 | 190 | | 14.50 | 0.3 | 13.2 | 0.9 | 7.2 |
| | 20 | 210 | | 14.2 | 0.3 | 13.5 | 0.9 | 6.8 |
| | 20 | 230 | | 13.9 | 0.4 | 13.9 | 1.2 | 6.4 |
| | 20 | 250 | | 13.6 | 0.3 | 14.2 | 0.9 | 6.1 |
| | 20 | 270 | | 13.3 | 0.3 | 14.5 | 0.9 | 5.8 |

**Remarks:**
**Grass land used for extensive grazing. Since it is rainy season pre-wetting was not under taken.**

**The field has big & Medium gilgai. Moisture penetration 60cm**

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile No. DP86 | | Date:-100609 | | Replication 1 | | Author: Dr.Tesfaye Ertebo/Zelealem | | |
| Soil Type: Hyperferric Acrisols (ACfrh) | | | | | | | UTM Reading | |
| From Burka Annane | | | | | | | N: 994740 | |
| | | | | | | | E: 184436 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 8:43 | 0 | 0 | 35 | | | | | |
| | 5 | 5 | | 33.4 | 1.6 | 1.6 | 19.2 | 19.2 |
| | 5 | 10 | | 28.1 | 5.3 | 6.9 | 63.6 | 41.4 |
| | 5 | 15 | | 27.1 | 1 | 7.9 | 12.0 | 31.6 |
| | 5 | 20 | | 25.2 | 1.9 | 9.8 | 22.8 | 29.4 |
| | 5 | 25 | | 23.5 | 1.7 | 11.5 | 20.4 | 27.6 |
| | 5 | 30 | | 22 | 1.5 | 13.0 | 18.0 | 26.0 |
| | 5 | 35 | 34.8 | 33.1 | 1.8 | 14.8 | 21.6 | 25.4 |
| | 10 | 45 | | 31.6 | 1.5 | 16.3 | 9.0 | 23.3 |
| | 10 | 55 | | 30.3 | 1.3 | 17.6 | 7.8 | 21.6 |
| | 10 | 65 | | 28.9 | 1.4 | 19.0 | 8.4 | 20.3 |
| | 10 | 75 | | 27.8 | 1.1 | 20.1 | 6.6 | 19.0 |
| | 10 | 85 | | 26.6 | 1.2 | 21.3 | 7.2 | 18.1 |
| | 15 | 100 | | 25.5 | 1.1 | 22.4 | 4.4 | 17.0 |
| | 15 | 115 | | 25.5 | 1 | 23.4 | 4.0 | 16.1 |
| | 15 | 130 | | 24.4 | 1.1 | 24.5 | 4.4 | 15.3 |
| | 15 | 145 | | 23.3 | 1.1 | 25.6 | 4.4 | 14.6 |
| | 15 | 160 | | 22.1 | 1.2 | 26.8 | 4.8 | 14.0 |
| | 15 | 175 | | 21.1 | 1 | 27.8 | 4.0 | 13.5 |
| | 15 | 190 | | 19.1 | 2 | 29.8 | 8.0 | 13.2 |
| | 15 | 205 | | 17.6 | 1.5 | 31.3 | 6.0 | 12.8 |
| | 15 | 220 | | 16.4 | 1.2 | 32.5 | 4.8 | 12.4 |
| | 20 | 240 | | 15.3 | 1.1 | 33.6 | 3.3 | 12.0 |
| | 20 | 260 | | 14.3 | 1 | 34.6 | 3.0 | 11.6 |
| | 20 | 280 | | 13.5 | 0.8 | 35.4 | 2.4 | 11.3 |
| | 20 | 300 | | 12.8 | 0.7 | 36.1 | 2.1 | 10.9 |
| | 20 | 320 | | 12.2 | 0.6 | 36.7 | 1.8 | 10.5 |
| | 20 | 340 | | 11.6 | 0.6 | 37.3 | 1.8 | 10.2 |
| | 20 | 360 | 33.6 | 11.1 | 0.5 | 37.8 | 1.5 | 9.9 |
| | 20 | 380 | | 33.1 | 0.5 | 38.3 | 1.5 | 9.6 |
| | 20 | 400 | | 32.5 | 0.6 | 38.9 | 1.8 | 9.4 |

**Cont.**

**INFILTRATION RATE MEASUREMENT FORM**

| **Profile No. DP86** | **Date:-100609** | **Replication 1** | **Author: Dr.Tesfaye Ertebo/Zelealem** | | | | |
|---|---|---|---|---|---|---|---|
| **Soil Type: Hyperferric Acrisols (ACfrh)** | | | | | | **UTM Reading** | |
| **From Burka Annane** | | | | | | **N: 994740** | |
| | | | | | | **E: 184436** | |
| **Local** | **Interval** | **Cumulative** | **Depth of** | | **Intake** | **Cumulative** | **Infiltration rate** | |
| | **(min)** | **time** | **Water (cm)** | | **(cm)** | **Intake** | **(cm/hr)** | |
| | | **(min)** | **Initial** | **Final** | | **(cm)** | **Immediate** | **Mean** |
| | **20** | **420** | | **32.1** | **0.4** | **39.3** | **1.2** | **9.1** |
| | **20** | **440** | | **31.8** | **0.3** | **39.6** | **0.9** | **8.8** |
| | **20** | **460** | | **31.5** | **0.3** | **39.9** | **0.9** | **8.6** |

**REMARKS:**
**Intensively cultivated land, Pre-wetting was done one day back, moisture penetration 75cm**

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**
**INFILTRATION RATE MEASUREMENT FORM**

| Profile No. DP86 | Date:-100609 | Replication 2 | Author: Dr.Tesfaye Ertebo/Zelealem | | | | |
|---|---|---|---|---|---|---|---|
| Soil Type: Hyperferric Acrisols (ACfrh) | | | | | | UTM Reading | |
| From Burka Annane | | | | | | N: 994740 | |
| | | | | | | E: 184436 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 1.41 | | | 36.5 | | | | | |
| | 5 | 5 | | 34.1 | 2.4 | 2.4 | 28.8 | 28.8 |
| | 5 | 10 | | 32.1 | 2 | 4.4 | 24.0 | 26.4 |
| | 5 | 15 | | 30.7 | 1.4 | 5.8 | 16.8 | 23.2 |
| | 5 | 20 | | 29.5 | 1.2 | 7.0 | 14.4 | 21.0 |
| | 5 | 25 | | 28.4 | 1.1 | 8.1 | 13.2 | 19.44 |
| | 5 | 30 | | 27.4 | 1.0 | 9.1 | 12.0 | 18.2 |
| | 10 | 40 | 36.7 | 26.5 | 0.9 | 10.0 | 5.4 | 16.4 |
| | 10 | 50 | | 35.7 | 1.0 | 11.0 | 6.0 | 15.1 |
| | 10 | 60 | | 34.5 | 1.2 | 12.2 | 7.2 | 14.2 |
| | 10 | 70 | | 33.5 | 1.0 | 13.2 | 6.0 | 13.4 |
| | 10 | 80 | | 32.4 | 1.1 | 14.3 | 6.6 | 12.8 |
| | 10 | 90 | | 31.5 | 0.9 | 15.2 | 5.4 | 12.2 |
| | 10 | 100 | 37.3 | 30.5 | 1 | 16.2 | 6.0 | 11.7 |
| | 10 | 110 | | 35.6 | 1.7 | 17.9 | 10.2 | 11.6 |
| | 15 | 125 | | 33.6 | 2 | 19.9 | 8.0 | 11.3 |
| | 15 | 140 | | 32.2 | 1.4 | 21.3 | 5.6 | 11.0 |
| | 15 | 155 | | 30.5 | 1.7 | 23.0 | 6.8 | 10.7 |
| | 15 | 170 | | 29.2 | 1.3 | 24.3 | 5.2 | 10.4 |
| | 15 | 185 | | 28 | 1.3 | 25.6 | 5.2 | 10.1 |
| | 15 | 200 | 36.9 | 26.8 | 1.2 | 26.8 | 4.8 | 9.9 |
| | 15 | 215 | | 34.6 | 2.2 | 29.0 | 8.8 | 9.8 |
| | 20 | 235 | | 32.8 | 1.8 | 30.8 | 5.4 | 9.6 |
| | 20 | 255 | | 31 | 1.8 | 32.6 | 5.4 | 9.4 |
| | 20 | 275 | | 29.2 | 1.8 | 34.4 | 5.4 | 9.28 |
| | 20 | 295 | | 27.4 | 1.8 | 36.2 | 5.4 | 9.12 |

**REMARKS:**
Intensively cultivated land , Pre-wetting was done one day back, moisture penetration 75cm

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**
**INFILTRATION RATE MEASUREMENT FORM**

| Profile No. DP86 | Date:-100609 | Replication 3 | Author: Dr.Tesfaye Ertebo/Zelealem | | | | |
|---|---|---|---|---|---|---|---|
| Soil Type: Hyperferric Acrisols (ACfrh) | | | | | | UTM Reading | |
| From :Burka Annane | | | | | | N: 994740 | |
| | | | | | | E: 184436 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 0.10 | | | 35.75 | | | | | |
| | 5 | 5 | | 33.75 | 2.0 | 2.0 | 24.0 | 24 |
| | 5 | 10 | | 30.1 | 3.7 | 5.7 | 43.8 | 33.9 |
| | 5 | 15 | | 28.9 | 1.2 | 6.9 | 14.4 | 27.4 |
| | 5 | 20 | | 27.35 | 1.6 | 8.4 | 18.6 | 25.2 |
| | 5 | 25 | | 25.95 | 1.4 | 9.8 | 16.8 | 23.5 |
| | 5 | 30 | | 24.7 | 1.3 | 11.1 | 15.0 | 22.1 |
| | 5 | 35 | 35.75 | 23.4 | 1.3 | 12.4 | 15.6 | 21.2 |
| | 5 | 40 | | 33.65 | 2.1 | 14.5 | 25.2 | 21.7 |
| | 5 | 45 | | 32.4 | 1.3 | 15.7 | 15.0 | 20.9 |
| | 10 | 55 | | 31.2 | 1.2 | 16.9 | 7.2 | 19.6 |
| | 10 | 65 | | 30.1 | 1.1 | 18.0 | 6.6 | 18.4 |
| | 10 | 75 | | 29.05 | 1.1 | 19.1 | 6.3 | 17.4 |
| | 10 | 85 | 37.5 | 28.1 | 1.0 | 20.1 | 6.0 | 16.5 |
| | 10 | 95 | | 27.6 | 0.5 | 20.6 | 3.0 | 15.5 |
| | 10 | 105 | | 27.2 | 0.4 | 21.0 | 2.4 | 14.7 |
| | 15 | 120 | | 26.8 | 0.4 | 21.4 | 1.6 | 13.8 |
| | 15 | 135 | | 26.2 | 0.6 | 22.0 | 2.4 | 13.2 |
| | 15 | 150 | | 23.7 | 0.5 | 22.5 | 2.0 | 12.6 |
| | 15 | 165 | | 23.1 | 0.6 | 23.1 | 2.4 | 12.0 |
| | 15 | 180 | | 22.6 | 0.5 | 23.6 | 2.0 | 11.5 |
| | 20 | 200 | | 22.2 | 0.4 | 24.0 | 1.2 | 11.0 |
| | 20 | 220 | | 21.7 | 0.5 | 24.5 | 1.5 | 10.6 |
| | 20 | 240 | | 21.4 | 0.3 | 24.8 | 0.9 | 10.2 |
| | 20 | 260 | | 21.0 | 0.4 | 25.2 | 1.2 | 9.8 |
| | 20 | 280 | | 20.7 | 0.3 | 25.5 | 0.9 | 9.4 |
| | | | | | | | | |

**REMARKS:**
**Intensively cultivated land, Pre-wetting was done one day back, moisture penetration 75cm**

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile No. Dp90 | | Date:-110609 | | Replication 1 | | Author: Dr.Tesfaye Ertebo/Zelealem | | |
| Soil Type: Hyperferric Acrisols (ACfrh) | | | | | | | UTM Reading | |
| Water Source: From Burka Annane | | | | | | | N: 994577 | |
| | | | | | | | E: 181927 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 2.23 | | | 19.4 | | | | | |
| | 5 | 5 | | 17.6 | 1.8 | 1.8 | 21.6 | 21.6 |
| | 5 | 10 | | 16.2 | 1.4 | 3.2 | 16.8 | 19.2 |
| | 5 | 15 | | 15 | 1.2 | 4.4 | 14.4 | 17.6 |
| | 10 | 25 | | 14 | 1 | 5.4 | 6.0 | 14.7 |
| | 10 | 35 | | 13 | 1 | 6.4 | 6.0 | 13.0 |
| | 10 | 45 | | 12.1 | 0.9 | 7.3 | 5.4 | 11.7 |
| | 15 | 60 | | 11.3 | 0.8 | 8.1 | 3.2 | 10.5 |
| | 15 | 75 | 19 | 10.4 | 9 | 17.1 | 36.0 | 13.7 |
| | 15 | 90 | | 17.1 | 1.9 | 19.0 | 7.6 | 13.0 |
| | 20 | 110 | | 15.2 | 1.9 | 20.9 | 5.7 | 12.3 |
| | 20 | 130 | | 13.6 | 1.6 | 22.5 | 4.8 | 11.6 |
| | 20 | 150 | | 11.7 | 1.9 | 24.4 | 5.7 | 11.1 |
| | 20 | 170 | | 9.9 | 1.8 | 26.2 | 5.4 | 10.7 |
| | 20 | 190 | 19 | 7.6 | 2.3 | 28.5 | 6.9 | 10.4 |
| | 20 | 210 | | 15.7 | 3.3 | 31.8 | 9.9 | 10.4 |
| | 20 | 230 | | 12.8 | 2.9 | 34.7 | 8.7 | 10.3 |
| | 20 | 250 | | 10.6 | 2.2 | 36.9 | 6.6 | 10.0 |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**REMARKS:**
Cultivated land, currently it is under preparation for sorghum cultivation. Pre-wetting was done one day back, moisture penetration 80 cm.

**EASTERN NILE IRRIGATION & DRAINAGE STUDY PROJECT**

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Profile No. Dp90 | | Date:-110609 | | Replication 2 | | Author: Dr.Tesfaye Ertebo/Zelealem | | |
| Soil Type: Hyperferric Acrisols (ACfrh) | | | | | | | UTM Reading | |
| Water Source: From Burka Annane | | | | | | | N: 994577 | |
| | | | | | | | E: 181927 | |
| Local | Interval | Cumulative | Depth of | | Intake | Cumulative | Infiltration rate | |
| | (min) | time | Water (cm) | | (cm) | Intake | (cm/hr) | |
| | | (min) | Initial | Final | | (cm) | Immediate | Mean |
| 8.39 | | | 49.7 | | | | | |
| | 5 | 5 | | 52.0 | 2.3 | 2.3 | 27.6 | 27.6 |
| | 5 | 10 | | 50.2 | 1.8 | 4.1 | 21.6 | 24.6 |
| | 5 | 15 | | 49.1 | 1.1 | 5.2 | 13.2 | 20.8 |
| | 5 | 20 | | 47.7 | 1.4 | 6.6 | 16.8 | 19.8 |
| | 5 | 25 | | 46.1 | 1.6 | 8.2 | 19.2 | 19.7 |
| | 5 | 30 | | 45.6 | 0.5 | 8.7 | 6.0 | 17.4 |
| | 5 | 35 | | 44.7 | 0.9 | 9.6 | 10.8 | 16.5 |
| | 10 | 45 | | 43.4 | 1.3 | 10.9 | 7.8 | 15.4 |
| | 10 | 55 | | 42.9 | 0.5 | 11.4 | 3.0 | 14.0 |
| | 10 | 65 | | 41.6 | 1.3 | 12.7 | 7.8 | 13.4 |
| | 10 | 75 | | 40.9 | 0.7 | 13.4 | 4.2 | 12.5 |
| | 10 | 85 | | 40.3 | 0.6 | 14.0 | 3.6 | 11.8 |
| | 10 | 95 | 46.5 | 39.9 | 0.4 | 14.4 | 2.4 | 11.1 |
| | 15 | 110 | | 45.6 | 0.9 | 15.3 | 3.6 | 10.5 |
| | 15 | 125 | | 37.6 | 8.0 | 23.3 | 32.0 | 12.0 |
| | 15 | 140 | 36.90 | 36.9 | 0.7 | 24.0 | 2.8 | 11.4 |
| | 15 | 155 | | 36.1 | 0.8 | 24.8 | 3.2 | 10.9 |
| | 20 | 175 | | 35.4 | 0.7 | 25.5 | 2.1 | 10.4 |
| | 20 | 195 | | 34.6 | 0.8 | 26.3 | 2.4 | 10.0 |
| | 20 | 215 | | 33.9 | 0.7 | 27.0 | 2.1 | 9.6 |
| | 20 | 235 | 33.8 | 33.3 | 0.6 | 27.6 | 1.8 | 9.2 |
| | 20 | 255 | | 32.8 | 0.5 | 28.1 | 1.5 | 8.9 |
| | 20 | 275 | | 32.2 | 0.6 | 28.7 | 1.8 | 8.6 |
| | | | | | | | | |
| REMARKS: | | | | | | | | |
| Cultivated land, currently it is under preparation for sorghum cultivation. Pre-wetting was done one day back, moisture penetration 90 cm | | | | | | | | |

| INFILTRATION RATE MEASUREMENT FORM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Profile No. Dp90** | | **Date:-110609** | | **Replication 3** | | **Author: Dr.Tesfaye Ertebo/Zelealem** | | |
| **Soil Type: Hyperferric Acrisols (ACfrh)** | | | | | | | **UTM Reading** | |
| **Water Source: From Burka Annane** | | | | | | | **N: 994577** | |
| | | | | | | | **E: 181927** | |
| **Local** | **Interval** | **Cumulative** | **Depth of** | | **Intake** | **Cumulative** | **Infiltration rate** | |
| | **(min)** | **time** | **Water (cm)** | | **(cm)** | **Intake** | **(cm/hr)** | |
| | | **(min)** | **Initial** | **Final** | | **(cm)** | **Immediate** | **Mean** |
| | | | **44.5** | **0** | | | | |
| **2:15** | **5** | **5** | | **43.3** | **1.2** | **1.2** | **14.4** | **14.4** |
| | **5** | **10** | | **42.0** | **1.3** | **2.5** | **15.6** | **15** |
| | **5** | **15** | | **40.8** | **1.2** | **3.7** | **14.4** | **14.8** |
| | **5** | **20** | | **39.8** | **1** | **4.7** | **12.0** | **14.1** |
| | **10** | **30** | | **39.7** | **0.1** | **4.8** | **0.6** | **11.4** |
| | **10** | **40** | | **38.5** | **1.2** | **6.0** | **7.2** | **10.7** |
| | **10** | **50** | | **32.8** | **0.7** | **6.7** | **4.2** | **9.8** |
| | **10** | **60** | **45** | **37.3** | **0.5** | **7.2** | **3.0** | **8.9** |
| | **10** | **70** | | **43.6** | **1.4** | **8.6** | **8.4** | **8.9** |
| | **10** | **80** | | **41.8** | **1.8** | **10.4** | **10.8** | **9.1** |
| | **10** | **90** | | **40.1** | **1.7** | **12.1** | **10.2** | **9.2** |
| | **15** | **105** | | **38.2** | **1.9** | **14.0** | **7.6** | **9.0** |
| | **15** | **120** | | **37.0** | **1.2** | **15.2** | **4.8** | **8.7** |
| | **15** | **135** | **45** | **36.0** | **1** | **16.2** | **4.0** | **8.4** |
| | **15** | **150** | | **43.3** | **1.7** | **17.9** | **6.8** | **8.3** |
| | **20** | **170** | | **41.9** | **1.4** | **19.3** | **4.2** | **8.0** |
| | **20** | **190** | | **39.9** | **2** | **21.3** | **6.0** | **7.9** |
| | **20** | **210** | | **37.8** | **2.1** | **23.4** | **6.3** | **7.8** |
| | **20** | **230** | | **36.4** | **1.4** | **24.8** | **4.2** | **7.6** |
| | **20** | **250** | | **34.8** | **1.6** | **26.4** | **4.8** | **7.5** |
| | **20** | **270** | | **33.3** | **1.5** | **27.9** | **4.5** | **7.3** |
| | | | | | | | | |

**REMARKS:**
**Cultivated land, currently it is under preparation for sorghum cultivation. Pre-wetting was done one day back, moisture penetration 87cm**

# APPENDIX 5B2: HYDRAULIC CONDUCTIVITY TEST RESULTS

| | |
|---|---|
| Profile No DB: 2 Date: 04/06/09 | Auther: Dr. Tesfaye Ertebo |
| Soil Type: Rhodic Nitisols (NTro) | UTM Reading |
| Water Source:-From Dursitu River Tributor y of Dedessa River | E:186500 |
| | N:989140 |

| Rep. I | | Radius (cm):4.5 depth (cm):90 | | Rep. I | | Radius (cm):4.5 depth (cm):90 | | Rep. I | | Radius (cm):4.5 depth (cm):90 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| t(sec) | h'(t') cm | h'(t') cm | h'(t') +r/2cm | t (sec) | h'(t') cm | h'(t') cm | h'(t') +r/2cm | t (sec) | h'(t') cm | h'(t') cm | h'(t') +r/2cm |
| 0 | 0 | | | 0 | 0 | | | 0 | 0 | | |
| 1 | 2.5 | 87.5 | 89.5 | 1 | 2 | 88 | 90.0 | 1 | 8 | 82.0 | 84.0 |
| 3 | 5 | 85 | 87 | 3 | 3 | 87 | 89.0 | 3 | 9.5 | 80.5 | 82.5 |
| 8 | 8 | 82 | 84 | 8 | 4 | 86 | 88.0 | 8 | 11 | 79.0 | 81.0 |
| 18 | 13 | 77 | 79 | 18 | 9 | 81 | 83.0 | 18 | 16 | 74.0 | 76.0 |
| 33 | 18 | 72 | 74 | 33 | 14.5 | 75.5 | 77.5 | 33 | 21 | 69.0 | 71.0 |
| 63 | 27 | 63 | 65 | 63 | 22 | 68 | 70.0 | 63 | 17 | 73.0 | 75.0 |
| 93 | 32 | 58 | 60 | 93 | 26 | 64 | 66.0 | 93 | 34 | 56.0 | 58.0 |
| 153 | 43 | 47 | 49 | 153 | 35 | 55 | 57.0 | 153 | 42 | 48.0 | 50.0 |
| 213 | 50 | 40 | 42 | 213 | 40 | 50 | 52.0 | 213 | 49 | 41.0 | 43.0 |
| 333 | 60 | 30 | 32 | 333 | 49 | 41 | 43.0 | 333 | 56.5 | 33.5 | 35.5 |
| 453 | 65 | 25 | 27 | 453 | 55.5 | 34.5 | 36.5 | 453 | 62 | 28.0 | 30.0 |
| 633 | 73 | 17 | 19 | 633 | 62 | 28 | 30.0 | 633 | 69 | 21.0 | 23.0 |
| 813 | 88 | 2 | 4 | 813 | 66 | 24 | 26.0 | 813 | 72 | 18.0 | 20.0 |
| | | | | 1053 | 72 | 18 | 20.0 | 1053 | 76 | 14.0 | 16.0 |
| | | | | 1293 | 75 | 15 | 17.0 | 1293 | 78.5 | 11.5 | 13.5 |
| | | | | 1593 | 79 | 11 | 13.0 | 1593 | 81 | 9.0 | 11.0 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

REMARKS: 2 days back rain started in the area the soil is wet. Cultivation started 6 years ago in the area. Moisture penetration up to 110cm.

K1= 6.59 mday-1 K2= 2.09 mday-1 K3= 2.20 mday-1

$$K=1.15r\frac{[Log(h(ti+r/2)-Logh(tn+r/2)]*864}{tn-ti}$$ Average K= 3.63m/day

| HYDRAULIC CONDUCTIVITY MEASUREMENT FORM | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Profile No DB: 3 Date:-030609 | | | | | | | | Author: Dr. Tesfaye Ertebo | | | |
| Soil Type: Orthidystric Nitisols (NTdyo) | | | | | | | | | | | |
| Water Source: From Demeksa River tribute to Didessa River | | | | | | | | UTM Reading | | | |
| | | | | | | | | E: 186469 | | | |
| | | | | | | | | N: 987085 | | | |
| Rep.No.1 | | Radius (cm):4.5 depth (cm):90 | | Rep. No 2 | | Radius (cm):4.5 depth (cm):90 | | Rep. No 3 | | Radius (cm):4.5 depth (cm):90 | |
| | | | | | | | | | | | |
| 0 | | | | 0 | 0 | 90 | | 0 | | | |
| 1 | 4.0 | 86 | 88.0 | 1 | 7 | 83 | 85 | 1 | 3 | 87 | 89 |
| 3 | 7.0 | 83 | 85.0 | 3 | 7.5 | 82.5 | 84.5 | 3 | 7 | 83 | 85 |
| 8 | 1.5 | 88.5 | 90.5 | 8 | 8 | 82 | 84 | 8 | 8 | 82 | 84 |
| 18 | 2.0 | 88 | 90.0 | 18 | 10 | 80 | 82 | 18 | 14 | 76 | 78 |
| 33 | 3.5 | 86.5 | 88.5 | 33 | 13 | 77 | 79 | 33 | 18.5 | 71.5 | 73.5 |
| 63 | 6.0 | 84 | 86.0 | 63 | 17 | 73 | 75 | 63 | 27.5 | 62.5 | 64.5 |
| 93 | 8.0 | 82 | 84.0 | 93 | 21 | 69 | 71 | 93 | 34 | 56 | 58 |
| 153 | 11.5 | 78.5 | 80.5 | 153 | 25 | 65 | 67 | 153 | 42.5 | 47.5 | 49.5 |
| 213 | 14.0 | 76 | 78.0 | 213 | 29.5 | 60.5 | 62.5 | 213 | 48 | 42 | 44 |
| 333 | 18.0 | 72 | 74.0 | 333 | 35 | 55 | 57 | 333 | 56 | 34 | 36 |
| 453 | 21.5 | 68.5 | 70.5 | 453 | 39.5 | 50.5 | 52.5 | 453 | 61 | 29 | 31 |
| 633 | 26.3 | 63.7 | 65.7 | 633 | 45 | 45 | 47 | 633 | 68 | 22 | 24 |
| 813 | 30.0 | 60 | 62.0 | 813 | 49 | 41 | 43 | 813 | 71 | 19 | 21 |
| 1053 | 34.0 | 56 | 58.0 | 1053 | 53 | 37 | 39 | 1053 | 76 | 14 | 16 |
| 1293 | 37.5 | 52.5 | 54.5 | 1293 | 56 | 34 | 36 | 1293 | 80 | 10 | 12 |
| 1593 | 41.2 | 48.8 | 50.8 | 1593 | 60 | 30 | 32 | 1593 | 81 | 9 | 11 |
| 1893 | 45.5 | 44.5 | 46.5 | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

REMARKS:
Pre-wetting made 2 days earlier. The land is farm land & prepared for sowing currently the farming activity has been started 6 years back. High disturbance of vegetation is clearly seen.

K1= 0.58 mday-1 K2= 1.06 mday-1 K3= 2.27 mday-1

$$K=\frac{1.15r[Log(h(ti+r/2)-Logh(tn+r/2)]*864}{tn-ti}$$

Average K= 1.3m/day

| HYDRAULIC CONDUCTIVITY MEASUREMENT FORM | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Profile No DB: 9 Date: 03/06/09 | | | | | | | | Author: Dr. Tesfaye Ertebo | | | |
| Soil Type: Mesotrophic Vertisols (VRsm) | | | | | | | | UTM Reading | | | |
| | | | | | | | | E: 188525 | | | |
| Water Source: From Shimel Tokeye River | | | | | | | | N: 985407 | | | |
| | | | | | | | | | | | |
| Rep.No.1 | | Radius (cm):4.5 depth (cm):60 | | Rep.No 2 | | Radius (cm):4.5 depth (cm):60 | | Rep.No 3 | | Radius (cm):4.5 depth (cm):60 | |
| 0 | 0 | 90 | | 0 | 0 | 90 | | 0 | 0.0 | 90.0 | |
| 1 | 2 | 88 | 90 | 1 | 4 | 86 | 88 | 1 | 2.0 | 88.0 | 90.0 |
| 3 | 2.5 | 87.5 | 89.5 | 3 | 7 | 83 | 85 | 3 | 2.5 | 87.5 | 89.5 |
| 8 | 3.5 | 86.5 | 88.5 | 8 | 7.5 | 82.5 | 84.5 | 8 | 3.0 | 87.0 | 89.0 |
| 18 | 4.5 | 85.5 | 87.5 | 18 | 8.5 | 81.5 | 83.5 | 18 | 3.5 | 86.5 | 88.5 |
| 33 | 8.5 | 81.5 | 83.5 | 33 | 10 | 80 | 82 | 33 | 4.4 | 85.6 | 87.6 |
| 63 | 12.2 | 77.8 | 79.8 | 63 | 12.5 | 77.5 | 79.5 | 63 | 5.5 | 84.5 | 86.5 |
| 93 | 15 | 75 | 77 | 93 | 14.5 | 75.5 | 77.5 | 93 | 6.5 | 83.5 | 85.5 |
| 153 | 18 | 72 | 74 | 153 | 18 | 72 | 74 | 153 | 8.5 | 81.5 | 83.5 |
| 213 | 21 | 69 | 71 | 213 | 19 | 71 | 73 | 213 | 9.6 | 80.4 | 82.4 |
| 333 | 24 | 66 | 68 | 333 | 22.7 | 67.3 | 69.3 | 333 | 11.0 | 79.0 | 81.0 |
| 453 | 27 | 63 | 65 | 453 | 25.5 | 64.5 | 66.5 | 453 | 13.0 | 77.0 | 79.0 |
| 633 | 29 | 61 | 63 | 633 | 28 | 62 | 64 | 633 | 15.0 | 75.0 | 77.0 |
| 813 | 29.7 | 60.3 | 62.3 | 813 | 30.5 | 59.5 | 61.5 | 813 | 16.5 | 73.5 | 75.5 |
| 1053 | 31 | 59 | 61 | 1053 | 34.5 | 55.5 | 57.5 | 1053 | 18.8 | 71.2 | 73.2 |
| 1293 | 32.6 | 57.4 | 59.4 | 1293 | 37.5 | 52.5 | 54.5 | 1293 | 20.5 | 69.5 | 71.5 |
| 1593 | 34.7 | 55.3 | 57.3 | 1593 | 39.7 | 50.3 | 52.3 | 1593 | 22.6 | 67.4 | 69.4 |
| 1893 | 31.33 | 58.67 | 60.67 | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

REMARKS:
Grass land, during Rainy season gets wet. Has big gilgai and cracks.-One day before. Pre-wetting was undertaken. Moisture penetration 90cm.

K1= 0.36 mday-1 K2= 0.56 mday-1 K3= 0.28 mday-1

$$K = 1.15r \frac{[\text{Log}(h(ti+r/2) - \text{Log}\, h(tn+r/2)]*864}{tn-ti}$$

Average K= 0.4m/day

| HYDRAULIC CONDUCTIVITY MEASUREMENT FORM | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Profile No DB: 12 Date: 04/06/09 | | | | | | | | Author: Dr. Tesfaye Ertebo | | | |
| Soil Type : Orthidystric Nitisols (NTdyo) | | | | | | | | UTM Reading | | | |
| | | | | | | | | E: 190251 | | | |
| Water Source:-From Shimel Tokaye River Tributary of Dessesea River | | | | | | | | N: 985914 | | | |
| | | | | | | | | | | | |
| Rep.No.1 | | Radius (cm):4.5 depth (cm):60 | | Rep. No 2 | | Radius (cm):4.5 depth (cm):60 | | Rep. No 3 | | Radius (cm):4.5 depth (cm):90 | |
| 0 | 0 | 90 | | 0 | 0 | 90 | | 0 | 0 | 90 | |
| 1 | 4 | 86 | 88 | 1 | 9 | 81 | 83 | 1 | 2 | 88 | 90 |
| 3 | 7 | 83 | 85 | 3 | 12 | 78 | 80 | 3 | 6 | 84 | 86 |
| 8 | 12 | 78 | 80 | 8 | 15 | 75 | 77 | 8 | 8 | 82 | 84 |
| 18 | 20 | 70 | 72 | 18 | 19 | 71 | 73 | 18 | 11 | 79 | 81 |
| 33 | 26 | 64 | 66 | 33 | 25 | 65 | 67 | 33 | 17 | 73 | 75 |
| 63 | 34 | 56 | 58 | 63 | 32 | 58 | 60 | 63 | 22 | 68 | 70 |
| 93 | 40 | 50 | 52 | 93 | 38 | 52 | 54 | 93 | 27 | 63 | 65 |
| 153 | 48 | 42 | 44 | 153 | 44 | 46 | 48 | 153 | 35 | 55 | 57 |
| 213 | 56 | 34 | 36 | 213 | 51 | 39 | 41 | 213 | 40 | 50 | 52 |
| 333 | 63 | 27 | 29 | 333 | 59.5 | 30.5 | 33 | 333 | 48 | 42 | 44 |
| 453 | 71 | 19 | 21 | 453 | 66 | 24 | 26 | 453 | 53 | 37 | 39 |
| 633 | 77 | 13 | 15 | 633 | 72 | 18 | 20 | 633 | 60 | 30 | 32 |
| 813 | 82 | 8 | 10 | 813 | 77 | 13 | 15 | 813 | 64 | 26 | 28 |
| 1053 | 86 | 4 | 6 | 1053 | 84 | 6 | 8 | 1053 | 69.5 | 21 | 23 |
| 1293 | 89 | 1 | 3 | 1293 | 89 | 1 | 3 | 1293 | 74 | 16 | 18 |
| | | | | | | | | 1593 | 76 | 14 | 16 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

K1=4.51 mday-1 K2=4.43 mday-1 K3=1.87 mday-1

$$K=1.15r\frac{[Log(h(ti+r/2)-Logh(tn+r/2)]*864}{tn-ti}$$

Average K= 3.6m/day

| HYDRAULIC CONDUCTIVITY MEASUREMENT FORM | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Profile No DB:18 Date: 020609 | | | | | | | | Author: Dr. Tesfaye Ertebo | | | |
| Soil Type: Orthidistric Nitisols (NTdyo) | | | | | | | | UTM Reading | | | |
| | | | | | | | | E: 189379 | | | |
| Water Source: From Shimel Tokye River | | | | | | | | N:984892 | | | |
| | | | | | | | | | | | |
| Rep. 1 | | Radius (cm):4.5 depth (cm):90 | | Rep. 2 | | Radius (cm):4.5 depth (cm):90 | | Rep. 3 | | Radius (cm):4.5 depth (cm):90 | |
| t (sec) | h'(t') cm | h'(t') cm | h'(t') +r/2cm | t (sec) | h'(t') cm | h'(t') cm | h'(t') +r/2cm | t (sec) | h'(t') cm | h'(t') cm | h'(t') +r/2cm |
| 0 | 0 | 90 | | 0 | 0 | 90 | | 0 | 0 | 90 | |
| 1 | 3 | 87 | 89 | 1 | 2.5 | 87.5 | 89.5 | 1 | 2.0 | 88.0 | 90.0 |
| 3 | 3.5 | 86.5 | 88.5 | 3 | 4 | 86.0 | 88.0 | 3 | 2.5 | 87.5 | 89.5 |
| 8 | 4.5 | 85.5 | 87.5 | 8 | 4.5 | 85.5 | 87.5 | 8 | 3.5 | 86.5 | 88.5 |
| 18 | 7 | 83 | 85 | 18 | 5 | 85.0 | 87.0 | 18 | 4.0 | 86.0 | 88.0 |
| 33 | 9.5 | 80.5 | 82.5 | 33 | 6 | 84.0 | 86.0 | 33 | 6.5 | 83.5 | 85.5 |
| 63 | 11.5 | 78.5 | 80.5 | 63 | 7.5 | 82.5 | 84.5 | 63 | 7.0 | 83.0 | 85.0 |
| 93 | 14.4 | 75.6 | 77.6 | 93 | 9.5 | 80.5 | 82.5 | 93 | 8.0 | 82.0 | 84.0 |
| 153 | 16 | 74 | 76 | 153 | 11 | 79.0 | 81.0 | 153 | 11.0 | 79.0 | 81.0 |
| 213 | 18.7 | 71.3 | 73.3 | 213 | 11.5 | 78.5 | 80.5 | 213 | 13.5 | 76.5 | 78.5 |
| 333 | 23 | 67 | 69 | 333 | 13.8 | 76.2 | 78.2 | 333 | 17.5 | 72.5 | 74.5 |
| 453 | 26 | 64 | 66 | 453 | 15.5 | 74.5 | 76.5 | 453 | 21.0 | 69.0 | 71.0 |
| 633 | 28.5 | 61.5 | 63.5 | 633 | 17.5 | 72.5 | 74.5 | 633 | 25.0 | 65.0 | 67.0 |
| 813 | 32 | 58 | 60 | 813 | 20 | 70.0 | 72.0 | 813 | 29.1 | 60.9 | 62.9 |
| 1053 | 32.5 | 57.5 | 59.5 | 1053 | 20 | 70.0 | 72.0 | 1053 | 31.0 | 59.0 | 61.0 |
| 1293 | 34.6 | 55.4 | 57.4 | 1293 | 20.05 | 70.0 | 72.0 | 1293 | 31.5 | 58.5 | 60.5 |
| 1593 | 36.05 | 53.95 | 55.95 | 1593 | 21.05 | 69.0 | 71.0 | 1593 | 32.5 | 57.5 | 59.5 |
| | | | | 1893 | 23.2 | 66.8 | 68.8 | 1893 | 33.5 | 56.5 | 58.5 |
| | | | | 20.33 | 25 | 65 | 67.0 | | | | |
| | | | | | | | | | | | |

Remarks

Cultivated land previously the area is used for sorghum cultivation,1 day back pre-wetting was undertaken and moisture penetration

K1= 0.5 mday-1 K2= 0.25 mday-1 K3=0.39 mday-1

$$K = \frac{1.15r[\text{Log}(h(ti+r/2)-\text{Log}h(tn+r/2)]*864}{tn-ti}$$

Average K= 0.38m/day

| HYDRAULIC CONDUCTIVITY MEASUREMENT FORM | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Profile no DB: 52 Date : 6/6/2009 | | | | | | | | Author: Dr. Tesfaye Ertebo | | | |
| Soil Type: Hyperferic Acrisols (ACfrh) | | | | | | | | UTM Reading | | | |
| | | | | | | | | N:996427 | | | |
| Water Source: From Burka Ananee River | | | | | | | | E:184833 | | | |
| | | | | | | | | | | | |
| Rep.No.1 | | Radius (cm):4.5 depth (cm):90 | | Rep. No 2 | | Radius (cm):4.5 depth (cm):90 | | Rep. No 3 | | Radius (cm):4.5 depth (cm):90 | |
| | | | | | | | | | | | |
| 0 | 0 | 90 | | 0 | 0 | 90 | | 0 | 0 | 90 | |
| 1 | 2 | 88 | 90 | 1 | 2 | 88 | 90 | 1 | 2 | 88 | 90 |
| 3 | 3 | 87 | 89 | 3 | 10 | 80 | 82 | 3 | 5 | 85 | 87 |
| 8 | 4 | 86 | 88 | 8 | 15 | 75 | 77 | 8 | 11 | 79 | 81 |
| 18 | 10 | 80 | 82 | 18 | 20 | 70 | 72 | 18 | 21 | 69 | 71 |
| 33 | 14.5 | 75.5 | 77.5 | 33 | 25 | 65 | 67 | 33 | 28 | 62 | 64 |
| 63 | 21.5 | 68.5 | 70.5 | 63 | 33 | 57 | 59 | 63 | 34 | 56 | 58 |
| 93 | 26 | 64 | 66 | 93 | 39 | 51 | 53 | 93 | 41 | 49 | 51 |
| 153 | 23 | 67 | 69 | 153 | 45 | 45 | 47 | 153 | 48 | 42 | 44 |
| 213 | 39.5 | 50.5 | 52.5 | 213 | 49 | 41 | 43 | 213 | 52.8 | 37.2 | 39.2 |
| 333 | 46 | 44 | 46 | 333 | 56.5 | 33.5 | 35.5 | 333 | 59 | 31 | 33 |
| 453 | 51.5 | 38.5 | 40.5 | 453 | 62.5 | 27.5 | 29.5 | 453 | 64 | 26 | 28 |
| 633 | 52 | 38 | 40 | 633 | 66.5 | 23.5 | 25.5 | 633 | 69.5 | 20.5 | 22.5 |
| 813 | 62 | 28 | 30 | 813 | 70 | 20 | 22 | 813 | 74 | 16 | 18 |
| 1053 | 67 | 23 | 25 | 1053 | 74 | 16 | 18 | 1053 | 83 | 7 | 9 |
| 1293 | 71 | 19 | 21 | 1293 | 77.5 | 12.5 | 14.5 | 1293 | 84.5 | 5.5 | 7.5 |
| 1593 | 75.5 | 14.5 | 16.5 | 1593 | | | | 1593 | 85.5 | 4.5 | 6.5 |
| 1893 | 81 | 9 | 11 | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

K1= 1.92 mday-1 K2= 2.44 mday-1 K3= 2.85 mday-1

$$K = 1.15r[\text{Log}(h(ti+r/2)-\text{Log}h(tn+r/2)]*864 \over tn-ti$$

Average K= 2.4m/day

| HYDRAULIC CONDUCTIVITY MEASUREMENT FORM | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Profile No DP: 65 Date:050609 | | | | | | | | Author: Dr. Tesfaye Ertebo | | | |
| Soil Type: Fluvic Cambisols (CMfv) | | | | | | | | UTM Reading | | | |
| | | | | | | | | N: 991896 | | | |
| Water Source:- From Sebategna River | | | | | | | | E:191038 | | | |
| | | | | | | | | | | | |
| Rep.No.1 | | Radius (cm):4.5 depth (cm):60 | | Rep. No 2 | | Radius (cm):4.5 depth (cm):60 | | Rep. No 3 | | Radius (cm):4.5 depth (cm):60 | |
| 0 | 0.0 | 90 | | 0 | 0 | 90 | | 0 | | | |
| 1 | 2.0 | 88 | 90 | 1 | 2 | 88 | 90 | 1 | 4 | 86 | 88 |
| 3 | 5.0 | 85 | 87 | 3 | 3 | 87 | 89 | 3 | 7 | 83 | 85 |
| 8 | 7.0 | 83 | 85 | 8 | 4.5 | 85.5 | 87.5 | 8 | 10 | 80 | 82 |
| 18 | 11.0 | 79 | 81 | 18 | 8.5 | 81.5 | 83.5 | 18 | 17 | 73 | 75 |
| 33 | 15.0 | 75 | 77 | 33 | 12.5 | 77.5 | 79.5 | 33 | 24 | 66 | 68 |
| 63 | 21.0 | 69 | 71 | 63 | 19 | 71 | 73 | 63 | 33 | 57 | 59 |
| 93 | 23.0 | 67 | 69 | 93 | 23 | 67 | 69 | 93 | 39 | 51 | 53 |
| 153 | 29.0 | 61 | 63 | 153 | 29 | 61 | 63 | 153 | 47 | 43 | 45 |
| 213 | 32.5 | 57.5 | 59.5 | 213 | 34 | 56 | 58 | 213 | 51 | 39 | 41 |
| 333 | 37.0 | 53 | 55 | 333 | 41 | 49 | 51 | 333 | 57.5 | 32.5 | 34.5 |
| 453 | 40.0 | 50 | 52 | 453 | 46 | 44 | 46 | 453 | 63 | 27 | 29 |
| 633 | 43.0 | 47 | 49 | 633 | 51 | 39 | 41 | 633 | 67 | 23 | 25 |
| 813 | 45.0 | 45 | 47 | 813 | 55 | 35 | 37 | 813 | 70 | 20 | 22 |
| 1053 | 48.0 | 42 | 44 | 1053 | 59 | 31 | 33 | 1053 | 72 | 18 | 20 |
| 1293 | 50.0 | 40 | 42 | 1293 | 62.5 | 27.5 | 29.5 | 1293 | 75 | 15 | 17 |
| 1593 | 52.0 | 38 | 40 | 1593 | 65.5 | 24.5 | 26.5 | 1593 | 78 | 12 | 14 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

K1= 0.88 mday-1 K2= 1.32 mday-1 K3=1.99 mday-1

$K=1.15r[\text{Log}(h(ti+r/2)-\text{Log } h(tn+r/2)]*864 / tn-ti$ Average K= 1.4m/day

| HYDRAULIC CONDUCTIVITY MEASUREMENT FORM | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Profile No DB: 78 Date: | | | | | | | | Author: Dr. Tesfaye Ertebo | | | |
| Soil Type: Orthidystric Nitisols (NRdyo) | | | | | | | | UTM Reading | | | |
| | | | | | | | | N: 991975 | | | |
| Water Source:- From Burka Anane | | | | | | | | E: 184396 | | | |
| | | | | | | | | | | | |
| Rep.No.1 | | Radius (cm):4.5 depth (cm):60 | | Rep. No 2 | | Radius (cm):4.5 depth (cm):60 | | Rep. No 3 | | Radius (cm):4.5 depth (cm):90 | |
| 0 | 0 | 90 | | 0 | 2 | 88 | 90 | 0 | | | |
| 1 | 2 | 88.0 | 90.0 | 1 | 3 | 87 | 89 | 1 | 1 | 89 | 91 |
| 3 | 4 | 86.0 | 88.0 | 3 | 3.5 | 86.5 | 88.5 | 3 | 2 | 87 | 89 |
| 8 | 5 | 85.0 | 87.0 | 8 | 4 | 86 | 88 | 8 | 2.5 | 87.5 | 89.5 |
| 18 | 7 | 83.0 | 85.0 | 18 | 6 | 84 | 86 | 18 | 3.5 | 86.5 | 88.5 |
| 33 | 15 | 75.0 | 77.0 | 33 | 9 | 81 | 83 | 33 | 12 | 78 | 80 |
| 63 | 22 | 68.0 | 70.0 | 63 | 13 | 77 | 79 | 63 | 20 | 70 | 72 |
| 93 | 28 | 62.0 | 64.0 | 93 | 16 | 74 | 76 | 93 | 25 | 65 | 67 |
| 153 | 33 | 57.0 | 59.0 | 153 | 21 | 69 | 71 | 153 | 29 | 61 | 63 |
| 213 | 39 | 51.0 | 53.0 | 213 | 25 | 65 | 67 | 213 | 35 | 55 | 57 |
| 333 | 47 | 43.0 | 45.0 | 333 | 32 | 58 | 60 | 333 | 42 | 48 | 50 |
| 453 | 52 | 38.0 | 40.0 | 453 | 37 | 53 | 55 | 453 | 46 | 44 | 46 |
| 633 | 60 | 30.0 | 32.0 | 633 | 42.5 | 47.5 | 49.5 | 633 | 51 | 39 | 41 |
| 813 | 64 | 26.0 | 28.0 | 813 | 46.5 | 43.5 | 45.5 | 813 | 55 | 35 | 37 |
| 1053 | 70 | 20.0 | 22.0 | 1053 | 50 | 40 | 42 | 1053 | 59 | 31 | 33 |
| 1293 | 75 | 15.0 | 17.0 | 1293 | 53 | 37 | 39 | 1293 | 63.5 | 26.5 | 28.5 |
| 1593 | 79 | 11.0 | 13.0 | 1593 | 56.5 | 33.5 | 35.5 | 1593 | 66.5 | 23.5 | 25.5 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

K1= 2.10 mday-1 K2= 1.00 mday-1 K3=1.38 mday-1

$$K=1.\frac{15r[Log(h(ti+r/2)-Logh(tn+r/2)]*864}{tn-ti}$$

Average K= 1.5m/day

| HYDRAULIC CONDUCTIVITY MEASUREMENT FORM | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Profile No DP83 Date : 30609 | | | | | | | | Author: Dr. Tesfaye Ertebo | | | |
| Soil Type: Mesotrophic Vertisols (VRsm) | | | | | | | | UTM Reading | | | |
| | | | | | | | | N: 9992161 | | | |
| Water Source: From Burka Ananee River | | | | | | | | E: 183590 | | | |
| | | | | | | | | | | | |
| Rep. 1 | | Radius (cm):4.5 depth (cm):90 | | Rep. 2 | | Radius (cm):4.5 depth (cm):90 | | Rep. 3 | | Radius (cm):4.5 depth (cm):90 | |
| t (sec) | h'(t') cm | h'(t') cm | h'(t') +r/2cm | t (sec) | h'(t') cm | h'(t') cm | h'(t') +r/2cm | t (sec) | h'(t') cm | h'(t') cm | h'(t') +r/2cm |
| 0 | 0 | 90 | | 0 | 0 | 90 | | 0 | 0 | 90 | |
| 1 | 2 | 88 | 90 | 1 | 2 | 88 | 90.0 | 1 | 2 | 88 | 90 |
| 3 | 3 | 87 | 89 | 3 | 3.5 | 86.5 | 88.5 | 3 | 4 | 86 | 88 |
| 8 | 3 | 87 | 89 | 8 | 4 | 86 | 88.0 | 8 | 5 | 85 | 87 |
| 18 | 3.5 | 86.5 | 88.5 | 18 | 4.25 | 85.75 | 87.8 | 18 | 5 | 85 | 87 |
| 33 | 3.5 | 86.5 | 88.5 | 33 | 5 | 85 | 87.0 | 33 | 6.5 | 83.5 | 85.5 |
| 63 | 4 | 86 | 88 | 63 | 5.75 | 84.25 | 86.3 | 63 | 7.5 | 82.5 | 84.5 |
| 93 | 5 | 85 | 87 | 93 | 7 | 83 | 85.0 | 93 | 9 | 81 | 83 |
| 153 | 6 | 84 | 86 | 153 | 8 | 82 | 84.0 | 153 | 10 | 80 | 82 |
| 213 | 7 | 83 | 85 | 213 | 8.75 | 81.25 | 83.3 | 213 | 10.5 | 79.5 | 81.5 |
| 333 | 8 | 82 | 84 | 333 | 9.75 | 80.25 | 82.3 | 333 | 11.5 | 78.5 | 80.5 |
| 453 | 8.5 | 81.5 | 83.5 | 453 | 10.25 | 79.75 | 81.8 | 453 | 12 | 78 | 80 |
| 633 | 9 | 81 | 83 | 633 | 10.75 | 79.25 | 81.3 | 633 | 12.5 | 77.5 | 79.5 |
| 813 | 9.5 | 80.5 | 82.5 | 813 | 11.25 | 78.75 | 80.8 | 813 | 13 | 77 | 79 |
| 1053 | 10 | 80 | 82 | 1053 | 11.5 | 78.5 | 80.5 | 1053 | 13 | 77 | 79 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

K1= 0.15 mday-1 K2= 0.18 mday-1 K3= 0.21 mday-1

$$K=1.15r\frac{[Log(h(ti+r/2)-Logh(tn+r/2)]*864}{tn-ti}$$

Average K=0.18m/day

| HYDRAULIC CONDUCTIVITY MEASUREMENT FORM | |
|---|---|
| Profile No DB: 86 Date | Author: Dr. Tesfaye Ertebo |
| Soil Type: Hyperferric Acrisols (ACfrh) | UTM Reading |
| | N: 994740 |
| Water Source:- Burka Ananee | E: 184436 |

| Rep.No.1 | | Radius (cm):4.5 depth (cm):90 | | Rep. No 2 | | Radius (cm):4.5 depth (cm):90 | | Rep. No 3 | | Radius (cm):4.5 depth (cm):90 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 2 | 88 | 90 | 0 | 6 | 84 | 86 | 0 | 2 | 88 | 90 |
| 1 | 5 | 85 | 87 | 1 | 10 | 80.0 | 82 | 1 | 7 | 83 | 85 |
| 3 | 7 | 83 | 85 | 3 | 12 | 78.0 | 80 | 3 | 11 | 79 | 81 |
| 8 | 9 | 81 | 83 | 8 | 15 | 75.0 | 77 | 8 | 15 | 75 | 77 |
| 18 | 13 | 77 | 79 | 18 | 19 | 71.0 | 73 | 18 | 20 | 70 | 72 |
| 33 | 17 | 73 | 75 | 33 | 25 | 65.0 | 67 | 33 | 28 | 62 | 64 |
| 1.03 | 21.5 | 68.5 | 70.5 | 1.03 | 32.5 | 57.5 | 59.5 | 1.03 | 41 | 49 | 51 |
| 1.33 | 20.5 | 69.5 | 71.5 | 1.33 | 39.5 | 50.5 | 52.5 | 1.33 | 48 | 42 | 44 |
| 2.33 | 33.5 | 56.5 | 58.5 | 2.33 | 48.5 | 41.5 | 43.5 | 2.33 | 54 | 36 | 38 |
| 3.33 | 37.5 | 52.5 | 54.5 | 3.33 | 55.5 | 34.5 | 36.5 | 3.33 | 56 | 34 | 36 |
| 5.33 | 45 | 45 | 47 | 5.33 | 65.5 | 24.5 | 26.5 | 5.33 | 69 | 21 | 23 |
| 7.33 | 50.5 | 39.5 | 41.5 | 7.33 | 72 | 18.0 | 20 | 7.33 | 74.5 | 15.5 | 17.5 |
| 10.33 | 56 | 34 | 36 | 10.33 | 79.5 | 10.5 | 12.5 | | | | |
| 13.33 | 60.5 | 29.5 | 31.5 | 13.33 | 86.5 | 3.5 | 5.5 | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

REMARKS: No pre-wetting

K1= 2.22 mday-1 K2=5.83 mday-1 K3=0.81 mday-1

$$K=1.\frac{15r[Log(h(ti+r/2)-Logh(tn+r/2)]*864}{tn-ti}$$

Average K= 2.95m/day

| HYDRAULIC CONDUCTIVITY MEASUREMENT FORM | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Profile no DB: 90 | | | | | | | | Author: Dr. Tesfaye Ertebo | | | |
| Soil Type : Hyperferric Acrisols (ACfrh) | | | | | | | | UTM Reading | | | |
| | | | | | | | | N: 994577 | | | |
| Water Source:- Burka Annanee | | | | | | | | E: 181927 | | | |
| | | | | | | | | | | | |
| Rep.No.1 | | Radius (cm):4.5 depth (cm):60 | | Rep. No 2 | | Radius (cm):4.5 depth (cm):60 | | Rep. .No 3 | | Radius (cm):4.5 depth (cm):60 | |
| 0 | | 90 | | 0 | 0 | 90 | | 0 | 0 | 90 | |
| 1 | 2 | 88 | 90 | 1 | 2 | 88 | 90 | 1 | 2 | 88 | 90 |
| 3 | 7 | 83 | 85 | 3 | 5 | 85 | 87 | 3 | 3.5 | 86.5 | 88.5 |
| 8 | 11 | 79 | 81 | 8 | 8.5 | 81.5 | 83.5 | 8 | 4.5 | 85.5 | 87.5 |
| 18 | 21 | 69 | 71 | 18 | 11 | 79 | 81 | 18 | 5 | 85 | 87 |
| 33 | 28 | 62 | 64 | 33 | 13 | 77 | 79 | 33 | 6 | 84 | 86 |
| 63 | 39 | 51 | 53 | 63 | 19 | 71 | 73 | 63 | 7.5 | 82.5 | 84.5 |
| 93 | 46.5 | 43.5 | 45.5 | 93 | 23.5 | 66.5 | 68.5 | 93 | 9 | 81 | 83 |
| 153 | 53.5 | 36.5 | 38.5 | 153 | 29.5 | 60.5 | 62.5 | 153 | 11 | 79 | 81 |
| 213 | 59.1 | 30.9 | 32.9 | 213 | 34.5 | 55.5 | 57.5 | 213 | 13.5 | 76.5 | 78.5 |
| 333 | 64.1 | 25.9 | 27.9 | 333 | 41.5 | 48.5 | 50.5 | 333 | 14.5 | 75.5 | 77.5 |
| 453 | 67.5 | 22.5 | 24.5 | 453 | 46.5 | 43.5 | 45.5 | 453 | 18.5 | 71.5 | 73.5 |
| 633 | 72 | 18 | 20 | 633 | 53 | 37 | 39 | 633 | 20.5 | 69.5 | 71.5 |
| | | | | 813 | 57 | 33 | 35 | 813 | 23 | 67 | 69 |
| | | | | 1053 | 62.5 | 27.5 | 29.5 | 1053 | 25 | 65 | 67 |
| | | | | 1293 | 64.4 | 25.6 | 27.6 | 1293 | 28.5 | 61.5 | 63.5 |
| | | | | 1593 | 69.3 | 20.7 | 22.7 | 1593 | 30.5 | 59.5 | 61.5 |
| | | | | | | | | 2633 | 33.5 | 56.5 | 58.5 |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

REMARKS:

Cultivated land used for sorghum cultivation, pre-wetting was done 1 day ago.

K1= 4.10 mday-1 K2= 1.50 mday-1 K3= 0.28 mday-1

$$K=1.15r[\text{Log}(h(ti+r/2)-\text{Log } h(tn+r/2)]*864 \over tn-ti$$

Average K= 1.96m/day

# APPENDIX 5C: EXCHANGEABLE ACIDITY RESULTS OF SELECTED SOIL SAMPLES

Appendix 5C : Exchangeable Acidity Test Results for Selected Soil Samples which have pH less than 5

| No | Profile Pit & Depth | | Av. P | K | Ca | Mg | Al+H | CEC | BSP | Exchange. | pH | OC | Tenure % | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N0 | (cm.) | ppm | meq/100gm soil | | | | | % | Acidity % | H2O | % | Clay | Class |
| 1 | DP1 | 20-62 | Trace | 0.14 | 6.4 | 2.7 | 0.77 | 23.8 | 39.8 | 7.7 | 4.8 | 1.2 | 58.1 | clay |
| 2 | DP7 | 0-17 | 3.0 | 0.7 | 11.6 | 5.4 | 0.36 | 39.0 | 45.9 | 2.0 | 5.0 | 2.3 | 39.2 | C.L |
| 3 | DP7 | 17-64 | 2.0 | 0.3 | 3.6 | 0.9 | 1.57 | 32.6 | 15.2 | 24.7 | 4.3 | 1.8 | 61.1 | Clay |
| 4 | DP10 | 15-35 | 1.7 | 0.2 | 5.4 | 1.8 | 1.49 | 10.2 | 73.9 | 16.8 | 4.9 | 1.5 | 48.0 | clay |
| 5 | DP11 | 16-46 | 0.7 | 0.1 | 5.4 | 1.8 | 0.92 | 21.9 | 34.3 | 11.2 | 4.7 | 2.0 | 47.0 | clay |
| 6 | DP12 | 14-35 | 1.0 | 0.2 | 7.2 | 0.9 | 0.54 | 24.8 | 34.0 | 6.1 | 4.9 | 2.3 | 47.6 | clay |
| 7 | DP13 | 0-17 | 5.9 | 0.4 | 9.9 | 1.8 | 0.45 | 38.0 | 32.2 | 3.6 | 5.0 | 3.5 | 25.7 | Loam |
| 8 | Dp17 | 15-37 | 4.3 | 0.4 | 6.3 | 1.8 | 0.85 | 31.4 | 27.4 | 9.1 | 4.6 | 2.8 | 71.4 | clay |
| 9 | DP18 | 0-20 | 6.6 | 0.6 | 9.0 | 3.6 | 0.36 | 36.8 | 36.5 | 2.6 | 4.9 | 3.3 | 50.5 | clay |
| 10 | DP18 | 20-42 | 3.3 | 0.3 | 7.2 | 1.8 | 2.39 | 33.9 | 27.9 | 20.4 | 4.6 | 2.6 | 55.0 | clay |
| 11 | Dp20 | 12-35 | 1.7 | 0.2 | 3.6 | 0.9 | 1.55 | 31.7 | 15.3 | 24.7 | 4.8 | 2.2 | 45.3 | clay |
| 12 | DP22 | 0-15 | 4.7 | 0.6 | 6.3 | 1.8 | 0.29 | 25.3 | 34.9 | 3.2 | 4.8 | 2.6 | 44.5 | clay |
| 13 | DP22 | 15-30 | 1.4 | 0.3 | 3.6 | 0.9 | 1.42 | 25.3 | 20.1 | 22.9 | 4.8 | 2.2 | 34.3 | Sancl |
| 14 | DP23 | 15-30 | 3.2 | 0.2 | 6.3 | 2.7 | 2.88 | 34.1 | 27.4 | 24.0 | 4.8 | 1.5 | 52.4 | clay |
| 15 | DP27 | 0-17 | 4.2 | 0.2 | 4.6 | 1.8 | 0.77 | 22.8 | 29.8 | 10.5 | 4.8 | 2.7 | 38.4 | Cl |
| 16 | DP27 | 17-40 | 2.4 | 0.1 | 2.7 | 0.9 | 1.42 | 24.8 | 16.0 | 27.3 | 4.7 | 2.0 | 44.7 | clay |
| 17 | DP31 | 18-43 | 1.3 | 0.7 | 6.3 | 6.3 | 1.57 | 37.8 | 36.0 | 10.5 | 4.9 | 2.6 | 62.5 | clay |
| 18 | DP38 | 14-36 | 0.6 | 0.2 | 4.5 | 2.7 | 1.45 | 28.7 | 26.3 | 16.5 | 4.8 | 3.0 | 38.8 | Cl |
| 19 | DP50 | 19-50 | 0.3 | 0.2 | 2.7 | 1.8 | 1.65 | 19.2 | 25.5 | 26.0 | 4.7 | 1.9 | 46.9 | clay |
| 20 | DP52 | 20-43 | 1.4 | 0.1 | 2.7 | 0.9 | 3.26 | 23.6 | 16.9 | 46.5 | 4.7 | 3.1 | 22.0 | Sal |
| 21 | DP54 | 13-40 | 3.3 | 0.1 | 4.5 | 1.8 | 1.45 | 20.0 | 33.0 | 18.4 | 4.8 | 2.6 | 42.7 | clay |
| 22 | DP58 | 0-17 | 4.5 | 1.3 | 26.0 | 3.6 | 1.80 | 43.8 | 70.9 | 5.5 | 4.5 | 3.1 | 44.3 | clay |
| 23 | Dp77 | 0-17 | 3.6 | 0.2 | 9.8 | 3.6 | 0.12 | 29.0 | 47.5 | 0.9 | 5.4 | 4.4 | 53.6 | clay |
| 24 | DP78 | 18-43 | 0.9 | 0.2 | 3.6 | 2.7 | 1.26 | 27.3 | 24.3 | 16.3 | 4.8 | 2.4 | 59.6 | clay |
| 25 | DP79 | 0-10 | 6.1 | 0.3 | 4.5 | 2.7 | 0.89 | 22.4 | 33.9 | 10.7 | 4.7 | 3.7 | 40.4 | Sac |
| 26 | DP79 | 10-43 | 2.8 | 0.1 | 2.7 | 1.8 | 3.37 | 8.3 | 57.3 | 42.4 | 4.9 | 2.4 | 40.7 | clay |
| 27 | DP80 | 15-40 | 1.8 | 0.1 | 3.6 | 0.9 | 3.39 | 29.2 | 16.2 | 42.5 | 4.9 | 2.6 | 39.0 | Cl |
| 28 | DP81 | 13-35 | 1.5 | 0.1 | 3.6 | 0.9 | 1.45 | 14.9 | 32.5 | 23.6 | 4.9 | 1.7 | 42.1 | Sac |
| 29 | DP82 | 15-37 | 0.9 | 0.1 | 2.7 | 1.8 | 1.46 | 21.6 | 22.2 | 24.0 | 5.0 | 2.8 | 36.7 | Sacy |
| 30 | DP83 | 0-23 | 9.2 | 0.4 | 21.7 | 8.1 | 1.88 | 51.6 | 59.0 | 5.9 | 5.5 | 4.6 | 47.4 | clay |
| 31 | DP84 | 12-40 | 0.9 | 0.1 | 2.7 | 2.7 | 0.73 | 11.3 | 49.9 | 11.7 | 4.9 | 2.4 | 74.6 | clay |
| 32 | DP86 | 0-16 | 4.5 | 0.1 | 5.4 | 3.6 | 0.69 | 29.2 | 31.7 | 7.0 | 4.9 | 4.0 | 54.3 | clay |
| 33 | DP86 | 16-42 | 0.6 | 0.1 | 3.6 | 0.9 | 2.80 | 23.4 | 20.1 | 38.0 | 4.9 | 2.1 | 56.5 | clay |
| 34 | DP90 | 12-70 | 2.1 | 0.1 | 1.8 | 0.9 | 5.87 | 27.8 | 10.6 | 67.7 | 4.6 | 2.7 | 24.2 | SiL |
| 35 | DP93 | 0-13 | 4.4 | 0.2 | 4.6 | 1.8 | 1.26 | 23.8 | 28.2 | 16.1 | 4.5 | 3.6 | 15.4 | SaL |

| No | Profile Pit & Depth | | Av. P | K | Ca | Mg | Al+H | CEC | BSP | Exchange. | pH | OC | Tenure % | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N0 | (cm.) | ppm | meq/100gm soil | | | | | % | Acidity % | H2O | % | Clay | Class |
| 36 | DP94 | 14-38 | 27.6 | 0.1 | 1.8 | 0.9 | 2.06 | 14.2 | 20.7 | 42.1 | 4.6 | 2.0 | 45.6 | clay |
| 37 | DP96 | 0-16 | 2.9 | 0.3 | 9.9 | 3.6 | 0.04 | 24.1 | 58.4 | 0.3 | 5.8 | 3.6 | 21.7 | Sacl |
| 38 | DP100 | 15-40 | 8.2 | 0.1 | 2.7 | 1.8 | 1.65 | 19.7 | 24.2 | 26.2 | 5.0 | 2.8 | 40.0 | clay |
| 39 | DP104 | 10-30 | 22.3 | 0.1 | 6.3 | 3.6 | 0.68 | 31.9 | 31.9 | 6.3 | 5.4 | 2.9 | 43.0 | clay |
| 40 | DP110 | 0-21 | 15.0 | 0.3 | 13.4 | 4.5 | 0.77 | 42.9 | 43.1 | 4.0 | 4.7 | 4.3 | 11.3 | Loam |

# APPENDIX 5D: DESCRIPTION OF ALL PROFILE PITS & LABORATORY RESULTS

## APPENDIX 5D1: DESCRIPTIONS OF ALL PROFILE PITS

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP1 | Map Sheet: 0836A1 |
| Location: East of Illuharar Town | Region: Oromiya, Zone: Illuababora: Wereda Chewaka | |
| Mapping Unit: G1b-1 | | |
| Author: Zelealem S/Mariam | Date: 07/05/09 | |
| *FAO - Soil Type: Orthidystric Nitisols (NTdyo)* | Coordinate (UTM): | *N: 989017* |
| Agro-Climatic Zone: Kolla | Elevation (m):1246 | *E: 185993* |
| Land form: Upper part of gently undulating plain with convex interfluves | Slope Class: Sloping | Slope: Position Medium |
| Slope Aspect: North-South | *Slope Length: 1km* | Slope Form: Convex |
| Micro- Topography: Termite | Coverage: 2% | |
| Parent Material: Volcanic ash/Coluvial | Soil depth cm: 200 | *Rock outcrop:* |
| *Surface Fragment coverage:* | Surface Crack: | *Sealing:* |
| Flooding: None | Water table cm: >200 | |
| Drainage - External *Well* | Internal: Well drained | |
| Human influence: 5years ago cultivation | | Moisture condition: Moist |
| Land Cover: Predominantly Cultivated Land | | |
| Land Use: Rain fed arable cultivation | | |
| Major Crop Type: | Fertilizer Type: | |
| Type of erosion: Sheet & Splash Erosion | Area Affected: 5-10% | |
| Activity: At present | Degree of dissection: Slight /Moderate | |

Remarks: Suitable area for irrigation development.

0-20cm: Dark reddish brown (5YR3/4)) color moist, loam texture, moderate, medium to coarse, sub-angular block structure, slightly hard dry, slightly stick /slightly plastic, consistency when wet, weakly cemented, nodular, clay cementation, few to common, fine to medium roots and few to common, fine to medium pores.

20-62cm: Red (2.5YR4/6) color moist, clay loam texture, moderate, medium, sub-angular block structure, slightly hard dry, stick / plastic consistency, weakly cemented, nodular, clay cementation, common, medium roots and common medium) pores.

62-140cm: Red (2.5YR4/8) color moist, clay loam texture, weak, coarse, sub-angular block structure, hard/ firm, dry, stick / plastic consistency wet, common, medium roots and common, medium pores.

140-200cm: Dark red (2.5YR3/6) color moist, clay loam texture, weak, medium, granular structure, very firm when dry slightly stick/slightly plastic consistency wet, few, medium to fine root and few, medium pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP2 | Map Sheet: 0836A1 |
| Location: N-W of ILLUHARAR | Region: Oromiya, Zone: Illuababora, | Wereda: Chewaka |
| Mapping Unit: G2d-2 | | |
| Author: Zelealem S/Mariam | Date: 07/05/09 | |
| FAO - Soil Type: Rhodic Nitisols (NTro) | Coordinate (UTM) | N: 989140 |
| Agro-Climatic Zone: Kolla | Elevation (m) 1248 | E:186500 |
| Land form: Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Gently slope | Slope: Position: Medium |
| Slope Aspect: South-North | Slope Length: 1.5km | Slope Form: Uniform |
| Micro - Topography: Termite | Coverage %: | |
| Parent Material : | Soil depth cm: 180 | Rock/ outcrop |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm:>180 | |
| Drainage - External Well | Internal: Well drained | |
| Human influence: Vegetation disturbed/Clearing | | Moisture condition: Moist |
| Land Cover: Predominantly cultivated | | |
| Land Use: Rain fed arable cultivation | | |
| Major Crop Type: sorghum, maize, rice, sesame | Fertilizer Type: Applies for maize | |
| Type of erosion: Sheet & splash erosion | Area Affected:10-25% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks:

0-15cm: Dark reddish brown (5YR3/4) color moist, loam texture, moderate, coarse, granular structure, slightly hard dry, slightly stick/slightly plastic dry, wet consistency, few, fines roots, many to common pores.

15-41cm: Red (2.5YR4/6) color moist, clay texture, strong, medium to coarse, sub-angular block structure, firm, stick / plastic moist, wet consistency, few, fine roots and few, fine pores.

41-92cm: Dark red (2.5YR3/6) color moist, clay texture, strong, medium to coarse, sub-angular block moist, wet consistency, moderately cemented, platy, clay cementation, few, fine roots and few, fine pores.

92-180cm: Dark red (2.5YR3/6) color moist, clay loam texture, strong, coarse, sub-angular block structure, firm, stick/plastic moist, wet consistency, moderately cemented, platy, clay cementation.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP3 | Map Sheet: 0836A1 |
| Location: N-W of ILLUHARAR | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author: Zelealem S/Mariam | Date: 07/05/09 | |
| FAO - Soil Type: Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 987085 |
| Agro-Climatic zone: Kolla | Elevation (m): 1253/1257 | E: 186469 |
| Land form: Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Strongly sloping | Slope: Position : Medium |
| Slope Aspect: West-East | Slope Length: 1km | Slope Form: Convex |
| Micro - Topography: Termite | Coverage %: 3 | |
| Parent Material : Volcanic ash/Coluvial deposit | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage: | Surface Crack: | Sealing: |
| Flooding | Water table cm: >200 | |
| Drainage - External Well | Internal – Well drained | |
| Human influence: New settlement | | Moisture condition: Moist |
| Land Use: Rain fed arable cultivation | | |
| Land cover: Predominantly cultivated | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected: 5-10% | |
| Activity: Active at present | Degree of dissection: Slight to medium | |

Remarks:

0-30cm: Dark reddish brown (5YR3/4) color moist, loam texture, weak, medium to coarse, sub-angular block structure, firm dry, slightly stick /slightly plastic consistency wet, patchy /broken, distinct, pressure faces cutanic feature, few to common, medium to fine roots, and many few to medium pores.

30-113cm: Red (2.5YR4/6) color moist, clay loam texture, moderate, medium to fine, sub-angular block structure, firm dry, stick / plastic consistency when wet, few, fine roots, very few, medium to coarse pores.

113-200cm: Dark reddish brown (5YR3/4) color moist, clay loam texture, moderate, medium to coarse, sub-angular block structure, firm dry, stick /plastic consistency when wet, few, fine roots and very few, coarse pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP4 | Map Sheet: 0836A1 |
| Location: E of ILLUHARA | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: V1b-3 | | |
| Author: Zelealem S/Mariam | Date: 06/05/09 | |
| FAO -Soil Type: Mesotrophic Verisols (VRsm) | Coordinate (UTM) | N: 986213 |
| Agro-Climatic zone: Kolla | Elevation (m): 1227 | E: 188406 |
| Land form: Seasonally wet valley floor | Slope Class: Level | Slope: Position : Lowest |
| Slope Aspect: East-West | Slope Length: 2km | Slope Form: Uniform |
| Micro- Topography: Medium giligai / High gili | Coverage %: 80 | |
| Parent Material: Alluvial | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage: | Surface Crack: | Sealing: |
| Flooding | Water table cm: >200 | |
| Drainage - External Poorly drained | Internal –Slow | |
| Human influence: | | Moisture condition: |
| Land Cover : Open grass land /Perennial swamp | | |
| Land Use: Animal production | | |
| Major Crop Type: Grass land | Fertilizer Type | |
| Type of erosion : | Area Affected: | |
| Activity : | Degree of dissection: | |

Remarks:

0-14cm: Dark brown (10YR3/3) color moist, common, yellowish red, faint to distinct mottle, clay texture, strong, medium to coarse structure and angular/pores.

14-61cm: Dark brown (7.5YR4/2) color moist, many, yellowish red, distinct/prominent mottle, clay texture.

61-114cm: Grayish brown (10YR5/2) color moist, many, yellowish red, prominent mottle, clay texture, few, fine coarse fragment, strong, coarse, sub-angler block structure, stick/plastic consistence when wet, moderately cemented, platy, clay cementation.

114-200cm: Grayish brown (10YR5/2) color moist, many, yellow, prominent mottle, clay texture, few, fine coarse fragment, strong, coarse, sub-angler block structure, stick/plastic consistence when wet, moderately cemented, platy clay cementation.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP5 | Map Sheet: 0836A1 |
| Location: E of ILLUHARAR | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author: Zelealem S/Mariam | Date: 07/05/09 | |
| FAO -Soil Type: Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | *N: 986200* |
| Agro-Climatic zone: Kolla | Elevation (m): 1247 | *E:187760* |
| Land form: Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Strongly sloping | Slope: Position : Medium |
| Slope Aspect: W-E | *Slope Length: 600m* | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %:3 | |
| Parent Material : | Soil depth cm: 178 | *Rock outcrop:* |
| *Surface Fragment coverage :* | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. :>178 | |
| Drainage - External *Well* | Internal –Well drained | |
| Human influence: New Settlement | | Moisture condition: Moist |
| Land Cover: Predominantly cultivated | | |
| Land Use Rain fed arable cultivation | | |
| Major Crop Type: sorghum | Fertilizer Type | |
| Type of erosion: Sheet & Slash erosion | Area Affected : 5-10% | |
| Activity : Active at present | Degree of dissection: Slightly to medium | |

Remarks:

0-19cm: Dark reddish brown (5YR3/4) color moist, clay texture, strong, medium to coarse, sub-angler block structure, hard dry, stick/plastic consistency when wet, few to common, fine to medium roots and common, fine to medium pores.

19-46cm: Dark red (2.5 YR3/6) color moist, clay texture, strong, coarse, sub-angler block structure, firm dry, stick/plastic consistency when wet, few, fine roots and few, fine pores.

46-178cm: Red (2.5YR4/8) color moist, clay texture, few to common, fine coarse fragment, strong, medium to coarse, sub-angler block structure, firm dry, stick/plastic consistency when wet, very few, fine roots and few, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP6 | Map Sheet: 0836A1 |
| Location: S of ILLUHARAR | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author: Zelealem S/Mariam | Date: 08/05/09 | |
| FAO -Soil Type : Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 983053 |
| Agro-Climatic zone: Kolla | Elevation (m):1255 | E: 188355 |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Strongly sloping | Slope: Position : Medium |
| Slope Aspect: E -W | Slope Length: 200m | Slope Form: Convex |
| Micro - Topography: Termite | Coverage %: | |
| Parent Material : Volcanic ash /Colluvial deposition | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>200 | |
| Drainage - External Well | Internal – Well drained | |
| Human influence: New settlement area | | Moisture condition: Moist |
| Land Cover: Predominantly cultivated | | |
| Land Use: Rain fed arable cultivation | | |
| Major Crop Type: sorghum | Fertilizer Type | |
| Type of erosion: Sheet & Splash erosion | Area Affected: 10-25% | |
| Activity: Active at present | Degree of dissection: Slightly /Medium | |

Remarks: New scattered villages are constructed in site .To the west there is perennial stream

0-30cm: Dark brown (7.5YR3/4) color moist, loam texture, weak, medium, sub-angler block structure, firm dry, stick/plastic consistency when wet, few to many roots and common, medium/fine pores.

30-80cm: Strong brown (7.5YR4/5) color moist, clay loam texture, moderate, medium sub-angler block structure, firm dry, stick/ plastic consistency when wet, few, fine roots and few, fine pores.

80-160cm: Reddish brown (5YR4/4) color moist, clay loam texture, moderate, coarse to medium, sub-angler block structure, firm dry, stick/plastic consistency when wet, weakly cementation, platy, clay cementation, few, fine roots and, few, fine pores.

160-200cm: Yellowish red (5YR4/6) color moist, few to common, yellow, distinct to faint mottle, clay loam texture, moderate, coarse sub-angler block structure, firm dry, stick/plastic consistency when wet

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP7 | Map Sheet: 0836A1 |
| Location: E of ILLUHARAR | Region: Oromiya, Zone: Illuababora, | Wereda: Chewaka |
| Mapping Unit: G2d-1 | | |
| Author: Zelealem S/Mariam | Date: 07/05/09 | |
| FAO - Soil Type: Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 986572 |
| Agro-Climatic zone: Kolla | Elevation (m):1250 | E: 187660 |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Very gently slope | Slope: Position : Medium |
| Slope Aspect: E-W | Slope Length: 3km | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %:1 | |
| Parent Material: Volcanic ash | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage: | Surface Crack: | Sealing: |
| Flooding | Water table cm : >200 | |
| Drainage - External Well | Internal – Well drained | |
| Human influence: | | Moisture condition: Moist |
| Land Cover: Predominantly cultivated | | |
| Land Use: Rain fed arable cultivation | | |
| Major Crop Type: sorghum, rice, haricot bean, Sesame | Fertilizer Type | |
| Type of erosion: Sheet & Splash erosion | Area Affected: 5-10cm | |
| Activity: Active at present | Degree of dissection:Slight | |

Remarks: For maize only they apply fertilizer. In the area there are new villages.

0-17cm: Dark reddish brown (5YR3/4) color moist, loam texture, strong, coarse, sub-angle block structure, slightly hard dry, slightly stick/slightly plastic consistency when wet, few, medium to fine roots and many, medium to fine pores.

17-64cm: Red (2.5Y 4/6) color moist, clay loam texture, moderate, coarse, sub-angle block structure, stick/ plastic consistency when wet, very few, fine, roots and common to many, medium to fine pores.

64-200cm: Red (2.5YR4/8) color moist, clay texture, moderate coarse, sub-angle block structure, stick/plastic consistency wet, common, fine pores

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP8 | Map Sheet: 0836A1 |
| Location: S-E of ILLUHARAR | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author: Zelealem S/Mariam | Date: 07/05/09 | |
| FAO -Soil Type: Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 982376 |
| Agro-Climatic zone: Kolla | Elevation (m) :1256 | E: 188111 |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Strongly sloping | Slope: Position : |
| Slope Aspect: W-E | Slope Length: 400m | Slope Form: Convex |
| Micro - Topography: | Coverage %: | |
| Parent Material: Volcanic ash | Soil depth cm: 70 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>70 | |
| Drainage - External Well | Internal – Well drained | |
| Human influence: New settlement | | Moisture condition: Moist |
| Land Cover : Predominantly cultivated | | |
| Land Use: Rain fed arable cultivation | | |
| Major Crop Type: sorghum, maize | Fertilizer Type | |
| Type of erosion: Sheet & Splash erosion | Area Affected: 10-25% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: The area is cultivated land and currently it is prepared for sowing maize & sorghum.

0-20cm: Dark brown (7.5YR 3/2) color moist, loam texture, few to many, fine to medium coarse fragment, weak, medium to coarse, angular structure, slightly hard dry, slightly stick/slightly plastic consistency when wet, common to fine, medium to coarse roots and many, medium to fine pores.

20-70cm: Dark brown (7.5YR 3/4) color moist, loam texture, common, coarse gravel to stone coarse fragment, weak, fine to coarse, angular block structure, slightly stick/slightly plastic consistency when wet few, fine to medium roots and many, medium to fine pores

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP9 | Map Sheet: 0836A1 |
| Location: S-E of ILLUHARAR | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: V1b-3 | | |
| Author:- Zelealem S/M | Date: 08/05/09 | |
| FAO -*Soil Type: Mesotrophic Verisols (VRms)* | Coordinate (UTM) | *N: 985410* |
| Agro-Climatic zone : Kolla | Elevation (m): 1227 | *E: 188510* |
| Land form: Seasonally wet valley floor | Slope Class: Nearly level | Slope: Position : Low |
| Slope Aspect: W-E | *Slope Length: 1km* | Slope Form: Uniform |
| Micro - Topography: Low giligai to Medium giligai | Coverage %: 90 | |
| Parent Material Alluvial deposit/Fluvial deposit: | Soil depth cm: 200 | *Rock outcrop:* |
| Surface Fragment coverage : | Surface Crack: Wide to very wide | Sealing: |
| Flooding: During rainy season A/4 | Water table cm. :>200 | |
| Drainage - External Very rapid | Internal – Moderate | |
| Human influence : | | Moisture condition: Moist |
| Land Cover: Seasonal swamp | | |
| Land Use: Animal production | | |
| Major Crop Type : | Fertilizer Type | |
| Type of erosion: | Area Affected: | |
| Activity | Degree of dissection: | |

Remarks: During rainy season it is covered with water and stays for 3-4 months.

0-13cm: Dark brown (7.5YR3/2) color moist, common, yellow, faint mottle, clay texture, moderate, medium to coarse, sub-angler block structure hard dry, stick/plastic consistency when wet, few, fine roots and few, fine pores.

13-46cm: Dark brown (7.5YR4/4) color moist, many, yellow, prominent mottle, clay texture, common to medium, fine coarse fragment, strong, medium to coarse, sub-angler block structure, firm dry stick/plastic consistency when wet cementation, platy, clay cementation, few, black, hard, manganese mineral nodules, very few, fine roots.

46-88cm: Dark brown (7.5YR4/2) color moist, (many, yellow, prominent) mottle, clay texture, common to many, fine coarse fragment, strong, medium to coarse, platy structure, firm dry, stick /plastic consistency wet, cemented, platy, clay cementation, few, black hard, manganese mineral nodules.

88-200cm: Dark grayish brown (10YR4/2) color moist, common, yellow, distinct mottle, clay texture, strong, medium to coarse, platy structure, firm dry, stick /plastic consistency when wet, cemented, platy, clay cementation.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP10 | Map Sheet: 0836A1 |
| Location: E of ILLUHARAR | Region: Oromiya, Zone: Illuababora, | Wereda: Chewaka |
| Mapping Unit: G2d-1 | | |
| Author:- Zelealem S/M | Date: | |
| FAO -Soil Type : Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 985926 |
| Agro-Climatic zone: Kolla | Elevation (m):1233 | E:189422 |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Nearly level | Slope: Position : Lowest |
| Slope Aspect: W-E | Slope Length: 300m | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %:1 | |
| Parent Material: Volcanic ash | Soil depth cm.: 160 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>160 | |
| Drainage - External Well | Internal – Well drained | |
| Human influence: Vegetation disturbed | | Moisture condition: Moist |
| Land Cover: Predominantly cultivated | | |
| Land Use: Rain fed arable cultivation | | |
| Major Crop Type : maize, sorghum, haricot bean | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected: 5-10% | |
| Activity: Active at present | Degree of dissection: Slight to Moderate | |

Remarks: After 100m to the west black vertisols soil start

0-15cm: Dark brown (7.5YR3/4) color moist, clay loam texture, weak, medium to fine, granular structure, very firm dry, slightly stick, slightly plastic consistency when wet, few to common, few to coarse roots and many, fine to medium pores.

15-35cm: Dark brown (7.5YR4/4) color moist, clay texture, moderate, medium, granular structure, firm dry, stick/plastic consistency wet, few, fine roots and common, fine to medium pores.

35-69cm: Dark reddish brown (5YR3/4) color moist, clay texture, moderate, medium, granular structure, firm dry, stick/plastic, consistency wet, very few, fine, common to fine roots and many, fine to medium pores.

69-160cm: Reddish brown (5YR4/4) color moist lay loam texture, weak, medium to fine, granular structure, firm dry slightly stick /slightly plastic consistency wet, few, fine to medium pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP11 | Map Sheet: 0836A1 |
| Location : W of village # 7 | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author: Zelealem S/Mariam | Date: 07/05/09 | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 987921* |
| Agro-Climatic Zone: Kolla | Elevation (m): 1258 | *E:189907* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Very gently slope | Slope: Position : Medium |
| Slope Aspect: E-W | *Slope Length: 1km* | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %:2 | |
| Parent Material: Volcanic ash | Soil depth cm.: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>200 | |
| Drainage - External Well | Internal – Well drained | |
| Human influence : | | Moisture condition: |
| Land Cover: Predominantly cultivated | | |
| Land Use: Rain fed arable cultivation | | |
| Major Crop Type: sorghum, maize | Fertilizer Type | |
| Type of erosion: Sheet & Splash erosion | Area Affected : 5-10% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Scattered settlements are there, 4years back settlements started

0-16cm: Dark brown (7.5YR3/4) color moist, loam texture, weak, medium to coarse, sub-angler block structure, slightly hard dry, stick/plastic consistency when wet few, fine roots and many to common, medium to coarse pores.

16-46cm: Brown (7.5YR4/4) color moist, clay loam texture,(moderate to weak, medium to coarse, sub-angler block structure firm dry stick/plastic consistency, wet very few, fine roots and many, medium to coarse pores.

46-132cm: dark reddish brown (5YR3/3) color moist, clay loam texture, few to coarse, faint coarse fragment, Moderate, medium to coarse, sub-angler block structure, firm dry stick/plastic consistency wet, very few roots and few, fine pores.

132-200cm: Dark reddish brown (5YR3/4 ) color moist, clay loam texture, few, faint coarse fragment, weak to moderate medium to coarse, sub-angler block structure, firm dry slightly stick/slight plastic consistency wet.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP12 | Map Sheet: 0836A1 |
| Location : | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author: Zelealem S/Mariam | Date: 07/05/09 | |
| FAO -*Soil Type: Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 985914* |
| Agro-Climatic zone: Kolla | Elevation (m) :1253 | *E : 190251* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Sloping | Slope: Position : Medium |
| Slope Aspect: N-S | *Slope Length: 300m* | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %: 2 | |
| Parent Material: Volcanic ash | Soil depth cm: 180 | *Rock outcrop:* |
| *Surface Fragment coverage :* | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. :>180 | |
| Drainage - External *Well* | Internal – Well drained | |
| *Human influence : New settlement* | | Moisture condition: Moist |
| Land Cover: Predominantly cultivated | | |
| Land Use: Rain fed arable cultivation | | |
| Major Crop Type: sorghum | Fertilizer Type | |
| Type of erosion: Sheet & Splash erosion | Area Affected: 5-10% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Scattered new settlements are occupied part of the area

0-14cm: Dark brown (7.5YR3/4) color moist, loam texture, weak, medium to coarse, sub-angle block structure, slightly hard dry stick/plastic consistency wet, few to common, fine to medium roots and many, medium to coarse pores

14-35cm: Dark brown (7.5YR4/4) color moist, clay loam texture, weak, medium, sub-angle block structure, firm, stick / plastic consistency wet, few, fine roots and many, fine pores.

35-59cm: Dark reddish brown (5YR3/4) color moist, clay loam texture, moderate, medium, sub-angle block structure, firm dry stick /plastic consistency wet and few, fine pores.

59-180cm: Reddish brown (5YR4/4) color moist, clay loam texture, moderate, medium to coarse sub-angle block structure, firm dry stick/plastic consistency wet and few, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP13 | Map Sheet: 0836A1 |
| Location: S of ILLUHARAR | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- Zelealem S/Mariam | Date: 08/05/09 | |
| FAO -*Soil Type: Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 982797* |
| Agro-Climatic zone: Kolla | Elevation (m):1255 | *E: 188119* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Very gently slope | Slope: Position: Medium |
| Slope Aspect: W-E | Slope Length: 400m | Slope Form: Convex /Uniform |
| Micro- Topography: Termite | Coverage %:1 | |
| Parent Material: Volcanic ash | Soil depth cm: 180 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>180cm | |
| Drainage - External Well | Internal – Well drained | |
| Human influence : | | Moisture condition: |
| Land Cover: Predominantly cultivated | | |
| Land Use: Rain fed arable cultivation | | |
| Major Crop Type: sorghum | Fertilizer Type | |
| Type of erosion: Sheet & Splash erosion | Area Affected: 5-10% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: One year ago fertilizer was applied for maize

0-17cm: Very dusky red (2.5YR2.5/2) color moist, loam texture, moderate, medium to coarse, sub-angle block structure, firm dry, slightly stick/slightly plastic consistency when wet common, medium to fine roots and common to many, medium to coarse pores

17-51cm : Very dusky red (2.5YR2.5/2) color moist, clay loam texture, moderate, medium to coarse, sub-angle block structure, firm dry, stick consistency when wet, few, fine roots and common, medium to fine pores

51-180cm: Dark reddish brown (5YR3/4) color moist, clay loam texture, moderate, medium to coarse, granular structure, firm dry, slightly stick /slightly plastic consistency when wet, few fine roots and few, fine pores

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP14 | Map Sheet: 0836A1 |
| Location: W of village # 7 | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-1 | | |
| Author: Zelealem S/Mariam | Date: 07/05/09 | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 991872* |
| Agro-Climatic zone : kolla | Elevation (m) :1225/23 | *E:189622* |
| Land form : Upper part of gently undulating with convex interfluves | Slope Class: Strongly sloping | Slope: Position : Medium |
| Slope Aspect: E-W | *Slope Length: 700m* | Slope Form: Convex |
| Micro- Topography: Termite | Coverage %:2 | |
| Parent Material : Volcanic ash | Soil depth cm: 102 | Rock outcrop: Few, coarse |
| Surface Fragment coverage : Coarse gravel, Stone | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>102 | |
| Drainage - External Slow | Internal – Rapid | |
| Human influence: | | Moisture condition: |
| Land Cover: Sparsely cultivated | | |
| Land Use: Rain fed arable cultivation | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected: Active at present | |
| Activity: 10-25cm | Degree of dissection: Slight to medium | |

Remarks: The area is mostly used for sorghum cultivation and with rotation rice (Steep slope up to 9-12%)

0-16cm: Dark red (7.5YR 3/3) color moist, loam texture, moderate, medium to coarse, sub-angle block structure, slightly hard dry, slightly stick /slightly plastic consistency when wet, few to common, fine to coarse roots and many, fine to medium pores

16-77cm: Dark yellowish brown (10YR4/6) color moist, clay loam texture, moderate, medium to coarse sub-angle block structure, stick/plastic consistency when wet few, fine roots, few, fine pores

77-102cm: Brown (7.5YR5/4) color moist, clay loam texture, few to common, fine to medium coarse fragment, moderate, medium to coarse, angular block structure, few, yellowish /brown, soft, iron/manganese mineral nodules

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP15 | Map Sheet: 0836A1 |
| Location: W of village # 7 | Region: Oromiya, Zone: Illuababora, | Wereda: Chewaka |
| Mapping Unit: U2f-9 | | |
| Author: Zelealem S/Mariam | Date:- | |
| FAO -*Soil Type : Hypereutric Cambisols (CMeuh)* | Coordinate (UTM) | *N: 992348* |
| Agro-Climatic zone: Kolla | Elevation (m): 1207/09 | *E: 189879* |
| Land form: Strongly sloping hill/ridge side | Slope Class: Strongly slope | Slope: Position Medium: |
| Slope Aspect: E-W | *Slope Length: 600m* | Slope Form: Convex |
| Micro- Topography: | Coverage %: | |
| Parent Material : Volcanic ash | Soil depth cm: 100 | *Rock outcrop:* |
| *Surface Fragment coverage :* | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. :>100 | |
| Drainage - External Slow | Internal – Rapid | |
| Human influence :New settlement | | Moisture condition: |
| Land Cover : Sparsely cultivated | | |
| Land Use: Rain fed arable cultivation | | |
| Major Crop Type : maize | Fertilizer Type | |
| Type of erosion: Sheet & Splash erosion | Area Affected: 10-25% | |
| Activity: Active at present | Degree of dissection: Slight to moderate | |

Remarks: Maize sown without fertilizer gave good yield, nearly 30 qu. /ha was obtained. After 100cm stones and gravely is observed. It is also suitable for rice .The area is highly raged and irregular surface

0-15cm: Dark brown (10YR3/3) color moist, clay loam texture, common, coarse to medium structure, consistency when wet slightly sticky and plastic roots and many, coarse to medium pores

15-52cm: Dark yellowish red (10YR3/4) color moist, clay loam texture, few, fine roots and many to common, fine medium pores

52-100cm: Dark yellowish red (10YR3/4) color moist, clay loam texture, many to common, fine to medium coarse fragment, strong to moderate, medium to coarse, sub-angle block structure, firm dry stick/plastic consistency when wet, few, fine pores

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP16 | Map Sheet: 0836A1 |
| Location : E of ILLUHARAR | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: V1b-3 | | |
| Author:- Zelealem S/Mariam | Date:- 08/05/09 | |
| FAO -*Soil Type: Mesotrophic Verisols (VRms)* | Coordinate (UTM) | *N: 9885000* |
| Agro-Climatic zone: Kolla | Elevation (m):1223/25 | *E: 189100* |
| Land form: Seasonally wet valley floor | Slope Class: Very gently slope | Slope: Position : Medium |
| Slope Aspect: E-W | Slope Length: 1km | Slope Form: Convex /Concave |
| Micro- Topography: Termite /Low giligai/Medium giligai | Coverage %: 5 | |
| Parent Material: Volcanic ash | Soil depth cm: 145 | Rock outcrop: |
| Surface Fragment coverage: | Surface Crack: | Sealing: |
| Flooding | Water table cm :>145 | |
| Drainage - External Poorly drained | Internal –Some what excessively drained | |
| Human influence: | | Moisture condition: Moist |
| Land Cover: Seasonal swamp | | |
| Land Use: Animal production | | |
| Major Crop Type : | Fertilizer Type | |
| Type of erosion: Sheet & Splash erosion | Area Affected: 5-10% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Profile pit is conducted on the bounder y of black vertisols and red nitosols. After 52cm it has hard pan. It become very hard to dig .The black soil area is flooded during rain season and stays for 3 months. The grass land is used for grazing.

0-23cm: Very dark gray (10YR3/1) color moist, few, yellowish brown, faint mottle, loam texture, few, fine to medium coarse fragment, strong, medium to coarse, sub-angle block structure, hard dry, slightly stick /slightly plastic consistency wet, weakly cementation, platy/ pisolithic, clay cementation, very few, fine root and few, fine to medium pores.

23-54cm: Brown (10YR4/3) color moist, abundant, yellowish red, prominent mottle, clay loam texture, few, fine coarse fragment, strong, medium to coarse, sub-angle block structure, hard dry, stick/plastic consistency when wet, moderately cemented, platy, clay cementation and few, fine pores

54-145cm: Weak red (2.5YR4/2) color moist, abundant, grayish, prominent mottle, clay loam texture, few, fine coarse fragment, strong, coarse, sub-angle block structure, hard dry, stick/plastic consistency when wet, cemented, clay cementation.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP17 | Map Sheet: 0836A1 |
| Location : N of ILLUHARAR | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- Zelealem S/M | Date:- 9-05-09 | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 987057* |
| Agro-Climatic zone : Kolla | Elevation (m): 1258/56 | *E:187082* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Very gently slope | Slope: Position : Medium |
| Slope Aspect: W-E | Slope Length: 2km | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %: | |
| Parent Material : Volcanic ash | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>200 | |
| Drainage -External Well | Internal –Well drained | |
| Human influence :New settlement | | Moisture condition: Moist |
| Land Cover : Intensively Cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : Haricot bean | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 5-10% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: Scattered new villages are constructed .The area is physical suitable for irrigation development

0-15cm: Very dark brown (7.5YR2/2) color moist, loam texture, strong to medium, medium to coarse, sub-angle block structure, hard dry, stick /plastic consistency wet, few, black, soft, manganese mineral nodules, common, fine to medium root and many, fine to medium pores.

15-37cm: Strong brown (7.5YR 4/6) color moist, clay texture, moderate, medium, sub-angle block structure, firm dry, stick/ plastic consistency wet, few, fine root and common, fine to medium pores.

37-68cm: Dark reddish brown (5YR 3/3) color moist, clay texture, moderate, medium to coarse sub-angle block structure, firm dry, stick /plastic consistency wet, few, fine pores.

68-200cm: Dark reddish brown (5YR 3/4) color moist, clay loam texture, moderate, medium to coarse sub-angle block structure firm dry slightly stick/slightly plastic consistence wet, few, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP18 | Map Sheet: 0836A1 |
| Location : E of ILLUHARAR | Region : Oromiya, Zone Illuababora, | Wereda: Chewaka |
| Mapping Unit: G2d-1 | | |
| Author:- Zelealem S/M | Date:- 09-05-09 | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N:984892* |
| Agro-Climatic zone : Kolla | Elevation (m): 1241 | *E:189379* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Gently slope | Slope: Position : Medium |
| Slope Aspect: E-W | *Slope Length: 800m* | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %:1 | |
| Parent Material : Volcanic ash /Co vial deposition | Soil depth cm.: 180 | *Rock outcrop:* |
| *Surface Fragment coverage :* | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. :>180 | |
| Drainage -External *Well* | Internal –Well drained | |
| *Human influence : Vegetation disturbed, Clearing* | | Moisture condition: |
| Land Cover : Predominantly cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum, Maize: | Fertilizer Type : For maize fertilizer is applied | |
| Type of erosion : | Area Affected : | |
| Activity | Degree of dissection: | |

Remarks: Suitable land for irrigation

0-20cm: Very dark brown (7.5YR 2/2) color moist, loam texture, few to common, medium to coarse fragment, moderate, medium to coarse, sub-angle block structure, firm dry slightly stick/slightly plastic consistency, few, fine root and many to coarse medium to coarse pores.

20-42cm: Dark reddish brown (5YR ¾) color moist, clay loam texture, few, medium to fine coarse fragment, weak to moderate, coarse to very coarse, sub-angle block structure, firm dry stick/plastic consistency wet, very few, fine root and common, medium to fine pores.

42-180cm: Dark red (2.5YR 3/6) color moist, clay loam texture, common to few, fine to medium coarse fragment, weak, medium, sub-angle block structure, firm dry stick /plastic consistency wet, common, medium to fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP19 | Map Sheet: 0836A1 |
| Location : | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit:V1b-3 | | |
| Author:- Zelealem S/M | Date:-09-05-09 | |
| FAO -*Soil Type : Mesotrophic Verisols (VRms)* | Coordinate (UTM) | *N: 985000* |
| Agro-Climatic zone: Kolla | Elevation (m) :1238 | *E:187000* |
| Land form: Seasonally wet valley floor | Slope Class: Level | Slope: Position : Medium |
| Slope Aspect: N-S | *Slope Length: 300m* | Slope Form: Uniform |
| Micro- Topography: Medium giligai to high giligai | Coverage %:90 | |
| Parent Material : Alluvial deposition | Soil depth cm: 200 | *Rock outcrop:* |
| *Surface Fragment coverage :* | Surface Crack: Medium to weak | *Sealing:* |
| Flooding : A/4 | Water table cm. :>200 | |
| Drainage -External *Poorly drained* | Internal –Some what excess drained | |
| *Human influence* | | Moisture condition: |
| Land Cover : Seasonal swamp | | |
| Land Use: Animal production | | |
| Major Crop Type : | Fertilizer Type | |
| Type of erosion : | Area Affected : | |
| Activity | Degree of dissection: | |

Remarks: Seasonal wet land used for grazing

0-20cm: Very dark brown (10YR 2/2) color moist, few to common, brown red, faint mottle, clay texture, strong, medium to very coarse, sub-angle block structure, very hard dry, stick/plastic consistency when wet, moderately cemented, platy, clay cementation, few, fine roots and few, very fine pores.

20-55cm:Very dark grayish brown (10YR3/2) color moist, many, yellow, prominent mottle, clay texture, strong, medium to very coarse, sub-angle block structure, firm dry, stick /plastic consistency when wet, cemented, platy, clay cementation, very few, fine root and few, very fine pores.

55-200cm: Black (2.5YR2 .5/0) color moist, clay texture, strong, medium to very coarse sub-angle block structure, firm dry stick/plastic consistency when wet, cemented, platy, clay cementation.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP20 | Map Sheet: 0836A1 |
| Location : S of ILLUHARAR | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- Zelealem S/M | Date:- 10-05-09 | |
| FAO -Soil Type : Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 983392 |
| Agro-Climatic zone : Kolla | Elevation (m): 1252 | E: 187498 |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Sloping | Slope: Position : Medium |
| Slope Aspect: E-W Slope Length: 200m | Slope Form: Uniform to convex | |
| Micro- Topography: Termite | Coverage %:2 | |
| Parent Material : Volcanic ash | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. : >200 | |
| Drainage -External Well | Internal –Well drained | |
| Human influence : | | Moisture condition: |
| Land Cover : Predominantly cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & splash erosion | Area Affected : Nearly slope | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks:

0-12cm:Dark reddish brown (5YR 3/3) color moist, loam texture, moderate, medium to coarse, sub-angle block structure, loose, slightly stick/slightly plastic consistence when wet, common, medium to fine roots and many, coarse to medium pores

12-32cm: Dark reddish brown (5YR 3/4) color moist, clay loam texture, weakly, coarse sub-angle block structure, firm dry, stick /plastic consistency wet, very few, fine roots and many, coarse pores

32-115cm: Dark red (2.5YR3/6) color moist, clay loam texture, few, fine gravel coarse fragment, weak, coarse sub-angle block structure, firm dry, stick/plastic consistency wet, many, coarse pores

115-176cm: Red (2.5YR4/6) color moist, loam texture, common, fine gravel coarse fragment, moderate to weak, coarse sub-angle block) structure, very firm dry, stick/plastic consistency wet, moderately cemented, nodular, clay cementation few, fine pores

176-200cm: Dark reddish brown (5YR3/3) color moist, loam texture, moderate to weak, coarse, sub-angle block moist, wet consistency, moderately cemented, nodular, clay cementation, common, black, hard /soft, manganese mineral nodules, few, fine pores

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP21 | Map Sheet: 0836A1 |
| Location : N of ILLUHARAR | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit:G2d-2 | | |
| Author:- Zelealem S/M | Date:- 11-05-09 | |
| FAO -*Soil Type : Rhodic Nitisols (NTro)* | Coordinate (UTM) | *N: 990204* |
| Agro-Climatic zone: Kolla | Elevation (m):1228 | *E:186796* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Gently slope | Slope: Position : Medium |
| Slope Aspect: E-W | *Slope Length: 1200m* | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %:5 | |
| Parent Material : Volcanic ash, Colluvial deposition | Soil depth cm: 250 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>250 | |
| Drainage -External Well | Internal –Well deposit | |
| Human influence : New settlement area | | Moisture condition: Moist |
| Land Cover : Intensively cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type: sorghum | Fertilizer Type : For maize they do | |
| Type of erosion: Sheet& Splash erosion | Area Affected: 5-10% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Well prepared for land, which is suitable for irrigation. Local - Aroresa, Gura Galla, Odda, Beressa, Wedesa

0-13cm: Black (7.5YR25/0) color moist, loam texture, very few, faint coarse fragment, moderate to strong, coarse, sub-angler block structure, hard dry slightly stick/slightly plastic consistency wet, few to common, fine to medium roots, common to many, medium to coarse pores.

13-30cm: Dark brown (7.5YR2.5/3) color moist, clay loam texture, few, fines gravel coarse fragment, moderate, coarse, sub-angler block structure, stick/plastic consistency wet, few, fine roots and common, medium to fine pores.

30-53cm: Dark reddish brown (5YR3/4) color moist, clay loam texture, moderate, medium to coarse, sub--angler block structure, few, fine pores.

53-250cm: Dark red (2.5YR3/6) color moist, clay loam texture, moderate, medium to coarse, sub--angler block structure, stick/plastic consistency wet.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP22 | Map Sheet: 0836A1 |
| Location : N-E of ILLUHARAR | Region : Oromiya Zone: Illuababora Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- Zelealem S/M | Date:- 12-05-09 | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 988300* |
| Agro-Climatic zone : kolla | Elevation (m): 1231 | *E : 187400* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Very gently slope | Slope: Position : Medium |
| Slope Aspect: S-N | *Slope Length: 300m* | Slope Form: Convex to uniform |
| Micro- Topography: Termite | Coverage %:1 | |
| Parent Material : Volcanic ash | Soil depth cm: 200 | *Rock outcrop:* Few |
| *Surface Fragment coverage :* | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. : >200 | |
| Drainage - External *Moderately well drained* | Internal – Well drained | |
| *Human influence : New settlement was carried out* | Moisture condition: Moist /Dry | |
| Land Cover: Intensively cultivated land/ Predominantly cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type: sorghum | Fertilizer Type | |
| Type of erosion: Sheet & Splash /Rill erosion | Area Affected: 10-25% | |
| Activity: Active at present | Degree of dissection: Moderate | |

Remarks: Soil conservation activities are under taken /require it / .The area is deforestation due to new settlements. Big boulders are found in the served area, 100m away from the observation site

0-15cm: Very dark brown (10YR 2/2) color moist, loam texture, moderate, medium to coarse, sub-angle block structure, Slightly hard dry, slightly sticky/slightly plastic consistency when wet, few, fine roots and common to medium, fine to medium pores sub-angle.

15-30cm: Dark reddish brown (5YR 3/4) color moist, clay loam texture, moderate to strong sub-angle block structure, firm dry, stick/plastic consistency when wet, weakly cemented, platy, clay /organic cementation, common, fine pores.

30-50cm: Dark red (2.5YR3/6) color moist, clay loam texture, moderate to strong, coarse to medium sub-angle block structure, firm dry, stick /plastic consistency wet, weakly cemented, platy, clay cementation.

50-200cm: Red (2.5YR 4/6) color moist, (clay loam) texture, moderate, coarse to medium, sub-angle block structure, firm dry, stick /plastic consistency wet.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP23 | Map Sheet: 0836A1 |
| Location : N-E of ILLUHARAR | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit:V1b-3 | | |
| Author:-Zelealem S/M | Date:- 12-05-09 | |
| FAO -Soil Type : Mesotrophic Verisols (VRms) | Coordinate (UTM) | N: 987200 |
| Agro-Climatic zone : Kolla | Elevation (m): 1222 | E : 188200 |
| Land form: Seasonally wet valley floor | Slope Class: Level | Slope: Position : Low |
| Slope Aspect: E-W : | Slope Length | Slope Form: |
| Micro- Topography: Medium giligai to high giligai | Coverage %:80 | |
| Parent Material : Alluvial deposition | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: Medium to well | Sealing: |
| Flooding: A/4 | Water table cm. : >200 | |
| Drainage -External Slow | Internal –Poorly drained | |
| Human influence : | Moisture condition: Moist | |
| Land Cover : Bushed shrub glass land/Open grass land/Seasonal swamp | | |
| Land Use: Animal product | | |
| Major Crop Type : | Fertilizer Type | |
| Type of erosion : Unknown | Area Affected : | |
| Activity : | Degree of dissection: | |

Remarks: Seasonal wet land stays for four months and currently used for seasonal grassing .Perennials big grass is a dominant vegetation (covers the area)

0-15cm: Very dark brown (10YR2/2) color moist, clay texture, moderate, fine to medium, massive to granular structure, very firm dry, slight stick/slightly plastic consistency wet, few, fine roots and many, fine to medium pores.

15-30cm: Dark brown (10YR 3/3) color moist, common, yellowish red, faint mottle, clay texture, strong to moderate, medium to coarse, sub-angle bock structure, firm dry, stick/plastic consistency wet very few, fine roots and few fine pores.

30-200cm: Grayish brown (10YR 5/2) color moist, many, yellowish brown, distinct mottle, clay texture, strong, coarse, sub-angle block structure, firm dry stick/plastic consistency when wet, moderately cemented, platy, clay cementation, common, black, soft to hard, manganese mineral nodules.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP25 | Map Sheet: 0836A1 |
| Location : N-W of ILLUHARAR | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit:G1b-4 | | |
| Author:- Niguse K | Datse:- 13-05-09 | |
| FAO -*Soil Type : Hyperferric Acrisols (ACfrh)* | Coordinate (UTM) | *N: 997032* |
| Agro-Climatic zone : Kolla | Elevation (m): 1217 | *E: 185718* |
| Land form: Upper part of gently undulating plain with convex interfluves | Slope Class: Sloping | Slope: Position : Medium |
| Slope Aspect: S-N | Slope Length: 175m | Slope Form: Concave |
| Micro- Topography: Termite | Coverage %:85 | |
| Parent Material : Unknown | Soil depth cm: 75 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm : >75 | |
| Drainage -External Well | Internal –Somewhat excess drained | |
| Human influence: | | Moisture condition: Moist & dry |
| Land Cover : Cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : Sesame | Fertilizer Type | |
| Type of erosion : Rill erosion | Area Affected : 25-50% | |
| Activity : Moderate | Degree of dissection: Active at present | |

Remarks: The site is dominated with TM & on the north of the site at 100m there is sugar cane plant w/c is planted in valley bottom near the stream .Generally even if the depth is moderate it is suitable for irrigation purpose development

0-20cm: Dark brown (10YR 3/3) color moist, silt clay loam texture, weak, very medium, angular block structure, firm consistency when dry, weakly cemented, platy, coarse cementation, few, fine roots and few, fine pores

20-50cm: Dark yellowish brown (10YR 3/4) color moist, few, white, faint mottle, loam very fine sand texture, very few fine coarse fragment, moderate, medium to coarse, sub-angle block structure, very firm consistence when dry, weakly cemented, vesicular cementation, few, brown, sub-angle block mineral nodules, very few, fine roots and few, fine pores

50-75cm: Dark yellowish brown (10YR 4/6) color moist, few, red, faint mottle, coarse sand texture, dominant, coarse fragment ,strong ,medium to very coarse ,massive structure, extremely firm consistency when dry, pisolithic cementation ,few yellowish red, hard, sub-angle block mineral nodules

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP26 | Map Sheet: 0836A1 |
| Location : S of Illuharer | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- Kumsa .B | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 983800* |
| Agro-Climatic z one: Kolla | Elevation (m):1250 | *E:187000* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Strongly slope | Slope: Position : Low |
| Slope Aspect: E-W | *Slope Length: 200m* | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage %:0.2 | |
| Parent Material : In suite weathered residual | Soil depth cm: 75 | *Rock outcrop:* |
| *Surface Fragment coverage :* | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. : >75 | |
| Drainage -External *Impermeable drained* | Internal –Well drained | |
| *Human influence : Burring, Terracing, Clearing* | | Moisture condition: Moist |
| Land Cover : Intensively cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: Effective depth is up to 50cm, below 50cm is C horizon valley upper side slope

0-22cm: Dark brown (7.5YR 3/2 ) color moist ,clay loam texture, weak, fine to medium, sub-angle blocky structure firm dry, sticky, plastic consistency when wet, weekly cemented, organic matter, clay cementation, many, fine roots and many, fine pores

22-50cm: Dark brown (7.5YR 4/4 ) color moist, common, reddish brown, distinct mottling, clay loam texture, weak, fine to medium, sub-angle blocky structure, very firm dry, slightly sticky, slightly plastic when wet weekly cemented, clay cementation, common, fine, roots and common, fine pores.

50-75cm: Brown (7.5YR 5/4) color moist, many, reddish brown, distinct mottling, clay loam texture moderate, fine to medium, sub-angle blocky structure very firm dry, slightly sticky, slightly plastic when wet, moderately cemented cementation, few, fine root.

75-cm: Pinkish gray (7.5YR 6/2 ) moist, yellowish red, distinct mottling, clay loam texture moderate, fine to medium, sub-angle blocky structure very firm moist, slightly sticky, slightly plastic wet, moderately cemented.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP27 | Map Sheet: 0836A1 |
| Location : S of chawake | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- Kumsa B | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 983000* |
| Agro-Climatic Zone : Kolla | Elevation (m) :1260 | *E:187500* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Sloping | Slope: Position : Medium |
| Slope Aspect: W-E | *Slope Length: >200m* | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage %: | |
| Parent Material : In situ weathered residual | Soil depth cm: 200 | *Rock outcrop:* |
| *Surface Fragment coverage :* | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. :>200 | |
| Drainage -External *Well* | Internal –Well drained | |
| *Human influence : Burning, Clearing, Terracing* | | Moisture condition: Moist |
| Land Cover : Intensively cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks:

0-17cm: Dark reddish brown (5YR3/2) color moist, clay loam texture, very fine to medium, sub-angle block structure, firm dry, stick/plastic consistency when wet, weakly cemented, organic cementation, many, fine roots and many, fine to medium pores

17-40cm: Dark reddish brown (5YR3/4) color moist, clay texture, very fine to medium, sub-angle block structure, very firm, stick/plastic, wet consistency, weakly cemented, clay cementation, common, fine roots and many, fine pores

40-78cm: Dark reddish brown (2.5YR3/4) color moist, clay texture, very fine to medium, sub-angle block structure, very firm dry, stick/plastic consistence when wet, weakly cemented, clay cementation, common, fine roots and common, fine pore

78-128cm: Dar red (2.5YR3/6) color moist, clay texture, very fine to medium, sub-angle block structure, very firm dry, stick/plastic consistence when wet, weakly cemented, clay cementation, few, fine roots and few, fine pores

128-200cm: Dark red (2.5YR3/6) color moist, clay texture, very fine to medium sub-angle block structure, firm dry, stick/plastic consistency when wet, weakly cemented, clay cementation, few, fine pores

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP28 | Map Sheet: 0836A1 |
| Location : S of chawaka | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- Kumsa B | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 983800* |
| Agro-Climatic zone : Kolla | Elevation (m): 1255m | *E:187100* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Sloping | Slope: Position : Medium |
| Slope Aspect: S-N | Slope Length: >200m | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage %:0.2 | |
| Parent Material : In situ weathered residual | Soil depth cm: 120 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. : >120 | |
| Drainage -External Well | Internal –Well drained | |
| Human influence : Burning, Terracing, Clearing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type sorghum : | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Effective depth is 160cm, >160 is rock & gravel

0-15cm: Dark reddish brown (5YR3/2) color moist, clay loam texture, weak, medium to fine, sub-angle block structure, firm dry, sick/plastic consistence wet, weak, organic cementation, many, fine roots and many, fine pores

15-30cm: Dark reddish brown (5YR3/4) color moist , clay texture , weak ,medium to fine , sub-angle block structure , very firm dry, stick/plastic consistence when wet , weak ,clay cementation , common ,fine roots and common , fine pores

30-60cm: Yellowish red (5YR3/6) color moist, clay texture, weak, medium to fine, sub-angle block structure, very firm dry, stick/plastic consistence when wet , weak, clay cementation, few, fine roots and common, fine pores

60-120cm: Yellowish red (5YR3/6) color moist, clay texture, weak, medium to fine, sub-angle block structure, very firm dry, stick /plastic, wet consistency, weak, clay cementation, very few, fine roots and common, fine pores

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP29 | Map Sheet: 0836A1 |
| Location : E of ILLUHARAR | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| *Author:- Zelealem S/M* | *Date:-* | |
| FAO -Soil Type : Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | *N: 983650* |
| Agro-Climatic zone: Kolla | Elevation (m) :1243 | *E:189100* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Strongly slope | Slope: Position : Medium |
| Slope Aspect E-W | Slope Length: 1km | Slope Form: Uniform t |
| Micro- Topography: Giligai | Coverage %: | |
| Parent Material : Coluvial deposition | Soil depth cm: 180 | *Rock outcrop:* |
| Surface Fragment coverage : | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. :>180 | |
| Drainage -External Impermeable drained | Internal –Somewhat excesses drained | |
| Human influence: | | Moisture condition: |
| Land Cover : Predominantly cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type sorghum: | Fertilizer Type | |
| Type of erosion: Gully erosion | Area Affected : 10-25% | |
| Activity: Active at present | Degree of dissection: Moderate to sever | |

Remarks:

0-18cm: Very dark grayish brown (10YR3/2) color moist, few, yellow, faint mottle, clay loam texture, few, fine coarse fragment, moderate, coarse, sub-angle block structure, hard dry, slightly stick/plastic consistency when wet few to common, fine roots and common, fine pores

18-49cm: Dark yellowish brown (10YR4/4) color moist, many, yellow, distinct to prominent mottle, clay texture, common, fine to medium coarse fragment, strong, coarse, sub-angle block structure, firm dry, stick/plastic consistency wet, few, fine roots and few, fine pores

49-85cm: Dark brown (10YR3/3) color moist, many, yellow, prominent mottle, sand clay texture, many, medium to coarse fragment, strong, coarse, sub-angle block structure, firm dry, slight stick/plastic consistency when wet.

85-135cm: brown (10YR5/3) color moist, many, yellow, prominent mottle, sand clay texture, many, coarse fragment, strong, coarse, sub-angle block structure, firm, slightly stick/slightly plastic moist, wet consistency, many to medium, black, hard, manganese mineral nodules

135-180cm:Grayish brown (10YR5/2) color moist, many to common, yellow, prominent mottle, clay texture, many, fine to medium coarse fragment, strong, coarse to medium, sub-angle block structure, firm dry, stick/plastic consistency wet, many, red, soft, iron mineral nodules

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP30 | Map Sheet: 0836A1 |
| Location : E of ILLUHARAR | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit:V1b-3 | | |
| Author: Zelealem S/M | Date:- 11-05-09 | |
| FAO -*Soil Type : Mesotrophic Verisols (VRms)* | Coordinate (UTM) | *N: 984500* |
| Agro-Climatic | Elevation (m):1244 | *E:190300* |
| Land form: Seasonally wet valley floor | Slope Class: Level | Slope: Position : Low |
| Slope Aspect: S-N | *Slope Length: 800m* | Slope Form: uniform |
| Micro- Topography: Medium giligai to High gili | Coverage %:80 | |
| Parent Material : Alluvial deposit | Soil depth cm: 180 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding: A/4 | Water table c:m. :>180 | |
| Drainage -External Impermeable drained to poorly drained | Internal –Somewhat excess drained | |
| Human influence: | | Moisture condition: Moist to wet |
| Land Cover : Open grass land/Seasonal swamp | | |
| Land Use: Animal production | | |
| Major Crop Type : | Fertilizer Type | |
| Type of erosion : | Area Affected : | |
| Activity | Degree of dissection: | |

Remarks: After 120cm the soil texture is sandy loam and increases down to the depth up to 180cm .120-180cm the soil is sand .Slope is no taken

0-26cm: Black (10YR2/ ) color moist, clay texture, strong to moderate, medium, sub-angle block structure, firm dry, slightly stick/slightly plastic consistency when wet, few, medium roots and many, medium to fine pores

26-53cm: Very dark brown (10YR2/2) color moist, few to common, yellow to block, finite mottle, clay texture, strong, coarse sub-angle block) structure, firm dry, stick/plastic consistency when wet, many, black, soft, manganese mineral nodules, very few roots and common, fine pores

53-71cm: Very dark brown (10YR3/2) color moist, few, common, yellow, distinct mottle, clay texture, strong, coarse sub-angle block structure, firm dry, stick/plastic consistency when wet many, black, soft, manganese mineral nodules, common, fine pores

71-114cm: Very dark brown (10YR3/2) color moist, common, yellow, distinct mottle, clay texture, common, faint to medium coarse fragment, strong, coarse, sub-angle block) structure, firm dry, stick /plastic) consistency when wet, cemented, patchy clay cementation

114-180cm: Very dark brown (10YR3/2) color moist, many, yellow, patchy mottle, clay texture, moderate, faint to medium coarse fragment, strong, coarse, sub-angle block structure, firm dry, loosely stick/slightly plastic consistency when wet, cemented, patchy, clay cementation

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP31 | Map Sheet: 0836A1 |
| Location : S-E of ILLUHARAR | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- Zelealem S/M | Date:- 11-05-09 | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 984518* |
| Agro-Climatic zone: Kolla | Elevation (m):1255 | *E:189265* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Gently slope | Slope: Position : Medium |
| Slope Aspect: N-S | *Slope Length: 300m* | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %:2 | |
| Parent Material : Volcanic ash | Soil depth cm: 200 | *Rock outcrop:* |
| Surface Fragment coverage : | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. :>200m | |
| Drainage -External Well | Internal –Well drained | |
| Human influence: New settlement | | Moisture condition: Moist |
| Land Cover : CL3 | | |
| Land Use:CA4 | | |
| Major Crop Type : sorghum, maize, haricot bean | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 5-10% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Regardless of moderate steep slope it is suitable land for irrigation development

0-18cm: Very dusk red (2.5YR2.5/2) color moist, loam texture, moderate, coarse to medium, sub-angle block structure slightly hard dry, slightly stick/slightly plastic, consistency when wet , few, medium to coarse root and many, fine to medium pores

18-43cm: Dark reddish brown (2.5YR2.5/4) color moist, clay loam texture, moderate, coarse, sub-angle block structure, firm dry, stick/plastic consistency wet, very few, fine roots and many to fine pores

43-175cm: Dark red (2.5YR3/6) color moist, clay loam texture, few, fine coarse fragment, moderate, coarse, sub-angle block structure, firm dry, moist consistency, common, fine pores

175-200cm: Dark red (2.5YR3/6) color moist, clay loam texture, many, fine coarse fragment, moderate, medium, sub-angle block structure, firm consistency when dry, many, black, hard, manganese mineral nodules, common, fine pores

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP32 | Map Sheet: 0836A1 |
| Location : E. Cheffe Megertu | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit:V3d-8 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Fluvic Cambisols (CMfv) | Coordinate (UTM) | N: 991000 |
| Agro-Climatic zone : Kolla | Elevation (m):1224 | E:193600 |
| Land form : Moderately dissected valley floor | Slope Class: Strong slope | Slope: Position : High |
| Slope Aspect: E-W | Slope Length: 300m | Slope Form: Concave |
| Micro- Topography: Giligai | Coverage %: 1 | |
| Parent Material : In suite weathered residual | Soil depth cm: 80 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>80 | |
| Drainage -External Well | Internal –Rapid | |
| Human influence: Burning, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated land | | |
| Land Use:CA4 Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected :>50% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: The slope range from 10-20%, Depth is limited to 80cm

0-25cm: Dark reddish brown (5YR3/2) color moist, clay loam texture, firm consistency when dry, weak, organic cementation

25-50cm: Reddish brown (5YR4/4 color moist, clay texture consistency when firm dry, weak, clay cementation

50-80cm: yellowish red (5YR4/6) color moist, clay texture, common, fine coarse fragment firm consistency dry, weak clay cementation

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP33 | Map Sheet: 0836A1 |
| Location : N of Biftu Oromia | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- Kumsa B | Date:- 08-05-09 | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 991600* |
| Agro-Climatic zone : Kollla | Elevation (m):1233 | *E:190800* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Strongly sloping | Slope: Position : High |
| Slope Aspect: W-E | *Slope Length: 150m* | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage %:2 | |
| Parent Material : In suite weathered residual | Soil depth cm: 125 | *Rock outcrop:* |
| Surface Fragment coverage : | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. :>125cm | |
| Drainage -External Well | Internal –Well drained | |
| Human influence: Burning, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Mango, reverien trees like bedesa.

0-25cm: Dark reddish brown (5YR3/4) color moist, clay loam texture, firm consistency when dry, organic cementation

25-50cm: Yellowish red (5YR3/6) color moist, clay texture, firm consistency when dry, clay cementation

50-90cm: Yellowish brown (5YR3/6) color moist, clay texture, firm consistency when dry, clay cementation

90-125cm: Yellowish brown (5YR4/6) color moist, clay texture, firm consistency when dry, clay cementation

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP34 | Map Sheet: 0836A1 |
| Location : W.Bufata totbaffa | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- Ku Bmsa | Date:- 09-05-09 | |
| FAO -*Soil Type: Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 991800* |
| Agro-Climatic zon:Kolla | Elevation (m):1236m | *E:188400* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Very gently slope | Slope: Position : High |
| Slope Aspect: N-S | *Slope Length: 200m* | Slope Form: Convex |
| Micro- Topography: Giligai | Coverage %:50 | |
| Parent Material : Fluvial deposition | Soil depth cm: 125 | *Rock outcrop:* |
| Surface Fragment coverage : | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. :>125cm | |
| Drainage -External Imperfectly drained | Internal –Imperfectly drained | |
| Human influence: | | Moisture condition: Moist |
| Land Cover : Grass land | | |
| Land Use: Grazing | | |
| Major Crop Type : | Fertilizer Type | |
| Type of erosion : | Area Affected : | |
| Activity | Degree of dissection: | |

Remarks: Gain soils, water logged land during rainy season

0-20cm: Dark brown (7.5YR3/1) color moist, clay structure, firm consistency when dry, organic cementation

20-45cm: Very dark grayish brown (10YR3/2) color moist, common, yellowish red, distinct mottle, clay texture, very firm consistency when dry, clay cementation

45-100cm: Dark grayish brown (10YR4/2) color moist, common, yellowish brown, distinct mottle, clay texture firm consistency when dry, clay cementation

100-125cm: Dark grayish brown (10YR4/2) color moist, common, yellowish brown, distinct mottle, clay texture, very firm consistency when dry, clay cementation

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP35 | Map Sheet: 0836A1 |
| Location : W.CHAWAKA | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: V1b_3 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Mesotrophic Vertisols (VRsm)/ leptosols | Coordinate (UTM) | N: 986600 |
| Agro-Climatic Zone : Kolla | Elevation (m):1238m | E:186000 |
| Land form: Seasonally wet valley floor | Slope Class: Strongly sloping | Slope: Position : Medium |
| Slope Aspect: N-S | Slope Length: 50m | Slope Form: Concave |
| Micro-Topography: Giligai | Coverage %:30 | |
| Parent Material : In suite weathered residual | Soil depth cm: 34 | Rock outcrop: Few, Stone |
| Surface Fragment coverage : Few | Surface Crack: | Sealing: |
| Flooding | Water table cm : >34 | |
| Drainage -External Well | Internal –Imperfectly drained | |
| Human influence : Burning, Clearing | | Moisture condition: Moist |
| Land Cover : Intensive cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Gully, Sheet & Splash erosion | Area Affected : 10-25% | |
| Activity: Active at present | Degree of dissection: Sever | |

Remarks: Middle stream side slope 14%.

0-14cm: Brown (7.5YR4/2) color moist, clay loam texture, weak, fine to medium sub-angler block) structure, slight, firm dry, stick/plastic consistency when wet, organic cementation, many, fine to medium root and many and fine to medium pores

14-34cm: Brown (7.5YR4/3) color moist, common, reddish yellow, distinct mottle, clay texture, common, fine to medium coarse fragment, moderate, fine to medium, sub-angler lock structure, very firm dry, stick/plastic consistency when wet common, fine root and common, fine pores

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP36 | Map Sheet: 0836A1 |
| Location : W.Chawaka | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | Photo No | |
| Author:- Kumsa B | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 987100* |
| Agro-Climatic zone: Kolla | Elevation (m):1250m | *E:185900* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Gently sloping | Slope: Position : Medium |
| Slope Aspect: W-E | *Slope Length: >200m* | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage %:0.2 | |
| Parent Material : In situ weathered residual | Soil depth cm: 160 | *Rock outcrop:* |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>160 | |
| Drainage -External *Well* | Internal –Well drained | |
| Human influence: Burning, Terracing, Clearing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Deep soil with 5-6% sloping, arable land

0-20cm: Dark reddish brown (5YR3/2) color moist, clay loam texture, moderate, medium to fine, sub-angler block structure, firm dry, stick/plastic consistency when wet, weak, organic cementation, many, fine to medium roots and many fine pores.

20-45cm: Dark reddish brown (5YR3/4) color moist, clay texture, moderate, medium to fine, sub-angler block structure, firm dry stick /plastic consistency when wet, weak, clay cementation, common, fine roots and common, fine to medium pores

45-83cm: Dark reddish brown (2.5YR3/4) color moist, clay texture, moderate, medium, sub-angler block structure, very firm dry, stick /plastic consistency when wet, weak, clay cementation, few, fine roots and common, fine pores

83-160cm: Dark red (2.5YR3/6) color moist, clay texture, moderate, medium, sub-angler block structure, very firm dry stick/plastic consistency when wet, weak, clay cementation

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP37 | Map Sheet: 0836A1 |
| Location : N-E of chewaka | Region : Oromiya, Zone: Illuababora , Wereda: | |
| Mapping Unit: G2d-1 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | *N: 987800* |
| Agro-Climatic zone : Kolla | Elevation (m):1237 | *E:186000* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class | Slope: Position : Low |
| Slope Aspect: W-E | *Slope Length: >100m* | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage %:0.2 | |
| Parent Material : In suite weathered residual | Soil depth cm: 132 | *Rock outcrop: Common* |
| Surface Fragment coverage :5% ,Stones ,Boulders | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. :>132 | |
| Drainage -External Well | Internal –Well drained | |
| Human influence : Burning, Clearing, Terracing | Moisture condition: Moist | |
| Land Cover : Intensively cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: There are patches of boulders stones, slope is 5% E.

0-14cm: Dark reddish brown (5YR3/2) color moist, clay loam texture, moderate, fine to medium, sub-angler block structure firm dry stick/plastic consistence when wet, organic cementation, many, fine to medium roots and many, fine pores

14-32cm: Dark reddish brown (5YR3/4) color moist, clay texture, moderate, medium, sub-angler block structure, firm dry, stick/plastic consistency when wet, clay cementation, common, fine roots and common, fine pores

32-95cm: Dark reddish brown (2.5YR3/4) color moist, clay texture, moderate, medium, sub-angler block structure, very firm dry, stick/plastic consistency when wet, clay cementation, common, fine roots and common, fine pores

95-132cm: Red (2.5YR4/6) color moist, clay loam texture, many, medium coarse fragment, moderate, medium, sub-angler block structure, very firm dry, stick/plastic consistency when wet, clay cementation and few, fine root

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP38 | Map Sheet: 0836A1 |
| Location : N-of Demeksa | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- Kumsa B | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 988400* |
| Agro-Climatic Zone : Kolla | Elevation (m):1248 | *E:185400* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Gently slope | Slope: Position : Medium |
| Slope Aspect: S-N | *Slope Length: 200m* | Slope Form: Concave |
| Micro- Topography: Termite | Coverage %:0.2 | |
| Parent Material : In suite weathered residual | Soil depth cm: 150 | *Rock outcrop:* |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. >150 | |
| Drainage -External *Well* | Internal –Well drained | |
| Human influence : Burning, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected :>50% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Slope is 5%N. Good arable land.

0-14cm: Dusk red (2.5YR3/2) color moist, clay loam texture, moderate, fine to medium, sub-angler block structure, firm dry, stick/plastic consistency when wet, organic cementation, many, fine to medium roots and many, fine to medium pores

14-36cm: Dusk red (2.5YR3/2) color moist, clay texture, moderate, fine to medium, sub-angler block structure, firm, dry stick/ plastic moist consistency wet, clay cementation, many, fine roots and many and fine to medium pores

36-65cm: dark reddish brown (2.5yr3/4) color moist, clay texture, moderate fine to medium sub-angler, block structure, firm dry, stick/plastic consistency wet, clay cementation, common, fine roots and common, fine pores

65-150cm: Dark red (2,5YR3/6) color moist, clay texture, moderate, fine to medium, sub-angler block structure, firm, dry stick/ plastic wet consistency and clay cementation

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP39 | Map Sheet: 0836A1 |
| Location : N-E of Illuharar | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-2 | | |
| Author:- Zeleam S/M | Date:- | |
| FAO -*Soil Type : Rhodic Nitisols (NTro)* | Coordinate (UTM) | *N: 989800* |
| Agro-Climatic zone: Kolla | Elevation (m): 1234 | *E: 186800* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Very gently slope | Slope: Position : Medium |
| Slope Aspect: W-E | *Slope Length: 900m* | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %:4/6 | |
| Parent Material : Volcanic ash | Soil depth cm: >200 | *Rock outcrop:* |
| *Surface Fragment coverage :* | Surface Crack: | *Sealing:* |
| Flooding | Water table cm :>200 | |
| Drainage -External *Moderate* | Internal –Moderate | |
| *Human influence :* | | Moisture condition: Moist |
| Land Cover : Intensively cultivated land/Predominantly cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum, maize, sesame, Haricot bean | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 5-10% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Before settlement the area was under forest, currently scattered big trees are there, Deforestation is clearly seen.

0-29cm: Dark reddish brown (5YR3/2) color moist, clay loam texture, strong, medium to coarse, angular block structure, hard firm moist, stick /plastic dry consistency, wet, weakly cemented, vesicular, clay cementation, few, fine to medium roots and many to common and fine to medium pores.

29-47cm: Dusk red (2.5YR3/2) color moist, clay texture, few, stones coarse fragment, coarse, angular block structure, firm moist, stick/plastic consistency wet, cemented, vesicular, clay cementation, many, black, hard, manganese mineral nodules, few, fine roots and common, fine pores.

47-75cm: Dark reddish brown (2.5YR3/4) color moist, clay texture, few, fine gravel coarse fragment, coarse, angular block structure, firm moist, stick/plastic consistency, wet, cemented, vesicular, clay cementation.

75-200cm: Dark red (2.5YR3/6) color moist, clay texture, coarse, angular block structure, firm moist, stick /plastic, consistence wet, cemented, vesicular, clay cementation, few, black, hard, manganese mineral nodules.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP40 | Map Sheet: 0836A1 |
| Location : N-W of ILLUHARAR | Region : Oromiya, Zone: Illubabora, Wereda: Chewaka | |
| Mapping Unit:G1b-1 | | |
| Author:- Zelealem S/M | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 989400* |
| Agro-Climatic zone: Kolla | Elevation (m): 1257 | *E:185000* |
| Land form : Upper part of gently undulating with convex interfluves | Slope Class: Nearly level | Slope: Position : |
| Slope Aspect: N-S | *Slope Length: 800m* | Slope Form: Uniform to |
| Micro- Topography: Termite | Coverage %:4 | |
| Parent Material : Volcanic ash /Collovial deposition | Soil depth cm: >200m | *Rock outcrop:* |
| *Surface Fragment coverage :* | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. : >200 | |
| Drainage -External *Well* | Internal –Well drained | |
| Human influence: | | Moisture condition: |
| Land Cover : Predominantly cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum, rice, sesame & maize | Fertilizer Type : | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 5-10% | |
| Activity : Active at present | Degree of dissection: | |

Remarks: Gura galla, Wedessa and Odda/ Regardless of scattered big trees in the area, it is good suitable land for irrigation development

0-21cm: Dark reddish brown (5YR3/2) color moist, loam texture, moderate to strong, coarse, sub-angler block structure, slightly hard dry, slightly stick/slightly plastic dry, moist ,wet)consistency, common, fine to medium roots, many and coarse to medium pores.

21-85cm: Dark reddish brown (2.5YR3/4) color moist, clay loam texture, moderate, medium, sub-angler block structure, very firm moist, stick /plastic consistency wet, patchy, distinct, coarse cutanic feature, few, black, soft, manganese mineral nodules, few, fine to medium roots and many to common, medium pores.

85-200cm: Dusk red (2.5YR2/4) color moist, clay loam texture, moderate, medium to fine, sub-angler block structure, very firm moist, stick/plastic moist, wet consistence, few, black, soft, manganese mineral nodules, common to few, few pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP41 | Map Sheet: 0836A1 |
| Location : N-E of ILUHARAR | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- Zelealem S/M | Date:- | |
| FAO -Soil Type : Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 987800 |
| Agro-Climatic zone | Elevation (m) :1251 | E: 187000 |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Very gently slope | Slope: Position : Medium |
| Slope Aspect: E-W Slope Length: 400m | Slope Form: Uniform/convex | |
| Micro- Topography: Termite | Coverage %:3 | |
| Parent Material : Volicanic ash /Colluvial deposits | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm :>200 | |
| Drainage -External Moderate | Internal –Well drained | |
| Human influence : New settlement | | Moisture condition: Moist |
| Land Cover : Intensively cultivated land | | |
| Land Use Rain fed arable cultivate | | |
| Major Crop Type : rice, sugar beet, haricot bean, maize, sorghum | Fertilizer Type : For maize fertilizer is applied | |
| Type of erosion : Sheet /Splash erosion | Area Affected : 5-10% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: New settlement area, deforestation is high, big trees like odessa, welgabise, dabaka .deep boring up to 4m is under taken.

0-19cm:Dusk red (2.5YR3/2) color moist, clay loam texture, moderate, coarse to medium, angular block structure, slight hard dry, stick/plastic consistency when wet, common, coarse to medium roots and many, coarse to medium pores.

19-34cm: Dusk red (2.5YR3/2) color moist, clay loam texture, moderately, coarse, angular block structure, firm moist stick to plastic consistency when wet, common, medium to fine roots and many, fine to medium pores.

34-62cm:Dark red (2.5YR3/6) color moist, clay texture, strong, coarse, sub-angler block structure, firm moist, stick /plastic consistency when wet, moderately cemented, patchy, clay cementation, common, medium to fine roots and few medium pores.

62-127cm: Dark red (2.5YR3/6) color moist, clay texture, strong, coarse to medium, sub-angler block structure, firm moist, stick /plastic consistency when wet, moderately cemented, patchy, clay cementation, few, black, slightly hard, manganese mineral nodules.

127-200cm: Dark red (2.5YR3/6) color moist, clay texture, strong, coarse to medium, sub-angler block structure, firm moist stick/plastic consistency when wet, moderately, patchy, clay cementation and few, black, slight hard, manganese mineral nodules.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP42 | Map Sheet: 0836A1 |
| Location : | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- | Date:- | |
| FAO -Soil Type : Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 987496 |
| Agro-Climatic : Gently sloping | Elevation (m) : 1258 | E : 189572 |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Gently sloping | Slope: Position : Medium |
| Slope Aspect: W-E | Slope Length: 300m | Slope Form: Uniform |
| Parent Material : Volcanic ash | Soil depth cm: 190 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm :>190 | |
| Drainage -External Moderately | Internal –Well drained | |
| Human influence : New settlement | | Moisture condition: Moist |
| Land Cover : Predominantly cultivated/ Intensively cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum, maize, haricot bean, rice | Fertilizer Type : For maize the apply fertilizer | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 5-10% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Cultivation started 5 years ago .In the area clearly seen that forest is cut

0-18cm: Dark reddish brown (5YR3/3) color moist, loam texture, strong ,medium to coarse ,angular block structure, hard dry, stick/plastic consistence when wet common and fine/medium roots.

18-50cm:Yellowish red (5YR4/6) color moist, clay loam texture, strong, medium, angular block structure, firm moist stick/ plastic consistency when wet, common/ few and medium to fine roots.

50-80cm:Red (2.5YR4/6) color moist, clay loam texture, few, fine coarse fragment, moderate, medium, sub-angler block structure, slightly firm moist, stick/plastic consistency when wet, weak, distinct cementation and few fine roots.

80-190cm: Red (2.5YR4/8) color moist, clay loam texture, few, fine coarse fragment, moderate, medium, sub-angler block structure, slightly firm moist, slightly stick /slightly plastic consistency when wet, weakly cemented, distinct cementation.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP43 | Map Sheet: 0836A1 |
| Location : E of Illuharar | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- Zeleam S/M | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N:987826* |
| Agro-Climatic zone: Kolla | Elevation (m) 1244/42 | *E:188972* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Gently slope | Slope: Position Medium: |
| Slope Aspect: N-S | *Slope Length: 600m* | Slope Form: |
| Micro- Topography: Termite | Coverage %:3 | |
| Parent Material : | Soil depth cm: 180 | *Rock outcrop:* |
| Surface Fragment coverage : | Surface Crack: | *Sealing:* |
| Flooding | Water table cm: >180 | |
| Drainage -External Moderate | Internal –Well | |
| Human influence: | | Moisture condition: |
| Land Cover : Predominantly cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum, maize, rice, haricot bean sesame, For maize fertilizer is applied | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 5-10% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Debeka, Weddessa and Dereku trees

0-15cm: Dark reddish brown (5YR3/2) color moist, loam texture, strong, coarse, sub-angler block structure, hard dry, slightly stick/slightly plastic consistency, wet, few, medium to fine roots and many, medium to coarse pores.

15-40cm:Reddish brown (5YR4/4) color moist, clay loam texture, strong, medium to coarse sub-angler block structure, firm moist, stick /plastic consistency when wet, weakly cemented, patchy, clay cementation, very few, roots, few, medium to fine pores.

40-180cm: Red (2.5YR4/6) color moist, clay loam texture, strong, medium, angular block structure, firm dry, stick/plastic consistency, wet, weakly cemented, patchy, clay cementation and few, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP44 | Map Sheet: 0836A1 |
| Location : E .Dursitu Misoma | Region : Oromiya, Zone: Illuababora, | Wereda: Chewaka |
| Mapping Unit: G2d-1 | | |
| Author:- Kumsa B | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 990200* |
| Agro-Climatic zone : Kolla | Elevation (m):1225 | *E:187900* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Strongly sloping | Slope: Position : High |
| Slope Aspect: E-W | *Slope Length: 50m* | Slope Form: Concave |
| Micro- Topography: Ridges | Coverage %:100 | |
| Parent Material : In suite weathered residual: | Soil depth cm: 50 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>50cm | |
| Drainage -External Well | Internal –Well drained | |
| Human influence: | | Moisture condition: Moist |
| Land Cover : Grass land | | |
| Land Use: Grassing | | |
| Major Crop Type : | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity : Active at present | Degree of dissection: Moderate | |

Remarks: Eroded area

0-10cm: Dark brown (7.5YR3/2) color moist, clay loam texture, weak, fine to medium, sub-angler block structure, stick/plastic consistency when wet, weak, organic cementation, many, fine to medium roots, many, fine to medium pores

10-27cm: Dark brown (7.5YR3/2) color moist, clay texture, weak, fine to medium, sub-angler block) structure, stick/plastic consistency wet, weak, clay cementation, many, fine roots, many, fine pores.

27-50cm: Brown (7.5YR4/4) color moist, clay loam texture, many, fine coarse fragment, moderate, fine to medium, sub-angler block structure, slight stick /slight plastic consistency wet, weak, clay cementation, common, fine roots and common, fine to medium pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP45 | Map Sheet: 0836A1 |
| Location : E .Dursitu Misoma | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-1 | Photo No | |
| Author:- Kumsa B | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 990396* |
| Agro-Climatic zone : Kolla | Elevation (m) :1244m | *E : 188359* |
| Land form : Upper part of gently undulating with convex interfluves | Slope Class: Sloping | Slope: Position : High |
| Slope Aspect: E-W | *Slope Length: 200m* | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage %:0.2 | |
| Parent Material : In suite weathered residual | Soil depth cm: 80 | *Rock outcrop:* |
| Surface Fragment coverage : | Surface Crack: | *Sealing:* |
| Flooding | Water table cm: >80 | |
| Drainage -External Well | Internal –Well drained | |
| Human influence : Burning, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks:

0-10cm: Dark reddish brown (5YR3/3) color moist, clay loam texture, weak, fine to medium, sub-angler structure, firm dry, stick/plastic consistency wet, organic cementation, common, fine roots and common, fine pores.

10-25cm: dark reddish brown (5YR3/4) color moist, clay texture, moderate, fine to medium, sub-angler block structure, firm dry, stick /plastic consistency wet, common, fine roots and common, fine pores.

25-60cm: Yellowish red (5YR3/6) color moist, clay texture, weak, medium, sub-angler block structure, firm moist, stick/ plastic, consistency wet, clay cementation, few, fine roots and few, fine pores.

60-80cm: Yellowish red (5YR3/6) color moist, clay loam texture, many, fine to many coarse fragment, weak, medium, sub-angler block structure, firm moist, stick/plastic consistency wet, clay cementation, very few, fine roots and few, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP46 | Map Sheet: 0836A1 |
| Location : E of Durrsitu misoma | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit:G1b-1 | | |
| Author:- Kumsa B | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 989594* |
| Agro-Climatic zone | Elevation (m) :1258 | *E:188429* |
| Land form : Upper part of gently undulating with convex interfluves | Slope Class: Very gently slope | Slope: Position : High |
| Slope Aspect: E-W | *Slope Length: >300m* | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage %:0.2 | |
| Parent Material : In suite weathered residual | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>200m | |
| Drainage -External Well | Internal –Well drained | |
| Human influence: Burning, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated land | | |
| Land Use: Sub-angler | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash | Area Affected : >50% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: Deep soil >200cm, slope 2-3% altitude <1260cm, this land cover big area

0-26cm: Dark reddish brown (5YR3/3) color moist, clay loam texture, weak, fine to medium, sub-angler block structure, firm consistency when moist, weakly cemented, organic cementation.

26-36cm: Dark reddish brown (5YR3/4) color moist, clay texture, moderate, fine to medium, sub-angler block) structure, very firm consistency when dry, weakly, clay cementation, common, fine roots and many, fine to medium pores.

36-93cm: Dark reddish brown (2.5YR3/4) color moist, clay texture, weak, fine to medium, sub-angler block structure, firm consistency when moist, weakly clay cementation, few, fine roots, common and, fine to medium pores.

93-200cm: Dark red (2.5YR3/6) color moist, clay texture, weak, fine to medium, sub-angler block structure, firm consistency moist, weakly cemented, clay cementation, very few, fine roots, and few, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP47 | Map Sheet: 0836A1 |
| Location : E. Harro chewaka | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit:G1b-1 | | |
| Author:- Kumsa B | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N:989573* |
| Agro-Climatic zone : Kolla | Elevation (m):1256 | *E:188995* |
| Land form : Upper part of gently undulating with convex interfluves | Slope Class: Gently slope | Slope: Position : Medium: |
| Slope Aspect: E-W | Slope Length: >200m | Slope Form: Concave |
| Micro- Topography: Terrace | Coverage %:0.2 | |
| Parent Material : | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>200m | |
| Drainage -External Well | Internal –Well drained | |
| Human influence : Burring, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Deep soil >200cm, slope 2-3%.

0-12:- Dark Radish Brown (5YR 3/2) color clay loam texture, weak, fine and medium, sub-angler structure, firm moist, sticky /plastic consistency when wet, weakly cemented, organic matter cementation, many, fine roots, many, fine and medium pores.

12-30:- Dark reddish brown (5YR3/4) color clay texture, moderate, fine and medium, sub-angler blocky structure, very hard dry, sticky /plastic consistency when wet, distinct, clay cutanic feature, moderately cemented, clay cementation common, fine roots, many, fine and medium pores.

30-65:- Dark red (2.5YR 3/6) color clay texture, moderate, fine and medium, sub-angler blocky structure, firm moist, sticky /plastic consistency wet, distinct, clay cutanic feature, moderately cemented, clay cementation, few, fine roots, common, fine and medium pores.

65-200 Dark red (2.5YR 3/6) color clay texture, weak, fine and medium, sub-angler blocky structure firm moist , sticky / plastic consistency wet , weakly cemented, clay cementation, few, fine roots, common, fine and medium pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP48 | Map Sheet: 0836A1 |
| Location : W of ILLU HARAR | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: U2f-9 | | |
| Author:- Zelealem S/m | Date:- | |
| FAO -*Soil Type : Hypereutric Cambisols (CMeuh)* | Coordinate (UTM) | *N: 989435* |
| Agro-Climatic Zone : Kolla | Elevation (m) : 1250/1253 | *E : 189864* |
| Land form: Strongly sloping hill/ridge side | Slope Class: Sloping | Slope: Position : Low |
| Slope Aspect: N-S | *Slope Length: 250m* | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %:6 | |
| Parent Material : Volcanic ash | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm:> 200 | |
| Drainage -External Rapid | Internal –Well | |
| Human influence: New settlement | | Moisture condition: Moist |
| Land Cover : Predominantly cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum, maize, sesame, rice, Haricot bean | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 10-25% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: Drbeka, Berenssa, Wedessa and Bedessa trees.

0-23cm: Dark reddish brown (5YR3/3) color moist, clay loam texture, few, fine coarse fragment, strong, coarse, sub-angler block structure, firm moist stick/plastic consistency when wet, common, fine to medium, roots and common, medium pores.

23-58cm: Dark reddish brown (5YR3/4) color moist, clay loam texture, common, fine coarse fragment, strong, coarse, sub-angler block structure, firm moist, stick/plastic consistency wet, moderately cemented, clay cementation, fine roots and many, fine pores.

58-77cm: Dark reddish brown (2.5YR3/4) color moist, clay loam texture, few, fine coarse fragment, medium to strong, coarse, sub-angler block structure, firm moist, stick/plastic consistency when wet, moderate, patchy, coarse cementation, few, fine roots, many and fine to medium pores.

77-200cm: Dark red (2.5YR3/6) color moist, loam texture, moderate, medium, sub-angler block structure, firm moist, slightly stick/slightly plastic consistency wet and few, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP49 | Map Sheet: 0836A1 |
| Location : E of Illuharar | Region : Oromiya, Zone: Illuababora, | Wereda: Chewaka |
| Mapping Unit: G2d-1 | | |
| Author:- Zelealem S/m | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 988588* |
| Agro-Climatic zone | Elevation (m): 1250/46 | *E: 189407* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Gently slope | Slope: Position : Low |
| Slope Aspect: N-s Slope Length: 150m | Slope Form: Uniform to convex | |
| Micro- Topography: Termite | Coverage %: | |
| Parent Material : Volcanic ash | Soil depth cm: 171 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>171 | |
| Drainage -External Rapid | Internal –Well drain | |
| Human influence: New settlement | | Moisture condition: Moist |
| Land Cover : Predominantly cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 5-10% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Debeka, Gura galla

0-15cm:Dark reddish brown (5YR3/2) color moist, loam texture, strong, coarse, sub-angler block structure, hard dry, stick/ plastic consistency when wet, few, fine roots, common and fine to medium pores.

15-31cm: Dark reddish brown (5YR3/6) color moist, clay loam, strong, coarse, sub-angler block structure, hard dry, stick/ plastic, consistency wet and few, fine pores.

31-126cm: Red (2.5YR4/6) color moist, clay loam texture, few, fine coarse fragment, strong, coarse, sub-angler block structure, firm moist and stick/plastic consistency when wet.

126 - 171 cm: Red (2.5YR4/8) color moist, clay loam texture, many, medium to coarse fragment, structure less, medium to coarse, massive structure, many, reddish yellow and hard mineral nodules.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION SHEET | Field No:DP50 | Map Sheet: 0836A1 |
| Location : E of Illuharar | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- Zelealem S/M | Date:- | |
| FAO –*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 988846* |
| Agro-Climatic zone : Kolla | Elevation (m) :1231 | *E:188591* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Gently slope | Slope: Position : Moist |
| Slope Aspect: W-E | *Slope Length: >200m* | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %:3 | |
| Parent Material : Volcanic ash | Soil depth cm. 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>200 | |
| Drainage -External Rapid /Medium | Internal –Well | |
| Human influence: | | Moisture condition: Moist |
| Land Cover: Predominantly cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum, sesame, maize, Finger, Mellette | Fertilizer Type | |
| Type of erosion : Sheet & Splash | Area Affected : 5-10% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: Maize is sown with fertilizer

0-19cm: Dusky red (2.5YR3/3) color moist loam texture, strong, coarse, sub-angler block structure, hard dry, slight stick / slight plastic consistency when wet, common /many, fine to medium roots and many, medium to fine pores.

19-50cm: Reddish Brown (2.5YR4/4) color moist, clay loam texture, strong, medium/coarse, sub-angler block structure, firm moist, stick/plastic consistency when wet, few, fine roots and many, coarse/fine pores.

50-110cm: Red (2.5YR4/6) color moist, clay loam texture, few, fine coarse fragment, many, medium, angular block structure, firm moist stick/plastic consistency when wet, weak, patchy cementation and few, fine pores.

110-200cm: Red (2.5YR4/6) color moist, sand clay loam texture, many, fine to medium coarse fragment, moderate, medium sub-angler block structure, firm moist and, stick/plastic consistency when wet.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP51 | Map Sheet: 0836A1 |
| Location : | Region : Oromiya, Zone: Illuababora, | Wereda: Chewaka |
| Mapping Unit: G1b-1 | | |
| Author:- Zelealem S/m | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 996961* |
| Agro-Climatic zone:Kolla | Elevation (m):1195 | *E:183724* |
| Land form : Upper part of gently undulating with convex interfluves | Slope Class: Strongly sloping | Slope: Position : Medium |
| Slope Aspect: W-E | *Slope Length: 500m* | Slope Form: Convex |
| Micro- Topography: Termite | Coverage %: | |
| Parent Material : Volcanic ash | Soil depth cm: 130 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :> 130 | |
| Drainage -External | Internal - | |
| Human influence: Vegetation disturbed, clearing | | Moisture condition: |
| Land Cover : Moderately cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sesame, maize, sorghum | Fertilizer Type : For maize they apply | |
| Type of erosion : Sheet & Slash erosion | Area Affected : 10-25 | |
| Activity : Active at present | Degree of dissection: Slight to medium | |

Remarks: The area scattered boulders in the field some of them have height of 3-2m .To the south of the pit deeply incised gully is there.

0-25cm: Very dark grayish brown (10YR3/2) color moist, loam texture, few, fine to medium coarse fragment, strong, coarse to medium, sub-angler block structure, very hard dry, stick/plastic consistency wet, common, white, hard, silicone dioxide, segregate mineral nodules, few, medium to coarse roots, and few, medium to coarse pores

25-48cm: Brown (10YR4/3) color moist, many, coarse to many coarse fragment, strong, coarse, sub-angler block structure, very hard dry, stick/plastic consistency wet, common ,white, hard, silicone dioxide, segregate mineral nodules.

48-78cm: brown (7.5YR4/4) color moist, many, coarse to medium coarse fragment, moderate, coarse, sub-angler block structure, slight hard dry, slight stick/slight plastic consistency wet, cemented, carbonate –silicate cementation, many to common, white, hard, silicone dioxide, segregate mineral nodules.

78-130cm: Many, coarse fragment, many, white, hard, silicone dioxide, segregate mineral nodules.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP52 | Map Sheet: 0836A1 |
| Location : NW of Illuharer | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-4 | | |
| Author:- Zelealem S/M | Date:- | |
| FAO -*Soil Type : Hyperferric Acrisols (ACfrh)* | Coordinate (UTM) | *N: 996427* |
| Agro-Climatic Zone : Kolla | Elevation (m) :1250 | *E:184833* |
| Land form: Upper part of gently undulating plain with convex interfluves | Slope Class: | Slope: Position : Medium |
| Slope Aspect: W-E | *Slope Length: 80m* | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %:3 | |
| Parent Material : Volcanic ash | Soil depth cm: >200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>200 | |
| Drainage -External Moderately | Internal –Well drained | |
| Human influence: Clearing | | Moisture condition: |
| Land Cover : Intensively cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum, maize, sesame, rice | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 5-10% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: To the east 100-200m there is wet land. Deforestation is clearly seen in the area.

0-20cm: Dusky red (2.5YR3/3) color moist ,loam texture , strong to medium ,coarse ,angular block structure , slightly hard dry , slight stick/slight plastic consistency wet , few ,medium to fine roots , many and coarse to medium pores.

20-43cm: Dark reddish brown (2.5YR3/4) color moist , clay loam , moderate ,medium to coarse ,angular block structure , firm moist, stick /plastic consistency wet, few ,fine roots and many ,fine to medium pores.

43-120cm: Dark red (2.5YR3/6) color moist, clay texture, moderate, medium, angular block structure, firm moist, sticky/ plastic consistency when wet, few, very fine roots and many, fine pores.

120-200cm: Dark red (2.5YR3/6) color moist, clay loam texture, moderate, medium, angular block structure, firm moist, stick / plastic consistency when wet, few, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP53 | Map Sheet: 0836A1 |
| Location: N of Illuharar | Region : Oromiya Zone: Illuababora | Wereda: Chewaka |
| Mapping Unit: G1b-1 | | |
| Author:- Zelealem S/M | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 992000* |
| Agro-Climatic : Kolla | Elevation (m): 1250 | *E:185970* |
| Land form : Upper part of gently undulating with convex interfluves | Slope Class: Nearly level | Slope: Position : Medium |
| Slope Aspect: N-S | *Slope Length:* | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %:2 | |
| Parent Material : Volcanic ash | Soil depth cm: 60 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm: | |
| Drainage -External Moderate to slow | Internal –Well drained | |
| Human influence : Clearing Vegetation disturbed | | Moisture condition: Moist |
| Land Cover : Predominantly cultivated | | |
| Land Use:CA4 Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 5-10% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: It is prepared for cultivation.

0-14cm: Dark reddish brown (5YR3/4) color moist, loam texture, moderate, medium to coarse sub-angler block structure.

14-40cm: Dark red (2.5YR3/6) color moist, clay loam texture, moderate, medium, sub-angler block structure.

40-60cm: Dark red (2.5YR3/6) color moist, loam texture, many, medium to coarse fragment, weak, medium, granular structure.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP54 | Map Sheet: 0836A1 |
| Location : | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: Sg-6 | | |
| Author:- | Date:- | |
| FAO -*Soil Type : Orthieutric Leptosols (LPeou)* | Coordinate (UTM) | *N: 994653* |
| Agro-Climatic zone:Kolla | Elevation (m) :1226 | *E:186649* |
| Land form : Moderately steep side of hill/ridge | Slope Class: Gently slope | Slope: Position : Medium |
| Slope Aspect: E-W | *Slope Length: 1km* | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %: | |
| Parent Material : | Soil depth c m: 70 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>70 | |
| Drainage -External Moderate | Internal –Well | |
| Human influence: New settlement area | | Moisture condition: |
| Land Cover : Predominantly cultivated/ Intensively cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 5-10% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks:

0-13cm: Dark reddish brown (5YR3/2) color moist, loam texture, strong, coarse, angular block structure, hard dry, slightly stick/slight plastic consistency wet, few , fine to medium roots, many and coarse to medium pores.

13-40cm: Dark reddish brown (5YR3/4) color moist, clay loam texture, strong, coarse, angular block structure, stick/ plastic consistency when wet, few, fine to medium roots and common, coarse to medium pores.

40-70cm: Yellowish red (5YR3/6) color moist, clay loam texture many, fine to medium coarse fragments, strong, coarse, angular block structure, stick/plastic consistency when wet and common, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP55 | Map Sheet: 0836A1 |
| Location : N of Illuharar | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-4 | | |
| Author:- | Date:- | |
| FAO -*Soil Type : Hyperferric Acrisols (ACfrh)* | Coordinate (UTM) | *N: 994400* |
| Agro-Climatic | Elevation (m) : 1205 | *E: 188000* |
| Land form : Upper part of gently undulating with convex interfluves | Slope Class: Very gently slope | Slope: Position : High |
| Slope Aspect: E-W | Slope Length: 80m | Slope Form: |
| Micro- Topography: Termite | Coverage %:3 | |
| Parent Material : Volcanic ash | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>200 | |
| Drainage -External Slow to Moderate | Internal –Well | |
| Human influence | | Moisture condition: |
| Land Cover : | Land Use: | |
| Major Crop Type : | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 0-5% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Surrounding area is covered with dense shrubs, hyperpiesia grasses and open wood land

0-23cm: Brown (7.5YR4/2) color moist, loam texture, moderate, medium to coarse, granular structure, hard dry, slight stick /slight plastic consistence when wet, many, medium to coarse roots and common, medium, fine pores.

23-50cm: Brown (7.5YR4/4) color moist, clay loam texture, strong, medium to coarse, granular/ sub-angler block structure, firm dry, stick/plastic consistence when wet, few, fine to medium roots and common, fine pores.

50-90cm: Strongly brown (7.5YR4/6) color moist, clay loam texture, very few, fine coarse fragment, strong, medium, sub-angler block structure, firm dry, stick /plastic consistency wet, weakly cemented, iron –manganese cementation few and fine to medium roots.

90-150cm: Yellowish red (5YR4/6) color moist, loam texture, few, fine coarse fragment, strong, medium, sub-angler block structure, firm dry, stick/plastic consistency wet, moderately cemented, iron-manganese cementation and few fine to medium roots.

150-200cm: Yellowish red (5YR4/6) color moist, loam texture, many, fine to medium coarse fragment, strong, medium, sub-angler block structure, slight firm moist, slightly stick/slightly plastic consistency wet, weakly cemented, iron- manganese cementation, few, black, hard, manganese mineral nodules and few, fine roots.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP56 | Map Sheet: 0836A1 |
| Location : N of Illuharar | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: Sg-6 | | |
| Author:- Zelealem S/M | Date:- | |
| FAO -Soil Type : Orthieutric Leptosols (LPeou) | Coordinate (UTM) | N: 995602 |
| Agro-Climatic zone:Kolla | Elevation (m):1187 | E : 187193 |
| Land form : Moderately steep side of hill/ridge | Slope Class: Gently slope | Slope: Position : Medium |
| Slope Aspect: N-S | Slope Length: 70m | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %:2 | |
| Parent Material : Volcanic ash | Soil depth cm: 60 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>60cm | |
| Drainage -External Rapid /Medium | Internal –Well | |
| Human influence : New settlement area | | Moisture condition: |
| Land Cover : Predominantly cultivated/ Intensively cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum, maize, rice, haricot bean, Sesame | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 5-10% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: Along the streams the channels are covered with forest .Deforestation is high .After 60cm the soil is stony, gravel

0-23cm: Dark reddish brown (5YR3/2) color moist, loam texture, few, fine coarse fragment, strong, coarse, angular block/ sub-angler block structure, hard dry, slightly stick /slightly plastic consistency wet, common, fine to medium roots and common, medium to coarse pores.

23-60cm: Reddish brown (5YR4/3) color moist, clay loam texture, common, fine to medium coarse fragment, strong, coarse sub-angler block structure, slightly stick/slight plastic consistency when wet, few, black, hard, manganese mineral nodules, few, fine roots and common, fine to medium pores

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP57 | Map Sheet: 0836A1 |
| Location : | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: Sg-6 | | |
| Author:- Zelealem S/M | Date:- | |
| FAO -*Soil Type : Orthieutric Leptosols (LPeou)* | Coordinate (UTM) | *N: 996998* |
| Agro-Climatic zone:Kolla | Elevation (m):1222 | *E:184403* |
| Land form : Moderately steep side of hill/ridge | Slope Class: Gently slope | Slope: Position : |
| Slope Aspect: N-S | *Slope Length: 300m* | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %:1 | |
| Parent Material : Volcanic ash | Soil depth cm: 64 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>64 | |
| Drainage -External Moderately drained | Internal –Well drained | |
| Human influence: | | Moisture condition: |
| Land Cover : Cultivated land/Moderately cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum, sesame, maize, rice | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 10-25% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: After 64cm down throughout gravel.

0-23cm: Brown (10YR5/3) color moist, loam texture, common, fine to medium coarse fragment, strong, coarse, sub-angler block structure, hard dry, slight stick /slight plastic consistency wet, very few, fine roots and common medium to fine pores.

23-64cm: Brown (7.5YR4/4) color moist, loam texture, common to moderate, medium to coarse fragment, strong, coarse, sub-angler block structure, hard dry, stick/plastic consistency wet, few, yellow , hard, moderately cemented mineral nodules.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION SHEET | Field No:DP58 | Map Sheet: 0836A1 |
| Location : SW of Urji Oromia | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit:G2d-1 | | |
| Author:- Kumsa B | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 990016* |
| Agro-Climatic zone: kola | Elevation (m): 1255 | *E:189712* |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Sloping | Slope: Position : Medium |
| Slope Aspect: N-S | Slope Length: 300m | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage %:0.2 | |
| Parent Material : In suite weathered residual | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm: >200m | |
| Drainage -External Well | Internal –Well drained | |
| Human influence: Clearing, Burning, Terracing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & splash erosion | Area Affected : >50% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: Big land unit, with deep soil >200m

0-17cm: Dusky red (2.5YR3/2) color moist, clay loam texture, weak, fine to medium, sub-angler block structure , firm moist consistency, patchy, distinct, coarse cutanic feature, many, fine to medium roots and many, fine to medium pores.

17-60cm: Dark reddish brown (2.5YR3/4) color moist, clay texture, moderate, fine to medium, sub-angler block structure, firm moist consistence, patchy, distinct, coarse cutanic feature, common, fine to medium roots and common, fine pores.

60-200cm: Dark red (2.5YR3/6) color moist, clay texture, moderate, fine to medium, sub-angler block structure, firm moist consistence, few, fine to medium roots and common, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION SHEET | Field No:DP59 | Map Sheet: 0836A1 |
| Location : W.Urji Oromia V | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 990016 |
| Agro-Climatic Zone : Kolla | Elevation (m): 1255 | E: 189712 |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Strongly slope | Slope: Position : Medium |
| Slope Aspect: E-W | Slope Length: 200m | Slope Form: Concave |
| Micro- Topography: Termite | Coverage %:0.2 | |
| Parent Material : In suite weathered residual | Soil depth cm: 90 | Rock outcrop: Few |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm: | |
| Drainage -External Well | Internal –Well drained | |
| Human influence: Terracing, Burning | | Moisture condition: Moist |
| Land Cover : Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : maize | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: Soil depth is limited to 90cm slope is 10% near mango trees.

0-16cm: Very dark gray (5YR3/1) color moist, clay loam texture, weak, fine to medium, sub-angler block structure, firm moist, stick /plastic consistency when wet, patchy, distinct, coarse cutanic feature, weakly cemented, organic matter cementation, many, fine to medium roots, many and fine to medium pores.

16-40cm: Dark reddish brown (5YR3/2) color moist, clay loam texture, weak, fine to medium, sub-angler block structure, firm moist, stick /plastic consistency when wet, patchy, distinct, coarse cutanic feature, weakly cemented, organic cementation, many, fine to medium roots and many, fine to medium pores.

40-90cm: Reddish brown (5YR4/4) color moist, clay texture, few, medium coarse fragment, moderate, fine to medium, sub-angler block structure, very firm mist, stick/plastic consistency wet, moderately cemented, clay cementation, common, fine roots and common, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP60 | Map Sheet: 0836A1 |
| Location: W. Urji Oromia Village | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b_1 | | |
| Author:- Kumsa B | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 991206* |
| Agro-Climatic Zone:Kolla | Elevation (m):1240 | *E:188980* |
| Land form : Upper part of gently undulating with convex interfluves | Slope Class: Strongly slope | Slope: Position : Low |
| Slope Aspect: W-E | Slope Length: 100m | Slope Form: Concave |
| Micro- Topography: Termite | Coverage % : 1 | |
| Parent Material : In suite weathered residual | Soil depth c m: 130 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. : >130cm | |
| Drainage -External Well | Internal –Well drained | |
| Human influence : Clearing, Burning | | Moisture condition: Moist |
| Land Cover : Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected: >50% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: The site is located 30m west of gully / stream.

0-19cm: Very dark gray (5YR3/1) color moist, clay loam texture, weak, fine to medium, sub-angler block structure, firm moist, stick/plastic consistency wet, patchy, distinct, coarse cutanic feature, weakly cemented, organic matter cementation, many, fine to medium roots s and many fine to medium pores.

19-67cm: Dark reddish gray (5YR3/2) color moist, clay texture, moderate, fine to medium sub-angler block structure, very firm stick /plastic, consistency wet, patchy, distinct, coarse cutanic feature, weakly cemented, clay cementation, common, fine roots s and common, fine to medium pores.

67-130cm: Yellowish red (5YR4/6) color moist, clay loam texture, moderate, fine to medium, sub-angler block structure, very firm moist, stick/plastic consistency wet, patchy, distinct, coarse cutanic feature, weakly cemented, clay cementation, few, fine roots and few to common fine to many pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP61 | Map Sheet: 0836A1 |
| Location : N of Illuharer | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-4 | | |
| Author:- | Date:- | |
| FAO -*Soil Type : Hyperferric Acrisols (ACfrh)* | Coordinate (UTM) | *N: 993601* |
| Agro-Climatic zone Kolla | Elevation (m):1234 | *E:187937* |
| Land form: Upper part of gently undulating plain with convex interfluves | Slope Class: Very gently slope | Slope: Position : Lower |
| Slope Aspect: N-S | Slope Length: 1km | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %:1 | |
| Parent Material : Volcanic ash | Soil depth cm: 108 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. : >108 | |
| Drainage -External Moderately well drained | Internal –Moderately well drained | |
| Human influence: New cultivation land | | Moisture condition: Moist |
| Land Cover : Intensively cultivated Land/Predominantly cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type : | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 5-10% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Many dried big trees, like debeka and chewake. The observation point taken on plateau land.

0-14cm: Dark reddish brown (5YR3/2) color moist, loam texture, few, fine coarse fragment, moderate, medium to coarse, angular block structure, hard dry, stick/plastic dry consistency wet, few, medium to fine roots and many, fine to medium pores.

14-34cm: Dark reddish brown(5YR3/4) color moist, clay loam texture, few, fine coarse fragment, moderate, coarse, sub-angler block structure, firm moist, stick/plastic consistency wet, few, red, hard, iron mineral nodules, few, fine roots and common, fine to medium pores.

34-69cm: Dark reddish brown (2.5YR3/4) color moist, clay loam texture, common fine to medium coarse fragment, moderate, coarse, sub-angler block structure, firm moist, stick/plastic consistency, few, yellowish red, hard, silicon mineral nodules, common, fine pores

69-108cm: Dark red (2.5YR3/6) color moist, loam texture, common, medium to coarse fragment, moderate coarse, sub-angler block structure, firm moist, stick/plastic consistency wet and few, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP62 | Map Sheet: 0836A1 |
| Location : | Region : Oromiya, Zone: Illuababora | Wereda: Chewaka |
| Mapping Unit: U2f-9 | | |
| Author:- Zelealem S/M | Date:- 15/05/09 | |
| FAO -Soil Type : Hypereutric Cambisols (CMeuh) | Coordinate (UTM) | N: 992610 |
| Agro-Climatic zone:Kolla | Elevation (m) | E: 0191489 |
| Land form: Strongly sloping hill/ridge side | Slope Class: Strongly sloping | Slope: Position : Medium |
| Slope Aspect: E-W | Slope Length: 400m | Slope Form: Convex |
| Micro- Topography: | Coverage %: | |
| Parent Material : Volcanic ash | Soil depth cm : 50 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. : >50 | |
| Drainage -External Rapid | Internal –Slight | |
| Human influence: New settlement | | Moisture condition: |
| Land Cover : Predominantly cultivated/Moderately cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum, maize, rice | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 10-15% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Throughout the area the slope is more than 12%, the soil is shallow and the surface is exposed

0-15cm: Very dark brown(7.5YR2/2) color moist, loam texture, few, fine coarse fragment, moderate medium to coarse, sub angular block structure, slight hard dry, slight stick/plastic consistency when wet, very few ,fine roots and many ,medium to coarse pores.

15-50cm: Dark brown (7.5YR4/2) color moist, sandy loam moist, many, fine to medium coarse fragment, weak, fine to medium, massive structure, firm moist, stick/plastic consistency wet, very few, fine roots and many, medium to coarse pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP63 | Map Sheet: 0836A1 |
| Location : N of Illuharar | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: U2f-9 | | |
| Author:- | Date:- | |
| FAO -*Soil Type : Hypereutric Cambisols (CMeuh)* | Coordinate (UTM) | *N: 992200* |
| Agro-Climatic zone:Kolla | Elevation (m) : 1218 | *E: 191269* |
| Land form: Strongly sloping hill/ridge side | Slope Class: Strongly sloping | Slope: Position : Medium |
| Slope Aspect: E-W | *Slope Length: 300m* | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %:2 | |
| Parent Material : Volcanic ash | Soil depth cm: >65cm | *Rock outcrop:* |
| *Surface Fragment coverage :* | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. : | |
| Drainage -External | Internal - | |
| *Human in fluence* | | Moisture condition: |
| Land Cover : Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 10-25% | |
| Activity: Active at present | Degree of dissection: Slight to medium | |

Remarks: New settlement area dissected land with slope percentage of 9%

0-13cm: Very dark brown(7.5YR 2/2) color moist, loam texture, strong, medium to coarse, sub-angler block structure, hard dry, slight stick/slight plastic consistency wet, few, black, soft, manganese mineral nodules, common, coarse to medium roots and many, medium to coarse pores.

13-38cm: Dark brown(7.5YR 3/3) color moist, clay loam texture, few, fine coarse fragment, strong, medium, sub-angular block structure, few, stick to plastic consistency wet, weakly cemented, patchy cementation, few, black soft, manganese mineral nodules, few, fine roots, few, fine pores.

38- 65 Dusky red (2.5YR3/3) color moist medium coarse fragment, strong, medium sub-angular block structure, firm moist, stick/plastic consistency, few, black, soft, manganese mineral nodules, few, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP64 | Map Sheet: 0836A1 |
| Location : E of Illuharer | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: U2f-9 | | |
| Author:- Kumsa B. | Date:- | |
| FAO -Soil Type : Hypereutric Cambisols (CMeuh) | Coordinate (UTM) | N: 991672 |
| Agro-Climatic zone : Kolla | Elevation (m): 1248 | E:191445 |
| Land form: Strongly sloping hill/ridge side | Slope Class: Strongly sloping | Slope: Position : Medium |
| Slope Aspect: N-S | Slope Length: 150m | Slope Form: Convex |
| Micro- Topography: Termite | Coverage %:3 | |
| Parent Material : Volcanic ash | Soil depth cm: 40 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. : >40 | |
| Drainage -External Rapid to Medium | Internal –Well to Slow | |
| Human influence | | Moisture condition: |
| Land Cover : Predominantly cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum, mango, maize, rice | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 10-25% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: Scattered few big mango trees are found in the area, some of them are too dry.

0-40cm: Very dark gray (7.5YR3/0) color moist, loam texture, many, coarse to medium coarse fragment, medium to coarse, granular structure, slight stick/slight plastic consistency when wet, few, fine to medium roots and many, fine to medium pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP65 | Map Sheet: 0836A1 |
| Location : W-S | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: V3c-8 | | |
| Author:- Zelealem S/M | Date:- | |
| FAO -*Soil Type : Hypereutric Fluvisols (FLeuh)* | Coordinate (UTM) | *N: 991896* |
| Agro-Climatic zone: Kolla | Elevation (m):1222 | *E:191038* |
| Land form : Moderately dissected valley floor | Slope Class : Strongly | Slope: Position : Low |
| Slope Aspect: W-E | *Slope Length: 100m* | Slope Form: Convex |
| Micro- Topography: Termite | Coverage %:2 | |
| Parent Material : Volcanic ash | Soil depth cm: 175 | |
| *Surface Fragment coverage :* | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. :>175 | |
| Drainage -External *Rapid* | Internal –Well drained | |
| *Human influence: New settlement area* | | Moisture condition: Moist |
| Land Cover : Predominantly cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum, maize, sesame, rice, pepper | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 10-25% | |
| Activity : Active at present | Degree of dissection: Slight to Medium | |

Remarks: Both river sides have similar surface feature and vegetation cover .At the valley bottom there are big trees like Bedessa and Harabo.

0-21cm: Dusky red (2.5YR3/3) color moist, loam texture, strong, coarse sub-angler block structure, hard dry, slightly stick/ plastic consistency wet, common, fine to medium roots and many to common, medium to fine pores.

21-55cm: Dusky red(2.5YR3/3) color moist, clay loam texture, few, fine coarse fragment, strong, medium to coarse, sub-angler block structure, firm moist, stick/plastic consistency wet, common, red, slightly hard, iron mineral nodules, few, fine roots and common, fine pores.

55-69cm: Dusky red(2.5YR3/3) color moist, clay loam texture, few, fine coarse fragment, strong, medium to coarse, sub-angler block structure, firm moist, stick/plastic consistency wet, common, red, soft, iron mineral nodules, common and medium pores.

69-175cm: Reddish brown (2.5YR4/4) color moist, clay loam texture.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP66 | Map Sheet: 0836A1 |
| Location : Oda Kabena | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: U1e-4 | | |
| Author:- Kumsa B | Date:- | |
| FAO -*Soil Type : Hyperferric Acrisols (ACfrh)* | Coordinate (UTM) | *N: 997000* |
| Agro-Climatic zone:Kolla | Elevation (m):1259 | *E:180400* |
| Land form: Strongly sloping valley / hill side | Slope Class: Gently slope | Slope: Position : High |
| Slope Aspect: | *Slope Length: E-W* | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage %:0.2 | |
| Parent Material :In suite weathered residual | Soil depth cm: 200 | *Rock outcrop:* |
| *Surface Fragment coverage :* | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. :> 200cm | |
| Drainage -External *Well* | Internal –Well drained | |
| *Human influence : Burning, Clearing, Terracing* | | Moisture condition: Moist |
| Land Cover : Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: Soil is deep >200cm, Slope is 3%.

0-12cm: Dark reddish brown(5YR3/2) color moist, clay loam texture, weak, fine to medium, sub-angler block structure, firm moist, stick/plastic consistency when wet, patchy ,distinct ,clay cutanic feature, many, fine to medium roots and many, fine to medium pores.

12-30cm: Dark reddish brown(5YR3/4) color moist, sand clay texture, moderate, fine to medium, sub-angler block structure firm moist, stick/plastic consistency wet, patchy, distinct, clay cutanic feature, common, fine to medium roots and many, fine to medium pores.

30-65cm:Red (2.5YR4/6) color moist, sand clay texture, moderate, fine to medium, sub-angler block structure, firm moist, stick/plastic consistency wet, patchy ,distinct, clay cutanic feature, few, fine to medium roots and, many fine pores.

65-200cm: Red (2.5YR4/8) color moist, sand clay texture, moderate, fine to medium, sub-angler block structure, firm moist, stick/plastic consistency wet, few, fine to medium roots and many, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP67 | Map Sheet: 0836A1 |
| Location : Barjk Anani | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: U1e-4 | | |
| Author:- Kumsa | Date:- | |
| FAO -Soil Type : Hyperferric Acrisols (ACfrh) | Coordinate (UTM) | N: 995438 |
| Agro-Climatic | Elevation (m) :1237 | E:181318 |
| Land form: Strongly sloping valley / hill side | Slope Class: Sloping | Slope: Position : Medium |
| Slope Aspect: N-S | Slope Length: >200m | Slope Form: Concave |
| Micro- Topography: Terracing /Termite | Coverage %:1 | |
| Parent Material : In suite weathered residual | Soil depth cm: 160 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>160 | |
| Drainage -External Well | Internal –Well drained | |
| Human influence : Burning, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: Deep soil ,7% Slope

0-14cm: Dark reddish brown (5YR3/2) color moist, clay loam texture, weak, fine to medium, sub-angler block structure, firm moist, stick/plastic consistency, many, fine roots and many, fine pores.

14-45cm: Dark reddish brown 5YR3/4) color moist, clay texture, moderate, fine to medium, sub-angler block) structure, firm moist, stick/plastic) consistency wet, common, fine to medium roots s and many, fine pores.

45-80cm: Dark reddish brown (2.5YR3/4) color moist, clay texture, moderate, fine to medium, sub-angler block structure, firm mist, stick/plastic consistency, few, fine to medium roots and many, fine pores.

80-160cm: dark red (2.5YR3/6) moist, clay texture, moderate, fine to medium, sub-angler block structure, firm moist, stick/plastic consistency wet, few, fine roots and many, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION SHEET | Field No:DP68 | Map Sheet: 0836A1 |
| Location : Urji Oromia | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: U2f-9 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Hypereutric Cambisols (CMeuh) | Coordinate (UTM) | N: 992982 |
| Agro-Climatic Zone : Kolla | Elevation (m) : 1210 | E : 189483 |
| Land form: Strongly sloping hill/ridge side | Slope Class: Sloping | Slope: Position : High |
| Slope Aspect: W-E | Slope Length: 200m | Slope Form: Uniform |
| Micro- Topography: Terracing, Termite | Coverage %:1 | |
| Parent Material : Fluvial Deposition | Soil depth cm: 120 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>120 | |
| Drainage -External Imperfectly | Internal – Imperfectly drained | |
| Human influence : Burning, Terracing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : rice | Fertilizer Type | |
| Type of erosion : | Area Affected : | |
| Activity | Degree of dissection: | |

Remarks:

0-19cm: Dark brown (7.5YR3/1) color moist, common, yellowish red, distinct mottle, clay loam texture, weak, fine to medium, sub angler block structure, firm moist, stick/plastic consistency wet, many, fine roots and many, fine pores.

19-46cm: Dark brown (7.5YR4/2) color moist, many, yellowish red, distinct) mottle, clay texture, moderate, medium to coarse, wedged –shaped structure, very firm moist, very stick/very plastic consistency wet, many, fine roots and many, fine pores.

46-120cm: Brown 7.5YR5/2) color moist, many, yellowish red, distinct mottle, clay texture, common, medium coarse fragment, moderate, medium, wedged –shaped structure, very firm moist, very stick/very plastic consistency wet, few, fine roots and common, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP69 | Map Sheet: 0836A1 |
| Location : Urji Oromia | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: U2f-9 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Hypereutric Cambisols (CMeuh) | Coordinate (UTM) | N: 992613 |
| Agro-Climatic:Kolla | Elevation (m) :1245 | E: 188796 |
| Land form: Strongly sloping hill/ridge side | Slope Class: Strongly slope | Slope: Position : Medium |
| Slope Aspect: W-E | Slope Length: >200m | Slope Form: Concave |
| Micro- Topography: Termite/Terracing | Coverage %:1 | |
| Parent Material : In situ weathered residual | Soil depth cm: 160 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm: >160 | |
| Drainage -External Well | Internal –Well drained | |
| Human influence: Burning, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: Deep soil

0-20cm : Dark reddish brown (5YR 3/2) color moist, clay loam texture, moderate, fine to medium, sub-angular block structure, firm moist, stick/plastic consistency wet, many, fine/medium roots and many, fine to medium pores.

20-64cm: Dark reddish brown (5YR3/4) color moist, clay texture, moderate, fine/medium, sub-angular block structure, firm moist, stick/plastic consistency wet, many, fine to medium roots and many, fine/medium pores.

64-160cm: Dark red (2.5YR3/6) color moist, clay texture, many, fine to medium sub-angular block structure, firm moist, stick/ plastic consistency wet, common, fine roots and common, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP70 | Map Sheet: 0836A1 |
| Location : Urji Oromiya | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: U2f-9 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Hypereutric Cambisols (CMeuh) | Coordinate (UTM) | N: 992870 |
| Agro-Climatic Zone : Kolla | Elevation (m) :1259 | E : 188094 |
| Land form: Strongly sloping hill/ridge side | Slope Class: Gently sloping | Slope: Position : High: |
| Slope Aspect: E-W | Slope Length: >200m | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage %: 0,2 | |
| Parent Material : In suite weathered residual | Soil depth cm: 80 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>80 | |
| Drainage -External Well | Internal –Well drained | |
| Human influence : Burning, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: 72cm is with many types of gravel, it is also found in 14-72cm, depth.

0-14cm: Dark reddish brown (5YR3/2) color moist, clay loam texture, weak, fine to medium, sub-angular block structure, firm moist, stick/plastic consistency when wet, common, fine roots and many, fine/medium pores.

14-72cm: Yellowish red (5YR3/6) color moist, common, fine to medium coarse fragment, weak, fine to medium, sub-angler block structure, firm moist, stick/ plastic consistency when wet, few, fine roots and many, fine/medium pores.

72 - 80cm: Dark red (2.5YR3/6) color moist, moderate, medium coarse fragment, weak, fine to medium, sub-angler block structure, firm moist, stick/plastic consistency when wet and common, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP71 | Map Sheet: 0836A1 |
| Location : Sirre Guddo | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-4 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Hyperferric Acrisols (ACfrh) | Coordinate (UTM) | N: 995360 |
| Agro-Climatic Condition : Kolla | Elevation (m) :1239 | E: 185391 |
| Land form: Upper part of gently undulating plain with convex interfluves | Slope Class: Very gently slope | Slope: Position : Medium |
| Slope Aspect: N-S | Slope Length: 300m | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage %: 0.2 | |
| Parent Material : In suite weathered residual | Soil depth cm: 160 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>160 | |
| Drainage -External Well | Internal –Well drained | |
| Human influence : Burning, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: Deep soil, slope 3-4%s, well drained soil.

0-12cm: Dark reddish brown (5YR3/2) moist, clay loam texture, weak, fine to medium, sub-angler block structure, firm dry stick/plastic consistency when wet, many, fine roots and many, fine to medium pores.

12-34cm: Dark reddish brown (5YR3/4) moist, clay texture, moderate, fine to medium, sub-angler block structure firm moist, stick/plastic consistency when wet, common, fine roots and many, fine to medium pores.

34-70cm: Yellowish red (5YR3/6) color moist, clay texture, moderate, fine to medium, sub-angler block structure, firm moist, stick/plastic consistency when wet, few, fine roots and many, fine pores.

70-160cm: Red (2.5YR4/6) color moist, clay texture, moderate, fine to medium, sub-angler block structure, firm moist, stick/plastic consistency when wet.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP72 | Map Sheet: 0836A1 |
| Location : Sirre Guddo | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit:Sg-6 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Orthieutric Leptosols (LPeou) | Coordinate (UTM) | N: 995587 |
| Agro-Climatic condition : Kolla | Elevation (m) : 1203 | E : 185969 |
| Land form : Moderately steep side of hill/ridge | Slope Class: Strongly slope | Slope: Position : Medium |
| Slope Aspect: W-E | Slope Length: 200m | Slope Form: Concave |
| Micro- Topography: Termite /Terracing | Coverage %: 1 | |
| Parent Material : In suite weathered residual | Soil depth cm: 70 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. : >70 | |
| Drainage -External Well | Internal – Well | |
| Human influence : Burning, Terracing, Clearing | | Moisture condition: Moist |
| Land Cover: Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type: sorghum | Fertilizer Type | |
| Type of erosion: Sheet & Splash erosion | Area Affected : >50% | |
| Activity: Active at present | Degree of dissection: Moderate | |

Remarks:

0-16cm: Dark reddish brown (5YR3/2) color moist, clay texture, weak, fine/medium, sub-angler block structure, firm moist stick/plastic consistency when wet, many, fine roots and many, fine to medium pores.

16-70cm: Dark reddish brown (5YR3/3) color moist, clay texture, common, medium coarse fragment, moderate, fine to medium, sub-angler block structure, very firm moist, stick/plastic consistency when wet, many, fine to many roots and many, fine to medium pores

>70cm : Many, medium coarse fragment, few and fine roots

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP73 | Map Sheet: 0836A1 |
| Location : Sire Gudo, West of Dedessa | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-4 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Hyperferric Acrisols (ACfrh) | Coordinate (UTM) | N: 996121 |
| Agro-Climatic Zone:Kolla | Elevation (m): 1223m | E : 186128 |
| Land form: Upper part of gently undulating plain with convex interfluves | Slope Class: Undulating sloping | Slope: Position : Medium |
| Slope Aspect: W-E | Slope Length: >200m | Slope Form: Concave |
| Micro- Topography : Terrace /Termite | Coverage % : 1 | |
| Parent Material : In suite weathered residual | Soil depth cm: 155 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>155 | |
| Drainage -External Rapid | Internal –Well drained | |
| Human influence : Burning, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks:

0-11cm: Dark reddish brown (5YR3/2) color, moist, clay loam texture weak, fine to medium, block structure, firm moist, sticky/plastic consistency when wet, common, patchy, stick insides cutanic feature, many, fine/medium roots and many, fine/medium pores.

11-34cm: Dark reddish brown( 5YR3/3) color moist, clay loam texture, moderate, fine to medium, sub-angler block structure, very firm moist, stick/plastic consistency when wet, common, patchy cutanic feature, common, fine roots and ,common, fine/ medium pores.

34-80cm: Reddish brown (5YR4/4) color moist, moderate, fine to medium, sub-angler block structure, very firm moist, slight stick, slight plastic consistency when wet, few, patchy cutanic feature, few, fine roots and common, fine pores.

80-155cm: Yellowish red (5YR4/4) color moist, moderate, medium, sub-angler block structure, firm moist, slight stick /slight plastic consistency when wet, very few, fine roots and common, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP74 | Map Sheet: 0836A1 |
| Location : Dire misoma | Region : Oromiya, Zone: Illuababora; Wereda: Chewaka | |
| Mapping Unit: G1b-1 | | |
| Author:- Kumsa | Date:- | |
| FAO -Soil Type : Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 995058 |
| Agro-Climatic zone : Kolla | Elevation (m) :1212m | E : 186412 |
| Land form : Upper part of gently undulating with convex interfluves | Slope Class: Strongly sloping | Slope: Position : Hight |
| Slope Aspect: S-N | Slope Length: >200m | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage %:0.2 | |
| Parent Material : | Soil depth cm: 157 | Rock outcrop: Few, |
| Surface Fragment coverage : Few, Medium | Surface Crack: | Sealing: |
| Flooding | Water table cm. : >157 | |
| Drainage -External Well | Internal –Well drained | |
| Human influence: Burning, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks:

0-16cm: Dark reddish brown (5YR3/2) color moist, clay loam texture, weak, fine to medium sub-angler block structure, firm dry consistency when wet, patchy, distinct, organic cutanic feature, many, fine to medium roots and many, fine to medium pore.

16-50cm: Dark reddish brown (5YR3/3) color moist, clay texture, moderate, fine to medium, sub-angler block structure, firm moist, patchy, distinct, unknown cutanic feature, common, few roots and many, fine to medium pores.

50-80cm: Dark reddish brown (5YR3/4) color moist, clay texture, moderate, fine to medium, sub-angler block structure, few, fine roots and many, fine pore.

80-157cm: Dark reddish brown (5YR3/6) color moist, clay texture, common, fine to medium cementation, moderate, fine to medium, sub-angler block structure, firm dry consistency when wet, very few, fine roots and many, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION SHEET | Field No: DP75 | Map Sheet: 0836A1 |
| Location: N of Illuharar | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit:V3d-8 | | |
| Author:- Zelealem S/M | Date:- | |
| FAO -Soil Type : Fluvic Cambisols (CMfv) | Coordinate (UTM) | N: 997709 |
| Agro-Climatic Zone: | Elevation (m): 1203 | E: 184341 |
| Land form : Moderately dissected valley floor | Slope Class: Gently sloping | Slope: Position : Medium |
| Slope Aspect: N-S | Slope Length: 2km | Slope Form: Uniform |
| Micro- Topography M | Coverage % : 3 | |
| Parent Material : Volcanic ash | Soil depth cm: 114 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. >114 | |
| Drainage -External Moderate | Internal –Moderate | |
| Human influence : Vegetation disturbed/Clearing | | Moisture condition: Moist |
| Land Cover : Moderately cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum, maize, sesame, rice | Fertilizer Type | |
| Type of erosion : Sheet & splash erosion | Area Affected : 5-10% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks: Major problem in the area deforestation.

0-24cm: Dark brown (7.5YR3/2) color moist, clay loam texture, moderate, coarse, sub-angler block structure, hard dry, stick / plastic consistency when wet, few, fine/medium roots and many, coarse/medium pores.

24-50cm: Dark brown (7.5YR3/3) color moist, clay loam texture, few, fine coarse fragment, strong, coarse, sub-angler block structure, firm moist stick/plastic consistency when wet, few, fine roots and common, medium to fine pores.

50-114cm: Yellowish red (5YR4/6) color moist, clay loam, many, fine to medium coarse fragment, strong, medium sub-angler block/granular structur, firm moist, stick /plastic consistency when wet, moderately cemented, distinct cementation, many, black, soft to hard, iron/mechanical mineral nodules and few, medium pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION SHEET | Field No:DP76 | Map Sheet: 0836A1 |
| Location : E of Jegen | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit:G1b-1 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 993386 |
| Agro-Climatic: Zone Kolla | Elevation (m): 1252m | E : 184445 |
| Land form : Upper part of gently undulating with convex interfluves | Slope Class: Very gently slope | Slope: Position : Medium |
| Slope Aspect: S TO N | Slope Length: >300m | Slope Form: Concave |
| Micro- Topography: Terrace /Termite | Coverage % : 0.3 | |
| Parent Material : In situ weathered residual | Soil depth cm: 35 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. :>35 | |
| Drainage -External Well | Internal –Well drained | |
| Human influence : Burning, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks:

0-18cm: Dark reddish brown (5YR3/2) color moist, clay loam texture, weak, fine to medium, sub-angler block structure,
Firm moist, stick /plastic consistency when wet, many, fine roots and many, fine pores.

18-35cm: Dark reddish brown (5YR3/4) color moist, moderate, fine to medium, sub-angler block patchy, distinct, vascular cutanic feature, common, fine to medium roots and many, fine to medium pores.

>35cm: Moderately cemented mechanical, clay cementation.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP77 | Map Sheet: 0836A1 |
| Location: Dirre Misoma | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit:G1b-1 | | |
| Author:-Kumsa B | Date:- | |
| FAO -Soil Type : Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 993787 |
| Agro-Climatic Zone:Kolla | Elevation (m):1244 | E:185612 |
| Land form : Upper part of gently undulating with convex interfluves | Slope Class: Gently slope | Slope: Position : Medium |
| Slope Aspect: N-S | Slope Length: >300 | Slope Form: Concave |
| Micro- Topography: Terrace | Coverage % :0.2 | |
| Parent Material : In situ weathered residual | Soil depth cm. 140 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding: D | Water table cm. >140 | |
| Drainage -External Well | Internal –Well drained | |
| Human influence : Burning, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover : Intensively cultivated Land | | |
| Land UseCA4 Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : >50% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks:

0-17cm: Dark reddish brown (5YR3/2) color moist, clay loam texture, weak, fine to medium, sub-angler block structure, firm moist, stick/plastic consistency when wet, many, fine) roots and many, fine to medium pores.

17-57cm: Dark reddish brown (5YR3/4) color moist, clay texture, moderate, fine to medium, sub-angler block structure, firm moist, stick/plastic consistency when wet, patchy .distinct cutanic feature, common, fine roots and many, fine pores.

57-140cm: Dark red (2.5YR3/6) color moist, clay texture, many, fine to medium coarse fragment, moderate fine/medium, sub-angler block structure, firm moist, stick/plastic consistency when wet, few, fine roots, many, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP78 | Map Sheet: 0836A1 |
| Location: | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-1 | | |
| Author:- Zelealem S/M | Date:- | |
| FAO -*Soil Type : Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 991975* |
| Agro-Climatic Zone: Kolla | Elevation (m): 1250 | *E:184396* |
| Land form : Upper part of gently undulating with convex interfluves | Slope Class: Nearly level | Slope: Position : Medium |
| Slope Aspect: N-s | *Slope Length: 400m* | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage % : | |
| Parent Material : Volcanic ash | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm :>200 | |
| Drainage -External Well | Internal – Well drained | |
| Human influence: Clearing | | Moisture condition: |
| Land Cover : Predominantly cultivated | | |
| Land Use : Rain fed arable cultivate | | |
| Major Crop Type : sorghum, sesame, haricot bean, maize | Fertilizer Type | |
| Type of erosion : Sheet & splash erosion | Area Affected : 5-10% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks : Scattered big trees occupy nearly 20% of the area

0-18cm: Dark reddish brown 5YR3/2) color moist, clay loam texture, moderate, medium/coarse, sub-angler block structure, firm moist, stick/plastic consistency when wet, few, fine roots and many, coarse to medium pores.

18-43cm: Dark reddish brown (5YR3/4) color moist, clay loam texture, moderate, medium, sub-angler block structure, firm moist, stick /plastic consistency when wet, very few, few roots and many, medium pores.

43-85cm: Dark reddish (2.5YR3/6) color moist, clay texture, moderate, very medium, sub-angler block structure, firm moist, stick/plastic consistency when wet, many/few, medium to fine pores.

85-200cm: Dark reddish (2.5YR3/6) color moist, loam texture, moderate to weak, very medium, granular moist, stick/ plastic consistency when wet, few, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP79 | Map Sheet: 0836A1 |
| Location : N of Illuharar | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-4 | | |
| Author:- Zelealem S/M | Date:- | |
| FAO -Soil Type: Hyperferric Acrisols (ACfrh) | Coordinate (UTM) | N: 995492 |
| Agro-Climatic Zone: Kolla | Elevation (m): 1248 | E:184589 |
| Land form: Upper part of gently undulating plain with convex interfluves | Slope Class: Nearly slope | Slope: Position : Medium |
| Slope Aspect: N-S | Slope Length: 600m | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage % : 1 | |
| Parent Material : Volcanic ash | Soil depth cm. 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. >200 | |
| Drainage -External Well | Internal – Moderately well drained | |
| Human influence : Vegetation Disturbed | | Moisture condition: |
| Land Cover : Predominantly cultivated /Intensively cultivated Land | | |
| Land Use : Rain fed arable cultivate | | |
| Major Crop Type : sorghum, maize, sesame, haricot bean, rice, mango | Fertilizer Type | |
| Type of erosion : Sheet & Splash erosion | Area Affected : 5-10% | |
| Activity : Active at present | Degree of dissection: Slight | |

Remarks : Scattered, Big trees are grown, some of them are chewaka .Deep boring & Infiltration

0-10cm: Brown (7.5YR4/2) color moist, loam texture, moderate, medium, sub-angler block structure, soft/hard dry, slight stick/slight plastic consistency when wet, weakly cemented, ploughed cementation, common, fine /medium roots and common, coarse /medium pores.

10-43cm: Yellowish red (5YR4/6) color moist, clay loam texture, few, fine/medium coarse fragment, moderate, medium, s ub-angler block structure, firm moist, stick/plastic consistency when wet few, fine/medium roots and common, medium pores.

43-100cm: Red (2.5YR4/6) color moist, clay loam texture, few, fine coarse fragment, moderate, medium, angular block structure, firm moist consistency, very few, medium roots and few, fine pores.

100-200cm: Dark red (2.5YR3/6) color moist, loam, few, fine coarse fragment, moderate, medium, angular block structure, firm moist consistency.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No:DP80 | Map Sheet: 0836A1 |
| Location: N of Illuharar | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-1 | | |
| Author:- Zelealem S/M | Date:- | |
| FAO -Soil Type : Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 993400 |
| Agro-Climatic Zone:Kolla | Elevation (m): 1248 | E : 186416 |
| Land form : Upper part of gently undulating with convex interfluves | Slope Class: Nearly level | Slope: Position : Medium |
| Slope Aspect: E-W | Slope Length: 800m | Slope Form: Convex |
| Micro- Topography: Termite | Coverage % : 2 | |
| Parent Material : Volcanic ash | Soil depth cm. : 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. >200 | |
| Drainage -External Well | Internal – Well drained | |
| Human influence : Vegetation | | Moisture condition: |
| Land Cover:: disturbed | | |
| Land Use: Rain fed arable cultivate | | |
| major crop type : sorghum, maize, sesame, haricot bean, finger millet, mango | Fertilizer Type | |
| Type of erosion : Sheet & splash erosion | Area Affected : Active at present | |
| Activity : 5-10% | Degree of dissection: Slight | |

Remarks : Good for irrigation

0-15cm: Dark reddish brown (5YR3/2) color moist, clay loam texture, strong, coarse, sub-angler block structure, firm moist, stick/plastic consistency when wet, many, medium to fine roots and common, medium to fine pores.

15-40cm: Dark reddish brown (5YR3/4) color moist, clay texture, strong, coarse, sub-angler block structure, firm moist, stick/ plastic consistency when wet, patchy, distinct cutanic feature, common, fine roots and common, medium to fine pores.

40-96cm: Dark red (2.5YR3/6) color moist, clay texture, moderate, medium/coarse sub-angler block, firm moist, stick/plastic consistency when wet, patchy, distinct cutanic feature, few, fine roots and many, fine pores.

96-200cm: Dark red (2.5YR3/6) color moist, clay texture, moderate, medium to very coarse, sub-angler block structure, slight firm moist, stick/plastic consistency when wet, many, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP81 | Map Sheet: 0836A1 |
| Location: | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: V3c-8 | | |
| Author:- | Date:- | |
| FAO -Soil Type: Hypereutric Fluvisols (FLeuh) | Coordinate (UTM) | N: 994040 |
| Agro-Climatic Zone: Kolla | Elevation (m):1251 | E: 179720 |
| Land form : Moderately dissected valley floor | Slope Class: Nearly level | Slope: Position : Lowest |
| Slope Aspect: E-W Slope Length: 150m | Slope Form: Concave | |
| Micro- Topography: Low gilgai | Coverage % | |
| Parent Material : | Soil depth cm. : 160 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding: During Rainy, season it is wet land | Water table cm.>160 | |
| Drainage - External Slow | Internal – Poorly drained | |
| Human influence: Surface compaction | | Moisture condition: Moist |
| Land Cover: Perennial marsh | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type | Fertilizer Type | |
| Type of erosion: Sheet &Splash erosion | Area Affected: 5-10% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Most of the lower valley bottom area is characterized by gilgai and along the stream there are high trees.

0-13cm: Brown (7.5YR4/3) color moist, many, yellowish red, distinct mottle, loam texture, common, fine/medium coarse fragment, strong, coarse, angular block structure, very hard dry, stick/plastic consistency when wet, cemented cementation, very few ,fine roots and few, fine pores

13-35cm: Brown (7.5YR5/4) color moist, many, yellowish red, distinct mottle, clay loam texture, many,fine/ medium coarse fragment, strong, coarse, angular block structure, very hard dry, stick/plastic consistency when wet, cemented cementation, common, blush black, hard, manganese mineral nodules, few, fine pores.

35-66cm: Light brown (7.5YR6/4) color moist, many, yellowish red, distinct mottle, clay loam texture, many, fine/medium coarse fragment, strong, medium/coarse sub-angler block structure, very firm moist, slightly stick /slightly plastic consistency when wet, cemented cementation, many, blush brown, hard, manganese mineral nodules.

65-160cm: Pinkish gray (7.5YR6/2) color moist, many, yellowish red, distinct mottle, clay texture, many, fine/medium coarse fragment, strong, medium, sub-angler block cemented cementation many, blush black, hard, manganese mineral nodules.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP82 | Map Sheet: 0836A1 |
| Location : West of Jegen | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-1 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type: Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 992835 |
| Agro-Climatic Zone: Kolla | Elevation (m): 1259 | E:182011 |
| Land form : Upper part of gently undulating with convex interfluves | Slope Class: Sloping | Slope: Position : Medium |
| Slope Aspect: W-E | Slope Length: >200m | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage % : 0.2 | |
| Parent Material: In suite weathered residue | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm: >200 | |
| Drainage - External Well | Internal – Well drained | |
| Human influence: Burring Clearing Terracing | | Moisture condition: Moist |
| Land Cover: Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type : sorghum | Fertilizer Type | |
| Type of erosion: Sheet & Splash erosion | Area Affected : >50% | |
| Activity: Active at present | Degree of dissection: Slightly | |

Remarks:

0-15cm: Dark reddish brown (5YR3/3) color moist, clay loam texture, weak, fine/medium, sub-angler block structure, firm moist, stick/plastic consistency when wet, patchy, slickenside cutanic feature, many, fine/medium roots and many fine/medium pores

15-37cm: Dark reddish brown (5YR3/4) color moist, clay texture, moderate, fine/medium, sub-angler block structure, firm moist, stick/plastic consistency when wet, patchy cutanic feature, common, fine roots and many, fine/medium pores.

37-77cm: Dark red (2.5YR3/6) color moist, clay texture, moderate, fine/medium sub-angler block structure, firm moist, stick /plastic consistency when wet, common, fine roots, many, fine pores.

77-200cm: Dark red (2.5YR3/6) color moist, clay texture, moderate, fine/medium, sub-angler block structure, firm moist, stick/plastic consistency when wet, few, fine roots and many, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION SHEET | Field No: DP83 | Map Sheet: 0836A1 |
| Location: Jegene | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: V1b-3 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Mesotrophic Verisols (VRms) | Coordinate (UTM) | N: 992161 |
| Agro-Climatic Zone:Kolla | Elevation (m):1243m | E: 183590 |
| Land form: Seasonally wet valley floor | Slope Class: Nearly level | Slope: Position : Medium |
| Slope Aspect: W-E | Slope Length: >300m | Slope Form: Uniform |
| Micro- Topography: Gilgai | Coverage % : 20 | |
| Parent Material: Fluvial deposition | Soil depth cm: 160 | Rock outcrop: |
| Surface Fragment coverage: | Surface Crack: | Sealing: |
| Flooding | Water table cm: >160 | |
| Drainage - External Rapid | Internal – Imperfectly drained | |
| Human influence: | | Moisture condition: Moist |
| Land Cover: Grass land | | |
| Land Use: Grain | | |
| Major Crop Type | Fertilizer Type | |
| Type of erosion | Area Affected | |
| Activity : | Degree of dissection: | |

Remarks: Deep soil, seasonal water logged, wide cracks, slope 2% formation of carbonic horizon in the lower layer

0-23cm: Very dark brown (10YR3/1) color moist, many, yellowish red, distinct) mottle, clay texture, moderate, fine/medium, sub-angler block structure, firm moist, very stick/very plastic consistency when wet, many, fine roots, many, fine pores.

23-70cm: Dark gray (10YR4/1) color moist, many, yellowish red, distinct) mottle, clay texture, moderate, medium/coarse, wedged –shaped structure, very firm moist, very stick /very plastic consistency when wet, many, fine roots, many, fine pores.

70-160cm: Dark gray (10YR4/1) color moist, few mottle, clay texture, common, medium coarse fragment, moderate, medium /coarse, wedged-shaped structure, very firm moist, very stick /very plastic consistency when wet, few, fine roots common, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP84 | Map Sheet: 0836A1 |
| Location: S-E of village #4 | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-1 | | |
| Author: Zelealem S/Mariam | Date:- | |
| FAO -Soil Type : Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 992803 |
| Agro-Climatic Zone: Kolla | Elevation (m):1255 | E: 183488 |
| Land form : Upper part of gently undulating with convex interfluves | Slope Class: Gently slope | Slope: Position : Medium |
| Slope Aspect: N-S | Slope Length: 400m | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage % : | |
| Parent Material: Volcanic ash | Soil depth cm.: 190 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. >190 | |
| Drainage - External Rapid/Well | Internal – Well drained | |
| Human influence: Vegetation disturbed /Clearing | | Moisture condition: |
| Land Cover: Intensively cultivated Land/Cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| major crop type: maize, sorghum, haricot, ground nut bean, rice | Fertilizer Type | |
| Type of erosion: Sheet & Splash erosion | Area Affected: 5-10% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: For maize & rice they apply fertilizer .Cultivation has been started 5-6years ago. Yield gradually decreases from the previous time (5&4Years)

0-12cm: Dark reddish brown (5YR3/2) color moist, strong, medium, angular block structure, hard dry, stick /plastic consistency wet, strong, medium/coarse, angular block/ sub-angler block) structure, firm moist, stick/plastic consistency when wet, weakly cemented and, vascular, iron-manganese cementation, few, fine/medium roots, moderate, medium/coarse pores.

12-40cm: Dark reddish brown 5YR3/4) color moist, few, fine/medium coarse fragment, moderate, medium, angular block structure, firm moist, stick/plastic consistency when wet, weak, vascular, iron manganese cementation, very few, fine/ medium roots and moderate, fine/medium pores.

40-75cm: Red (2.5YR4/6) color moist, few, fine coarse fragment, moderate, medium, angular block structure, firm moist, slightly stick/slightly plastic consistency when wet, weak, vascular, iron manganese cementation, few, yellow/ red, soft/hard, moderately cemented mineral nodules, few, medium roots and few, fine pores

75-190cm: Dark red (2.5YR3/6) color moist, few, fine/medium coarse fragment, moderate, medium, angular block structure, firm moist, slightly stick/slightly plastic consistency when wet, few, yellow/red, soft/hard, moderately mineral nodules.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP85 | Map Sheet: 0836A1 |
| Location: Jegen | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-1 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 993985 |
| Agro-Climatic Zone: Kolla | Elevation (m): 1255 | E : 183617 |
| Land form: Upper part of gently undulating plain with convex interfluves | Slope Class: Gently slope | Slope: Position : High |
| Slope Aspect: S-N | Slope Length: >200m | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage % : 0.2 | |
| Parent Material : In situ weathered residuals | Soil depth cm. : 130 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm.>130 | |
| Drainage - External Well | Internal – Well drained | |
| Human influence: Burning, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover: Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type: sorghum | Fertilizer Type | |
| Type of erosion: Sheet & splash erosion | Area Affected: >50% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remark:

0-15cm: Dark reddish brown (5YR3/3) color moist, clay loam texture, weak, fine/medium sub-angler block structure, firm moist, stick /plastic consistency when wet, many, fine roots and many, fine pores.

15-48cm: Dark reddish brown (2.5YR3/4) color moist, clay texture, moderately, fine/medium, sub-angler block structure, firm moist, stick/plastic consistency when wet, patchy, distinct, coarse cutanic feature, common, fine/medium roots and many, fine pores.

48-130cm: Dark red (2.5YR3/6) color moist, clay texture moderate, fine/moderate, sub-angler block structure, stick/plastic consistency when wet, fine, fine/medium roots and many, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP86 | Map Sheet: 0836A1 |
| Location: Jagen | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-4 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Hyperferric Acrisols (ACfrh) | Coordinate (UTM) | N: 994740 |
| Agro-Climatic Zone: Kolla | Elevation (m):1260 | E : 184436 |
| Land form: Upper part of gently undulating plain with convex interfluves | Slope Class: Gently slope | Slope: Position : Medium |
| Slope Aspect: N-S | Slope Length: >200m | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage %: 0.2 | |
| Parent Material: In suite weathered residuals | Soil depth cm. 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. : >200 | |
| Drainage - External Well | Internal – Well drained | |
| Human influence: Burning, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover: Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type: sorghum | Fertilizer Type | |
| Type of erosion: Sheet & Splash erosion | Area Affected: >50% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks : Deep soil, slope 5%, wide area coverage

0-16cm: Dusky red (2.5YYR3/2) color moist, clay loam texture, weak, fine/medium, sub-angler block structure, firm moist, stick /plastic consistency when wet, patchy, distinct, coarse cutanic feature, many, fine roots and many, fine/medium pores.

16-42cm: Dark reddish brown (2.5YR3/4) color moist, clay texture, moderate, fine/medium, sub-angler block structure, firm moist, stick/plastic consistency, patchy, distinct, coarse cutanic feature, common, fine/medium roots s and many, fine/medium pores.
42-80cm: Dark red (2.5YR3/6) color moist, clay texture, moderate, fine/medium, sub-angler block structure, firm moist, stick/plastic consistency when wet, common, fine/medium roots and many, fine pores.

80-200cm: Dark red (2.5YR3/6) color moist, clay texture, moderate, fine/medium, sub-angler block structure, firm moist, stick/plastic consistency when wet, few, fine roots and many, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP87 | Map Sheet: 0836A1 |
| Location: N-S of Illuharar | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: U2f-9 | | |
| Author:- Zelealem S/Mariam | Date:- | |
| FAO -Soil Type: Hypereutric Cambisols (CMeuh) | Coordinate (UTM) | N: 995905 |
| Agro-Climatic Zone:Kolla | Elevation (m): 1215 | E : 183544 |
| Land form: Strongly sloping hill/ridge side | Slope Class: Strongly slope | Slope: Position: Low |
| Slope Aspect: E-W | Slope Length: 500m | Slope Form: Convex |
| Micro- Topography: Gilgai | Coverage %: 25 | |
| Parent Material: Colluvial deposition | Soil depth cm: 200 | Rock outcrop: Boulders |
| Surface Fragment coverage: Medium gravel, Boulders, Large boulders | Surface Crack: | Sealing: |
| Flooding | Water table cm.>200 | |
| Drainage - External Rapid | Internal – Well drain to medium | |
| Human influence: Vegetation disturbed | | Moisture condition: Moist |
| Land Cover: Predominantly cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type: sorghum, maize | Fertilizer Type | |
| Type of erosion: Gully erosion | Area Affected: 25-50% | |
| Activity: Active at present | Degree of dissection: Sever | |

Remarks: Profile pit is taken from gully cut. Surrounding area is highly dissected and which occupied by rock out crop & boulders 10% of the surrounding area.

0-20cm: Dark brown (7.5YR3/2) color moist, loam texture, weak, very fine/medium, granular structure, soft, slightly stick/slightly plastic moist, wet consistency, very few, fine roots and many, coarse/medium pores.

20-41cm: Dark brown (10YR4/3) color moist, few, yellowish red, faint mottle, loam texture, many, fine/medium coarse fragment, moderate, medium to coarse structure, very friable, slightly stick/slightly plastic moist, wet consistency, few, blush black, hard, manganese mineral nodules, common, medium /fine pores.

41-90cm: Dark yellowish brown (10YR4/4) color moist, many, yellowish red, distinct mottle, clay loam texture, many, fine/medium coarse fragment, strong, coarse, sub-angler block structure, firm consistency, cemented, coarse cementation, many, red, soft/hard mineral nodules.

90-200cm: Grayish brown (10YR5/2) color moist, few, yellow, faint) mottle, clay texture, many, fine/medium coarse fragment, strong, coarse, sub-angler block structure, firm consistency moist, cemented.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION SHEET | Field No: DP88 | Map Sheet: 0836A1 |
| Location: Sire Guddo | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-1 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 995907 |
| Agro-Climatic Zone: Kolla | Elevation (m): 1250 | E: 182665 |
| Land form: Undulating slope | Slope Class: Strongly slope | Slope: Position : Low |
| Slope Aspect: S-N | Slope Length: 100m | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage %: 0.2 | |
| Parent Material: In suite weathered residue | Soil depth cm: 170 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm: >170 | |
| Drainage - External Well | Internal – Well drained | |
| Human influence : Burning, Clearing, Terracing | | Moisture condition: Moist |
| Land Cover: Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type: sorghum | Fertilizer Type | |
| Type of erosion: Sheet & Splash erosion | Area Affected : >50% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks :

0-13cm: Dark reddish brown (5YR3/2) color moist, clay loam texture, weak, fine/medium, sub-angler block structure, firm moist, stick/plastic consistency, patchy, distinct, clay cutanic common, fine/medium roots and many, fine/medium pores.

13-50cm: Dark reddish brown (5YR3/3) color moist, clay texture, moderate, fine/medium, sub-angler block structure, firm moist, stick/plastic consistency, patchy, distinct, clay cutanic, few, fine/medium roots and many, fine/medium pores.

50-94cm: Dark reddish brown (5YR3/4) color moist, clay texture, moderate, fine/medium, sub-angler block structure, firm moist, stick /plastic consistency, few, fine roots and many, fine pores.

94-170cm: Yellowish red (5YR4/6) color moist, clay texture, moderate, fine/medium, sub-angler block structure, firm moist, stick/plastic consistency, few, fine roots and many, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP89 | Map Sheet: 0836A1 |
| Location: Sirre guddo | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-4 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Hyperferric Acrisols (ACfrh) | Coordinate (UTM) | N: 995034 |
| Agro-Climatic Zone: Kolla | Elevation (m): 1254 | E : 182094 |
| Land form: Upper part of gently undulating plain with convex interfluves | Slope Class: Strongly slope | Slope: Position : Low |
| Slope Aspect: S-N | Slope Length: 150m | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage %: 0.2 | |
| Parent Material: In suited weathered material | Soil depth cm. 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm :>200 | |
| Drainage - External Well | Internal – Well drained | |
| Human influence : Burning, Terracing, Clearing | | Moisture condition: Moist |
| Land Cover: Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type: sorghum | Fertilizer Type | |
| Type of erosion: Sheet & Splash erosion | Area Affected : >50% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks : Many ant borrowed holes

0-14cm: Very dark gray (5YR3/1) color moist, clay loam texture, weak fine/medium, sub-angler block structure, firm moist, stick/plastic moist, wet consistency, patchy, distinct, clay cutanic feature, many, fine roots and many, fine/medium pores.

14-67cm: Dark reddish brown (5YR3/2) color moist, clay texture, moderate, fine/medium, sub-angler block structure, firm moist stick/plastic moist, wet consistency, patchy, distinct, clay cutanic feature, common, fine/medium roots and many , fine/medium pores.

67-106cm: dark reddish brown( 5YR3/4) color moist, clay texture, moderate, fine/medium, sub-angler block structure, firm moist stick/plastic moist, wet consistency, patchy, distinct, clay cutanic feature, few, fine/medium roots and many, fine pores.

106-200cm: Yellowish red (5YR3/6) color moist, clay texture, moderate, fine/medium, sub-angler block structure, firm moist, stick/ plastic, very few, fine roots and common, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION SHEET | Field No: DP90 | Map Sheet: 0836A1 |
| Location: Burka Anani | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit : G1b_4 | | |
| Author:- Zeleam S/Mariam | Date:- | |
| FAO -Soil Type: Hyperferric Acrisols (ACfrh) | Coordinate (UTM) | N: 994577 |
| Agro-Climatic Zone: Kolla | Elevation (m): 1256 | E : 181927 |
| Land form: Upper part of gently undulating plain with convex interfluves | Slope Class: 06 | Slope: Position : Lowest |
| Slope Aspect: S-N | Slope Length: 200m | Slope Form: Concave |
| Micro- Topography: Terracing | Coverage % : 0.2 | |
| Parent Material: In situ weathered, residual | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding: | Water table cm. >200 | |
| Drainage - External Well | Internal – Well drained | |
| Human influence: Burning, Clearing, Terracing | | Moisture condition: |
| Land Cover: Intensively cultivated Land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type: sorghum | | Fertilizer Type |
| Type of erosion: Sheet & Splash erosion | | Area Affected: >50% |
| Activity: Active at present | | Degree of dissection: Slight |

Remarks: Deep soil >200cm, slope 7% N

0-12 cm:-Dark red ( 2.5YR3/2) color, Clay loam texture, weak fine/medium, sub-angler block structure, firm moist stick/plastic consistency when wet, patchy, distinct, clay cutanic feature, common, Fine and medium roots and many, fine/medium pores.

12-70cm:- Dark reddish brown (2.5YR3/4 ) color, Clay texture, moderate fine/medium, sub-angler block structure, firm moist, stick/plastic, wet consistency, patchy, distinct, clay cutanic, feature Few, Fine and medium roots and many, fine/medium pores.

70-200cm: - Dark red (2.5YR3/6) color, Clay texture, moderate fine/medium, sub-angler block structure, firm moist, stick/plastic few, medium roots and common, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP91 | Map Sheet: 0836A1 |
| Location: N-W of Illuharar | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: V2a-7 | | |
| Author:- Zeleam S/Mariam | Date:- | |
| FAO -Soil Type: Gelic Gleysols (GLge) | Coordinate (UTM) | N: 9956634 |
| Agro-Climatic Zone: Kolla | Elevation (m): 1244 | E : 182903 |
| Land form: Permanently wet valley floor | Slope Class: Gently slope | Slope: Position : Lowest |
| Slope Aspect: N-S | Slope Length: 1.5km | Slope Form: Irregular |
| Micro- Topography: gilgai | Coverage % : | |
| Parent Material: Fluvial deposit | Soil depth cm. 184 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding: A/4 | Water table cm. >184 | |
| Drainage - External Moderately drained | Internal – Poorly drained | |
| Human influence: Vegetation disturbed | | Moisture condition: Moist / Wet |
| Land Cover: Seasonal marsh | | |
| Land Use: Animal production | | |
| Major Crop Type: | Fertilizer Type | |
| Type of erosion: Gully erosion | Area Affected: 10-25% | |
| Activity: Active at present | Degree of dissection: Moderate/ Slight | |

Remarks: Profile pit is taken from gully cut, surrounding land is covered with hyperemia grasses along the stream & Currently the area is used for grazing, it is communal land.

0-42cm: Black (10YR2/1) color moist, (clay) texture, moderate, medium, sub-angler block structure, firm moist, stick/ plastic consistency, many, fine/medium roots and few, fine/medium pores.

42-68cm: Very dark gray (10YR3/1) color moist, many, yellowish red, distinct mottle, clay texture, few, fine coarse fragment, moderate, medium, sub-angler block structure, firm moist, stick/plastic consistency wet, few, fine/medium roots and few, fine pores.

68-159cm: Dark grayish brown (10YR4/2) color moist, many, yellowish red, prominent) mottle, clay texture, many fine coarse fragment, firm moist, stick /plastic consistency, few, brownish, soft, moderate mineral nodules, few, fine roots.

159-184 cm: Very dark gray (10YR3/1) color moist, few, yellowish red, faint mottle, clay texture, many, fine coarse fragment, firm moist, stick/plastic consistency when wet.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP93 | Map Sheet: 0836A1 |
| Location: South of dedessa river | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-4 | | |
| Author:- Zelealem S/Mariam | Date:- | |
| FAO -*Soil Type : Hyperferric Acrisols (ACfrh)* | Coordinate (UTM) | *N: 996410* |
| Agro-Climatic Zone: Kolla | Elevation (m): 1253 | *E: 181163* |
| Land form: Upper part of gently undulating plain with convex interfluves | Slope Class: Sloping | Slope: Position : Medium |
| Slope Aspect: NE-SE | *Slope Length: 300* | Slope Form: Uniform |
| Micro- Topography: Termite | Coverage %: 3 | |
| Parent Material: Volcanic ash/Colluvial deposit | Soil depth cm: 200 | *Rock outcrop:* |
| Surface Fragment coverage: | Surface Crack: | Sealing: |
| Flooding | Water table cm: >200 | |
| Drainage - External Rapid | Internal – Well drain | |
| Human influence: Vegetation disturbed /Clear | | Moisture condition: Moist |
| Land Cover : Moderately cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type: sorghum, maize, haricot bean, rice, finger millet and ground nut | Fertilizer Type | |
| Type of erosion: Sheet & splash erosion | Area Affected: 5-10% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: For maize fertilizer is applied. Along the streams high vegetation disturbance is seen.

0-13cm: Yellowish red (5YR3/6) color moist, loam texture, moderate, medium, angular block structure, hard, slightly stick /slightly plastic dray, wet consistency, common, fine/medium roots and many, medium/coarse pores.

13_54cm: Dark brown (2.5YR3/6) color moist, clay loam texture, very few, fine coarse fragment, moderate/strong, medium, sub-angler block structure, firm moist,, stick/plastic consistency, moderately, organic, vesicular cementation, few, fine roots and many ,medium/coarse pores.

54-102cm: Dark brown (2.5YR3/6) color moist, clay texture, very few, fine coarse fragment, (strong, medium, sub-angler block) structure, firm moist,, sticky, plastic consistency, moderately, organic, vesicular cementation, few, black, soft to hard, manganese mineral nodules, few, fine roots and few, fine pores.

102-200cm: Dark brown (7.5YR3/4) color moist, clay loam texture, few, fine coarse fragment, moderate/strong, medium, sub-angler block structure, friable to firm moist, sticky / plastic consistency, moderately, organic, vesicular cementation, few, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP94 | Map Sheet: 0836A1 |
| Location: N-S | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: U1e-5 | | |
| Author:- Zelealem S/Mariam | Date:- | |
| FAO -Soil Typ : Orthidystric Cambisols (CMdyo) | Coordinate (UTM) | N: 996968 |
| Agro-Climatic Zone: kola | Elevation (m): 1253 | E: 181653 |
| Land form: Strongly sloping valley / hill side | Slope Class: Gently slope | Slope: Position : |
| Slope Aspect: E-W Slope Length: 400m | Slope Form: Uniform | |
| Micro- Topography: Termite | Coverage % : 2 | |
| Parent Material: Volcanic ash/ In situ weathered, Residual | Soil depth cm: Moderately deep | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm: >70 | |
| Drainage - External Rapid | Internal – Well Drained | |
| Human influence Vegetation disturbed, Clearing | | Moisture condition: |
| Land Cover: CL4 Moderately cultivated land | | |
| Land Use: CA4 Rain fed arable cultivate | | |
| Major Crop type: sorghum, sesame, rice, haricot bean | Fertilizer Type | |
| Type of erosion: Sheet & splash erosion | Area Affected: 5-10% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Previously it was under forest vegetation cover, now most of the vegetation is cleared, at the bottom the soil is gravelly stony & quartzes. The soil is shallow.

0-14cm: Brown (7.5YR4/4) color moist, loam texture, few, fine coarse fragment, moderate, medium, angular block structure, hard, slightly stick/ slight plastic dray, wet consistency, very few, fine roots and many, medium to fine pores.

14-38cm: Strong brown (7.5YR4/6) color moist, clay loam texture, few, fine coarse fragment, (moderate, medium/coarse, sub-angler block structure, very firm moist, stick/plastic moist, wet consistency, cemented, organic matter, prominent cementation, common, yellowish brown, soft, iron/manganese mineral nodules, common, medium to fine pores.

38-70cm: Strong brown (7.5YR4/6) color moist, clay loam texture, many, fine & medium coarse fragment, moderate, medium, sub-angler block structure, very firm moist, stick /plastic moist, wet consistency, cemented, organic matter, prominent) cementation, (many, yellowish brown, soft, manganese mineral nodules.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP98 | Map Sheet: 0836A1 |
| Location: N – W of Iluharar | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-4 | | |
| Author:- Tulu | Date:- | |
| FAO -Soil Type : Hyperferric Acrisols (ACfrh) | Coordinate (UTM) | N: 997976 |
| Agro-Climatic Zone: Kolla | Elevation (m): 1220 | E: 185182 |
| Land form: Upper part of gently undulating plain with convex interfluves | Slope Class: Nearly level | Slope Position: Low |
| Slope Aspect: E-W | Slope Length: 75cm | Slope Form: Concave |
| Micro- Topography: Termite | Coverage %: 5 | |
| Parent Material : Organic matter | Soil depth cm. : 85 | Rock outcrop: |
| Surface Fragment coverage : Very few / Fine gravel | Surface Crack: | Sealing: |
| Flooding : A/1 | Water table cm : >85 | |
| Drainage - External Well | Internal – Well drained | |
| Human influence | | Moisture condition: Dry |
| Land Cover: Cultivated land | | |
| Land Use: Mixed farming /Rain fed arable cultivate | | |
| Major Crop Type: sorghum | Fertilizer Type | |
| Type of erosion: Rill erosion | Area Affected : 5-10 | |
| Activity: Unknown | Degree of dissection: Slight | |

Remarks: Irregular land & also valley found around.

0-10cm: Very dark grayish brown (10YR3/2) color moist, loam texture, fine & very fine, angular block structure, loose, loose dry, moist consistency, few roots and very few pores.

10-25cm: Dark brown (7.5YR3/4) color moist, clay loam texture, weak, medium & coarse, sub-angler block structure, very firm moist, consistency moist, weakly cemented, platy, clay cementation, very few roots and few pores.

25-75cm: Reddish brown (5YR3/3) color moist, sandy clay loam texture, few, fine gravel coarse fragment, strong, medium to very coarse, granular structure, firm moist, moist consistency, moderately cemented, nodular) cementation, (fine) pores.

75-85cm: Reddish brown (5YR4/4) color moist, clay sand texture, dominant, coarse fragment, extremely firm moist consistency.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP100 | Map Sheet: 0836A1 |
| Location: N | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b-1 | | |
| Author:- Batru W. | Date:- | |
| FAO -*Soil Type: Orthidystric Nitisols (NTdyo)* | Coordinate (UTM) | *N: 991586* |
| Agro-Climatic Zone: Kolla | Elevation (m):1248 | *E: 184829* |
| Land form: Upper part of gently undulating plain with convex interfluves | Slope Class: Nearly level | Slope Position : Medium |
| Slope Aspect: N-S | *Slope Length: 300M* | Slope Form: Convex |
| Micro- Topography: Termite | Coverage %: 1 | |
| Parent Material: Unknown | Soil depth cm: 175 | *Rock outcrop:* |
| *Surface Fragment cover:* | Surface Crack: | *Sealing:* |
| Flooding | Water table cm. >175 | |
| Drainage - External *Well* | Internal – Well drained | |
| *Human influence : Burning* | | Moisture condition: Moist |
| Land Cover: Intensively cultivated land /Predominantly cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type: sorghum | Fertilizer Type | |
| Type of erosion: Sheet and splash erosion | Area Affected: 0-5% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Deforestation activity is found.

0-15cm: Dark reddish brown (5YR3/2) color moist, loam texture, loose, non stick moist, wet consistency, common fine roots, many, fine pores.

15-40cm: Dark reddish brown (2.5YR3/4) color moist, clay loam texture, weak, medium & very fine, sub-angler block structure, firm moist, stick consistency, compacted, ploughed, coarse cementation, few, medium roots, few, fine pores.

40-75cm: Reddish brown (2.5YR4/4) color moist, clay loam texture, moderate, medium & coarse, angular block structure, very firm moist, stick consistency, weakly cemented, ploughed, coarse cementation, very few, medium/coarse roots.

75-175cm: Red (2.5YR4/8) color moist, clay texture, moderate, medium & coarse structure, firm moist, sticks consistency, moderately cemented, unknown, coarse cementation.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP102 | Map Sheet: 0836A1 |
| Location : N-E of Illuharar | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G1b_1 | | |
| Author:- Tulu | Date:- | |
| FAO -Soil Type : Orthidystric Nitisols (NTdyo) | Coordinate (UTM) | N: 990160 |
| Agro-Climatic Zone: Kolla | Elevation (m): 1245 | E: 183633 |
| Land form: Upper part of gently undulating plain with convex interfluves | Slope Class: Gently slope | Slope: Position : Medium |
| Slope Aspect: W-E | Slope Length: 100m | Slope Form: Irregular |
| Micro- Topography: Termite, Gilgai, Animal track | Coverage % : 2-3 | |
| Parent Material: Fluvial deposits | Soil depth cm. 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm: >200 | |
| Drainage - External Well | Internal – Mod. Well drained | |
| Human influence : | | Moisture condition: Moist |
| Land Cover: Bushed shrub grass land | | |
| Land Use: Semi nomadic | | |
| Major Crop Type: | Fertilizer Type | |
| Type of erosion: Rill erosion | Area Affected: 5-10% | |
| Activity: Period active unknown | Degree of dissection: Slight | |

Remarks : The area is seasonally water logged and is recommended for rice production.

0-15cm: Black (10YR2/1) color moist, loam texture, weak, very fine /medium sub-angler block structure, loose consistency when wet, very few roots.

15-40cm: Dark grayish brown (10YR4/2) color moist, few, faint, brown mottling, clay loam texture, moderate, medium/coarse, angular block structure, very friable consistency, weakly cementation, few roots.

40-100cm: Dark gray (10YR4/1) color moist, few, faint, brown mottling, sandy clay loam texture, moderate, medium/ coarse, granular structure, very friable consistency, moderate cementation.

100-200cm: Gray (10YR6/1) color moist, common, distinct, brown mottling, sandy clay loam texture, common, coarse gravel coarse fragments, weak, medium/very coarse, sub-angler block structure, very friable consistency, moderate cementation.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP103 | Map Sheet: 0836A1 |
| Location: N of Illu harar | Region: Oromiya, Zone: Illuababora, | Wereda: Chewaka |
| Mapping Unit: V1b-3 | | |
| Author:- Batru | Date:- | |
| FAO -Soil Type : Mesotrophic Verisols (VRms) | Coordinate (UTM) | *N: 992500* |
| Agro-Climatic Zone: Kolla | Elevation (m): 1197 | *E: 187000* |
| Land form: Seasonally wet valley floor | Slope Class: Flat | Slope Position : Low |
| Slope Aspect: E-W | Slope Length: 250 | Slope Form: Concave |
| Micro- Topography: Low gilgai / termite | Coverage % : 20/1 | |
| Parent Material: Unknown | Soil depth cm: 190 | *Rock outcrop:* |
| Surface Fragment coverage : | Surface Crack: | *Sealing:* |
| Flooding : A/4 | Water table cm. >190 | |
| Drainage - External Extremely slow | Internal – Poorly drained | |
| Human influence : Burning / Surface compaction | | Moisture condition: Wet |
| Land Cover Open grass land / Seasonal swamp | | |
| Land Use: Ranching | | |
| Major Crop Type | Fertilizer Type | |
| Type of erosion: Deposition by water | Area Affected : 10-25% | |
| Activity: Active at present | Degree of dissection: Moderate | |

Remarks: The area is seasonal marsh which is covered with grass and riparian trees.

0-20cm: Black (7.5YR2/0) color moist, loam texture, weak, fine, sub-angler block structures, slightly stick/slightly plastic consistency when wet, fine roots, many, fine pores.

20-50cm: Dark brown (7.5YR3/2) color moist, common, faint, yellowish red mottle, clay loam texture, weak, fine, sub-angler block structure, slightly stick/slightly plastic consistency, compacted, ploughed cementation, many, fine roots, many, fine pores.

50-160cm: Dark gray (7.5YR4/0) color moist, very few, faint, yellowish red mottle, clay texture, strong, coarse/very coarse, single grain structure, sticky /plastic consistency, cemented, vesicular, coarse cementation, few, fine roots, few, fine pores.

160-190cm: Grayish brown (10YR5/2) color moist, dominant, distinct, yellowish red mottle, sandy clay texture, strong, medium/ coarse granular structure, slightly sticky, slightly plastic consistency, cemented, vesicular, coarse consistency.

190-300cm: Grayish brown (10YR5/2) color moist, distinct, dominant, brown mottle, silt clay texture, weak, medium/ coarse structure, sticky, plastic consistency, moderately cemented, play, coarse cementation, black, hard, manganese mineral nodules.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION SHEET | Field No: DP104 | Map Sheet: 0836A1 |
| Location: North | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-2 | | |
| Author:- Batru | Date:- | |
| FAO -Soil Type : Rhodic Nitisols (NTro) | Coordinate (UTM) | N: 991196 |
| Agro-Climatic Zone: Kolla | Elevation (m): 1233 | E: 186390 |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: Sloping | Slope Position : Medium |
| Slope Aspect: S-N | Slope Length: 300m | Slope Form: Convex |
| Micro- Topography: Termite | Coverage % :3 | |
| Parent Material: Unknown | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm: >200cm | |
| Drainage - External Rapid | Internal – Well drained | |
| Human influence : Burning | | Moisture condition: Moist |
| Land Cover: Intensively cultivated land / Predominantly cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type: sorghum | Fertilizer Type | |
| Type of erosion: Sheet & Splash erosion | Area Affected: 5-10% | Degree of dissection: Moderate |
| Activity: Active at present | | |

Remarks: The forest is cleared due to settlement

0-10cm: Dark reddish brown (5YR 3/2) color moist, loam texture, loose moist, non stick/ plastic consistency, common, fines roots and many, fine pores.

10-30cm: Dark red (2.5YR3/6) color moist, clay loam texture, weak, fine/medium, granular structure, very friable, slightly stick consistency, few, fine roots and few, fine pores.

30-200cm: Red (2.5YR4/6) color moist, clay loam texture, moderate, medium/coarse, sub-angular block structure, firm moist, stick/plastic consistency.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP105 | Map Sheet: 0836A1 |
| Location: Cheffe Megertu | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: V3d-8 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type: Fluvic Cambisols (CMfv) | Coordinate (UTM) | N: 991600 |
| Agro-Climatic Zone: Kolla | Elevation (m): 1229 | E: 195000 |
| Land form : Moderately dissected valley floor | Slope Class: Strongly | Slope Position : Medium |
| Slope Aspect: W_E | Slope Length: >200m | Slope Form: Concave |
| Micro- Topography: Termite | Coverage % : 0.2 | |
| Parent Material: Colluvial deposit | Soil depth cm. : 123 | Rock outcrop: Boulders, Stone, Gravel |
| Surface Fragment coverage : 0.5, Boulder, Stone, Gravel | Surface Crack: N | Sealing: N |
| Flooding | Water table cm: >123 | |
| Drainage - External Well | Internal – Well drained | |
| Human influence: N | | Moisture condition: Moist |
| Land Cover: Perennial swamp | | |
| Land Use: Forest | | |
| Major Crop Type : | Fertilizer Type : | |
| Type of erosion: Sheet & splash erosion | Area Affected: >50% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Effective soil depth is 123cm; the area is covered by open wood land and tall grasses.

0-22cm: Black (7.5YR2/0) color moist, clay loam texture, weak, fine/ medium, sub-angular block structure, firm moist, stick/plastic consistency, many, fine/medium roots and many, fine pores.

22-75cm: D. reddish brown (5YR 3/2) color moist, clay texture, moderate, fine /medium, sub-angular block) structure, very firm moist, stick/plastic consistency, many, fine/medium roots and many, fine pores.

75-123cm: Yellowish red (5YR 4/4) color moist, clay texture, few, fine coarse fragment, moderate, fine/medium, sub-angular block structure, very firm moist, stick/ plastic consistency, common, fine/coarse roots and many, fine pores.

>123cm: Gravels, common, medium coarse fragments, fine/medium, clay cementation /compaction.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP106 | Map Sheet: 0836A1 |
| Location: Cheffe Megertu | Region : Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: U2f_9 | | |
| Author:- Kumsa B | Date:- | |
| FAO -Soil Type : Hypereutric Cambisols (CMeuh) | Coordinate (UTM) | N: 991328 |
| Agro-Climatic Zone: Kolla | Elevation (m): 1226 | E: 194502 |
| Land form: Strongly sloping hill/ridge side | Slope Class: Strongly slope | Slope Position : Low |
| Slope Aspect: W-E | Slope Length: 150M | Slope Form: Concave |
| Micro- Topography: | Coverage % | |
| Parent Material: Colluvial deposits | Soil depth cm : 124 | Rock outcrop : Few, Boulders, Stones |
| Surface Fragment coverage : 0.5, Boulders, Stones | Surface Crack: - | Sealing: - |
| Flooding : None | Water table cm. >124 | |
| Drainage - External - Well | Internal – Well drained | |
| Human influence : | | Moisture condition: Moist |
| Land Cover: Perennial marsh | | |
| Land Use: Forest | | |
| Major Crop Type | Fertilizer Type | |
| Type of erosion: Sheet & splash erosion | Area Affected : >50 | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Effective depth is 124cm, slope is 9% and surface soil is rich in organic matter

0-19mc: Very dark gray (5YR3/1) color wet, clay loam texture, weak, fine/medium, sub-angular block structure, firm moist, stick/plastic moist, wet consistency, many, fine/medium roots and many, fine/medium pores.

19-70cm: D. reddish brown (5YR3/2) color wet, clay texture, moderate, fine /medium, sub-angular block structure, firm moist, stick/plastic moist, wet consistency, many, fine/medium roots and many, fine pores.

70-124cm: Yellowish red (5YR4/6) color wet, clay texture, moderate, fine/medium, sub-angular block structure, firm moist, stick/plastic moist, wet consistency, common, fine/medium roots and many, fine pores

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP107 | Map Sheet: 0836A1 |
| Location: E of village #7 | Region : Oromiya, Zone: Illuababora, | Wereda: Chewaka |
| Mapping Unit: U2f-9 | | |
| Author:- | Date:- | |
| FAO -Soil Type: Hypereutric Cambisols (CMeuh) | Coordinate (UTM) | N: 991940 |
| Agro-Climatic Zone: | Elevation (m): 1239 | E: 192460 |
| Land form: Strongly sloping hill/ridge side | Slope Class: | Slope Position : Medium |
| Slope Aspect: N-S | Slope Length: 500M | Slope Form: Convex |
| Micro- Topography: | Coverage % | |
| Parent Material: Volcanic ash | Soil depth cm. : 60 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. >60 | |
| Drainage - External Rapid | Internal – Well drained | |
| Human influence : Vegetation disturbed Clearing | | Moisture condition: Wet |
| Land Cover: Moderately cultivated land | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type | Fertilizer Type | |
| Type of erosion : Sheet and splash erosion / Rill erosion | Area Affected: 10-25% | |
| Activity: Active at present | Degree of dissection: Slight/Moderate | |

Remarks: After 65cm the soil surface is stony & sandy. Currently the area is under sorghum, maize, rice, sesame, finger millet. Ground nut are the major crops grown in the area and for sorghum most suitable.

0-13cm: Very dark brown (10YR2/2) color, silt loam texture, slightly sticky, slightly plastic consistency, common, medium coarse roots and many, coarse/medium pores.

13-60cm: Dark brown (7.5YR3/2) color, sandy loam, few, stones/medium gravel coarse fragments, slightly sticky, slightly plastic consistency, common, fine roots and many, medium/fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP108 | Map Sheet: 0836A1 |
| Location: E of village # 7 | Region: Oromiya, Zone : Illuababora, Wereda : Chewaka | |
| Mapping Unit: U2f-9 | | |
| Author:- Zelealem S/M | Date:- | |
| FAO -Soil Type: Hypereutric Cambisols (CMeuh) | Coordinate (UTM) | N: 991029 |
| Agro-Climatic Zone: Kolla | Elevation (m): 1212 | E: 193130 |
| Land form: Strongly sloping hill/ridge side | Slope Class: Sloping | Slope Position : Medium |
| Slope Aspect: N-S | Slope Length: 300M | Slope Form: Convex |
| Micro- Topography: Termite | Coverage % : 1 | |
| Parent Material: Volcanic ash | Soil depth cm: 140 | Rocky outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding | Water table cm. >140 | |
| Drainage - External Rapid | Internal – Well drained | |
| Human influence : Vegetation disturbed/ Clearing | | Moisture condition: Moist |
| Land Cover: Predominantly cultivated | | |
| Land Use: Rain fed arable cultivate | | |
| Major Crop Type: sorghum, maize, sesame, rice | Fertilizer Type | |
| Type of erosion: Sheet and splash erosion | Area Affected: 10-25% | |
| Activity: Active at present | Degree of erosion: Slight | |

Remarks: High vegetation disturbing is under way.

0-13cm: very dark brown (10YR2/2) color, loam texture, weak, medium, granular structure, slightly sticky /slightly plastic consistence wet, common, fine/medium roots and many, coarse/medium pores.

13-35cm: Dark brown (7.5YR 3/2) color, clay loam texture, moderate, medium, granular structure, extremely firm moist, sticky, plastic consistence moist/wet, few, fine roots and many, fine pores.

35-140cm: Dark brown (7.5YR3/4) color clay texture, moderate, medium, sub-angler blocky structure, extremely firm consistency when moist, sticky plastic consistence moist/wet, few, black, soft/hard, iron / manganese mineral nodules, few, fine pores.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP109 | Map Sheet: 0836A1 |
| Location: | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: G2d-2 | | |
| Author:- | Date:- | |
| FAO -Soil Type: Rhodic Nitisols (NTro) | Coordinate (UTM) | N: 0990473 |
| Agro-Climatic Zone: | Elevation (m):1252 | E: 0184258 |
| Land form : Middle & lower part of gently undulating plains with convex interfluves | Slope Class: 06/07 | Slope: Position: Medium |
| Slope Aspect: N-S | Slope Length: 150m | Slope Form: Convex |
| Micro- Topography: Termite | Coverage % | |
| Parent Material: Volcanic ash | Soil depth cm. 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: | Sealing: |
| Flooding: None | Water table cm. >200 | |
| Drainage - External Rapid | Internal - Well drained | |
| Human influence: | | Moisture condition: Moist |
| Land Cover: Predominantly cultivated | | |
| Land Use: Rain fed arable cultivation | | |
| Major Crop Type : Maize, sorghum, Sesame, .Groundnut | Fertilizer Type | |
| Type of erosion: Sheet and splash erosion | Area Affected: 10-25% | |
| Activity: Active at present | Degree of dissection: Slight | |

Remarks: Forest soil, high vegetable disturbance in the area, scattered big trees, some of them are dried.

0-25cm: Very dusky red (2.5YR 2.5/2) color dry, loam texture moderate, medium, angular balky structure friable moist, slightly sticky, slightly plastic wet, few, red, soft, mineral nodules, many, course/medium/fine roots many, course/ medium pores.

25-55cm: Dark reddish brown (2.5YR 2.5/4) color dry, clay loam texture, few, fine gravel coarse fragments, moderate, coarse and medium, angular blocky structure, firm moist, sticky/ plastic wet, many, medium/fine roots, many, medium/ fine pores.

55-90cm: Dark red (2.5YR3/6) color dry, clay texture, few, fine gravel coarse fragments, moderate, medium and coarse, sub-angular, blocky structure, firm moist, sticky/ plastic wet, common, medium/fine roots, few, fine.

90-200cm: Dark red (10YR3/6) color dry, clay texture, weak, fine to coarse, sub-angular, blocky structure, friable moist, slightly sticky, slightly plastic wet.

| | | |
|---|---|---|
| SOIL PROFILE DESCRIPTION | Field No: DP110 | Map Sheet : 0836A1 |
| Location: N of village 4 | Region: Oromiya, Zone: Illuababora, Wereda: Chewaka | |
| Mapping Unit: V1b-3 | | |
| Author:- Zelealem S/M & Kumsa | Date:- | |
| FAO - Soil Type: Vertisols | Coordinate (UTM) | N: 0994170 |
| Agro-Climatic Zone: | Elevation (m): 1248 | E: 0182858 |
| Land form: Seasonally wet valley floor | Slope Class: 06 | Slope: Position: Low |
| Slope Aspect: W-E Slope Length: 300m | Slope Form Concave | |
| Micro- Topography: Medium gilgal /High gilgai | Coverage % 10 | |
| Parent Material: Alluvial deposits | Soil depth cm: 200 | Rock outcrop: |
| Surface Fragment coverage : | Surface Crack: wide/ very wide | Sealing: Moderate |
| Flooding: | Water table cm: >200 | |
| Drainage - External Well /Rapid | Internal – Imperfectly drained | |
| Human influence | | Moisture condition: Moist |
| Land Cover: Wet land seasonal swamp | | |
| Land Use: Animal production | | |
| Major Crop Type: | Fertilizer Type | |
| Type of erosion: Gully erosion | Area Affected: 0-25% | |
| Activity: Active at present | Degree of dissection: Moderate/Severe | |

Remark: Profile pit is taken from gully. It is highly increased gully, forms almost canon. The gully is formed due to road cut to drain water ; Needs soil conservation and check dam construction

0-21cm: Dark brown (10YR 3/3) color moist, clay loam texture strong, medium/ coarse granular structure, slightly hard dry slightly sticky, slightly plastic wet, few, fine roots and fine and medium, pore.

21-38cm: Dark brown (10YR 4/3 ) color moist, clay loam texture, moderate, fine, granular structure, friable to firm moist, sticky, plastic, moist, wet consistence, very few, fine and medium roots and common, fine and medium pores.

38-70cm: Dark brown (10YR 4/3) color moist, many yellowish red, mottling, distinct, clay texture, moderate, moderate, fine, granular structure.

70-200cm: Very dark gray (5YR3/1) color moist, clay texture, few course fragments, strong, coarse/very coarse, platy structure, firm moist, sticky platy moist, wet consistence, moderately cemented, platy, clay cementation.

# APPENDIX 5D2: LABORATORY RESULTS OF ALL PROFILE PITS

| Profile | Texture <2 mm. fraction | | | | pH(1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ | Fe | Mn | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Sand | Silt | Clay | Class | H2O | KCl | ΔPH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K | mg/ kg soil (ppm) | | | |
| cm. | DP1 | | | SMU : G1b_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-20 | 33.7 | 14.7 | 51.6 | C | 5.3 | 4.6 | -0.7 | 0.04 | 0.5 | 3.4 | 7 | 1.6 | 0.2 | 0.4 | 8.2 | 1.8 | 10.7 | 39.2 | 27 | 0.6 | 5 | 24 | 47.3 | 20.3 | 1.8 | 1.4 |
| 20-62 | 25.0 | 16.9 | 58.1 | C | 4.8 | 4.0 | -0.8 | 0.01 | 0.1 | 1.2 | 13 | Trace | 0.2 | 0.1 | 6.4 | 2.7 | 9.5 | 23.8 | 40 | 0.9 | 2 | 65 | | | | |
| 62-140 | 14.8 | 12.6 | 72.5 | C | 4.8 | 4.4 | -0.4 | 0.01 | 0.1 | 0.7 | 7 | 10.9 | 0.2 | 0.1 | 6.4 | 1.8 | 8.5 | 9.9 | 86 | 1.8 | 4 | 59 | | | | |
| 140-200 | 10.6 | 10.5 | 78.8 | C | 4.9 | 4.2 | -0.7 | 0.01 | 0.2 | 1.7 | 7 | Trace | 0.2 | 0.2 | 5.4 | 1.8 | 7.6 | 27.5 | 27 | 0.6 | 3 | 48 | | | | |
| | DP2 | | | SMU : G2_d2 | | | | | | | | | Soil Type : Rhodic Nitisols (Ntro) | | | | | | | | | | | | | |
| 0-30 | 30.8 | 34.1 | 35.1 | CL | 5.3 | 4.7 | -0.6 | 0.07 | 0.3 | 2.6 | 9 | 3.6 | 0.2 | 0.4 | 10.8 | 2.7 | 14.2 | 35.4 | 40 | 0.5 | 4 | 33 | 25.6 | 73.8 | 1.8 | 1.3 |
| 30-113 | 25.0 | 4.2 | 70.8 | C | 4.7 | 4.5 | -0.2 | 0.02 | 0.1 | 0.9 | 8 | 0.3 | 0.6 | 0.2 | 4.5 | 0.9 | 6.1 | 34.4 | 18 | 1.7 | 5 | 36 | | | | |
| 113-200 | 10.6 | 10.5 | 78.9 | C | 4.9 | 4.2 | -0.7 | 0.01 | 0.1 | 1.4 | 10 | Trace | 0.2 | 0.2 | 3.6 | 1.8 | 5.8 | 21.6 | 27 | 0.8 | 2 | 31 | | | | |
| 200-300 | | | | | 5.2 | 4.4 | -0.8 | 0.01 | | | | | | | | | | | | | | | | | | |
| 300-337 | | | | | 4.9 | 4.2 | -0.7 | 0.01 | | | | | | | | | | | | | | | | | | |
| | DP4 | | | SMU : V1b_3 | | | | | | | | | Soil Type Mesotrophic Vertisols (VRsm) | | | | | | | | | | | | | |
| 0-14 | 41.1 | 15.0 | 43.9 | C | 5.0 | 3.8 | -1.2 | 0.10 | 0.1 | 1.1 | 8 | 1.3 | 0.2 | 0.4 | 18.1 | 0.9 | 19.6 | 42.3 | 46 | 0.6 | 20 | 50 | 75.4 | 51.5 | 2.3 | 1.0 |
| 14-61 | 34.6 | 15.0 | 50.4 | C | 5.0 | 3.5 | -1.5 | 0.02 | 0.1 | 0.7 | 8 | Trace | 0.3 | 0.2 | 13.4 | 2.7 | 16.6 | 36.5 | 46 | 0.8 | 5 | 70 | | | | |
| 61-114 | 28.3 | 11.0 | 60.6 | C | 5.4 | 3.5 | -1.9 | 0.02 | 0.1 | 0.5 | 8 | Trace | 0.6 | 0.2 | 23.3 | 2.7 | 26.8 | 44.3 | 61 | 1.3 | 9 | 108 | | | | |
| 114-200 | 39.0 | 8.9 | 52.1 | C | 6.1 | 4.6 | -1.5 | 0.03 | 0.1 | 1.6 | 17 | 0.3 | 0.6 | 0.3 | 31.4 | 13.4 | 45.7 | 44.3 | 103 | 1.5 | 2 | 166 | | | | |
| | DP7 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-17 | 37.5 | 23.3 | 39.2 | CL | 5.0 | 4.3 | -0.7 | 0.15 | 0.3 | 2.3 | 7 | 3.0 | 0.2 | 0.7 | 11.6 | 5.4 | 17.9 | 39.0 | 46 | 0.5 | 2 | 26 | 26.1 | 73.7 | 1.5 | 0.4 |
| 17-64 | 21.8 | 17.1 | 61.1 | C | 4.3 | 4.0 | -0.3 | 0.04 | 0.2 | 1.8 | 10 | 2.0 | 0.2 | 0.3 | 3.6 | 0.9 | 5.0 | 32.6 | 15 | 0.5 | 4 | 14 | | | | |
| 64-200 | 8.9 | 12.9 | 78.2 | C | 4.3 | 4.1 | -0.3 | 0.04 | 0.1 | 1.2 | 9 | 2.6 | 0.2 | 0.2 | 5.4 | 0.9 | 6.7 | 21.9 | 30 | 0.7 | 6 | 27 | | | | |
| 0-17 | 37.5 | 23.3 | 39.2 | CL | 5.0 | 4.3 | -0.7 | 0.15 | 0.3 | 2.3 | 7 | 3.0 | 0.2 | 0.7 | 11.6 | 5.4 | 17.9 | 39.0 | 46 | 0.5 | 2 | 26 | 26.1 | 73.7 | 1.5 | 0.4 |
| 17-64 | 21.8 | 17.1 | 61.1 | C | 4.3 | 4.0 | -0.3 | 0.04 | 0.2 | 1.8 | 10 | 2.0 | 0.2 | 0.3 | 3.6 | 0.9 | 5.0 | 32.6 | 15 | 0.5 | 4 | 14 | | | | |

| Profile | Texture <2 mm. fraction | | | | pH(1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ | Fe | Mn | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Sand | Silt | Clay | Class | H2O | KCl | ΔPH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K | mg/ kg soil (ppm) | | | |
| cm. | DP9 | | | SMU : V1b_3 | | | | | | | | | Soil Type : Mesotrophic Vertisols (VRsm | | | | | | | | | | | | | |
| 0-13 | 47.4 | 20.0 | 32.6 | Sacl | 5.3 | 4.1 | -1.3 | 0.04 | 0.2 | 1.5 | 7 | 13.8 | 0.3 | 0.7 | 6.3 | 2.7 | 9.9 | 26.8 | 37 | 0.9 | 2 | 14 | 372.0 | 55.0 | 2.9 | 1.0 |
| 13-46 | 43.7 | 27.6 | 28.7 | CL | 5.1 | 4.5 | -0.6 | 0.02 | 0.1 | 0.9 | 8 | 32.9 | 0.2 | 0.2 | 8.9 | 4.4 | 13.7 | 21.7 | 63 | 1.0 | 2 | 62 | | | | |
| 46-88 | 44.4 | 18.2 | 37.4 | CL | 4.9 | 4.5 | -0.4 | 0.02 | 0.1 | 0.7 | 8 | 2.0 | 0.3 | 0.2 | 15.2 | 0.9 | 16.6 | 29.7 | 56 | 0.9 | 17 | 67 | | | | |
| 88-200 | 37.7 | 24.1 | 38.3 | CL | 6.5 | 5.5 | -1.0 | 0.05 | 0.1 | 1.4 | 13 | 0.7 | 0.6 | 0.3 | 24.2 | 0.9 | 26.0 | 41.9 | 62 | 1.4 | 27 | 95 | | | | |
| | DP10 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-15 | 33.9 | 16.0 | 50.1 | C | 5.5 | 4.5 | -1.0 | 0.09 | 0.3 | 3.1 | 10 | 3.6 | 0.2 | 1.0 | 15.2 | 1.8 | 18.3 | 39.4 | 46 | 0.5 | 9 | 16 | 48.8 | 11.9 | 2.3 | 2.3 |
| 15-35 | 43.4 | 8.5 | 48.0 | C | 4.9 | 3.8 | -1.1 | 0.02 | 0.2 | 1.5 | 7 | 1.7 | 0.2 | 0.2 | 5.4 | 1.8 | 7.6 | 10.2 | 74 | 1.5 | 3 | 31 | | | | |
| 35-69 | 17.0 | 21.6 | 61.4 | C | 5.0 | 4.0 | -1.0 | 0.02 | 0.1 | 0.9 | 7 | Trace | 0.1 | 0.2 | 5.4 | 1.8 | 7.5 | 31.2 | 24 | 0.4 | 3 | 33 | | | | |
| 69-160 | 17.7 | 9.7 | 72.5 | C | 5.1 | 4.1 | -0.9 | 0.02 | 0.2 | 1.8 | 10 | Trace | 0.2 | 0.2 | 3.6 | 1.8 | 5.8 | 21.4 | 27 | 0.9 | 2 | 25 | | | | |
| | DP11 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-16 | 38.5 | 10.4 | 51.0 | C | 5.3 | 4.2 | -1.1 | 0.05 | 0.2 | 3.3 | 17 | 85.7 | 0.2 | 0.2 | 5.4 | 1.8 | 7.6 | 21.4 | 35 | 0.8 | 3 | 33 | 43.2 | 52.5 | 1.8 | 0.3 |
| 16-46 | 37.3 | 15.7 | 47.0 | C | 4.7 | 3.9 | -0.7 | 0.02 | 0.1 | 2.0 | 22 | 0.7 | 0.2 | 0.1 | 5.4 | 1.8 | 7.5 | 21.9 | 34 | 1.0 | 3 | 57 | | | | |
| 46-132 | 30.1 | 12.5 | 57.4 | C | 4.7 | 4.0 | -0.7 | 0.03 | 0.1 | 1.1 | 13 | 0.3 | 0.1 | 0.1 | 7.2 | 0.9 | 8.3 | 16.6 | 50 | 0.8 | 8 | 70 | | | | |
| 132-200 | 24.1 | 12.5 | 63.4 | C | 4.6 | 4.1 | -0.5 | 0.04 | 0.1 | 0.8 | 10 | 0.4 | 0.2 | 0.1 | 4.5 | 2.7 | 7.4 | 16.6 | 45 | 0.9 | 2 | 69 | | | | |
| | DP12 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-14 | 32.5 | 13.7 | 53.8 | C | 5.4 | 4.3 | -1.1 | 0.07 | 0.2 | 3.8 | 15 | 3.6 | 0.2 | 0.4 | 10.7 | 3.6 | 14.8 | 28.5 | 52 | 0.7 | 3 | 35 | 56.8 | 76.5 | 1.8 | 1.1 |
| 14-35 | 35.5 | 16.9 | 47.6 | C | 4.9 | 4.0 | -0.9 | 0.02 | 0.1 | 2.3 | 17 | 1.0 | 0.2 | 0.2 | 7.2 | 0.9 | 8.4 | 24.8 | 34 | 0.7 | 8 | 41 | | | | |
| 35-59 | 29.2 | 14.8 | 56.0 | C | 4.8 | 3.9 | -0.9 | 0.01 | 0.2 | 1.7 | 11 | 0.9 | 0.2 | 0.2 | 3.6 | 0.9 | 4.9 | 21.9 | 22 | 0.9 | 4 | 21 | | | | |
| 59-180 | 16.4 | 12.7 | 70.9 | C | 4.9 | 4.1 | -0.8 | 0.01 | 0.1 | 1.0 | 12 | 1.9 | 0.2 | 0.2 | 3.6 | 0.9 | 4.8 | 16.9 | 28 | 1.1 | 4 | 28 | | | | |
| | DP13 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-17 | 32.6 | 41.7 | 25.7 | L | 5.0 | 4.3 | -0.6 | 0.10 | 0.3 | 3.5 | 11 | 5.9 | 0.2 | 0.4 | 9.9 | 1.8 | 12.2 | 38.0 | 32 | 0.4 | 6 | 27 | 32.7 | 137.7 | 2.1 | 1.0 |
| 17-51 | 21.7 | 23.6 | 54.7 | C | 5.1 | 4.2 | -0.9 | 0.02 | 0.2 | 2.1 | 11 | 0.9 | 0.2 | 0.3 | 4.5 | 0.9 | 5.9 | 26.8 | 22 | 0.7 | 5 | 17 | | | | |
| 51-180 | 11.7 | 16.2 | 72.2 | C | 4.9 | 4.0 | -0.9 | 0.01 | 0.1 | 1.2 | 9 | 3.9 | 0.1 | 0.3 | 3.6 | 0.9 | 5.0 | 56.0 | 9 | 0.2 | 4 | 14 | | | | |

| Profile | Texture <2 mm. fraction | | | | pH (1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ | Fe | Mn | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Sand | Silt | Clay | Class | H2O | KCl | ΔPH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K | mg/ kg soil (ppm) | | | |
| cm. | DP14 | | | SMU : G1b_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-16 | 49.3 | 26.9 | 23.8 | SCL | 6.4 | 5.6 | -0.8 | 0.12 | 0.3 | 3.3 | 11 | 12.1 | 0.1 | 0.6 | 13.3 | 2.7 | 16.6 | 21.7 | 77 | 0.4 | 5 | 28 | 40.2 | 42.4 | 1.5 | 0.1 |
| 16-77 | 48.3 | 18.3 | 33.5 | SCL | 6.4 | 5.2 | -1.2 | 0.04 | 0.1 | 1.3 | 14 | 50.5 | 0.1 | 0.3 | 7.6 | 2.7 | 10.7 | 17.5 | 61 | 0.4 | 3 | 31 | | | | |
| 77-102 | 38.7 | 18.7 | 42.6 | C | 6.1 | 6.0 | -0.1 | 0.04 | 0.7 | 0.0 | 19 | 1.4 | 0.1 | 0.4 | 8.7 | 6.4 | 15.5 | 22.3 | 70 | 0.5 | 1 | 42 | | | | |
| | DP15 | | | SMU : U2f_9 | | | | | | | | | Soil Type : Hypereutric Cambisols (CMeuh) | | | | | | | | | | | | | |
| 0-15 | 37.8 | 35.4 | 26.8 | C | 6.7 | 5.9 | 0.1 | 0.13 | 0.6 | 7.8 | 14 | 112.0 | 0.1 | 1.7 | 27.4 | 6.8 | 36.0 | 37.7 | 96 | 0.3 | 4 | 20 | 24.1 | 105.0 | 3.5 | 8.9 |
| 15-52 | 33.9 | 24.5 | 41.6 | C | 6.4 | 5.7 | 0.1 | 0.14 | 0.2 | 1.5 | 7 | 42.9 | 0.1 | 0.9 | 21.7 | 14.5 | 37.2 | 30.5 | 122 | 0.5 | 2 | 41 | | | | |
| 52-100 | 24.3 | 21.3 | 54.4 | C | 6.6 | 5.8 | -0.8 | 0.05 | 0.1 | 1.1 | 7 | 7.9 | 0.1 | 0.8 | 16.3 | 11.3 | 28.5 | 31.4 | 91 | 0.3 | 1 | 34 | | | | |
| | DP17 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-15 | 25.5 | 11.7 | 62.8 | C | 5.7 | 4.6 | -1.1 | 0.12 | 0.3 | 3.5 | 10 | 5.3 | 0.2 | 0.9 | 4.5 | 4.5 | 10.1 | 37.3 | 27 | 0.4 | 1 | 10 | 47.8 | 30.3 | 1.5 | 0.9 |
| 15-37 | 21.1 | 7.5 | 71.4 | C | 4.6 | 3.7 | -0.9 | 0.08 | 0.2 | 2.8 | 14 | 4.3 | 0.1 | 0.4 | 6.3 | 1.8 | 8.6 | 31.4 | 27 | 0.4 | 4 | 23 | | | | |
| 37-68 | 15.8 | 9.6 | 74.6 | C | 5.1 | 4.2 | -0.9 | 0.03 | 0.1 | 1.6 | 11 | 2.0 | 0.1 | 0.2 | 2.7 | 1.8 | 4.9 | 28.0 | 17 | 0.4 | 2 | 19 | | | | |
| 68-200 | 9.5 | 10.6 | 79.9 | C | 4.9 | 4.5 | -0.4 | 0.02 | 0.1 | 0.8 | 7 | 0.7 | 0.2 | 0.2 | 3.6 | 0.9 | 4.9 | 21.1 | 23 | 0.9 | 4 | 24 | | | | |
| | DP18 | | | SMU : G2d_1 | | | | | | | | | Soil Type: Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-20 | 10.9 | 38.7 | 50.5 | C | 4.9 | 4.2 | -0.8 | 0.09 | 0.4 | 3.3 | 8 | 6.6 | 0.2 | 0.6 | 9.0 | 3.6 | 13.4 | 36.8 | 36 | 0.5 | 3 | 21 | 66.9 | 84.4 | 2.6 | 1.8 |
| 20-42 | 27.7 | 17.3 | 55.0 | C | 4.6 | 3.7 | -0.8 | 0.03 | 0.3 | 2.6 | 9 | 3.3 | 0.2 | 0.3 | 7.2 | 1.8 | 9.5 | 33.9 | 28 | 0.5 | 4 | 34 | | | | |
| 42-180 | 17.0 | 10.8 | 72.3 | C | 4.7 | 3.9 | -0.8 | 0.04 | 0.2 | 1.4 | 8 | 5.3 | 0.2 | 0.2 | 3.6 | 0.9 | 4.9 | 26.0 | 19 | 0.8 | 4 | 20 | | | | |
| 200-280 | | | | | 5.4 | 4.4 | -1.0 | 0.08 | | | | | | | | | | | | | | | | | | |
| | DP19 | | | SMU : V1b_3 | | | | | | | | | Soil Type: Mesotrophic Vertisols (VRsm) | | | | | | | | | | | | | |
| 0-20 | 34.8 | 12.0 | 53.3 | C | 5.1 | 4.0 | -1.0 | 0.06 | 0.2 | 2.9 | 15 | 8.9 | 0.2 | 0.4 | 19.9 | 8.1 | 28.7 | 43.7 | 66 | 0.4 | 2 | 64 | 222.7 | 50.0 | 2.3 | 0.6 |
| 20-55 | 25.6 | 8.9 | 65.5 | C | 5.1 | 4.1 | -1.0 | 0.02 | 0.1 | 1.3 | 9 | 2.9 | 0.3 | 0.3 | 22.6 | 4.5 | 27.7 | 44.2 | 63 | 0.7 | 5 | 98 | | | | |
| 55-200 | 1.9 | 30.8 | 67.3 | C | 6.5 | 4.7 | -1.8 | 0.05 | 0.0 | 0.5 | 16 | 3.2 | 0.4 | 0.4 | 31.4 | 9.0 | 41.2 | 54.1 | 76 | 0.8 | 4 | 100 | | | | |

| Profile | Texture <2 mm. fraction | | | | pH(1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+M/ | Fe | Mn | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Sand | Silt | Clay | Class | H2O | KCl | ΔPH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K | mg/ kg soil (ppm) | | | |
| cm. | DP20 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-12 | 46.8 | 20.9 | 32.3 | SCL | 5.4 | 4.4 | -0.9 | 0.13 | 0.2 | 3.3 | 13 | 4.7 | 0.1 | 1.0 | 9.0 | 2.7 | 12.8 | 28.7 | 45 | 0.4 | 3 | 11 | 20.1 | 65.7 | 1.2 | 0.1 |
| 12--35 | 36.8 | 17.9 | 45.3 | C | 4.8 | 3.8 | -1.0 | 0.02 | 0.2 | 2.2 | 12 | 1.7 | 0.1 | 0.2 | 3.6 | 0.9 | 4.9 | 31.7 | 15 | 0.4 | 4 | 19 | | | | |
| 32-115 | 38.0 | 14.7 | 47.3 | C | 5.0 | 4.2 | -0.8 | 0.01 | 0.2 | 1.1 | 7 | 1.4 | 0.2 | 0.2 | 3.6 | 0.9 | 4.9 | 21.4 | 23 | 0.9 | 4 | 21 | | | | |
| 115-176 | 33.5 | 19.0 | 47.5 | C | 4.9 | 4.5 | -0.4 | 0.02 | 0.1 | 1.1 | 8 | 1.9 | 0.2 | 0.3 | 4.5 | 1.8 | 6.7 | 23.9 | 28 | 0.7 | 3 | 21 | | | | |
| 176-200 | 40.0 | 16.8 | 43.1 | C | 4.9 | 4.3 | -0.6 | 0.02 | 0.2 | 0.2 | 1 | 1.4 | 0.1 | 0.3 | 2.7 | 1.8 | 4.9 | 29.7 | 17 | 0.5 | 2 | 13 | | | | |
| | DP21 | | | SMU : G2_d2 | | | | | | | | | Soil Type : Rhodic Nitisols(Ntro) | | | | | | | | | | | | | |
| 0-13 | 38.6 | 40.9 | 20.5 | L | 5.2 | 4.4 | -0.8 | 0.19 | 0.5 | 5.4 | 11 | 7.9 | 0.2 | 0.3 | 17.0 | 3.6 | 21.1 | 52.6 | 40 | 0.3 | 5 | 72 | 42.2 | 104.3 | 2.3 | 1.4 |
| 13-30 | 38.3 | 41.1 | 20.6 | L | 5.1 | 4.2 | -0.9 | 0.10 | 0.3 | 4.2 | 13 | 2.2 | 0.2 | 0.2 | 8.9 | 3.6 | 12.8 | 52.6 | 24 | 0.4 | 3 | 61 | | | | |
| 30-53 | 17.1 | 36.6 | 46.3 | C | 5.3 | 4.2 | -1.1 | 0.02 | 0.2 | 3.3 | 14 | 1.1 | 0.2 | 0.2 | 7.2 | 1.8 | 9.3 | 66.7 | 14 | 0.3 | 4 | 49 | | | | |
| 53-200 | 7.2 | 14.9 | 77.9 | C | 5.2 | 4.7 | -0.6 | 0.02 | 0.1 | 1.1 | 10 | 1.9 | 0.2 | 0.2 | 8.1 | 3.6 | 12.0 | 26.8 | 45 | 0.7 | 2 | 68 | | | | |
| | DP22 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-15 | 43.1 | 12.4 | 44.5 | C | 4.8 | 4.0 | -0.8 | 0.20 | 0.3 | 2.6 | 9 | 4.7 | 0.2 | 0.6 | 6.3 | 1.8 | 8.8 | 25.3 | 35 | 0.8 | 4 | 14 | 67.9 | 61.4 | 1.2 | 0.2 |
| 15-30 | 48.0 | 17.7 | 34.3 | SCL | 4.8 | 3.9 | -0.9 | 0.02 | 0.1 | 2.2 | 16 | 1.4 | 0.3 | 0.3 | 3.6 | 0.9 | 5.1 | 25.3 | 20 | 1.2 | 4 | 14 | | | | |
| 30-50 | 39.5 | 21.9 | 38.6 | Cl | 4.8 | 4.0 | -0.8 | 0.01 | 0.1 | 1.7 | 12 | 1.7 | 0.3 | 0.3 | 2.7 | 0.9 | 4.2 | 32.1 | 13 | 1.0 | 3 | 11 | | | | |
| 50-200 | 30.3 | 15.6 | 54.1 | C | 4.9 | 4.2 | -0.7 | 0.03 | 0.1 | 0.8 | 7 | 11.1 | 0.3 | 0.3 | 3.6 | 2.7 | 6.8 | 14.6 | 47 | 2.1 | 1 | 24 | | | | |
| | DP23 | | | SMU : V1b_3 | | | | | | | | | Soil Type : Mesotrophic Vertisols (VRsm) | | | | | | | | | | | | | |
| 0-15 | 47.7 | 17.8 | 34.5 | SCL | 5.1 | 4.1 | -1.0 | 0.08 | 0.2 | 2.4 | 11 | 9.5 | 0.2 | 0.4 | 10.8 | 7.2 | 18.5 | 30.7 | 60 | 0.8 | 2 | 50 | 107.6 | 12.1 | 2.1 | 2.0 |
| 15-30 | 34.8 | 12.8 | 52.4 | C | 4.8 | 4.0 | -0.8 | 0.01 | 0.2 | 1.5 | 10 | 3.2 | 0.2 | 0.2 | 6.3 | 2.7 | 9.3 | 34.1 | 27 | 0.6 | 2 | 49 | | | | |
| 30-200 | 45.7 | 6.4 | 47.9 | SC | 5.2 | 3.6 | -1.7 | 0.01 | 0.0 | 0.5 | 12 | 2.9 | 0.3 | 0.2 | 10.8 | 5.4 | 16.6 | 28.7 | 58 | 0.9 | 2 | 67 | | | | |
| | DP 25 | | | SMU : G1b_4 | | | | | | | | | Soil Type : Hyperferric Acrisols (ACfrh) | | | | | | | | | | | | | |
| 0-20 | 44.8 | 27.1 | 28.1 | CL | 6.0 | 5.9 | -0.1 | 0.15 | 0.5 | 4.1 | 9 | 29.6 | 0.2 | 0.5 | 17.0 | 3.6 | 21.4 | 38.0 | 56 | 56.2 | 5 | 39 | 42.7 | 73.4 | 1.8 | 2.2 |
| 20-50 | 51.3 | 12.4 | 36.3 | SC | 6.5 | 5.7 | -0.7 | 0.04 | 0.2 | 2.0 | 12 | 11.1 | 0.2 | 0.4 | 11.1 | 2.2 | 13.9 | 15.4 | 90 | 89.9 | 5 | 35 | | | | |
| 50-75 | 56.8 | 5.1 | 38.1 | SC | 6.5 | 5.3 | -1.2 | 0.05 | 0.1 | 0.7 | 10 | 62.3 | 0.1 | 0.4 | 6.3 | 2.7 | 9.4 | 15.6 | 61 | 60.5 | 2 | 24 | | | | |

| Profile | Texture <2 mm. fraction | | | | pH(1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ | Fe | Mn | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Sand | Silt | Clay | Class | H2O | KCl | ΔPH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K | mg/ kg soil (ppm) | | | |
| cm | DP26 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-22 | 51.2 | 15.3 | 33.6 | SC | 5.4 | 4.3 | -1.1 | 0.04 | 0.1 | 1.8 | 20 | 4.2 | 0.2 | 0.2 | 4.5 | 3.6 | 8.4 | 16.1 | 53 | 1.3 | 1 | 50 | 29.7 | 28.3 | 0.6 | 1.5 |
| 22-50 | 50.2 | 10.2 | 39.6 | SC | 5.1 | 4.1 | -1.0 | 0.01 | 0.1 | 1.8 | 13 | 2.2 | 0.2 | 0.1 | 3.6 | 0.9 | 4.7 | 11.1 | 43 | 1.7 | 4 | 39 | | | | |
| 50-75 | 46.3 | 14.2 | 39.5 | SC | 4.9 | 4.0 | -0.9 | 0.01 | 0.1 | 0.7 | 9 | 0.9 | 0.2 | 0.1 | 2.7 | 0.9 | 3.9 | 15.1 | 26 | 1.2 | 3 | 35 | | | | |
| 75-200 | 46.0 | 10.2 | 43.8 | SC | 4.9 | 3.9 | -1.0 | 0.01 | 0.0 | 0.3 | 22 | 1.3 | 0.2 | 0.2 | 3.6 | 0.9 | 4.9 | 22.4 | 22 | 1.0 | 4 | 26 | | | | |
| | DP27 | | | SMU : G2d_1 | | | | | | | | | Soil Type: Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-17 | 38.8 | 22.8 | 38.4 | C | 4.8 | 3.9 | -0.9 | 0.07 | 0.2 | 2.7 | 14 | 4.2 | 0.2 | 0.2 | 4.6 | 1.8 | 6.8 | 22.8 | 30 | 1.0 | 3 | 34 | 45.2 | 40.2 | 0.9 | 0.4 |
| 17-40 | 29.3 | 26.0 | 44.7 | C | 4.7 | 4.3 | -0.4 | 0.02 | 0.2 | 2.0 | 13 | 2.4 | 0.2 | 0.1 | 2.7 | 0.9 | 4.0 | 24.8 | 16 | 0.8 | 3 | 28 | | | | |
| 40-78 | 32.7 | 18.6 | 48.7 | C | 4.7 | 4.3 | -0.4 | 0.02 | 0.1 | 1.6 | 17 | 1.6 | 0.2 | 0.1 | 2.7 | 1.8 | 4.9 | 18.3 | 27 | 1.1 | 2 | 33 | | | | |
| 78-128 | 26.6 | 21.3 | 52.1 | C | 4.8 | 4.5 | -0.2 | 0.02 | 0.1 | 1.2 | 14 | 1.9 | 0.2 | 0.1 | 1.8 | 1.8 | 3.9 | 17.7 | 22 | 1.1 | 1 | 28 | | | | |
| 128-200 | 33.3 | 3.2 | 63.5 | C | 5.0 | 4.3 | -0.7 | 0.02 | 0.1 | 0.9 | 8 | 0.7 | 0.2 | 0.2 | 2.7 | 2.7 | 5.8 | 17.2 | 34 | 1.3 | 1 | 36 | | | | |
| Cm. | DP30 | | | SMU : V1b_3 | | | | | | | | | Soil Type: Mesotrophic Vertisols (VRsm) | | | | | | | | | | | | | |
| 0-26 | 29.6 | 23.1 | 47.3 | C | 5.2 | 4.0 | -1.2 | 0.11 | 0.3 | 4.2 | 14 | 13.6 | 0.3 | 0.6 | 15.4 | 6.3 | 22.6 | 52.6 | 43 | 0.5 | 2 | 35 | | | | |
| 26-53 | 21.3 | 17.7 | 60.9 | C | 5.0 | 4.0 | -0.9 | 0.05 | 0.2 | 1.8 | 11 | 3.9 | 0.3 | 0.3 | 15.4 | 11.8 | 27.7 | 46.7 | 59 | 0.6 | 1 | 98 | | | | |
| 53-71 | 27.0 | 5.5 | 67.5 | C | 5.1 | 3.8 | -1.3 | 0.05 | 0.2 | 1.4 | 9 | 3.3 | 0.3 | 0.3 | 19.0 | 10.8 | 30.5 | 39.3 | 78 | 0.8 | 2 | 89 | | | | |
| 71-114 | 30.6 | 11.9 | 57.5 | C | 5.4 | 4.2 | -1.1 | 0.03 | 0.1 | 0.7 | 10 | 1.9 | 0.3 | 0.4 | 18.1 | 9.0 | 27.8 | 48.6 | 57 | 0.6 | 2 | 73 | | | | |
| | DP31 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-18 | 17.9 | 48.2 | 33.9 | SiCL | 6.1 | 5.1 | -1.0 | 0.14 | 0.3 | 4.0 | 14 | 10.3 | 0.1 | 1.5 | 15.8 | 3.2 | 20.6 | 47.2 | 44 | 0.2 | 5 | 13 | 40.2 | 72.7 | 1.2 | 0.9 |
| 18-43 | 6.8 | 30.7 | 62.5 | C | 4.9 | 3.8 | -1.1 | 0.05 | 0.2 | 2.6 | 12 | 1.3 | 0.2 | 0.7 | 6.3 | 6.3 | 13.6 | 37.8 | 36 | 0.6 | 1 | 18 | | | | |
| 43-175 | 20.4 | 4.4 | 75.3 | C | 5.0 | 4.1 | -1.0 | 0.02 | 0.1 | 1.4 | 15 | 1.1 | 0.3 | 0.3 | 4.5 | 4.5 | 9.6 | 37.8 | 25 | 0.7 | 1 | 34 | | | | |
| 175-200 | 33.6 | 6.5 | 59.8 | C | 4.9 | 4.0 | -0.9 | 0.01 | 0.1 | 1.0 | 7 | 1.8 | 0.2 | 0.2 | 5.4 | 3.6 | 9.5 | 29.0 | 33 | 0.7 | 2 | 37 | | | | |
| | DP32 | | | SMU : V3c_8 | | | | | | | | | Soil Type:Fluvic Cambisols (CMfv) | | | | | | | | | | | | | |
| 0-25 | 36.1 | 34.0 | 29.9 | CL | 7.0 | 6.1 | -0.9 | 0.11 | 0.3 | 3.7 | 11 | 73.3 | 0.1 | 0.8 | 14.3 | 2.7 | 18.0 | 26.8 | 67 | 0.4 | 5 | 20 | 38.2 | 68.7 | 1.5 | 0.9 |
| 25-50 | 32.7 | 20.7 | 46.6 | C | 6.8 | 5.6 | -1.2 | 0.06 | 0.1 | 1.5 | 16 | 219.5 | 0.1 | 0.6 | 8.4 | 2.2 | 11.4 | 13.5 | 84 | 1.0 | 4 | 18 | | | | |
| 50-80 | 34.1 | 18.3 | 47.7 | C | 6.5 | 5.5 | -1.0 | 0.06 | 0.1 | 1.1 | 14 | 108.9 | 0.1 | 0.5 | 5.8 | 2.7 | 9.1 | 15.1 | 60 | 0.6 | 2 | 16 | | | | |

| Profile | Texture <2 mm. fraction | | | | pH(1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+M/ | Fe | Mn | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Sand | Silt | Clay | Class | H2O | KCl | ΔPH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K | mg/ kg soil (ppm) | | | |
| cm | DP33 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-25 | 47.5 | 24.7 | 27.8 | SCL | 4.9 | 4.0 | -1.0 | 0.03 | 0.2 | 2.9 | 14 | 15.7 | 0.1 | 0.2 | 1.8 | 0.9 | 2.9 | 13.6 | 22 | 0.7 | 2 | 17 | 29.2 | 25.0 | 2.6 | 0.2 |
| 25-50 | 42.3 | 14.7 | 43.0 | C | 4.8 | 3.9 | -0.9 | 0.02 | 0.2 | 2.2 | 10 | 11.8 | 0.1 | 0.1 | 1.8 | 0.9 | 2.9 | 13.6 | 21 | 0.7 | 2 | 23 | | | | |
| 50-90 | 38.8 | 16.6 | 44.6 | C | 4.8 | 8.9 | 4.1 | 0.01 | 0.1 | 1.6 | 13 | 3.8 | 0.1 | 0.1 | 1.8 | 0.9 | 2.9 | 12.7 | 23 | 0.8 | 2 | 33 | | | | |
| 90-125 | 38.1 | 10.5 | 51.4 | C | 4.8 | 3.9 | -0.9 | 0.01 | 0.1 | 1.2 | 10 | 3.5 | 0.1 | 0.1 | 1.8 | 0.9 | 2.9 | 12.7 | 23 | 0.9 | 2 | 29 | | | | |
| | DP34 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-20 | 37.1 | 18.6 | 44.3 | C | 5.1 | 3.8 | -1.2 | 0.04 | 0.3 | 4.2 | 14 | 30.4 | 0.3 | 0.6 | 9.0 | 2.7 | 12.5 | 24.8 | 50 | 1.3 | 3 | 20 | | | | |
| 20-45 | 34.8 | 10.4 | 54.9 | C | 5.3 | 3.7 | -1.6 | 0.02 | 0.2 | 2.2 | 12 | 14.2 | 0.2 | 0.4 | 14.3 | 3.6 | 18.5 | 26.8 | 69 | 0.9 | 4 | 50 | | | | |
| 45-100 | 36.1 | 6.1 | 57.8 | C | 7.3 | 5.9 | -1.3 | 0.17 | 0.1 | 0.7 | 12 | 28.9 | 0.3 | 0.4 | 26.4 | 2.7 | 29.9 | 33.6 | 89 | 1.0 | 10 | 72 | | | | |
| 100-125 | 28.2 | 14.4 | 57.4 | C | 7.6 | 6.2 | -1.4 | 0.17 | 0.1 | 0.6 | 10 | 100.8 | 0.4 | 0.8 | 29.1 | 6.7 | 37.0 | 38.5 | 96 | 0.9 | 4 | 47 | | | | |
| | DP37 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-14 | 35.4 | 38.1 | 26.5 | L | 5.5 | 4.3 | -1.1 | 0.08 | 0.3 | 4.9 | 14 | 1.7 | 0.2 | 0.9 | 10.8 | 7.2 | 19.2 | 33.4 | 58 | 0.6 | 2 | 20 | 45.7 | 139.5 | 2.9 | 1.1 |
| 14-32 | 12.6 | 43.7 | 43.7 | SiC | 5.0 | 4.1 | -0.9 | 0.04 | 0.2 | 2.3 | 11 | 1.5 | 0.2 | 0.2 | 4.5 | 4.5 | 9.4 | 28.7 | 33 | 0.7 | 1 | 43 | | | | |
| 32-95 | 4.1 | 33.0 | 62.9 | C | 5.1 | 4.3 | -0.8 | 0.02 | 0.2 | 2.0 | 13 | 2.9 | 0.2 | 0.2 | 4.5 | 1.8 | 6.6 | 38.0 | 17 | 0.5 | 3 | 36 | | | | |
| 95-132 | 5.3 | 17.0 | 77.7 | C | 5.0 | 4.0 | -1.1 | 0.02 | 0.1 | 0.8 | 8 | 1.4 | 0.2 | 0.2 | 3.6 | 2.7 | 6.7 | 32.6 | 21 | 0.7 | 1 | 30 | | | | |
| | DP38 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-14 | 44.5 | 27.2 | 28.3 | CL | 5.5 | 4.6 | -0.9 | 0.10 | 0.3 | 4.6 | 14 | 0.8 | 0.2 | 0.6 | 9.0 | 8.1 | 17.8 | 33.1 | 54 | 0.6 | 1 | 29 | 58.8 | 17.3 | 2.3 | 0.4 |
| 14-36 | 31.8 | 29.4 | 38.8 | CL | 4.8 | 3.8 | -1.0 | 0.03 | 0.1 | 3.0 | 22 | 0.6 | 0.2 | 0.2 | 4.5 | 2.7 | 7.5 | 28.7 | 26 | 0.7 | 2 | 39 | | | | |
| 36-65 | 27.8 | 20.9 | 51.3 | C | 4.7 | 3.8 | -0.9 | 0.02 | 0.2 | 2.3 | 14 | 2.9 | 0.2 | 0.2 | 4.5 | 1.8 | 6.7 | 17.5 | 38 | 1.3 | 3 | 39 | | | | |
| 65-150 | 14.0 | 14.9 | 71.1 | C | 4.7 | 4.1 | -0.7 | 0.02 | 0.2 | 1.4 | 9 | 0.6 | 0.2 | 0.1 | 2.7 | 1.8 | 4.8 | 19.0 | 25 | 0.9 | 2 | 33 | | | | |

| Profile | Texture <2 mm. fraction | | | | pH(1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ | Fe | Mn | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Sand | Silt | Clay | Class | H2O | KCl | ΔPH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K | mg/ kg soil (ppm) | | | |
| cm | DP39 | | | SMU : G2_d2 | | | | | | | | | Soil Type : Rhodic Nitisols(Ntro) | | | | | | | | | | | | | |
| 0-29 | 24.8 | 45.8 | 29.4 | CL | 5.9 | 5.0 | -0.9 | 0.09 | 0.4 | 6.7 | 15 | 2.4 | 0.2 | 0.2 | 22.2 | 8.9 | 31.5 | 50.2 | 63 | 0.4 | 3 | 137 | 20.1 | 58.3 | 2.3 | 0.0 |
| 29-47 | 10.6 | 30.2 | 59.2 | C | 5.3 | 4.6 | -0.7 | 0.03 | 0.2 | 2.8 | 14 | 0.6 | 0.2 | 0.1 | 9.0 | 6.3 | 15.6 | 33.6 | 46 | 0.6 | 1 | 111 | | | | |
| 47-75 | 10.9 | 21.5 | 67.7 | C | 5.5 | 4.7 | -0.7 | 0.02 | 0.1 | 1.7 | 12 | 0.9 | 0.2 | 0.1 | 5.4 | 5.4 | 11.1 | 32.1 | 35 | 0.7 | 1 | 85 | | | | |
| 75-200 | 9.1 | 12.8 | 78.1 | C | 5.2 | 5.3 | 0.1 | 0.03 | 0.1 | 0.9 | 15 | 0.8 | 0.2 | 0.1 | 6.3 | 3.6 | 10.2 | 24.8 | 41 | 0.9 | 2 | 72 | | | | |
| 200-300 | | | | | 5.5 | 5.2 | -0.3 | 0.02 | | | | | | | | | | | | | | | | | | |
| 300-400 | | | | | 5.0 | 4.5 | -0.5 | 0.01 | | | | | | | | | | | | | | | | | | |
| 400-580 | | | | | 4.9 | 4.2 | -0.6 | 0.01 | | | | | | | | | | | | | | | | | | |
| | DP41 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-19 | 25.3 | 51.9 | 22.7 | SiL | 6.0 | 5.1 | -0.9 | 0.13 | 0.5 | 6.2 | 13 | 12.0 | 0.2 | 1.3 | 17.9 | 9.9 | 29.3 | 54.1 | 54 | 0.4 | 2 | 22 | 54.3 | 49.8 | 2.9 | 2.0 |
| 19-34 | 13.2 | 27.9 | 58.9 | C | 5.3 | 4.3 | -1.0 | 0.06 | 0.2 | 2.4 | 10 | 0.9 | 0.2 | 0.3 | 8.1 | 5.4 | 13.9 | 34.1 | 41 | 0.6 | 2 | 53 | | | | |
| 34-62 | 11.0 | 19.3 | 69.7 | C | 5.3 | 4.4 | -0.9 | 0.03 | 0.1 | 1.4 | 20 | 1.1 | 0.2 | 0.2 | 5.4 | 6.3 | 12.1 | 36.0 | 33 | 0.6 | 1 | 60 | | | | |
| 62-127 | 10.1 | 16.1 | 73.8 | C | 5.2 | 4.6 | -0.6 | 0.02 | 0.1 | 1.1 | 20 | 1.8 | 0.2 | 0.2 | 4.5 | 4.5 | 9.4 | 26.3 | 36 | 0.7 | 1 | 46 | | | | |
| 127-200 | 7.5 | 12.8 | 79.8 | C | 5.3 | 4.9 | -0.4 | 0.02 | 0.1 | 1.0 | 13 | 3.2 | 0.2 | 0.2 | 4.4 | 4.4 | 9.3 | 21.2 | 44 | 1.0 | 1 | 49 | | | | |
| 200-300 | | | | | 5.0 | 4.6 | -0.4 | 0.01 | | | | | | | | | | | | | | | | | | |
| 300-400 | | | | | 5.0 | 4.6 | -0.4 | 0.01 | | | | | | | | | | | | | | | | | | |
| | DP45 | | | SMU : G1b_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-10 | 40.1 | 16.8 | 43.1 | C | 5.1 | 4.5 | -0.7 | 0.14 | 0.4 | 4.0 | 11 | 2.9 | 0.2 | 0.2 | 6.2 | 5.3 | 12.0 | 25.6 | 47 | 0.9 | 1 | 48 | 72.4 | 102.3 | 1.5 | 0.1 |
| 10--25 | 35.6 | 11.6 | 52.8 | C | 5.1 | 4.2 | -0.9 | 0.03 | 0.3 | 3.5 | 12 | 0.8 | 0.2 | 0.1 | 4.5 | 2.7 | 7.5 | 25.8 | 29 | 0.8 | 2 | 62 | | | | |
| 25-60 | 29.9 | 22.3 | 47.8 | C | 5.0 | 4.2 | -0.8 | 0.02 | 0.2 | 2.7 | 11 | 10.8 | 0.2 | 0.1 | 3.6 | 3.6 | 7.5 | 29.2 | 26 | 0.7 | 1 | 69 | | | | |
| 60-80 | 33.5 | 19.0 | 47.5 | C | 4.8 | 4.1 | -0.7 | 0.02 | 0.2 | 2.2 | 10 | 0.3 | 0.2 | 0.1 | 3.6 | 0.9 | 4.9 | 29.2 | 17 | 0.8 | 4 | 49 | | | | |

| Profile | Texture <2 mm. fraction | | | | pH(1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ | Fe | Mn | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Sand | Silt | Clay | Class | H2O | KCl | ΔPH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K | mg/ kg soil (ppm) | | | |
| cm | DP47 | | | SMU : G1b_1 | | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | |
| 0-12 | 38.0 | 18.9 | 43.1 | C | 5.2 | 4.2 | -1.0 | 0.08 | 0.4 | 4.4 | 12 | 3.8 | 0.2 | 0.3 | 9.1 | 7.3 | 16.9 | 28.7 | 59 | 0.8 | 1 | 56 | 63.8 | 45.1 | 1.8 | 1.3 |
| 12-30 | 17.0 | 6.3 | 76.7 | C | 5.2 | 4.2 | -1.0 | 0.02 | 0.2 | 2.2 | 9 | 0.9 | 0.2 | 0.2 | 4.6 | 3.6 | 8.6 | 26.3 | 33 | 0.9 | 1 | 50 | | | | |
| 30-65 | 15.0 | 10.5 | 74.5 | C | 5.0 | 4.2 | -0.8 | 0.01 | 0.2 | 2.0 | 13 | 0.9 | 0.2 | 0.1 | 1.8 | 1.8 | 4.0 | 20.1 | 20 | 1.0 | 1 | 26 | | | | |
| 65-200 | 10.8 | 8.4 | 80.8 | C | 5.0 | 4.3 | -0.7 | 0.01 | 0.1 | 0.8 | 11 | 0.3 | 0.2 | 0.1 | 2.7 | 1.8 | 4.8 | 28.5 | 17 | 0.6 | 2 | 39 | | | | |
| | DP50 | | | SMU : G2d_1 | | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | |
| 0-19 | 45.1 | 8.3 | 46.6 | SCL | 5.4 | 4.4 | -1.0 | 0.05 | 0.3 | 3.0 | 3 | 3.2 | 0.2 | 0.7 | 5.4 | 3.6 | 9.9 | 26.0 | 38 | 0.8 | 2 | 14 | 24.1 | 56.6 | 1.2 | 1.0 |
| 19-50 | 40.6 | 12.5 | 46.9 | C | 4.7 | 3.9 | -0.8 | 0.02 | 0.2 | 1.9 | 2 | 0.3 | 0.2 | 0.2 | 2.7 | 1.8 | 4.9 | 19.2 | 26 | 1.0 | 2 | 26 | | | | |
| 50-110 | 31.8 | 12.6 | 55.6 | C | 4.8 | 3.9 | -1.0 | 0.01 | 0.1 | 1.3 | 1 | 0.3 | 0.2 | 0.2 | 2.7 | 1.8 | 4.9 | 24.1 | 20 | 0.7 | 2 | 26 | | | | |
| 110-200 | 34.0 | 14.7 | 51.3 | C | 4.9 | 3.9 | -0.9 | 0.01 | 0.1 | 0.8 | 1 | 0.5 | 0.2 | 0.2 | 3.6 | 0.9 | 4.9 | 20.6 | 24 | 0.9 | 4 | 28 | | | | |
| | DP51 | | | SMU : G2d_1 | | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | |
| 0-25 | 59.6 | 16.6 | 23.8 | SCL | 6.4 | 6.0 | -0.4 | 0.14 | 0.7 | 7.3 | 11 | 50.6 | 0.1 | 0.8 | 19.9 | 2.3 | 23.0 | 30.5 | 76 | 0.5 | 9 | 29 | 73.4 | 98.7 | 2.6 | 2.7 |
| 25-48 | 59.0 | 12.3 | 28.7 | SCL | 6.5 | 6.0 | -0.6 | 0.10 | 0.4 | 4.6 | 11 | 27.6 | 0.1 | 0.3 | 5.9 | 1.4 | 7.6 | 26.5 | 29 | 0.4 | 4 | 26 | | | | |
| 48-78 | 58.0 | 8.2 | 33.8 | SCL | 6.6 | 5.2 | -1.4 | 0.03 | 0.2 | 1.3 | 9 | 8.4 | 0.3 | 0.9 | 15.4 | 7.2 | 23.8 | 28.0 | 85 | 0.9 | 2 | 24 | | | | |
| | DP52 | | | SMU : G1b_4 | | | | | | | | | | Soil Type : Hyperferric Acrisols (ACfrh) | | | | | | | | | | | | |
| 0-20 | 51.9 | 24.1 | 24.1 | SL | 5.1 | 4.2 | -0.9 | 0.13 | 0.3 | 3.7 | 13 | 5.7 | 0.1 | 0.1 | 3.2 | 3.6 | 7.0 | 29.0 | 24 | 0.5 | 1 | 84 | 26.1 | 51.5 | 1.2 | 0.0 |
| 20-43 | 55.0 | 23.0 | 22.0 | SL | 4.7 | 4.1 | -0.6 | 0.07 | 0.2 | 3.1 | 13 | 1.4 | 0.2 | 0.1 | 2.7 | 0.9 | 4.0 | 23.6 | 17 | 1.0 | 3 | 28 | | | | |
| 43-120 | 33.1 | 17.8 | 49.2 | C | 4.4 | 4.1 | -0.4 | 0.05 | 0.1 | 1.3 | 9 | 0.8 | 0.2 | 0.1 | 1.8 | 0.9 | 2.9 | 20.5 | 14 | 0.9 | 2 | 33 | | | | |
| 120-200 | 20.2 | 10.4 | 69.4 | C | 4.2 | 3.9 | -0.3 | 0.03 | 0.1 | 1.2 | 11 | 0.8 | 0.2 | 0.1 | 3.6 | 2.7 | 6.6 | 18.5 | 35 | 0.9 | 1 | 61 | | | | |
| 200-300 | | | | | 5.0 | 4.0 | -1.0 | 0.01 | | | | | | | | | | | | | | | | | | |
| 300-400 | | | | | 4.7 | 3.9 | -0.8 | 0.01 | | | | | | | | | | | | | | | | | | |

| Profile | Texture <2 mm. fraction | | | | pH (1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ | Fe | Mn | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Sand | Silt | Clay | Class | H2O | KCl | ΔPH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K | mg/ kg soil (ppm) | | | |
| cm | DP54 | | | SMU : Sg-6 | | | | | | | | | Soil Type: Orthieutric Leptosols (Lpeoul) | | | | | | | | | | | | | |
| 0-13 | 39.2 | 26.2 | 34.6 | CL | 5.7 | 4.8 | -0.9 | 0.09 | 0.4 | 4.8 | 13 | 4.2 | 0.9 | 0.7 | 10.8 | 4.5 | 16.9 | 25.8 | 65 | 3.6 | 2 | 22 | 50.8 | 62.6 | 1.5 | 0.1 |
| 13-40 | 38.5 | 18.8 | 42.7 | C | 4.8 | 3.9 | -1.0 | 0.01 | 0.2 | 2.6 | 13 | 3.3 | 0.2 | 0.1 | 4.5 | 1.8 | 6.6 | 20.0 | 33 | 0.9 | 3 | 46 | | | | |
| 40-70 | 21.9 | 20.8 | 57.3 | C | 4.7 | 4.0 | -0.7 | 0.01 | 0.2 | 1.6 | 10 | 0.8 | 0.2 | 0.1 | 5.4 | 1.8 | 7.4 | 17.5 | 42 | 1.0 | 3 | 78 | | | | |
| | DP55 | | | SMU : G1b_4 | | | | | | | | | Soil Type : Hyperferric Acrisols (ACfrh) | | | | | | | | | | | | | |
| 0-23 | 53.6 | 18.6 | 27.9 | SCL | 6.4 | 5.6 | -0.9 | 0.07 | 0.4 | 3.6 | 9 | 14.7 | 0.1 | 0.4 | 9.8 | 2.7 | 12.9 | 21.2 | 61 | 0.7 | 4 | 34 | 68.4 | 16.3 | 1.2 | 2.9 |
| 23-50 | 42.7 | 12.5 | 44.8 | C | 6.6 | 5.4 | -1.2 | 0.04 | 0.2 | 1.6 | 9 | 4.1 | 0.1 | 0.4 | 9.9 | 3.6 | 13.9 | 17.0 | 82 | 0.6 | 3 | 34 | | | | |
| 50-90 | 38.5 | 10.4 | 51.1 | C | 6.8 | 5.9 | -0.9 | 0.05 | 0.1 | 1.1 | 8 | 3.8 | 0.1 | 0.4 | 9.9 | 3.6 | 14.0 | 16.1 | 87 | 0.7 | 3 | 30 | | | | |
| 90-150 | 34.2 | 12.5 | 53.3 | C | 6.4 | 5.8 | -0.6 | 0.04 | 0.1 | 0.8 | 11 | 3.5 | 0.1 | 0.4 | 7.6 | 3.6 | 11.7 | 16.6 | 71 | 0.8 | 2 | 30 | | | | |
| | DP56 | | | SMU : Sg-6 | | | | | | | | | Soil Type: Orthieutric Leptosols (Lpeoul) | | | | | | | | | | | | | |
| 0-23 | 48.7 | 29.3 | 22.0 | L | 6.8 | 6.0 | -0.8 | 0.24 | 0.7 | 6.8 | 10 | 33.3 | 1.23 | 0.1 | 1.3 | 26.0 | 3.6 | 31.1 | 43.8 | 71 | 0.3 | 7 | 22 | 28.7 | 44.0 | 0.6 |
| 23-60 | 44.8 | 20.8 | 34.4 | CL | 6.8 | 6.0 | -0.8 | 0.06 | 0.2 | 1.6 | 7 | 5.6 | 0.56 | 0.2 | 0.6 | 16.1 | 5.4 | 22.3 | 25.8 | 86 | 0.7 | 3 | 37 | | | |
| | DP58 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-17 | 43.3 | 12.4 | 44.3 | C | 4.5 | 3.8 | -0.8 | 0.06 | 0.3 | 3.1 | 10 | 4.5 | 0.1 | 1.3 | 26.0 | 3.6 | 31.1 | 43.8 | 71 | 0.3 | 7 | 22 | 35.7 | 73.3 | 1.2 | 0.0 |
| 17-60 | 52.4 | 17.6 | 30.0 | SCL | 4.4 | 4.0 | -0.4 | 0.03 | 0.2 | 2.3 | 12 | 0.6 | 0.2 | 0.6 | 16.1 | 5.4 | 22.3 | 25.8 | 86 | 0.7 | 3 | 37 | | | | |
| 60-200 | 29.5 | 15.5 | 54.9 | C | 4.3 | 3.9 | -0.3 | 0.05 | 0.2 | 1.5 | 9 | 3.2 | 0.2 | 0.1 | 4.5 | 1.8 | 6.6 | 21.9 | 30 | 0.9 | 3 | 46 | | | | |
| | DP60 | | | SMU : G1b_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-16 | 59.0 | 19.5 | 21.5 | SCL | 5.7 | 4.8 | -0.8 | 0.14 | 0.4 | 4.9 | 13 | 16.0 | 0.1 | 0.7 | 12.5 | 2.7 | 16.1 | 43.8 | 37 | 0.3 | 5 | 21 | 50.3 | 65.9 | 0.6 | 0.6 |
| 16-40 | 57.9 | 20.5 | 21.6 | SCL | 5.8 | 4.9 | -0.9 | 0.08 | 0.4 | 4.3 | 11 | 8.4 | 0.2 | 0.6 | 10.8 | 2.7 | 14.2 | 22.9 | 62 | 0.7 | 4 | 23 | | | | |
| 40-90 | 43.4 | 10.3 | 46.3 | C | 5.0 | 4.3 | -0.7 | 0.02 | 0.2 | 1.8 | 7 | 8.2 | 0.1 | 0.3 | 2.7 | 0.9 | 4.0 | 16.1 | 25 | 0.7 | 3 | 12 | | | | |
| | DP63 | | | SMU : U2f_9 | | | | | | | | | Soil Type : Hypereutric Cambisols (CMeuh) | | | | | | | | | | | | | |
| 0-13 | 52.4 | 23.8 | 23.8 | SCL | 6.4 | 6.1 | -0.4 | 0.13 | 0.5 | 5.5 | 11 | 31.5 | 0.1 | 1.0 | 17.9 | 3.6 | 22.6 | 28.7 | 79 | 0.5 | 5 | 22 | 47.8 | 60.6 | 1.8 | 2.8 |
| 13-38 | 53.7 | 18.5 | 27.8 | SCL | 6.5 | 5.8 | -0.8 | 0.07 | 0.3 | 2.3 | 8 | 3.2 | 0.1 | 0.4 | 9.8 | 3.6 | 13.8 | 17.4 | 80 | 0.6 | 3 | 32 | | | | |
| 38-65 | 47.4 | 14.4 | 38.2 | SCL | 6.5 | 5.6 | -0.8 | 0.05 | 0.4 | 2.5 | 7 | 3.0 | 0.1 | 0.4 | 9.0 | 3.6 | 13.1 | 18.0 | 73 | 0.6 | 3 | 28 | | | | |

| Profile | Texture <2 mm. fraction | | | | pH(1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ | Fe | Mn | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Sand | Silt | Clay | Class | H2O | KCl | ΔPH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K | mg/ kg soil (ppm) | | | |
| cm | DP65 | | | SMU : V3c_8 | | | | | | | | | Soil Type:Fluvic Cambisols (CMfv) | | | | | | | | | | | | | |
| 0-21 | 47.6 | 24.7 | 27.8 | SCL | 6.6 | 6.3 | -0.2 | 0.41 | 0.5 | 4.5 | 10 | 23.9 | 0.2 | 1.4 | 15.7 | 4.0 | 21.3 | 24.8 | 86 | 0.8 | 4 | 14 | 35.2 | 59.2 | 2.1 | 1.1 |
| 21-55 | 44.3 | 15.5 | 40.2 | C | 6.4 | 5.2 | -1.2 | 0.18 | 0.2 | 1.8 | 7 | 3.4 | 0.1 | 0.8 | 9.8 | 2.2 | 12.9 | 15.9 | 81 | 0.8 | 4 | 15 | | | | |
| 55-69 | 44.3 | 9.3 | 46.4 | C | 6.6 | 5.7 | -0.8 | 0.39 | 0.2 | 1.3 | 8 | 5.4 | 0.1 | 3.3 | 6.3 | 1.3 | 11.1 | 16.6 | 67 | 0.8 | 5 | 2 | | | | |
| 69-175 | 32.7 | 14.5 | 52.8 | C | 6.4 | 5.9 | -0.5 | 0.17 | 0.1 | 1.0 | 8 | 9.8 | 0.1 | 1.2 | 6.3 | 2.7 | 10.3 | 15.1 | 68 | 1.0 | 2 | 8 | | | | |
| | DP67 | | | SMU : Ue1_4 | | | | | | | | | Soil Type:Hyperferric Acrisols (ACfrh) | | | | | | | | | | | | | |
| 0-14 | 45.6 | 28.2 | 26.2 | L | 5.4 | 4.4 | -1.0 | 0.10 | 0.3 | 4.0 | 12 | 4.6 | 0.2 | 0.4 | 9.1 | 4.6 | 14.3 | 34.7 | 41 | 0.6 | 2 | 35 | 33.7 | 55.9 | 3.5 | 0.4 |
| 14-45 | 46.8 | 18.8 | 34.5 | SCL | 5.1 | 4.3 | -0.8 | 0.02 | 0.2 | 2.8 | 13 | 1.9 | 0.2 | 0.1 | 4.6 | 1.8 | 6.7 | 22.3 | 30 | 0.8 | 3 | 46 | | | | |
| 45-80 | 28.0 | 25.0 | 47.0 | C | 5.1 | 4.3 | -0.8 | 0.01 | 0.2 | 1.5 | 8 | 1.9 | 0.2 | 0.1 | 4.6 | 1.8 | 6.6 | 17.3 | 38 | 0.9 | 3 | 61 | | | | |
| 80-160 | 25.8 | 14.6 | 59.5 | C | 5.0 | 4.3 | -0.7 | 0.01 | 0.1 | 1.1 | 7 | Trace | 0.2 | 0.1 | 4.5 | 1.8 | 6.6 | 14.7 | 45 | 1.1 | 3 | 55 | | | | |
| | DP68 | | | SMU : U2f_9 | | | | | | | | | Soil Type : Hypereutricambisols (CMeuh) | | | | | | | | | | | | | |
| 0-19 | 53.8 | 20.5 | 25.7 | SCL | 5.6 | 4.6 | -1.0 | 0.07 | 0.2 | 2.6 | 17 | 10.7 | 0.3 | 0.2 | 9.0 | 4.5 | 14.0 | 22.1 | 63 | 1.2 | 2 | 62 | 108.6 | 21.2 | 1.5 | 0.7 |
| 19-46 | 43.5 | 16.4 | 40.1 | C | 5.5 | 4.2 | -1.2 | 0.02 | 0.1 | 1.5 | 11 | 6.5 | 0.3 | 0.1 | 7.2 | 3.6 | 11.2 | 17.7 | 64 | 1.4 | 2 | 78 | | | | |
| 46-120 | 26.3 | 21.8 | 52.0 | C | 5.7 | 4.3 | -1.4 | 0.02 | 0.1 | 0.8 | 8 | 2.4 | 0.3 | 0.2 | 9.0 | 3.6 | 13.2 | 14.7 | 90 | 2.3 | 3 | 57 | | | | |
| | DP69 | | | SMU : U2f_9 | | | | | | | | | Soil Type : Hypereutric Cambisols (CMeuh) | | | | | | | | | | | | | |
| 0-20 | 41.0 | 36.9 | 22.1 | L | 6.5 | 5.7 | -0.9 | 0.09 | 0.6 | 7.1 | 12 | 27.5 | 0.1 | 1.4 | 13.6 | 4.5 | 19.6 | 39.3 | 50 | 0.4 | 3 | 13 | 42.7 | 152.7 | 2.9 | 3.2 |
| 20-64 | 34.2 | 25.1 | 40.7 | C | 6.5 | 5.5 | -0.9 | 0.06 | 0.3 | 3.0 | 11 | 7.3 | 0.1 | 0.3 | 13.1 | 2.7 | 16.3 | 26.5 | 61 | 0.6 | 5 | 46 | | | | |
| 64-160 | 22.1 | 12.5 | 65.4 | C | 6.7 | 7.8 | 1.1 | 0.05 | 0.0 | 0.7 | 15 | 49.3 | 0.1 | 0.5 | 7.2 | 3.6 | 11.5 | 16.7 | 69 | 0.7 | 2 | 22 | | | | |
| | DP71 | | | SMU : G1b_4 | | | | | | | | | Soil Type : Hyperferric Acrisols (ACfrh) | | | | | | | | | | | | | |
| 0-12 | 48.7 | 11.3 | 40.0 | SC | 5.7 | 4.7 | -1.1 | 0.04 | 0.2 | 2.9 | 14 | 4.3 | 0.2 | 0.4 | 6.3 | 2.7 | 9.7 | 21.1 | 46 | 0.8 | 2 | 21 | 29.2 | 5.6 | 1.2 | 1.2 |
| 12--34 | 41.3 | 8.2 | 50.5 | C | 5.1 | 4.3 | -0.8 | 0.02 | 0.2 | 1.9 | 9 | 3.1 | 0.2 | 0.1 | 3.6 | 1.8 | 5.7 | 13.3 | 43 | 1.3 | 2 | 43 | | | | |
| 34-70 | 42.2 | 15.5 | 42.3 | C | 5.0 | 4.3 | -0.7 | 0.01 | 0.1 | 1.6 | 18 | 2.5 | 0.2 | 0.1 | 3.6 | 2.7 | 6.6 | 13.3 | 50 | 1.3 | 1 | 50 | | | | |
| 70-160 | 41.0 | 8.3 | 50.7 | C | 4.9 | 4.2 | -0.7 | 0.01 | 0.1 | 0.9 | 11 | 5.6 | 0.2 | 0.1 | 2.7 | 2.7 | 5.7 | 12.3 | 46 | 1.3 | 1 | 47 | | | | |

| Profile | Texture <2 mm. fraction | | | | pH (1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ | Fe | Mn | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Sand | Silt | Clay | Class | H2O | KCl | ΔPH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K | mg/ kg soil (ppm) | | | |
| cm | DP73 | | | SMU : G1b_4 | | | | | | | | | Soil Type : Hyperferric Acrisols (ACfrh) | | | | | | | | | | | | | |
| 0-11 | 67.5 | 11.2 | 21.3 | SCL | 5.9 | 5.0 | -0.9 | 0.07 | 0.2 | 2.0 | 12 | 7.4 | 0.2 | 0.4 | 7.2 | 3.6 | 11.3 | 17.0 | 66 | 0.9 | 2 | 27 | 26.6 | 31.6 | 0.9 | 0.6 |
| 11--34 | 58.0 | 8.2 | 33.8 | SCL | 5.6 | 4.3 | -1.2 | 0.02 | 0.1 | 1.9 | 18 | 3.7 | 0.2 | 0.2 | 4.5 | 3.6 | 8.4 | 16.6 | 51 | 1.2 | 1 | 44 | | | | |
| 34-80 | 53.8 | 8.2 | 38.0 | SCL | 5.3 | 4.2 | -1.1 | 0.02 | 1.4 | 0.1 | 0 | 1.3 | 0.2 | 0.2 | 5.4 | 4.5 | 10.2 | 12.2 | 84 | 1.3 | 1 | 43 | | | | |
| 80-155 | 47.5 | 10.3 | 42.2 | SCL | 5.3 | 4.2 | -1.0 | 0.01 | 0.7 | 0.1 | 0 | 0.9 | 0.2 | 0.2 | 3.6 | 1.8 | 5.7 | 13.6 | 42 | 1.3 | 2 | 28 | | | | |
| | DP75 | | | SMU : V3c_8 | | | | | | | | | Soil Type: Fluvic Cambisols (CMfv) | | | | | | | | | | | | | |
| 0-24 | 48.6 | 31.5 | 19.9 | L | 7.1 | 6.5 | -0.7 | 0.18 | 0.6 | 4.9 | 8 | 29.7 | 0.1 | 0.8 | 22.4 | 6.7 | 30.1 | 36.0 | 83 | 0.4 | 3 | 35 | 29.7 | 89.1 | 1.5 | 3.5 |
| 24-50 | 47.1 | 20.8 | 32.2 | SCL | 7.1 | 6.2 | -0.9 | 0.07 | 0.2 | 1.8 | 7 | 7.1 | 0.1 | 0.7 | 13.4 | 4.9 | 19.2 | 21.4 | 90 | 0.6 | 3 | 26 | | | | |
| 50-114 | 38.2 | 10.5 | 51.4 | C | 5.9 | 6.0 | 0.2 | 0.07 | 0.1 | 1.0 | 11 | 5.1 | 0.2 | 0.7 | 11.6 | 3.6 | 16.2 | 17.5 | 92 | 1.2 | 3 | 21 | | | | |
| 0-24 | 48.6 | 31.5 | 19.9 | L | 7.1 | 6.5 | -0.7 | 0.18 | 0.6 | 4.9 | 8 | 29.7 | 0.1 | 0.8 | 22.4 | 6.7 | 30.1 | 36.0 | 83 | 0.4 | 3 | 35 | 29.7 | 89.1 | 1.5 | 3.5 |
| | DP77 | | | SMU : G1b_1 | | | | | | | | | Soil Type: Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-17 | 34.9 | 11.6 | 53.6 | C | 5.4 | 4.7 | -0.8 | 0.07 | 0.3 | 4.4 | 14 | 3.6 | 0.2 | 0.2 | 9.8 | 3.6 | 13.8 | 29.0 | 47 | 0.7 | 3 | 56 | 58.3 | 91.7 | 1.2 | 0.7 |
| 17-57 | 15.8 | 9.5 | 74.8 | C | 5.2 | 4.4 | -0.9 | 0.02 | 0.2 | 2.2 | 13 | 1.3 | 0.2 | 0.1 | 4.5 | 2.7 | 7.4 | 24.3 | 31 | 0.7 | 2 | 69 | | | | |
| 57-140 | 3.1 | 9.5 | 87.4 | C | 4.9 | 4.2 | | 0.02 | 0.1 | 1.2 | 11 | 3.6 | 0.2 | 0.1 | 3.6 | 2.7 | 6.5 | 15.1 | 43 | 1.0 | 1 | 68 | | | | |
| | DP78 | | | SMU : G1b_1 | | | | | | | | | Soil Type: Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-18 | 32.0 | 10.5 | 57.5 | C | 5.6 | 4.5 | -1.0 | 0.07 | 0.3 | 4.1 | 13 | 2.7 | 0.2 | 0.4 | 10.8 | 3.6 | 15.0 | 28.7 | 52 | 0.7 | 3 | 34 | 50.3 | 58.4 | 1.2 | 1.5 |
| 18-43 | 27.9 | 12.5 | 59.6 | C | 4.8 | 3.8 | -1.0 | 0.02 | 0.1 | 2.4 | 20 | 0.9 | 0.2 | 0.2 | 3.6 | 2.7 | 6.6 | 27.3 | 24 | 0.6 | 1 | 34 | | | | |
| 43-85 | 27.8 | 8.4 | 63.9 | C | 5.1 | 4.2 | -0.9 | 0.02 | 0.1 | 1.6 | 13 | 0.4 | 1.9 | 0.2 | 4.5 | 3.6 | 10.2 | 20.0 | 51 | 9.8 | 1 | 35 | | | | |
| 85-200 | 15.9 | 8.4 | 75.7 | C | 5.0 | 4.0 | -1.0 | 0.01 | 0.1 | 0.6 | 7 | 1.0 | 0.2 | 0.1 | 3.6 | 2.7 | 6.6 | 15.6 | 42 | 1.1 | 1 | 42 | | | | |
| 200-300 | | | | | 5.4 | 4.8 | -0.7 | 0.01 | | | | | | | | | | | | | | | | | | |
| 300-400 | | | | | 5.3 | 4.5 | -0.8 | 0.01 | | | | | | | | | | | | | | | | | | |

| Profile | Texture <2 mm. fraction | | | | pH(1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ | Fe | Mn | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Sand | Silt | Clay | Class | H2O | KCl | ΔPH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K | mg/ kg soil (ppm) | | | |
| cm | DP79 | | | SMU : G1b_4 | | | | | | | | | Soil Type : Hyperferric Acrisols (ACfrh) | | | | | | | | | | | | | |
| 0-10 | 45.0 | 14.5 | 40.4 | SC | 4.7 | 4.2 | -0.5 | 0.13 | 0.3 | 3.7 | 12 | 6.1 | 0.2 | 0.3 | 4.5 | 2.7 | 7.6 | 22.4 | 34 | 0.8 | 2 | 28 | 79.9 | 26.8 | 1.9 | 0.7 |
| 10--43 | 47.7 | 15.6 | 40.7 | C | 4.9 | 4.2 | -0.7 | 0.04 | 0.1 | 2.4 | 18 | 2.8 | 0.2 | 0.1 | 2.7 | 1.8 | 4.7 | 8.3 | 57 | 2.1 | 2 | 49 | | | | |
| 43-100 | 36.9 | 16.6 | 46.6 | C | 5.0 | 4.3 | -0.6 | 0.03 | 0.1 | 1.8 | 19 | 0.7 | 0.2 | 0.1 | 2.7 | 1.8 | 4.7 | 7.7 | 61 | 2.3 | 2 | 65 | | | | |
| 100-200 | 34.0 | 54.7 | 11.4 | C | 4.7 | 4.3 | -0.5 | 0.03 | 0.0 | 1.0 | 21 | 0.9 | 0.2 | 0.1 | 2.7 | 1.8 | 4.7 | 12.7 | 37 | 1.2 | 2 | 56 | | | | |
| 200-300 | | | | | 5.1 | 4.4 | -0.7 | 0.0 | | | | | | | | | | | | | | | | | | |
| 300-350 | | | | | 4.9 | 4.2 | -0.7 | 0.0 | | | | | | | | | | | | | | | | | | |
| | DP80 | | | SMU : G1b_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 15-40 | 41.0 | 20.0 | 39.0 | CL | 4.9 | 4.2 | -0.8 | 0.02 | 0.2 | 2.6 | 13 | 1.8 | 0.2 | 0.1 | 3.6 | 0.9 | 4.7 | 29.2 | 16 | 0.5 | 4 | 43 | 49.8 | 72.0 | 1.8 | 2.6 |
| 40-96 | 24.4 | 15.8 | 59.9 | C | 5.2 | 4.2 | -1.0 | 0.02 | 0.2 | 1.7 | 9 | 0.1 | 0.2 | 0.1 | 1.8 | 0.9 | 3.0 | 21.4 | 14 | 0.8 | 2 | 26 | | | | |
| 96-200 | 17.8 | 8.1 | 74.1 | C | 4.9 | 4.2 | -0.7 | 0.01 | 0.1 | 1.0 | 11 | 0.6 | 0.2 | 0.1 | 1.8 | 0.9 | 3.0 | 19.8 | 15 | 0.8 | 2 | 29 | | | | |
| | DP81 | | | SMU : V3c_8 | | | | | | | | | Soil Type: FluvicCambisols (CMfv) | | | | | | | | | | | | | |
| 0-13 | 59.0 | 10.3 | 30.8 | SCL | 5.7 | 4.7 | -0.9 | 0.11 | 0.3 | 3.2 | 12 | 8.0 | 0.2 | 0.5 | 7.3 | 4.6 | 12.5 | 16.9 | 74 | 1.2 | 2 | 25 | 56.3 | 48.6 | 2.1 | 0.6 |
| 13-35 | 48.6 | 9.2 | 42.1 | SC | 4.9 | 4.1 | -0.8 | 0.30 | 0.1 | 1.7 | 14 | 1.5 | 0.1 | 0.1 | 3.6 | 0.9 | 4.8 | 14.9 | 32 | 0.9 | 4 | 35 | | | | |
| 35-66 | 51.7 | 4.1 | 44.2 | SC | 4.8 | 3.7 | -1.1 | 0.01 | 0.1 | 1.0 | 15 | 1.2 | 0.1 | 0.1 | 3.6 | 1.8 | 5.6 | 15.7 | 36 | 0.8 | 2 | 52 | | | | |
| 66-160 | 46.5 | 12.6 | 40.9 | SC | 5.0 | 4.2 | -0.8 | 0.04 | 0.0 | 0.7 | 21 | 0.6 | 0.2 | 0.2 | 5.4 | 3.6 | 9.4 | 14.7 | 64 | 1.3 | 2 | 60 | | | | |
| | DP82 | | | SMU : G1b_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-15 | 49.2 | 29.1 | 21.8 | L | 5.2 | 4.3 | -0.9 | 0.16 | 0.4 | 4.6 | 13 | 4.3 | 0.2 | 0.2 | 9.0 | 3.6 | 13.1 | 28.0 | 47 | 0.6 | 3 | 52 | 46.2 | 40.9 | 1.5 | 0.6 |
| 15-37 | 46.5 | 16.8 | 36.7 | SC | 5.0 | 4.2 | -0.8 | 0.04 | 0.2 | 2.8 | 12 | 0.9 | 0.2 | 0.1 | 2.7 | 1.8 | 4.8 | 21.6 | 22 | 0.7 | 2 | 39 | | | | |
| 37-77 | 29.6 | 16.8 | 53.6 | C | 4.9 | 4.3 | -0.7 | 0.03 | 0.1 | 1.6 | 13 | 0.3 | 0.2 | 0.1 | 1.8 | 0.9 | 3.0 | 24.1 | 12 | 0.7 | 2 | 26 | | | | |
| 77-200 | 16.8 | 12.6 | 70.6 | C | 4.6 | 4.0 | -0.6 | 0.03 | 0.1 | 1.1 | 17 | 0.4 | 0.1 | 0.1 | 1.8 | 0.9 | 2.9 | 19.7 | 15 | 0.7 | 2 | 29 | | | | |

| Profile | Texture <2 mm. fraction | | | | pH(1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ | Fe | Mn | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Sand | Silt | Clay | Class | H2O | KCl | ΔPH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K | mg/ kg soil (ppm) | | | |
| cm | DP83 | | | SMU : V1b_3 | | | | | | | | | Soil Type : Mesotrophic Vertisols (VRsm) | | | | | | | | | | | | | |
| 0-23 | 31.5 | 21.1 | 47.4 | C | 5.5 | 4.2 | -1.3 | 0.05 | 0.3 | 4.6 | 14 | 9.2 | 0.2 | 0.4 | 21.7 | 8.1 | 30.4 | 51.6 | 59 | 0.5 | 3 | 80 | 402.1 | 101.3 | 4.7 | 0.2 |
| 23-70 | 29.9 | 10.5 | 59.6 | C | 5.5 | 4.0 | -1.5 | 0.03 | 0.1 | 1.7 | 14 | 2.8 | 0.3 | 0.2 | 19.0 | 9.0 | 28.6 | 42.3 | 68 | 0.7 | 2 | 121 | | | | |
| 70-160 | 28.9 | 5.2 | 65.9 | C | 7.9 | 7.1 | -0.8 | 0.30 | 0.0 | 0.5 | 18 | 0.6 | 0.8 | 0.3 | 52.0 | 10.4 | 63.5 | 57.0 | 111 | 1.4 | 5 | 215 | | | | |
| | DP84 | | | SMU : G1b_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-12 | 47.6 | 5.2 | 47.1 | SC | 5.6 | 4.6 | -1.0 | 0.07 | 0.3 | 4.4 | 14 | 4.3 | 0.2 | 0.4 | 6.3 | 1.8 | 8.7 | 22.1 | 40 | 0.7 | 4 | 18 | 61.3 | 21.8 | 0.9 | 0.6 |
| 12--40 | 21.2 | 4.2 | 74.6 | C | 4.9 | 3.9 | -1.0 | 0.02 | 0.1 | 2.4 | 18 | 0.9 | 0.1 | 0.1 | 2.7 | 2.7 | 5.6 | 11.3 | 50 | 1.0 | 1 | 59 | | | | |
| 40-75 | 14.9 | 6.3 | 78.8 | C | 5.0 | 4.1 | -0.8 | 0.02 | 0.1 | 1.7 | 12 | 0.6 | 0.2 | 0.1 | 3.6 | 0.9 | 4.7 | 17.5 | 27 | 0.9 | 4 | 65 | | | | |
| 75-190 | 22.9 | 7.1 | 70.0 | C | 5.0 | 4.4 | -0.6 | 0.01 | 0.1 | 0.9 | 14 | 0.1 | 0.2 | 0.1 | 2.7 | 0.9 | 3.8 | 17.5 | 22 | 1.0 | 3 | 62 | | | | |
| | DP86 | | | SMU : G1b_4 | | | | | | | | | Soil Type : Hyperferric Acrisols (ACfrh) | | | | | | | | | | | | | |
| 0-16 | 36.4 | 9.2 | 54.3 | C | 4.9 | 3.9 | -1.0 | 0.06 | 0.3 | 4.0 | 13 | 4.5 | 0.2 | 0.1 | 5.4 | 3.6 | 9.3 | 29.2 | 32 | 0.6 | 2 | 65 | 52.3 | 28.3 | 1.2 | 0.4 |
| 16-42 | 33.2 | 10.3 | 56.5 | C | 4.9 | 4.1 | -0.8 | 0.01 | 0.1 | 2.1 | 20 | 0.6 | 0.1 | 0.1 | 3.6 | 0.9 | 4.7 | 23.4 | 20 | 0.6 | 4 | 56 | | | | |
| 42-80 | 21.8 | 7.2 | 71.0 | C | 4.9 | 4.2 | -0.7 | 0.01 | 0.1 | 1.0 | 19 | 0.9 | 0.1 | 0.1 | 2.7 | 1.8 | 4.7 | 19.5 | 24 | 0.7 | 2 | 56 | | | | |
| 80-200 | 19.3 | 4.2 | 76.5 | C | 5.3 | 4.4 | -1.0 | 0.01 | 0.1 | 0.8 | 14 | 0.4 | 0.2 | 0.1 | 3.6 | 2.7 | 6.5 | 14.6 | 45 | 1.1 | 1 | 78 | | | | |
| | DP88 | | | SMU : G2d_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-13 | 50.5 | 27.8 | 21.7 | SCL | 5.7 | 4.7 | -1.0 | 0.07 | 0.3 | 3.8 | 13 | 3.1 | 0.2 | 0.7 | 6.3 | 1.8 | 8.9 | 21.9 | 41 | 0.8 | 4 | 12 | 58.3 | 75.4 | 1.5 | 0.7 |
| 13-50 | 45.1 | 12.4 | 42.4 | SC | 5.5 | 4.5 | -1.0 | 0.01 | 0.2 | 1.9 | 12 | 1.5 | 0.1 | 0.1 | 2.7 | 1.8 | 4.7 | 14.5 | 33 | 0.9 | 2 | 33 | | | | |
| 50-94 | 41.2 | 11.2 | 47.7 | C | 5.7 | 4.7 | -0.9 | 0.01 | 0.1 | 1.4 | 15 | 1.1 | 0.1 | 0.2 | 5.4 | 1.8 | 7.5 | 7.8 | 96 | 1.8 | 3 | 42 | | | | |
| 94-170 | 31.3 | 10.3 | 58.4 | C | 5.6 | 4.8 | -0.8 | 0.02 | 0.1 | 1.0 | 12 | 3.1 | 0.1 | 0.3 | 4.5 | 4.5 | 9.4 | 13.1 | 72 | 1.0 | 1 | 29 | | | | |
| | DP89 | | | SMU : G1b_4 | | | | | | | | | Soil Type : Hyperferric Acrisols (ACfrh) | | | | | | | | | | | | | |
| 0-14 | 50.7 | 27.7 | 21.6 | C | 6.2 | 5.7 | -0.5 | 0.03 | 0.4 | 5.0 | 13 | 7.9 | 0.2 | 1.2 | 16.1 | 5.4 | 22.9 | 31.2 | 73 | 0.6 | 3 | 18 | 31.7 | 56.8 | 1.2 | 1.0 |
| 14-67 | 42.4 | 25.7 | 31.9 | SCL | 5.8 | 4.9 | -0.9 | 0.03 | 0.2 | 2.1 | 13 | 1.5 | 0.1 | 0.4 | 7.2 | 1.8 | 9.5 | 20.9 | 45 | 0.7 | 4 | 22 | | | | |
| 67-106 | 33.9 | 18.9 | 47.2 | CL | 5.6 | 4.9 | -0.7 | 0.03 | 0.1 | 1.3 | 14 | 1.7 | 0.2 | 0.3 | 5.4 | 1.8 | 7.7 | 16.1 | 48 | 1.3 | 3 | 24 | | | | |
| 106-200 | 30.5 | 12.5 | 57.1 | C | 5.4 | 4.4 | -1.0 | 0.02 | 0.0 | 0.8 | 20 | 1.8 | 0.1 | 0.3 | 3.6 | 1.8 | 5.8 | 16.1 | 36 | 0.8 | 2 | 21 | | | | |

| Profile | Texture <2 mm. fraction | | | | pH (1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ | Fe | Mn | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Sand | Silt | Clay | Class | H2O | KCl | ΔPH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K | mg/ kg soil (ppm) | | | |
| cm | DP90 | | | SMU : G1b_4 | | | | | | | | | Soil Type : Hyperferric Acrisols (ACfrh) | | | | | | | | | | | | | |
| 0-12 | 48.6 | 23.1 | 28.3 | SCL | 5.1 | 4.2 | -0.9 | 0.10 | 0.3 | 3.9 | 14 | 6.1 | 0.2 | 0.3 | 5.4 | 1.8 | 7.6 | 31.7 | 24 | 0.5 | 3 | 23 | 64.8 | 41.7 | 2.1 | 0.2 |
| 12--70 | 25.4 | 50.4 | 24.2 | SiL | 4.6 | 4.2 | -0.5 | 0.03 | 0.2 | 2.7 | 16 | 2.1 | 0.1 | 0.1 | 1.8 | 0.9 | 2.9 | 27.8 | 11 | 0.5 | 2 | 23 | | | | 0.1 |
| 70-200 | 35.8 | 6.3 | 57.9 | C | 4.5 | 4.2 | -0.3 | 0.05 | 0.1 | 1.8 | 14 | 0.8 | 0.1 | 0.1 | 2.7 | 1.8 | 4.7 | 18.0 | 26 | 0.6 | 2 | 39 | | | | 0.1 |
| 0-12 | 48.6 | 23.1 | 28.3 | SCL | 5.1 | 4.2 | -0.9 | 0.10 | 0.3 | 3.9 | 14 | 6.1 | 0.2 | 0.3 | 5.4 | 1.8 | 7.6 | 31.7 | 24 | 0.5 | 3 | 23 | 64.8 | 41.7 | 2.1 | 0.2 |
| | DP91 | | | SMU : V2b_7 | | | | | | | | | Soil Type :Gelic Glysols (GLge) | | | | | | | | | | | | | |
| 0-42 | 31.5 | 19.0 | 49.5 | C | 5.2 | 3.9 | -1.3 | 0.04 | 0.3 | 4.6 | 15 | 3.4 | 0.2 | 0.3 | 11.6 | 4.5 | 16.6 | 35.5 | 47 | 0.5 | 3 | 59 | 196.0 | 16.3 | 2.3 | 17.1 |
| 42-68 | 26.8 | 15.7 | 57.5 | C | 5.3 | 3.9 | -1.5 | 0.02 | 0.1 | 1.7 | 16 | 1.4 | 0.2 | 0.2 | 12.4 | 3.6 | 16.4 | 27.0 | 61 | 0.6 | 4 | 83 | | | | |
| 68-159 | 27.9 | 10.5 | 61.7 | C | 5.3 | 4.0 | -1.4 | 0.02 | 0.1 | 1.0 | 13 | 1.1 | 0.3 | 0.2 | 14.3 | 2.7 | 17.6 | 28.2 | 62 | 1.1 | 5 | 78 | | | | |
| 159-184 | 59.2 | 8.4 | 32.5 | SCL | 5.4 | 3.8 | -1.6 | 0.02 | 0.0 | 0.9 | 61 | 21.8 | 0.2 | 0.1 | 5.4 | 2.7 | 8.4 | 20.0 | 42 | 1.2 | 2 | 59 | | | | |
| | DP93 | | | SMU : G1b_4 | | | | | | | | | Soil Type : Hyperferric Acrisols (ACfrh) | | | | | | | | | | | | | |
| 0-13 | 64.1 | 20.5 | 15.4 | SL | 4.5 | 3.7 | -0.7 | 0.16 | 0.2 | 3.6 | 15 | 4.4 | 0.1 | 0.2 | 4.6 | 1.8 | 6.7 | 23.8 | 28 | 0.5 | 3 | 32 | 31.7 | 70.8 | 1.8 | 58.6 |
| 13-54 | 45.5 | 16.4 | 38.0 | SC | 5.2 | 4.2 | -1.0 | 0.07 | 0.2 | 2.5 | 15 | 2.4 | 0.1 | 0.1 | 2.7 | 0.9 | 3.9 | 18.8 | 20 | 0.6 | 3 | 39 | | | | |
| 54-102 | 31.1 | 12.3 | 56.6 | C | 4.4 | 3.9 | -0.5 | 0.02 | 0.2 | 1.8 | 10 | 0.6 | 0.1 | 0.1 | 2.7 | 0.9 | 3.8 | 18.8 | 20 | 0.6 | 3 | 52 | | | | |
| 102-200 | 25.6 | 10.5 | 64.0 | C | 4.5 | 4.2 | -0.3 | 0.03 | 0.3 | 2.5 | 8 | 0.5 | 0.1 | 0.1 | 1.8 | 0.9 | 2.9 | 16.2 | 18 | 0.8 | 2 | 33 | | | | |
| | DP94 | | | SMU : U1e_5 | | | | | | | | | Soil Type:Orthidystric Cambisols (Cmdyo) | | | | | | | | | | | | | |
| 0-14 | 48.5 | 14.7 | 36.8 | SC | 5.3 | 4.3 | -1.0 | 0.12 | 0.6 | 3.9 | 7 | 77.9 | 0.2 | 0.5 | 2.7 | 2.7 | 6.1 | 16.7 | 37 | 1.1 | 1 | 10 | 35.2 | 31.8 | 2.1 | 37.4 |
| 14-38 | 36.1 | 18.3 | 45.6 | C | 4.6 | 4.0 | -0.6 | 0.03 | 0.2 | 2.0 | 8 | 27.6 | 0.1 | 0.1 | 1.8 | 0.9 | 2.9 | 14.2 | 21 | 0.8 | 2 | 23 | | | | |
| 38-70 | 43.6 | 16.4 | 40.0 | CL | 4.8 | 4.0 | -0.8 | 0.02 | 0.1 | 1.4 | 12 | 4.4 | 0.1 | 0.1 | 1.8 | 0.9 | 3.0 | 13.8 | 22 | 1.0 | 2 | 23 | | | | |
| | DP98 | | | SMU : G1b_4 | | | | | | | | | Soil Type : Hyperferric Acrisols (ACfrh) | | | | | | | | | | | | | |
| 0-10 | 58.0 | 26.7 | 15.4 | SL | 6.9 | 6.4 | -0.5 | 0.41 | 0.6 | 6.6 | 12 | 126.7 | 0.1 | 1.4 | 31.6 | 2.3 | 35.4 | 41.8 | 85 | 0.3 | 14 | 24 | 42.2 | 32.6 | 0.9 | 8.3 |
| 10--25 | 55.8 | 24.7 | 19.5 | SL | 6.4 | 6.2 | -0.2 | 0.07 | 0.4 | 3.0 | 8 | 144.4 | 0.1 | 1.1 | 17.9 | 2.7 | 21.8 | 30.2 | 72 | 0.3 | 7 | 19 | | | | |
| 25-75 | 41.4 | 18.5 | 40.1 | C | 7.1 | 5.8 | -1.3 | 0.06 | 0.1 | 1.5 | 11 | 9.8 | 0.1 | 0.9 | 9.6 | 2.3 | 12.9 | 24.3 | 53 | 0.4 | 4 | 13 | | | | |
| 75-85+ | 65.4 | 8.4 | 26.2 | SCL | 6.9 | 5.7 | -1.1 | 0.05 | 0.0 | 0.7 | 19 | 7.2 | 0.1 | 0.5 | 4.6 | 1.4 | 6.5 | 10.9 | 60 | 0.6 | 3 | 11 | | | | |

| Profile | Texture <2 mm. fraction | | | | pH(1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ | Fe | Mn | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Sand | Silt | Clay | Class | H2O | KCl | ΔPH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K | mg/ kg soil (ppm) | | | |
| cm | DP100 | | | SMU : G1b_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-15 | 44.2 | 25.3 | 30.5 | CL | 5.3 | 4.4 | -1.0 | 0.11 | 0.3 | 2.9 | 10 | 16.2 | 0.1 | 0.6 | 9.0 | 4.5 | 14.3 | 15.2 | 94 | 0.9 | 2 | 23 | 56.8 | 54.5 | 2.6 | 47.5 |
| 15-40 | 43.1 | 16.8 | 40.0 | C | 5.0 | 3.7 | -1.3 | 0.02 | 0.2 | 2.8 | 12 | 8.2 | 0.1 | 0.1 | 2.7 | 1.8 | 4.8 | 19.7 | 24 | 0.6 | 2 | 35 | | | | |
| 40-75 | 46.7 | 12.6 | 40.8 | SC | 5.1 | 4.1 | -1.0 | 0.01 | 0.1 | 2.2 | 18 | 2.0 | 0.1 | 0.1 | 3.6 | 1.8 | 5.6 | 16.6 | 34 | 0.8 | 2 | 52 | | | | |
| 75-175 | 32.0 | 11.0 | 57.0 | C | 4.8 | 3.9 | -0.8 | 0.01 | 0.1 | 1.3 | 21 | 15.9 | 0.1 | 0.1 | 2.7 | 1.8 | 4.7 | 6.9 | 69 | 1.4 | 2 | 39 | | | | |
| | DP102 | | | SMU : G1b_1 | | | | | | | | | Soil Type:Orthidystric Nitisols (NTdyo) | | | | | | | | | | | | | |
| 0-15 | 59.0 | 14.0 | 27.0 | SCL | 6.0 | 5.0 | -1.0 | 0.08 | 0.3 | 3.9 | 15 | 17.7 | 0.1 | 1.1 | 9.0 | 2.7 | 12.9 | 27.5 | 47 | 0.4 | 3 | 11 | 177.9 | 16.8 | 2.1 | 40.9 |
| 15-40 | 61.1 | 14.7 | 24.2 | SCL | 5.0 | 3.9 | -1.1 | 0.01 | 0.1 | 1.8 | 19 | 7.5 | 0.1 | 0.1 | 2.7 | 1.8 | 4.7 | 15.1 | 31 | 0.9 | 2 | 35 | | | | |
| 40-100 | 52.7 | 12.6 | 34.7 | SCL | 5.1 | 3.8 | -1.3 | 0.01 | 0.0 | 0.7 | 19 | 0.9 | 0.2 | 0.1 | 3.6 | 1.8 | 5.7 | 17.0 | 33 | 0.9 | 2 | 36 | | | | |
| 100-200 | 54.4 | 8.1 | 37.5 | SCL | 5.5 | 4.0 | -1.5 | 0.01 | 0.0 | 0.2 | 16 | 1.4 | 0.2 | 0.2 | 4.5 | 2.7 | 7.6 | 18.0 | 42 | 1.2 | 2 | 37 | | | | |
| | DP103 | | | SMU : V1b_3 | | | | | | | | | Soil Type: MesotrophicVertisols (VRsm) | | | | | | | | | | | | | |
| 0-20 | 27.0 | 32.0 | 41.0 | C | 5.5 | 4.1 | -1.4 | 0.03 | 0.4 | 4.3 | 12 | 43.7 | 0.2 | 0.3 | 14.5 | 8.1 | 23.2 | 48.1 | 48 | 0.5 | 2 | 67 | 408.2 | 26.5 | 5.6 | 41.5 |
| 20-50 | 25.0 | 26.0 | 49.0 | C | 5.5 | 3.9 | -1.6 | 0.02 | 0.2 | 1.7 | 10 | 10.7 | 0.3 | 0.2 | 13.6 | 9.0 | 23.1 | 30.0 | 77 | 0.9 | 2 | 115 | | | | |
| 50-160 | 29.0 | 16.5 | 54.5 | C | 6.4 | 4.5 | -1.9 | 0.03 | 0.1 | 0.8 | 12 | 23.2 | 0.9 | 0.3 | 19.3 | 9.4 | 29.9 | 39.9 | 75 | 2.2 | 2 | 85 | | | | |
| 160-190 | 67.5 | 10.5 | 22.0 | SCL | 7.5 | 5.9 | -1.6 | 0.06 | 0.0 | 0.4 | 16 | 218.5 | 0.6 | 0.1 | 9.9 | 4.9 | 15.5 | 21.9 | 71 | 2.8 | 2 | 123 | | | | |
| 190-300 | | | | | 7.4 | 5.7 | -1.6 | 0.0 | | | | | | | | | | | | | | | | | | |
| | DP105 | | | SMU : V3c_8 | | | | | | | | | Soil Type: Fluvic Cambisols (CMfv) | | | | | | | | | | | | | |
| 0-22 | 54.7 | 25.3 | 20.0 | SCL | 7.1 | 5.3 | -1.8 | 0.13 | 0.3 | 4.9 | 15 | 152.5 | 0.1 | 1.3 | 19.0 | 5.4 | 25.8 | 39.8 | 65 | 0.3 | 4 | 19 | 106.6 | 21.2 | 1.8 | 79.2 |
| 22-75 | 60.0 | 20.0 | 20.0 | SCL | 5.4 | 4.3 | -1.2 | 0.01 | 0.2 | 2.6 | 15 | 129.5 | 0.2 | 0.2 | 4.5 | 3.6 | 8.4 | 24.8 | 34 | 0.6 | 1 | 35 | | | | |
| 75-123 | 35.2 | 17.8 | 47.1 | C | 5.4 | 4.3 | -1.1 | 0.01 | 0.1 | 0.9 | 10 | 147.9 | 0.2 | 0.3 | 7.2 | 2.7 | 10.4 | 25.1 | 42 | 0.6 | 3 | 31 | | | | |
| | DP106 | | | SMU : U2f_9 | | | | | | | | | Soil Type : Hypereutric Cambisols (CMeuh) | | | | | | | | | | | | | |
| 0-19 | 61.3 | 23.0 | 15.7 | SL | 7.0 | 6.4 | -0.6 | 0.20 | 0.5 | 7.2 | 14 | 78.9 | 0.2 | 2.0 | 27.8 | 5.4 | 35.3 | 41.9 | 84 | 0.5 | 5 | 17 | 39.2 | 61.4 | 1.8 | 2.0 |
| 19-70 | 38.2 | 18.8 | 42.9 | C | 6.3 | 5.0 | -1.3 | 0.04 | 0.4 | 2.6 | 7 | 6.4 | 0.1 | 0.7 | 15.2 | 2.7 | 18.7 | 71.6 | 26 | 0.1 | 6 | 27 | | | | |
| 70-124 | 22.2 | 17.9 | 59.9 | C | 5.8 | 4.7 | -1.0 | 0.03 | 0.2 | 1.2 | 8 | 123.7 | 0.3 | 1.0 | 9.0 | 2.7 | 12.9 | 20.5 | 63 | 1.3 | 3 | 12 | | | | |

| Profile | Texture <2 mm. fraction | | | | pH (1:2.5) | | | EC | T N | OC | C/N | Avail P | Ex. Cations (meq/100gm soil) | | | | | CEC | BS | ESP | Ca/ | Ca+Mg/ | Fe | Mn | Cu | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Depth | Sand | Silt | Clay | Class | H2O | KCl | ΔPH | dS/m | % | % | | ppm | Na | K | Ca | Mg | Sum | meq/g | % | % | Mg | K | mg/ kg soil (ppm) | | | |
| cm | DP107 | | | SMU : U2f_9 | | | | | | | | | Soil Type : Hypereutric Cambisols (CMeuh) | | | | | | | | | | | | | |
| 0-13 | 56.9 | 21.0 | 22.1 | C | 6.3 | 5.5 | -0.8 | 0.15 | 0.4 | 4.4 | 11 | 100.0 | 0.2 | 1.0 | 25.5 | 7.2 | 33.9 | 47.7 | 71 | 0.3 | 4 | 32 | 48.3 | 53.2 | 11.4 | 52.0 |
| 13-60 | 53.0 | 14.6 | 32.4 | SCL | 6.5 | 5.1 | -1.4 | 0.05 | 0.2 | 1.8 | 12 | 10.5 | 0.1 | 0.2 | 11.2 | 4.0 | 15.5 | 22.4 | 69 | 0.5 | 3 | 95 | | | | |
| | DP109 | | | SMU : G2_d2 | | | | | | | | | Soil Type : Rhodic Nitisols (Ntro) | | | | | | | | | | | | | |
| 0-25 | 69.6 | 18.8 | 11.5 | SL | 6.0 | 5.1 | -0.9 | 0.08 | 0.4 | 6.7 | 15 | 42.0 | 0.2 | 0.5 | 17.0 | 17.0 | 34.8 | 50.2 | 69 | 0.4 | 1 | 66 | 47.8 | 26.8 | 2.1 | 0.7 |
| 25-55 | 33.8 | 23.1 | 43.1 | C | 5.3 | 4.3 | -1.1 | 0.02 | 0.2 | 2.6 | 15 | 4.0 | 0.2 | 0.1 | 5.4 | 3.6 | 9.2 | 35.5 | 26 | 0.4 | 2 | 71 | | | | |
| 55-90 | 8.6 | 18.9 | 72.5 | C | 5.2 | 4.5 | -0.6 | 0.01 | 0.1 | 1.0 | 13 | 4.1 | 0.2 | 0.1 | 4.5 | 1.8 | 6.5 | 29.2 | 22 | 0.5 | 3 | 55 | | | | |
| 90-200 | 10.7 | 15.2 | 74.1 | C | 5.3 | 4.7 | -0.6 | 0.01 | 0.0 | 0.6 | 21 | 19.8 | 0.2 | 0.1 | 4.5 | 3.6 | 8.4 | 19.0 | 44 | 0.9 | 1 | 64 | | | | |
| | DP110 | | | SMU : V1b_3 | | | | | | | | | Soil Type : Mesotrophic Vertisols (VRsm) | | | | | | | | | | | | | |
| 0-21 | 41.6 | 47.2 | 11.3 | L | 4.7 | 3.9 | -0.8 | 0.32 | 0.3 | 4.3 | 14 | 15.0 | 0.2 | 0.3 | 13.4 | 4.5 | 18.5 | 42.9 | 43 | 0.5 | 3 | 54 | 103.6 | 45.7 | 2.3 | 1.3 |
| 21-38 | 41.4 | 20.5 | 38.0 | CL | 4.6 | 3.7 | -0.9 | 0.31 | 0.2 | 2.0 | 10 | 10.1 | 0.2 | 0.3 | 9.0 | 5.4 | 14.8 | 32.6 | 45 | 0.7 | 2 | 52 | | | | |
| 38-70 | 37.3 | 14.4 | 48.3 | C | 4.8 | 3.8 | -1.0 | 0.28 | 0.1 | 1.1 | 9 | 4.4 | 0.3 | 0.3 | 14.3 | 3.6 | 18.5 | 41.4 | 45 | 0.6 | 4 | 52 | | | | |
| 70-200 | 29.7 | 8.4 | 61.9 | C | 6.2 | 4.7 | -1.5 | 0.08 | 0.1 | 0.8 | 13 | 4.4 | 0.3 | 0.4 | 35.8 | 6.7 | 43.3 | 63.8 | 68 | 0.5 | 5 | 109 | | | | |

Source: MCE laboratory analyses, 2009; DP = Dinger Profile Pit; SMU = Soil Mapping Unit

Texture codes: SC - Sandy Clay ; SL - Sandy Loam; SCL - Sandy Clay Loam; SiL - Silt Loam; L - Loam; CL - Clay Loam & Sicl-Silty Clay Loam

Note: Values have been rounded off for presentation.

# APPENDIX 5E: IN-SITU PH MEASUREMENT RESULTS

In-Situ pH Measurement Results of Study Area

| No. | Local code | East | North | Depth | pH Reading |
|---|---|---|---|---|---|
| 1 | D40/30 | 189200 | 987400 | 25-100 | 5.17 |
| 2 | D40/30 | 189200 | 987400 | 0-25 | 5.30 |
| 3 | D40/32 | 190000 | 987400 | 25-100 | 5.52 |
| 4 | D40/32 | 190000 | 987400 | 0-25 | 5.58 |
| 5 | D43/29 | 188800 | 988200 | 0-25 | 5.57 |
| 6 | D43/29 | 188800 | 988200 | 0-100 | 5.58 |
| 9 | D60/21 | 195600 | 992000 | 0-25 | 5.99 |
| 10 | D63/21 | 195600 | 992000 | 0-25 | 5.98 |
| 11 | D64/10 | 181200 | 992200 | 0-25 | 5.67 |
| 12 | D64/9 | 180800 | 992200 | 0-25 | 5.34 |
| 13 | D64/9 | 180800 | 992200 | 25-100 | 5.74 |
| 15 | D65/34 | 190800 | 992400 | 25-100 | 6.27 |
| 16 | D65/34 | 190800 | 992400 | 0-25 | 6.65 |
| 17 | D67/3 | 182400 | 992800 | 0-25 | 5.81 |
| 18 | D67/35 | 194200 | 992800 | 25-100 | 5.77 |
| 20 | D67/35 | 180000 | 999600 | 0-25 | 6.44 |
| 21 | D67/35 | 182400 | 992800 | 25-100 | 5.49 |
| 22 | D72/31 | 189600 | 993800 | 0-25 | 6.49 |
| 23 | D72/31 | 189600 | 993800 | 25-100 | 6.17 |
| 24 | D73/26 | 187600 | 994000 | 25-100 | 6.08 |
| 25 | D73/26 | 187600 | 994000 | 0-25 | 5.80 |
| 26 | D76/14 | 182800 | 994600 | 0-25 | 5.06 |
| 27 | D76/14 | 182800 | 994600 | 0-100 | 5.24 |
| 29 | D76/17 | 181485 | 998027 | 25-100 | 5.70 |
| 30 | D76/17 | 184000 | 994600 | 0-25 | 5.15 |
| 31 | D77/19 | 184800 | 994800 | 0-25 | 5.59 |
| 32 | D77/8 | 180400 | 994900 | 0-25 | 4.99 |
| 33 | D77/8 | 180400 | 994800 | 25-100 | 6.25 |
| 35 | D78/25 | 187200 | 995000 | 0-25 | 6.52 |
| 36 | D79/19 | 184800 | 995200 | 0-25 | 5.92 |
| 37 | D79/23 | 186400 | 995200 | 0-25 | 6.09 |
| 38 | D81/15 | 183200 | 995600 | 0-25 | 6.23 |
| 39 | D81/15 | 183200 | 995600 | 0-100 | 6.67 |
| 40 | D82/20 | 185200 | 995800 | 0-25 | 5.24 |
| 41 | D82/20 | 185200 | 995600 | 25-100 | 5.31 |
| 42 | D83/20 | 185200 | 996000 | 0-25 | 5.50 |

| No. | Local code | East | North | Depth | pH Reading |
|---|---|---|---|---|---|
| 43 | D83/20 | 185200 | 996000 | 0-100 | 5.24 |
| 44 | D90/11 | 181600 | 997400 | 0-25 | 5.19 |
| 45 | D90/11 | 181600 | 997400 | 0-100 | 5.32 |
| 46 | D90/14 | 182800 | 997400 | 0-25 | 6.07 |
| 47 | D93/18 | 184400 | 998000 | 0-25 | 6.11 |
| 49 | D95/17 | 184000 | 998400 | 0-25 | 6.00 |
| 50 | D95/17 | 184000 | 998400 | 25-100 | 6.06 |
| 51 | D96/8 | 180400 | 998600 | 0-25 | 6.68 |
| 52 | D96/8 | 180400 | 998600 | 25-100 | 5.68 |
| 53 | DP93/18 | 184400 | 998000 | 0-25 | 6.00 |
| 54 | DP50/48 | 189864 | 989465 | 0-25 | 6.23 |
| 55 | DP40/19 | 184800 | 989400 | 0-25 | 6.33 |
| 56 | DP40/19 | 184800 | 989400 | 25-100 | 6.14 |
| 57 | DP48/32 | 189864 | 989435 | 0-25 | 5.50 |
| 58 | DP49/31 | 189407 | 988588 | 0-25 | 5.55 |
| 59 | DP49/31 | 189407 | 988588 | 25-50 | 5.21 |
| 60 | DP53/22 | 185970 | 992000 | 25-100 | 5.60 |
| 61 | DP53/22 | 185970 | 992000 | 0-25 | 5.79 |
| 62 | DP62/10 | 181489 | 992610 | 0-25 | 6.31 |
| 63 | DP62/10 | 181489 | 992600 | 25-100 | 6.20 |
| 64 | DP87/16 | 183544 | 995905 | 25-100 | 5.86 |
| 65 | DP87/16 | 183544 | 995905 | 0-25 | 6.17 |
| 66 | DP89/15 | 183200 | 997200 | 25-100 | 5.75 |
| 67 | DP89/15 | 183200 | 997200 | 0-25 | 5.81 |
| 68 | DP97/12 | 181485 | 998027 | 0-39 | 6.37 |

# APPENDIX 5F: SUMMARY CRITERIA FOR ANALYTICAL DATA INTERPRETATION & RECOMMENDED RATING RANGE

**Analytical Data Interpretation**

| Description | Very Low | Low | Medium | High | Very High |
|---|---|---|---|---|---|
| Total Nitrogen % | <0.05 | 0.05-0.125 | 0.125-0.225 | 0.225-0.3 | >0.3 |
| Organic carbon % | <2 | 2-4 | 4-10 | 10-20 | >20 |
| CEC (meq/100g soil) | <5 | 5-15 | 15-25 | 25-40 | >40 |
| Exch. Ca (meq/100g soil) | <2 | 2-5 | 5-10 | 10-20 | >20 |
| Exch.Mg(meq/100g soil) | <0.5 | 0.5-1.5 | 0.5-3 | 3-8 | >8 |
| Exch.K(meq/100g soil) | <0.1 | 0.1-0.3 | 0.3-0.6 | 0.6-1.2 | >1.2 |
| Exch.Na (meq/100g soil) | <0.1 | 0.1-0.3 | 0.3-0.7 | 0.7-2.0 | >2.0 |
| Sodicity (ESP) | <2 | 2-8 | 8-15 | 15-27 | >27 |
| Available P (ppm) Olsen Method | <5 | 5-8 | 8-12 | 12-20 | >20 |
| pH | <5.3 Very acid | 5.3-6 M. Acid | 6-7 Slightly Acid | 7-8.5 M. Alkaline | >8.5 V. Alkaline |
| ESP | <2 | 2-8 | 8-15 | 15-27 | >27 |
| C:N | | <10 Good | 10-14 Medium | >14 Poor | |

Source: B. Frank 1990 (Adopted from Agricultural Compendium; FAO and Booker TSM)

2. Bulk density in relation to texture class

| No. | Soil texture class | Bulk density (gm/cc$^3$) |
|---|---|---|
| 1 | Clay, clay loam and Silty loam (surface soil) | 1.0-1.6 |
| 2 | Sand and sandy loams | 1.2-1.8 |
| 3 | Recently cultivated soils | 0.9-1.2 |
| 4 | Soils showing root restriction | |
| 4.1 | Sand and loams | > 1.75 |
| 4.2 | Silts | 1`.4-1.6 |
| 4.3 | Clays | > 1.3 |
| 5 | Compacted sub-soils | > 2.0 |

Source: Taylor et al. 1966; De Geus, 1973

3. Ranking Infiltration Rate for Surface Irrigation Development

| No. | (cm/hr) | Suitability for surface Irrigation |
|---|---|---|
| 1 | <0.1 | Unsuitable (too slow) but suitable for Rice |
| 2 | 0.1-0.3 | Marginally suitable (too slow) & marginally for Rice |
| 3 | 0.3-0.7 | Suitable; but unsuitable for Rice |
| 4 | 0.7-3.5 | Optimum |
| 5 | 3.5-6.5 | Suitable |
| 6 | 6.5-12.5 | Marginally suitable (too rapid); small basins is needed |
| 7 | 12.5-25.0 | Unsuitable only under special conditions; Very small basins needed |
| 8 | >25 | Unsuitable (too rapid) overhead irrigation methods only |

4. Infiltration Rates in Relation to Soil Texture

| No. | Soil texture | Representative IR (cm/h) | Normal IR Rang (cm/h) |
|---|---|---|---|
| 1 | Sand | 5 | 2 - 5 |
| 2 | Sandy loam | 2 | 1 - 8 |
| 3 | Loam | 1 | 1 - 2 |
| 4 | Clay loam | 0.8 | 0.2 – 1.5 |
| 5 | Silty clay | 0.2 | 0.03 – 0.5 |
| 6 | Clay | 0.05 | < 0.1 – 0.8 |

5. Hydraulic Conductivity Value Rating

| No. | Hydraulic Conductivity Class | K (Cm/h ) | K (m/ day ) |
|---|---|---|---|
| 1 | Very slow | < 0.8 | < 0.2 |
| 2 | Slow | 0.8 – 2.0 | o.2 – 0.5 |
| 3 | Moderate | 2.0 – 6.0 | 0.5 – 1.4 |
| 4 | Moderately rapid | 6.0 – 12.5 | 1.9 – 3.0 |
| 5 | Rapid | 8.0 – 12.5 | 1.9 – 3.0 |
| 6 | Very Rapid | > 12.5 | > 3.0 |

Source: FAO (1963)

6. Approximate Relationship between soil Texture and Hydraulic Conductivity

| No | Texture Class | K (Cm/h ) | K (m/ day ) |
|---|---|---|---|
| 1 | Loamy Sand & Fine sand | 12-25 | 3-6 |
| 2 | Sandy loam | 6-12 | 1.5-3 |
| 3 | Clay Loam, Silt, Silty Loam | 2-6 | 0.5-1.5 |
| 4 | Silty Clay, Sandy Clay,Silty Clay,Loam,Clay Loam,Silty Loam, Silty Sandy Clay Loam | 0-5-2 | 0.1-0.5 |
| 5 | Clay Loam, Silty Clay, Clay, Sandy Clay Loam | 0.25-0.5<br><0.25 | 0.1-0.5<br><0.05 |
| 6 | Clay, heavy clay | <0.25 | <0.05 |

Source FAO-1979

**7.** Available Water Holding Capacity Rating for Irrigation Suitability

| Rating for irrigation suitability | AWC (mm/m) |
|---|---|
| Low | <120 |
| Medium | 120-180 |
| High | >180 |

8. Electrical Conductivity (EC) (mS/cm)

| Approximate value | Rating | Interpretation |
|---|---|---|
| 0-2 | Salt free | Salinity effects are negligible except for most sensitive |
| 4-8 | Slightly saline | Yields of many crops restricted. |
| 8-15 | Moderately Saline | Only tolerant crops restricted |
| >15 | Strongly saline | Only very tolerant crops yield satisfactory. |

9. Cation Exchange Capacity (CEC)

| (me/100g soil) | Rating | Interpretation |
|---|---|---|
| >40 | Very high | Normal good agricultural soils |
| 25-40 | High | As above only small amounts of lime and K fertilizer needed |
| 12-25 | Medium | Satisfactory for agriculture given fertilizer. |
| 5-15 | Low | Moderate to poor response to Fertilizer |
| <5 | Very low | Few nutrient reserves. Marginal for sustainable and rain fed agriculture unsuitable for irrigation. |

10. Base Saturation Percentage (BSP)

| % | Rating | Interpretation |
|---|---|---|
| <20 | Low | Less fertile soil |
| 20-60 | Medium | Moderately fertile soil |
| >60 | High | More fertile soil soil |

11. Exchangeable Cation Ratio

| Cat ion Ratio | Approximate Value | Effects | |
|---|---|---|---|
| Ca:Mg | >5:1 | Mg increasingly unavailable with increasing Ca and P availability may be reduced | |
| | 3:1 to 4:1 | Approximate optimum range for most crops | |
| | < 3:1 | Available P up take may be inhibited (Yates, 1964) | |
| | 1:1 | Suggested lowest acceptable limit (Fauck et al.1969). With lower values. Ca Availability slightly reduced | |
| K:Mg | >2:1 | Mg uptake may be inhibited | |
| | <3:2 | Field crops recommended levels (doll and lucas1973) | |
| | <1:1 | Vegetables and Sugar beet | |
| | <3:5 | Fruit and greenhouse crops | |
| (Ca+Mg)/K | >40 | Very high | Overdose Ca +Mg or lack of K. |
| | 25-40 | High. | Fertilizer response no need |
| | 15-25 | Optimal. | Fertilizer response unlikely |
| | 0-15 | Lack of Ca or Mg (see ca/Mg). | Fertilizer response probable |
| | <5 | Low | Fertilizer response most likely |

12. Carbonate%

| Range | Interpretation |
|---|---|
| <15 | Low to Medium |
| 15-40 | Calcic |
| >40 | Extremely calcareous |

13. Indicative Level of Micronutrient in The Soils & Their Value Rating

| Category (ppm) | Iron (Fe) | Manganese (Mn) | Copper (Cu) | Zinc (Zn) | Source |
|---|---|---|---|---|---|
| Low | 0-3 | 0-0.5 | 0-0.2 | 0-0.9 | * |
| Marginal | 3.1-5 | 0.6-1 | 0.3-0.5 | 1-1.5 | * |
| Adequate | >5 | >1 | >0.5 | >1.5 | * |
| Approximate mean in soil | | 200 | 30 | 90 | Fairbridge & Finkl, 1979 |
| Usual rang in soil | 10-1000 | 20-300 | 2-100 | 10-100 | |
| Toxic | >1000 | >300 | >100 | >100 | |

Source: * Soil analytical hand book for reference method by Soil and Plant Analysis Council INC-1992.
Extracting solution IS DTPA.

14. Exchangeable Aluminum Level in the soil & its effects

| Exchangeable Al % | Effects | Source |
|---|---|---|
| 30 | -Sensitive crops may be affected | |
| 60 | ▪ Generally toxic only very low Al concentrations expected<br>▪ 60% tolerated by sugar cane | Nye etal (1961)<br><br>Evans - 1965 |
| 85 | May be tolerated by some crops in some condition tea, rubber, cassava, Pineapple & legumes are notably Al tolerant | Scacher 1976 |

# APPENDIX 5G: LAND USE REQUIREMENTS FOR IRRIGATED AGRICULTURAL DEVELOPMENT

**Land use requirements for surface irrigated onion (allium ecpa) cultivation, moderate to high input level**

| Land use requirements | | | Unit | Factor Ratings/Range of suitability/level of yield | | | | |
|---|---|---|---|---|---|---|---|---|
| Land Quality/diagnostic factors | | Land Characteristics | | S1 | S2 | S3 | N1 | N |
| Description | Sub class Suffix | | 100 | 85 | 60 | 40 | 25 | 0 |
| Crop requirement | | | | | | | | |
| Climate | c | Mean air temperature for growing cycle | 0C | 13-24 | 22–23<br>13–16 | 23–55<br>10– 13 | – | >25<br><10 |
| | | Relative humidity | % | 24–80 | 80–90<br>20–24 | <20<br>>90 | – | – |
| Moisture availability | m | AWC | Mm/m | >150 | 130-150 | 100-130 | <100 | <60 |
| Oxygen availability | d | Soil Drainage | Class | W- M.W, | ID,SD | Poor and aeric | V.Poor | Poor not drainable |
| | | Flooding | duration /depth | FO | – | F1 | – | F2+ |
| Nutrient retention | n | Organic carbon | % (25 cm) | > 1.2 | 1.2– 0.8 | < 0.8 | – | – |
| | | CEC | Meq/ 100g soil (50cm) | >16 | <16 | <16 | – | – |
| Nutrient Availability | z | Soil reaction | pH (25cm) | 6.0–7.5 | 5.5 – 6<br>7.5 – 8 | 5.0- 5.5<br>8.0– 8.2 | < 5.5 | > 8.2 |
| | | Texture / Structure | Class | CL,L,SiCl,Si,SiC,Co,C<60s,LS,LfS | C>60s, C<60v, LS, LfS | C>60v,Fs, LcS, cS | – | Cm,SiCcm |
| Rooting condition | r | Effective soil depth | Cm | >100 | 75–50 | 75–50 | | <50 |
| | | Stones and rocks | % | no | <15 | 15–35 | 15–35 | >35 |
| | | Texture / Structure | Class | CL,L,SiCl,Si,SiC,Co,C<60s,LS,LfS | C>60s, C<60v, LS, LfS | C>60v,fS, LcS, cS | – | Cm,SiCcm |
| | | Compaction (Db) | g/cm–3 | <1.6 | <1.6 | <1.6 | >1.6 | >1.6 |
| | | Organic carbon | % | > 1.2 | 1.2– 0.8 | < 0.8 | – | – |
| Toxicity | x | CaCo3 | % | 0–5 | 5–10 | 10–20 | | >20 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Land development and management requirement | | | | | | | | |
| Workability | w' | Slope | % | 0-2 | 2-4 | 4-6 | | >6 |
| | | Stones & rocks | Class | <15 | 15–35 | | | >35 |
| | | Organic carbon | % (25 cm) | > 1.2 | < 0.8 | | – | – |
| | | Texture / Structure | Class | CL,L,SiCl,Si, SiC,Co,C<60s,LS,LfS | C>60s, C<60v, LS, LfS | C>60v,fS, LcS | – | Cm, SiCm |
| Potential for mechanization | k | Slope | % | 0-2 | 2-4 | 4-6 | | >6 |
| | | Stones & rocks | Class | no | <15 | 15–35 | 15–35 | >35 |
| | | Texture / Structure | Class | CL,L,SiCl,Si, SiC,Co,C<60s,LS,LfS | C>60s, C<60v, LS, LfS | C>60v,fS, LcS, cS | – | Cm, SiCm |
| Drainage | d’ | Infiltration | cm/h | 0.7-3.5 | 0.3-0.7 3.5-6.5 | 0.1-0.3 6.5-12.5-15 | | <0.1 >12.5 |
| | | Depth to ground water | M | >3 | 1.5– 3 | 0.5–1.5 | | <0.5 |
| | | Hydraulic conductivity | M/day | 1.0–3 | 0.5–1.0 | 0.2–0.5 | 0.1-0.2 | <0.2 >3 |
| Flood hazard | f | Flooding | Duration /depth | Protection feasible | Protection feasible | Protection feasible | Protection feasible | Protection not feasible |
| Conservation requirement | | | | | | | | |
| Erosion hazard | e | Sheet | Class | No | Moderate | | | Strong |
| | | Slope | % | 0-2 | 2-4 | 4-6 | | >6 |
| | | Gully | Class | None | Slight | | – | Moderate strong |

**Land use requirements for overhead irrigated onion (allium ecpa) cultivation, moderate to high input level**

| Land use requirements | | | Unit | Factor Ratings /Range of Suitability /level of yield | | | | |
|---|---|---|---|---|---|---|---|---|
| Land Quality/diagnostic factors | | Land Characteristics | | S1 | S2 | S3 | N1 | N |
| Description | Sub class Suffix | | 100 | 85 | 60 | 40 | 25 | 0 |
| Crop requirement | | | | | | | | |
| Climate | c | Mean air temperature for growing cycle | $^0$C | 13-24 | 22–23<br>13–16 | 23–55<br>10– 13 | – | >25<br><10 |
| | | Relative humidity | % | 24–80 | 80–90<br>20–24 | <20<br>>90 | – | – |
| Moisture availability | m | AWC | Mm/m | >180 | 180–120 | 120–160 | – | <60 |
| Oxygen availability | d | Soil Drainage | Class | W- M.W | ID,SE | Poor and aeric | V. Poor | Poor not drainable |
| | | Flooding | duration /depth | FO | – | F1 | – | F2+ |
| Nutrient retention | n | Organic carbon | % (25 cm) | > 1.2 | 1.2– 0.8 | < 0.8 | – | – |
| | | CEC | Meq/ 100g soil (50cm) | >16 | <16 | <16 | – | – |
| Nutrient Availability | z | Soil reaction | pH (25cm) | 6.0–7.5 | 5.5 – 6<br>7.5 – 8 | 5.0- 5.5<br>8.0– 8.2 | < 5.5 | > 8.2 |
| | | Texture / Structure | Class | CL,L,SiCl, Si,SiC,Co, C<60s,LS, LfS | C>60s, C<60v, LS, LfS | C>60v,Fs, LcS, cS | – | Cm, SiCcm |
| Rooting condition | r | Effective soil depth | Cm | >100 | 75–50 | 75–50 | | <50 |
| | | Stones and rocks | % | no | <15 | 15–35 | 15–35 | >35 |
| | | Texture / Structure/ | Class | CL,L,SiCl, Si,SiC,Co, C<60s,LS, LfS | C>60s, C<60v, LS, LfS | C>60v,fS, LcS, cS | – | Cm, SiCcm |
| | | Compaction (Db) | g/cm–3 | <1.6 | <1.6 | <1.6 | >1.6 | >1.6 |
| | | Organic carbon | % | > 1.2 | 1.2– 0.8 | < 0.8 | – | – |
| Toxicity | x | CaCo3 | % | 0–5 | 5–10 | 10–25 | – | >25 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Land development and management requirement | | | | | | | | |
| Workability | w' | Slope | % | 0–4 | 4–6 | 6–8 | 8–16 | >16 |
| | | Stones & rocks | Class | <15 | 15–35 | 15–35 | | >35 |
| | | Organic carbon | % (25 cm) | > 1.2 | 1.2– 0.8 | < 0.8 | – | – |
| | | Texture / Structure | Class | CL,L,SiCl, Si,SiC,Co, C<60s,LS, LfS | C>60s, C<60v, LS, LfS | C>60v,fS, LcS, cS | – | Cm, SiCcm |
| Potential for mechanization | k | Slope | % | 0–4 | 4–6 | 6–8 | 8–16 | >16 |
| | | Stones & rocks | Class | <15 | 15–35 | 15–35 | | >35 |
| | | Texture / Structure | Class | CL,L,SiCl, Si,SiC,Co, C<60s,LS, LfS | C>60s, C<60v, LS, LfS | C>60v,fS, LcS, cS | – | Cm,SiCm |
| Drainage | d’ | Infiltration | cm/h | 0.7-3.5 | 0.3-0.7 3.5-6.5 | 0.1-0.3 6.5-12.5-15 | | <0.1 >12.5 |
| | | Depth to ground water | M | >3 | 1.5– 3 | 0.5–1.5 | | <0.5 |
| | | Hydraulic conductivity | M/day | 1.0–3 | 0.5–1.0 | 0.2–0.5 | 0.1-0.2 | <0.2 >3 |
| Flood hazard | f | Flooding | Duration /depth | Protection feasible | Protection feasible | Protection feasible | Protection feasible | Protection not feasible |
| Conservation requirement | | | | | | | | |
| Erosion hazard | e | Sheet | Class | No | Slight | Moderate | | Strong |
| | | Slope | % | 0–4 | 4–6 | 6–8 | 8–16 | >16 |
| | | Gully | Class | None | None | Slight | – | Moderate strong |

**Land use requirements for surface irrigated beans (phaseolus vulgaris) cultivation, moderate to high input level**

| Land use requirements | | | Unit | Factor Ratings /Range of Suitability /level of yield | | | | |
|---|---|---|---|---|---|---|---|---|
| Land Quality/diagnostic factors | | Land Characterstics | 100 | S1 85 | S2 60 | S3 40 | N1 25 | N 0 |
| Crop requirement | | | | | | | | |
| Climate | c | Mean air temperature for growing cycle | $^0$C | 12-24 | 24-27<br>10-12 | 27-30<br>10-8 | - | >30<br><8 |
| | | Relative humidity | % | 42-75 | 42-36<br>75-90 | 36-30<br>>90 | -- | <30 |
| Moisture availability | m | AWC | mm/m | >180 | 180-120 | 120-60 | - | <60 |
| Oxygen availability | d | Soil Drainage | Class | W-M | I | P | P | P |
| | | Flooding | Duration /depth | Protection feasible | Protection feasible | Protection feasible | Protection feasible | Protection not feasible |
| Nutrient retention | n | Organic carbon | % (25 cm) | > 1.2 | 1.2-0.8 | <0.8 | - | - |
| | | CEC | Meq/ 100g soil (50cm) | >16 | <16 (-) | <16 (+) | - | - |
| Nutrient Availability | z | Soil reaction | PH (25cm) | 6.5-5.6<br>6.5-7.6 | 5.6-5.4<br>7.6-8.0 | 5.4-5.2<br>8.0-8.2 | < 5.2 | > 8.2 |
| | | Texture / Structure | Class | C<60s, Co, SiCs, SiCL, CL, Si, SiL C>60s, SC, C<60v, L, SCL | C>60v, SCL, LfS, LS | LCS, fS, S | | Cm, SiCm, CS |
| Rooting condition | r | Effective soil depth | Cm | >75 | 75-50 | 50-20 | | <20 |
| | | Stones and rocks | % | <15 | 15-35 | 35-55 | | >55 |
| | | Compaction (Db) | g/cm-3 | <1.6 | <1.6 | <1.6 | >1.6 | >1.6 |
| | | Organic carbon | % | > 1.2 | 1.2-0.8 | <0.8 | - | - |
| Toxicity | x | CaCo3 | % | 0–6 | 6–15 | 15–25 | – | >25 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Land development and management requirement | | | | | | | | |
| Workability | w' | Slope | % | 0-2 | 2-4 | 4-6 | | >6 |
| | | Stones & rocks | Class | <15 | 15-35 | 35-55 | | >55 |
| | | Organic carbon | % (25 cm) | > 1.2 | 1.2-0.8 | <0.8 | - | - |
| | | Texture / Structure | Class | C<60s, Co, SiCs, SiCL, CL, Si, SiL C>60s, SC, C<60v, L, SCL | C>60v, SCL, LfS, LS | LCS, fS, S | | Cm, SiCm, CS |
| Potential for mechanization | k | Slope | % | 0-2 | 2-4 | 4-6 | | >6 |
| | | Stones & rocks | Class | <15 | 15-35 | 35-55 | | >55 |
| | | Texture / Structure | Class | C<60s, Co, SiCs, SiCL, CL, Si, SiL C>60s, SC, C<60v, L, SCL | C>60v, SCL, LfS, LS | LCS, fS, S | | Cm, SiCm, CS |
| Drainage | d' | Infiltration | Cm/h | 0.7-3.5 | 0.3-0.7 3.5-6.5 | 0.1-0.3 6.5-12.5 | | <0.1 >12.5 |
| | | Depth to ground water | M | >3 | 1.5- 3 | 0.5-1.5 | | <0.5 |
| | | Hydraulic conductivity | M/day | 1.4-3 | 0.5-1.4 | 0.2-0.5 | - | <0.2 >3 |
| Flood hazard | f | Flooding | Duration /depth | Protection feasible | Protection feasible | Protection feasible | Protection feasible | Protection not feasible |
| Conservation requirement | | | | | | | | |
| Erosion hazard | e | Sheet | Class | No | Slight | Moderate | | Strong |
| | | Slope | % | 0-2 | 2-4 | 4-6 | | >6 |
| | | Gully | Class | None | None | Slight | - | Moderate strong |

**Land use requirements for overhead irrigated bean (phaseolus vulgaris) cultivation, moderate to high input level**

| Land use requirements | | | Unit | Factor Ratings /Range of Suitability /level of yield | | | | |
|---|---|---|---|---|---|---|---|---|
| Land Quality/diagnostic factors | | Land Characteristics | 100 | S1 85 | S2 60 | S3 40 | N1 25 | N 0 |
| Crop requirement | | | | | | | | |
| Climate | c | Mean air temperature for growing cycle | $^0$C | 12-24 | 24-27<br>10-12 | 27-30<br>10-8 | - | >30<br><8 |
| | | Relative humidity | % | 42-75 | 42-36<br>75-90 | 36-30<br>>90 | -- | <30 |
| Moisture availability | m | AWC | mm/m | >180 | 180-120 | 120-60 | - | <60 |
| Oxygen availability | d | Soil Drainage | Class | W-M | I | P | P | P |
| | | Flooding | Duration /depth | Protection feasible | Protection feasible | Protection feasible | Protection feasible | Protection not feasible |
| Nutrient retention | n | Organic carbon | % (25 cm) | > 1.2 | 1.2-0.8 | <0.8 | - | - |
| | | CEC | Meq/ 100g soil (50cm) | >16 | <16 (-) | <16 (+) | - | - |
| Nutrient Availability | z | Soil reaction | PH (25cm) | 6.5-5.6<br>6.5-7.6 | 5.6-5.4<br>7.6-8.0 | 5.4-5.2<br>8.0-8.2 | < 5.2 | > 8.2 |
| | | Texture / Structure | Class | C<60s, Co, SiCs, SiCL, CL, Si, SiL<br>C>60s, SC, C<60v, L, SCL | C>60v, SCL, LfS, LS | LCS, fS, S | | Cm, SiCm, CS |
| Rooting condition | r | Effective soil depth | Cm | >75 | 75-50 | 50-20 | | <20 |
| | | Stones and rocks | % | <15 | 15-35 | 35-55 | | >55 |
| | | Compaction (Db) | g/cm-9 | <1.6 | <1.6 | <1.6 | >1.6 | >1.6 |
| | | Organic carbon | % | > 1.2 | 1.2-0.8 | <0.8 | - | - |
| Toxicity | x | CaCo3 | % | 0–6 | 6–15 | 15–25 | – | >25 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Land development and management requirement | | | | | | | | |
| Workability | w' | Slope | % | 0-4 | 4 -6 | 6 -8 | 8-16 | >16 |
| | | Stones & rocks | Class | <15 | 15-35 | 35-55 | | >55 |
| | | Organic carbon | % (25 cm) | > 1.2 | 1.2-0.8 | <0.8 | - | - |
| | | Texture / Structure | Class | C<60s, Co, SiCs, SiCL, CL, Si, SiL C>60s, SC, C<60v, L, SCL | C>60v, SCL, LfS, LS | LCS, fS, S | | Cm, SiCm, CS |
| Potential for mechanization | k | Slope | % | 0-4 | 4 -6 | 6 -8 | 8-16 | >16 |
| | | Stones & rocks | Class | <15 | 15-35 | 35-55 | | >55 |
| | | Texture / Structure | Class | C<60s, Co, SiCs, SiCL, CL, Si, SiL C>60s, SC, C<60v, L, SCL | C>60v, SCL, LfS, LS | LCS, fS, S | | Cm, SiCm, CS |
| Drainage | d' | Infiltration | Cm/h | 0.7-6.5 | 0.3-0.7 65-12 | 0.1-0.3 12-25 | | <0.1 >25 |
| | | Depth to ground water | M | >3 | 1.5- 3 | 0.5-1.5 | | <0.5 |
| | | Hydraulic conductivity | M/day | 1.4-3 | 0.5-1.4 | 0.2-0.5 | - | <0.2 >3 |
| Flood hazard | f | Flooding | Duration /depth | Protection feasible | Protection feasible | Protection feasible | Protection feasible | Protection not feasible |
| Conservation requirement | | | | | | | | |
| Erosion hazard | e | Sheet | Class | No | Slight | Moderate | | Strong |
| | | Slope | % | 0-4 | 4 -6 | 6 -8 | 8-16 | >16 |
| | | Gully | Class | None | None | Slight | - | Moderate strong |

**Land use requirements for surface irrigated citrus cultivation, moderate to high input level**

| Land use requirements | | | Unit | Factor Ratings /Range of Suitability /level of yield | | | | |
|---|---|---|---|---|---|---|---|---|
| Land Quality/diagnostic factors | | Land Characteristics | 100 | S1 85 | S2 60 | S3 40 | N1 25 | N 0 |
| Description | Sub class Suffix | | | | | | | |
| Crop requirement | | | | | | | | |
| Climate | c | Mean air temperature for growing cycle | $^0$C | 19-33 | 33-36<br>19-16 | 36-39<br>16-13 | - | <39<br><13 |
| | | Relative humidity | % | < 60 | 60-90 | >90 | - | - |
| Moisture availability | m | AWC | mm/m | >180 | 180-120 | 120-60 | - | <60 |
| Oxygen availability | d | Soil Drainage | Class | W | M | I | P | P |
| | | Flooding | Duration /depth | Protection feasible | Protection feasible | Protection feasible | Protection feasible | Protection not feasible |
| Nutrient retention | n | Organic carbon | % (25 cm) | > 1.5 | 1.5-0.8 | < 0.8 | - | - |
| | | CEC | Meq/ 100g soil (50cm) | >16 | <16 (-) | <16 (+) | - | - |
| Nutrient Availability | z | Soil reaction | PH (25cm) | 6.5-5.5<br>6.5-7.6 | 5.5-5.2<br>7.6-8.0 | 5.2-5.0<br>8.0-8.2 | < 5.0 | > 8.2 |
| | | Texture / Structure | Class | L, SCL, SL, SiCl, SiL, Si, CL, LS, LfS, | C<60s, SiCs, SC, S, fS, Co | C<60v, C>60s | | Cm, SiCm, C>60v |
| Rooting condition | r | Effective soil depth | Cm | >150 | 150-100 | 100-75 | | <75 |
| | | Stones and rocks | % | < 15 | 15-35 | 35-55 | | >55 |
| | | Texture | Class | L, SCL, SL, SiCl, SiL, Si, CL, LS, LfS, | C<60s, SiCs, SC, S, fS, Co | C<60v, C>60s | | Cm, SiCm, C>60v |
| | | Compaction (Db) | g/cm-9 | <1.6 | <1.6 | <1.6 | >1.6 | >1.6 |
| | | Organic carbon | % | > 1.5 | 1.5-0.8 | < 0.8 | - | - |
| Toxicity | x | CaCo3 | % | 0–6 | 6–15 | 15–25 | – | >25 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Land development and management requirement | | | | | | | | |
| Workability | w' | Slope | % | 0-2 | 2-4 | 4-6 | | >6 |
| | | Stones & rocks | Class | < 15 | 15-35 | 35-55 | | >55 |
| | | Organic carbon | % (25 cm) | > 1.5 | 1.5-0.8 | < 0.8 | - | - |
| | | Texture / Structure | Class | L, SCL, SL, SiCl, SiL, Si, CL, LS, LfS, | C<60s, SiCs, SC, S, fS, Co | C<60v, C>60s | | Cm, SiCm, C>60v |
| Potential for mechanization | k | Slope | % | 0-2 | 2-4 | 4-6 | | >6 |
| | | Stones & rocks | Class | < 15 | 15-35 | 35-55 | | >55 |
| | | Texture / Structure | Class | L, SCL, SL, SiCl, SiL, Si, CL, LS, LfS, | C<60s, SiCs, SC, S, fS, Co | C<60v, C>60s | | Cm, SiCm, C>60v |
| Drainage | d' | Infiltration | Cm/h | 0.7-3.5 | 0.3-0.7 3.5-6.5 | 0.1-0.3 6.5-12.5 | | <0.1 >12.5 |
| | | Depth to ground water | M | >3 | 1.5- 3 | 0.5-1.5 | | <0.5 |
| | | Hydraulic conductivity | M/day | 1.4-3 | 0.5-1.4 | 0.2-0.5 | - | <0.2 >3 |
| Flood hazard | f | Flooding | Duration /depth | Protection feasible | Protection feasible | Protection feasible | Protection feasible | Protection not feasible |
| Conservation requirement | | | | | | | | |
| Erosion hazard | e | Sheet | Class | No | Slight | Moderate | | Strong |
| | | Slope | % | 0-2 | 2-4 | 4-6 | | >6 |
| | | Gully | Class | None | None | Slight | - | Moderate strong |

**Land use requirements for overhead irrigated citrus cultivation, moderate to high Input level**

| Land use requirements | | | | Factor Ratings /Range of Suitability /level of yield | | | | |
|---|---|---|---|---|---|---|---|---|
| Land Quality/diagnostic factors | | Land Characteristics | 100 | S1 85 | S2 60 | S3 40 | N1 25 | N 0 |
| Description | Sub class Suffix | | | | | | | |
| Crop requirement | | | | | | | | |
| Climate | c | Mean air temperature for growing cycle | $^0$C | 19-33 | 33-36<br>19-16 | 36-39<br>16-13 | - | <39<br><13 |
| | | Relative humidity | % | < 60 | 60-90 | >90 | - | - |
| Moisture availability | m | AWC | mm/m | >180 | 180-120 | 120-60 | - | <60 |
| Oxygen availability | d | Soil Drainage | Class | W | M | I | P | P |
| | | Flooding | Duration /depth | Protection feasible | Protection feasible | Protection feasible | Protection feasible | Protection not feasible |
| Nutrient retention | n | Organic carbon | % (25 cm) | > 1.5 | 1.5-0.8 | < 0.8 | - | - |
| | | CEC | Meq/ 100g soil (50cm) | >16 | <16 (-) | <16 (+) | - | - |
| Nutrient Availability | z | Soil reaction | PH (25cm) | 6.5-5.5<br>6.5-7.6 | 5.5-5.2<br>7.6-8.0 | 5.2-5.0<br>8.0-8.2 | < 5.0 | > 8.2 |
| | | Texture / Structure | Class | L, SCL, SL, SiCl, SiL, Si, CL, LS, LfS, | C<60s, SiCs, SC, S, fS, Co | C<60v, C>60s | | Cm, SiCm, C>60v |
| Rooting condition | r | Effective soil depth | Cm | >150 | 150-100 | 100-75 | | <75 |
| | | Stones and rocks | % | < 15 | 15-35 | 35-55 | | >55 |
| | | Texture / Structure | Class | L, SCL, SL, SiCl, SiL, Si, CL, LS, LfS, | C<60s, SiCs, SC, S, fS, Co | C<60v, C>60s | | Cm, SiCm, C>60v |
| | | Compaction (Db) | g/cm-9 | <1.6 | <1.6 | <1.6 | >1.6 | >1.6 |
| | | Organic carbon | % | > 1.5 | 1.5-0.8 | < 0.8 | - | - |
| Toxicity | x | CaCo3 | % | 0–6 | 6–15 | 15–25 | – | >25 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Land development and management requirement | | | | | | | | |
| Workability | w' | Slope | % | 0-4 | 4 -6 | 6 -8 | 8-16 | >16 |
| | | Stones & rocks | Class | < 15 | 15-35 | 35-55 | | >55 |
| | | Organic carbon | % (25 cm) | > 1.5 | 1.5-0.8 | < 0.8 | - | - |
| | | Texture / Structure | Class | L, SCL, SL, SiCl, SiL, Si, CL, LS, LfS, | C<60s, SiCs, SC, S, fS, Co | C<60v, C>60s | | Cm, SiCm, C>60v |
| Potential for mechanization | k | Slope | % | 0-4 | 4 -6 | 6 -8 | 8-16 | >16 |
| | | Stones & rocks | Class | < 15 | 15-35 | 35-55 | | >55 |
| | | Texture / Structure | Class | L, SCL, SL, SiCl, SiL, Si, CL, LS, LfS, | C<60s, SiCs, SC, S, fS, Co | C<60v, C>60s | | Cm, SiCm, C>60v |
| Drainage | d' | Infiltration | Cm/h | 0.7-6.5 | 0.3-0.7<br>65-12 | 0.1-0.3<br>12-25 | | <0.1<br>>25 |
| | | Depth to ground water | M | >3 | 1.5- 3 | 0.5-1.5 | | <0.5 |
| | | Hydraulic conductivity | M/day | 1.4-3 | 0.5-1.4 | 0.2-0.5 | - | <0.2<br>>3 |
| Flood hazard | f | Flooding | Duration /depth | Protection feasible | Protection feasible | Protection feasible | Protection feasible | Protection not feasible |
| Conservation requirement | | | | | | | | |
| Erosion hazard | e | Sheet | Class | No | Slight | Moderate | | Strong |
| | | Slope | % | 0-4 | 4 -6 | 6 -8 | 8-16 | >16 |
| | | Gully | Class | None | None | Slight | - | Moderate strong |

**Land use requirements for surface irrigated maize cultivation, moderate to high input level**

| Land use requirements | | | Unit | Factor Ratings /Range of Suitability /level of yield | | | | |
|---|---|---|---|---|---|---|---|---|
| Land Quality/diagnostic factors | | Land Characteristics | | S1 | S2 | S3 | N1 | N |
| Description | Sub class Suffix | | 100 | 85 | 60 | 40 | 25 | 0 |
| Crop requirement | | | | | | | | |
| Climate | c | Mean air temperature for growing cycle | 0C | 18 – 32 | 16–18<br>32–35 | 14–16<br>35–40 | – | <14<br>>40 |
| | | Relative humidity | % | 24–75 | 20–24<br>75–90 | <20<br>>90 | – | – |
| Moisture availability | m | AWC | Mm/m | >180 | 120–180 | 60–120 | – | <60 |
| Oxygen availability | d | Soil Drainage | Class | W–Mw | Ip | Poor and aeric | Poor, and drainable | Poor, not drainable |
| | | Flooding | Duration /depth | Protection feasible | Protection feasible | Protection feasible | Protection feasible | Protection not feasible |
| Nutrient retention | n | Organic carbon | % (25 cm) | > 1.2 | 0.8 – 1.2 | < 0.8 | – | – |
| | | CEC | Meq/ 100g soil (50cm) | >16 | <16 | <16 | – | – |
| Nutrient Availability | z | Soil reaction | pH (25cm) | 6 –7. 6 | 5.6 – 6.0<br>7.6 – 8.0 | 5.5 – 5.6<br>8 – 8.2 | – | < 5.5<br>>8.2 |
| | | Texture / Structure | Class | C<60s,CO, SiC,SiCL,Si, SiL,CL,SC, SCL,C<60v, C>60s | C>60v ,SL,Lf S,LS | fS,S,LcS,cS | – | Cm, SiCm |
| Rooting condition | r | Effective soil depth | Cm | >75 | 75–50 | 50–20 | – | <20 |
| | | Stones and rocks | % | <15 | 15–35 | 15–35 | – | >35 |
| | | Texture / Structure/ | Class | C<60s,CO, SiCSiCL, Si, SiL, CL,SC,SCL, C<60v,C>60s | C>60v ,SL, LfS, LS | fS, S, LcS, cS | – | Cm, SiCm |
| | | Compaction (Db) | G/cm–3 | <1.6 | <1.6 | <1.6 | >1.6 | >1.6 |
| | | Organic carbon | % | >0.8 | 0.8–0.5 | <0.5 | – | – |
| Toxicity | x | CaCo3 | % | 0–15 | 15–25 | 25–35 | – | >35 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Land development and management requirement | | | | | | | | |
| Workability | w' | Slope | % | 0-2 | 2-4 | 4-6 | | >6 |
| | | Stones & rocks | Class | <15 | 15–35 | 15–35 | | >35 |
| | | Organic carbon | % (25 cm) | >0.8 | 0.8–0.5 | <0.5 | – | – |
| | | Texture / Structure | Class | C<60s,CO, SiC,SiCL,Si, SiL,CL,SC, SCL,C<60v, C>60s | C>60v, SL, LfS, LS | fS, S, LcS, cS | – | Cm, SiCm |
| Potential for mechanization | k | Slope | % | 0-2 | 2-4 | 4-6 | | >6 |
| | | Stones & rocks | Class | <15 | 15–35 | 15–35 | | >35 |
| | | Texture / Structure | Class | C<60s,CO, SiC, SiCL, Si, SiL, CL, SC, SCL, C<60v,C>60s | C>60v SL, LfS, LS | fS, S, LcS, cS | – | Cm, SiCm |
| Drainage | d’ | Infiltration | cm/h | 0.7–3.5 | 0.3–0.7 3.5–6.5 | 0.1–0.3 6.5–12.5 | – | <0.1 >12.5 |
| | | Depth to ground water | M | >3 | 1.5– 3 | 0.5–1.5 | | <0.5 |
| | | Hydraulic conductivity | M/day | 1.4–3 | 0.5–1.4 | 0.2–0.5 | – | <0.2 >3 |
| Flood hazard | f | Flooding | Duration /depth | Protection feasible | Protection feasible | Protection feasible | Protection feasible | Protection not feasible |
| Conservation requirement | | | | | | | | |
| Erosion hazard | e | Sheet | Class | No | Slight | Moderate | | Strong |
| | | Slope | % | 0-2 | 2-4 | 4-6 | | >6 |
| | | Gully | Class | None | None | Slight | – | Moderate strong |

**Land use requirements for overhead irrigated maize cultivation, moderate to high input level**

| Land use requirements | | | Unit | Factor Ratings /Range of Suitability /level of yield | | | | |
|---|---|---|---|---|---|---|---|---|
| Land Quality/diagnostic factors | | Land Characteristics | 100 | S1 85 | S2 60 | S3 40 | N1 25 | N 0 |
| Description | Sub class Suffix | | | | | | | |
| Crop requirement | | | | | | | | |
| Climate | c | Mean air temperature for growing cycle | $^0$C | 22 – 32 | 16–18<br>32–35 | 14–16<br>35–40 | – | <14<br>>40 |
| | | Relative humidity | % | 24–75 | 20–24<br>75–90 | <20<br>>90 | – | – |
| Moisture availability | m | AWC | Mm/m | >180 | 120–180 | 60–120 | – | <60 |
| Oxygen availability | d | Soil Drainage | Class | W–M | Ip | Poor and aeric | Poor, and drainable | Poor, not drainable |
| | | Flooding | Duration /depth | Protection feasible | Protec tion feasible | Protection feasible | Protection feasible | Protection not feasible |
| Nutrient retention | n | Organic carbon | % (25 cm) | > 1.2 | 0.8 – 1.2 | < 0.8 | – | – |
| | | CEC | Meq/ 100g soil (50cm) | >16 | <16 | <16 | – | – |
| Nutrient Availability | z | Soil reaction | pH (25cm) | 6 –7. 6 | 5.6 – 6.0<br>7.6 – 8.0 | 5.5 – 5.6<br>8 – 8.2 | – | < 5.6<br>>8.2 |
| | | Texture / Structure | Class | C<60s,CO, SiC, SiCL, Si, SiL, CL, SC, SCL, C<60v,C> 60s | C>60v,S L, LfS, LS | fS,S,LcS,cS | – | Cm, SiCm |
| Rooting condition | r | Effective soil depth | Cm | >75 | 75–50 | 50–20 | – | <20 |
| | | Stones and rocks | % | <15 | 15–35 | 15–35 | – | >35 |
| | | Texture / Structure/ | Class | C<60s,CO, SiC, SiCL, Si, SiL, CL, SC, SCL, C<60v,C> 60s | C>60v,S L, LfS, LS | fS, S, LcS, cS | – | Cm, SiCm |
| | | Compaction (Db) | g/cm–3 | <1.6 | <1.6 | <1.6 | >1.6 | >1.6 |
| | | Organic carbon | % | >0.8 | 0.8–0.5 | <0.5 | – | – |
| Toxicity | x | CaCo3 | % | 0–15 | 15–25 | 25–35 | – | – |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Land development and management requirement | | | | | | | | |
| Workability | w | Slope | % | 0–4 | 4–6 | 6–8 | 8–16 | >16 |
| | | Stones & rocks | Class | <15 | 15–35 | 15–35 | | >35 |
| | | Organic carbon | % (25 cm) | >0.8 | 0.8–0.5 | <0.5 | – | – |
| | | Texture / Structure | Class | C<60s,CO, SiC, SiCL, Si, SiL, CL, SC, SCL, C<60v,C>60s | C>60v, SL, LfS, LS | fS,S,LcS,cS | – | Cm, SiCm |
| Potential for mechanization | k | Slope | % | 0–4 | 4–6 | 6–8 | 8–16 | >16 |
| | | Stones & rocks | Class | <15 | 15–35 | 15–35 | | >35 |
| | | Texture / Structure | Class | C<60s,CO, SiC, SiCL, Si, SiL, CL, SC, SCL, C<60v,C>60s | C>60v, SL, LfS, LS | fS,S,LcS,cS | – | Cm, SiCm |
| Drainage | d’ | Infiltration | cm/h | 0.7-6.5 | 0.3-0.7<br>65-12 | 0.1-0.3<br>12-25 | | <0.1<br>>25 |
| | | Depth to ground water | M | >3 | 1.5– 3 | 0.5–1.5 | | <0.5 |
| | | Hydraulic conductivity | m/day | 1.4–3 | 0.5–1.4 | 0.2–0.5 | – | <0.2<br>>3 |
| Flood hazard | f | Flooding | Duration /depth | Protection feasible | Protection feasible | Protection feasible | Protection feasible | Protection not feasible |
| Conservation requirement | | | | | | | | |
| Erosion hazard | e | Sheet | Class | No | Slight | Moderate | | Strong |
| | | Slope | % | 0–4 | 4–6 | 6–8 | 8–16 | >16 |
| | | Gully | Class | None | None | Slight | – | Moderate strong |

**Land use requirements for surface irrigated sesame cultivation, moderate to high input level**

| Land use requirements | | | Unit | Factor Ratings /Range of Suitability /level of yield | | | | |
|---|---|---|---|---|---|---|---|---|
| Land Quality/diagnostic factors | | Land Characteristics | 100 | S1 85 | S2 60 | S3 40 | N1 25 | N 0 |
| Description | Sub class Suffix | | | | | | | |
| Crop requirement | | | | | | | | |
| Climate | c | Mean air temperature for growing cycle | $^0$C | 20-28 | 28-30<br>20-18 | 30-38<br>18-16 | <16, >38 | <14<br>>38 |
| | | Relative humidity | % | <56 | 65-75 | 75-85 | – | – |
| Moisture availability | m | AWC | Mm/m | >180 | 120–180 | 60–120 | – | <60 |
| Oxygen availability | d | Soil Drainage | Class | W–Mw | Sw. ex. – Imperfe. | Poor and aeric | Poor& drainable | Poor not drainable |
| Nutrient retention | n | Organic carbon | % (25 cm) | > 1.2 | 0.8 – 1.2 | < 0.8 | – | – |
| | | CEC | Meq/ 100g soil (50cm) | >16 | >16, <16 | <16 | – | – |
| Nutrient Availability | z | Soil reaction | pH (25cm) | 5.8-7.0 | 5.5 – 5.8<br>7.0 – 7.5 | 5.2 – 5.5<br>7.5 – 8.2 | <5.2, >8.2 | < 5.5<br>>8.2 |
| | | Texture / Structure | Class | L, SCL, SiL, CL,Si,CL, SiC SC, | Cs, ,Ls, | C>60s,S | – | Cm, SiCm CS , |
| Rooting condition | r | Effective soil depth | Cm | >75 | 75-50 | 30-50 | – | <30 |
| | | Stones and rocks | % | 0-15 | 15–35 | 15–35 | – | >35 |
| | | Texture / Structure/ | Class | L, SCL, SL, CL,SiCL. SiCs, SiL,SC | Cs,Co,LS | C>60s,S | – | Cm, SiCm , |
| | | Compaction (Db) | G/cm–3 | <1.6 | <1.6 | <1.6 | >1.6 | >1.6 |
| | | Organic carbon | % | > 1.2 | 0.8 – 1.2 | < 0.8 | – | – |
| Toxicity | x | CaCo3 | % | 0–5 | 5–10 | 10-25 | – | >25 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Land development and management requirement | | | | | | | | |
| Workability | w' | Slope | % | 0-2 | 2-4 | 4-6 | 4-6 | >6 |
| | | Stones & rocks | Class | <15 | 15–35 | 15–35 | | >35 |
| | | Organic carbon | % (25 cm) | >0.8 | 0.8–0.5 | <0.5 | – | – |
| | | Texture / Structure | Class | L, SCL, SL, CL, SiCL. SiCs, SiL, SC | Cs, Co, LS | C>60s, S | – | Cm, SiCm |
| Potential for mechanization | k | Slope | % | 0-2 | 2-4 | 4-6 | 4-6 | >6 |
| | | Stones & rocks | Class | <15 | 15–35 | 15–35 | | >35 |
| | | Texture / Structure | Class | L, SCL, SL, CL,SiCL. SiCs, SiL,SC | Cs, Co, LS | C>60s, S | – | Cm, SiCm |
| Drainage | d' | Infiltration | cm/h | 0.7–3.5 | 0.3–0.7 3.5–6.5 | 0.1–0.3 6.5–12.5 | – | <0.1 >12.5 |
| | | Depth to ground water | M | >3 | 1.5– 3 | 0.5–1.5 | | <0.5 |
| | | Hydraulic conductivity | M/day | 1.4–3 | 0.5–1.4 | 0.2–0.5 | – | <0.2 >3 |
| Conservation requirement | | | | | | | | |
| Erosion hazard | e | Sheet | Class | No | Slight | Moderate | | Strong |
| | | Slope | % | 0-2 | 2-4 | 4-6 | | >6 |
| | | Gully | Class | None | None | Slight | – | Moderate strong |

**Land use requirements for over head irrigated sesame cultivation, moderate to high input level**

| Land use requirements | | | Unit | Factor Ratings /Range of Suitability /level of yield | | | | |
|---|---|---|---|---|---|---|---|---|
| Land Quality/diagnostic factors | | Land Characteristics | 100 | S1 85 | S2 60 | S3 40 | N1 25 | N 0 |
| Description | Sub class Suffix | | | | | | | |
| Crop requirement | | | | | | | | |
| Climate | c | Mean air temperature for growing cycle | $^0$C | 20-28 | 28-30<br>20-18 | 30-38<br>18-16 | <16, >38 | <14<br>>38 |
| | | Relative humidity | % | <56 | 65-75 | 75-85 | – | – |
| Moisture availability | m | AWC | Mm/m | >180 | 120–180 | 60–120 | – | <60 |
| Oxygen availability | d | Soil Drainage | Class | W–Mw | Sw. ex. – Imperfe. | Poor and aeric | Poor & drainable | Poor not drainable |
| Nutrient retention | n | Organic carbon | % (25 cm) | > 1.2 | 0.8 – 1.2 | < 0.8 | – | – |
| | | CEC | Meq/ 100g soil (50cm) | >16 | >16, <16 | <16 | – | – |
| Nutrient Availability | z | Soil reaction | pH (25cm) | 5.8-7.0 | 5.5 – 5.8<br>7.0 – 7.5 | 5.2 – 5.5<br>7.5 – 8.2 | <5.2, >8.2 | < 5.5<br>>8.2 |
| | | Texture / Structure | Class | L, SCL, SiL, CL, Si,CL, SiC SC, | Cs,Ls, | C>60s, S | – | Cm, SiCm CS |
| Rooting condition | r | Effective soil depth | Cm | >50 | 50- 20 | 20-10 | – | <10 |
| | | Stones and rocks | % | 0-15 | 15–35 | 15–35 | – | >35 |
| | | Texture / Structure/ | Class | L, SCL, SL, CL,SiCL. SiCs, SiL,SC | Cs,Co,LS | C>60s,S | – | Cm, SiCm , |
| | | Compaction (Db) | G/cm–3 | <1.6 | <1.6 | <1.6 | >1.6 | >1.6 |
| | | Organic carbon | % | > 1.2 | 0.8 – 1.2 | < 0.8 | – | – |
| Toxicity | x | CaCo3 | % | 0–5 | 5–10 | 10-25 | – | >25 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Land development and management requirement | | | | | | | | |
| Workability | w' | Slope | % | 0-4 | 4-6 | 6-8 | 8-16 | >16 |
| | | Stones & rocks | Class | <15 | 15–35 | 15–35 | | >35 |
| | | Organic carbon | % (25 cm) | >0.8 | 0.8–0.5 | <0.5 | – | – |
| | | Texture / Structure | Class | L, SCL, SL, CL, SiCL. SiCs, SiL, SC | Cs, Co, LS | C>60s, S | – | Cm, SiCm |
| Potential for mechanization | k | Slope | % | 0-4 | 4-6 | 6-8 | 8-16 | >16 |
| | | Stones & rocks | Class | <15 | 15–35 | 15–35 | | >35 |
| | | Texture / Structure | Class | L, SCL, SL, CL, SiCL. SiCs, SiL, SC | Cs,Co, LS | C>60s, S | – | Cm, SiCm |
| Drainage | d' | Infiltration | cm/h | 0.7–6.5 | 0.3–0.7 6.5–12.5 | 12.5-25 | – | <0.1 >25 |
| | | Depth to ground water | M | >3 | 1.5– 3 | 0.5–1.5 | | <0.5 |
| | | Hydraulic conductivity | M/day | 1.4–3 | 0.5–1.4 | 0.2–0.5 | – | <0.2 >3 |
| Conservation requirement | | | | | | | | |
| Erosion hazard | e | Sheet | Class | No | Slight | Moderate | | Strong |
| | | Slope | % | 0-4 | 4-6 | 6-8 | 8-16 | >16 |
| | | Gully | Class | None | None | Slight | – | Moderate strong |

# APPENDIX 5H: PARTIAL SUITABILITY CLASSES FOR DINGER BEREHA IRRIGATION AREA

Land suitability for surface irrigated onion (allium espa l) cultivation

| Land qualities or land characteristics/ Suffixes | FACTOR RATING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | c | | m | x | d | | n | | Z | | r | | | | | w | | | | k | | | t | | d' | | | f | e | | Final suitability class and sub-class |
| | Climate | | Moisture availability | Toxicity | Oxygen availability | | Nutrient retention | | Nutrient availability | | Rooting condition | | | | | Workability | | | | Potential for mechanization | | | Land preparation & clearance | | Drainage | | | Flood hazard | Erosion hazard | | |
| Land units | t 0c | R. H | AWC (mm/m) | $CaCO_3$ | S.DC | Flo. | OC | CEC | PH | Texture | Depth | Stones | Texture | Com. | OC | Slope | Stones | OC | Texture | Slope | Stones | Texture | Stones | Texture | I.N | D.G.W | H. C | Flo. | Sheet | Slope | |
| *G1b-1* | S2 | S1 | N1 | - | S1 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S1 | S2 | S2 | S1 | S2 | S1 | S2 | S3 | S1 | S1 | S1 | S3 | S2 | S3zd[1] |
| *G1b-4* | S2 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S2 | S1 | S1 | S2 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S2 | S3 zd[1] |
| *G2d-1* | S2 | S1 | N1 | S2 | S1 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S2 | S1 | S1 | S3 | S1 | S1 | S2 | S3 | S1 | S2 | S1 | S2 | S3 | S1 | S1 | S1 | S3 | S3 | S3z wk |
| *G2d-2* | S2 | S1 | S3 | - | S1 | S1 | S1 | S1 | S3 | S2 | S1 | S3 | S2 | S1 | S1 | S3 | S3 | S1 | S2 | S3 | S3 | S2 | S3 | S2 | S3 | S1 | S1 | S1 | S3 | S3 | S3zwk |
| *Sg-6* | S2 | S1 | S3 | - | S1 | S1 | S1 | S1 | S2 | S1 | S2 | S3 | S1 | S1 | S1 | N2 | S3 | S1 | S1 | N2 | S3 | S1 | S3 | S1 | S2 | S1 | S2 | S1 | N1 | N2 | N2wk |
| *U1e-4* | S2 | S1 | N1 | - | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S2 | S1 | S1 | S1 | N1 | S2 | S1 | S1 | N1 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | N1 | N1kw |
| *U1e-5* | S2 | S1 | S3 | - | S1 | S1 | S1 | S2 | S3 | S1 | S2 | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | N1 | N1k |
| *U2f-9* | S2 | S1 | N1 | - | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | N1 | N1 | N1wk |
| *V1b-3* | S2 | S1 | S2 | S1 | S2 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S2 | S1 | S1 | S3 | S1 | S1 | S1 | S3zd[1] |
| *V2a-7* | S2 | S1 | S2 | - | S3 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S2 | S1 | S2 | S3 | S1 | S1 | S1 | S3zdd[1] |
| *V3c-8* | S2 | S1 | N1 | S2 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S1 | S3 | S1 | S1 | S2 | S3 | S1 | S2 | S1 | S2 | S3 | S1 | S1 | S1 | S3 | S3 | S3wk |
| *G3d* | S2 | S1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2 | - | - | - | N2 | - | N2 | - | - | - | - | - | - | - | N2wk |
| *R* | S2 | S | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2w |
| *F&St* | S | S | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N1w |

Land suitability for overhead irrigated onion (allium espa l) cultivation

| Land qualities or land characterstics/ Suffixes | FACTOR RATING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | c | | m | x | d | | n | | z | | r | | | | | w | | | | k | | | t | | d' | | | f | e | | Final suitability class and sub-class |
| | Climate | | Moisture availability | Toxicity | Oxygen availability | | Nutrient retention | | Nutrient availability | | Rooting condition | | | | | Workability | | | | Potential for mechanization | | | Land preparation & clearance | | Drainage | | | Flood hazard | Erosion hazard | | |
| Land units | t 0c | R. H | AWC | CaCO3 | S.DC | Flo. | OC | CEC | PH | Texture | Depth | Stones | Texture | Com. | OC | Slope | Stones | OC | Texture | Slope | Stones | Texture | Stones | Texture | I.N | D.G.W | H. C | Flo. | Sheet | Slope | |
| *G1b-1* | S2 | S1 | N1 | - | S1 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S2 | S3 | S1 | S1 | S1 | S3 | S1 | S3zd[1] |
| *G1b-4* | S2 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S3zd[1] |
| *G2d-1* | S2 | S1 | N1 | S2 | S1 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S1 | S2 | S2 | S1 | S2 | S1 | S2 | S3 | S1 | S1 | S1 | S3 | S2 | S3z wk |
| *G2d-2* | S2 | S1 | S3 | - | S1 | S1 | S1 | S1 | S3 | S2 | S1 | S3 | S2 | S1 | S1 | S2 | S3 | S1 | S2 | S2 | S3 | S2 | S3 | S2 | S3 | S1 | S1 | S1 | S3 | S2 | S3zwk |
| *Sg-6* | S2 | S1 | S3 | - | S1 | S1 | S1 | S1 | S2 | S1 | S2 | S3 | S1 | S1 | S1 | N1 | S3 | S1 | S1 | N1 | S3 | S1 | S3 | S1 | S2 | S1 | S2 | S1 | N1 | N1 | N1wk |
| *U1e-4* | S2 | S1 | N1 | - | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S2 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S3 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S3kw |
| *U1e-5* | S2 | S1 | S3 | - | S1 | S1 | S1 | S2 | S3 | S1 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S3k |
| *U2f-9* | S2 | S1 | N1 | - | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | N1 | N1 | N1wk |
| *V1b-3* | S2 | S1 | S2 | S1 | S2 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S2 | S1 | S1 | S3 | S1 | S1 | S1 | S3zd[1] |
| *V2a-7* | S2 | S1 | S2 | - | S3 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S2 | S1 | S2 | S3 | S1 | S1 | S1 | S3zdd[1] |
| *V3c-8* | S2 | S1 | N1 | S2 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S1 | S2 | S2 | S1 | S2 | S1 | S2 | S3 | S1 | S1 | S1 | S3 | S2 | S3d' |
| *G3d* | S2 | S1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2 | - | - | - | N2 | - | N2 | - | - | - | - | - | - | - | N2wk |
| *R* | S2 | S1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2w |
| *F&St* | S2 | S1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N1w |

Land suitability for surface irrigated beans cultivation

| Land qualities or land characteristics/ Suffixes | FACTOR RATING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | c | | m | x | d | | n | | z | | r | | | | | w | | | | k | | | t | | d' | | | f | e | | Final suitability class and sub-class |
| | Climate | | Moisture availability | Toxicity | Oxygen availability | | Nutrient retention | | Nutrient availability | | Rooting condition | | | | | Workability | | | | Potential for mechanization | | | Land preparation & clearance | | Drainage | | | Flood hazard | Erosion hazard | | |
| Land units | t 0c | R. H | AWC | $CaCO_3$ | S.DC | Flo. | OC | CEC | PH | Texture | Depth | Stones | Texture | Com. | OC | Slope | Stones | OC | Texture | Slope | Stones | Texture | Stones | Texture | I.N | D.G.W | H. C | Flo. | Sheet | Slope | |
| *G1b-1* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S2 | S3d[1]e |
| *G1b-4* | S1 | S2 | S2 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S2 | S1 | S1 | S2 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S2 | S3zd[1] |
| *G2d-1* | S1 | S2 | S3 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S3zwk |
| *G2d-2* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S1 | S1 | S3 | S3 | S1 | S3 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S3zwk |
| *Sg-6* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S3 | S1 | S1 | S1 | N2 | S3 | S1 | S1 | N2 | S3 | S1 | S3 | S1 | S1 | S1 | S2 | S1 | N1 | N2 | N2wk |
| *U1e-4* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S2 | S1 | S1 | S1 | N1 | S2 | S1 | S1 | N1 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | N1 | N1wk |
| *U1e-5* | S1 | S2 | S3 | - | S1 | S1 | S1 | S2 | N1 | S1 | S2 | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | S1 | S3 | S1 | S2 | S1 | S3 | N1 | N1zwk |
| *U2f-9* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | N1 | N1 | N1wk |
| *V1b-3* | S1 | S2 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S3 | S1 | S3 | S1 | S1 | S3 | S1 | S1 | S1 | S3zrw |
| *V2a-7* | S1 | S2 | S2 | - | N1 | S1 | S1 | S1 | S3 | S3 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S3 | S1 | S3 | S1 | S1 | S3 | S1 | S1 | S1 | N1d |
| *V3c-8* | S1 | S2 | S3 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S3 | S3 | S3wkd[1] |
| *G3d* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2 | - | - | - | N2 | - | N2 | - | - | - | - | - | - | - | N2wk |
| *R* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2w |
| *F&St* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N1w |

Land suitability for overhead irrigated beans cultivation

| Land qualities or land characterstics/ Suffixes | FACTOR RATING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | c | | m | x | d | | n | | z | | r | | | | | w | | | | k | | | t | | d' | | | f | e | | Final suitability class and sub-class |
| | Climate | | Moisture availability | Toxicity | Oxygen availability | | Nutrient retention | | Nutrient availability | | Rooting condition | | | | | Workability | | | | Potential for mechanization | | | Land preparation & clearance | | Drainage | | | Flood hazard | Erosion hazard | | |
| Land units | t 0c | R. H | AWC | $CaCO_3$ | S.DC | Flo. | OC | CEC | PH | Texture | Depth | Stones | Texture | Com. | OC | Slope | Stones | OC | Texture | Slope | Stones | Texture | Stones | Texture | I.N | D.G.W | H. C | Flo. | Sheet | Slope | |
| *G1b-1* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S3d1 |
| *G1b-4* | S1 | S2 | S2 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S3zd1 |
| *G2d-1* | S1 | S2 | S3 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S2 | S3zd1 |
| *G2d-2* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S3 | S1 | S1 | S1 | S2 | S3 | S1 | S1 | S2 | S3 | S1 | S3 | S1 | S3 | S1 | S3 | S1 | S3 | S2 | S3zd1 |
| *Sg-6* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S3 | S1 | S1 | S1 | N1 | S3 | S1 | S1 | N1 | S3 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | N1 | N1 | N1wk |
| *U1e-4* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S2 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S3 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S3zwk |
| *U1e-5* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | N1 | S3 | S2 | S1 | S3 | S1 | S1 | S3 | S1 | S1 | S3 | S3 | S1 | S3 | S1 | S3 | S3 | S1 | S1 | S1 | S3 | S3 | N1z |
| *U2f-9* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | N1 | N1 | N1kw |
| *V1b-3* | S1 | S2 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S3 | S1 | S3 | S2 | S1 | S3 | S1 | S1 | S1 | S3zr |
| *V2a-7* | S1 | S2 | S2 | - | N1 | S1 | S1 | S1 | S3 | S3 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S3 | S1 | S3 | S1 | S3 | S1 | S1 | S1 | S1 | N1d |
| *V3c-8* | S1 | S2 | S3 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S2 | S3d1e |
| *G3d* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2 | - | - | - | N2 | - | N2 | - | - | - | - | - | - | - | N2wk |
| *R* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2w |
| *F&St* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N1w |

Land suitability for surface irrigated citrus cultivation

| Land qualities or land characterstics/ Suffixes | FACTOR RATING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | c | | m | x | d | | n | | z | | r | | | | | w | | | | k | | | t | | d' | | | f | e | | Final suitability class and sub-class |
| | Climate | | Moisture availability | Toxicity | Oxygen availability | | Nutrient retention | | Nutrient availability | | Rooting condition | | | | | Workability | | | | Potential for mechanization | | | Land preparation & clearance | | Drainage | | | Flood hazard | Erosion hazard | | |
| Land units | t 0c | R. H | AWC | $CaCO_3$ | S.DC | Flo. | OC | CEC | PH | Texture | Depth | Stones | Texture | Com. | OC | Slope | Stones | OC | Texture | Slope | Stones | Texture | Stones | Texture | I.N | D.G.W | H. C | Flo. | Sheet | Slope | |
| *G1b-1* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S2 | $S3d^1e$ |
| *G1b-4* | S1 | S2 | S2 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S2 | S1 | S1 | S2 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S2 | $S3d^1e$ |
| *G2d-1* | S1 | S2 | S3 | S2 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S3mwk |
| *G2d-2* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S1 | S1 | S3 | S3 | S1 | S3 | S1 | S3 | S1 | S3 | S1 | S3 | S3 | S3wk |
| *Sg-6* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S1 | S1 | N2 | S3 | S1 | S1 | S1 | N2 | S3 | S1 | S1 | N2 | S3 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | N1 | N2 | N2rwk |
| *U1e-4* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S1 | S1 | N1 | S2 | S1 | S1 | N1 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | N1 | N1kw |
| *U1e-5* | S1 | S2 | S3 | - | S1 | S1 | S1 | S2 | S3 | S1 | N2 | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | N1 | N2r |
| *U2f-9* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | N1 | N1 | N1wk |
| *V1b-3* | S1 | S2 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S3 | S1 | S3 | S2 | S1 | S3 | S1 | S1 | S1 | S3zwk |
| *V2a-7* | S1 | S2 | S2 | - | N1 | S1 | S1 | S1 | S3 | S3 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S3 | S1 | S3 | S1 | S3 | S1 | S1 | S1 | S1 | N1d |
| *V3c-8* | S1 | S2 | S2 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S3wk |
| *G3d* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2 | - | - | - | N2 | - | N2 | - | - | - | - | - | - | - | N2wk |
| *R* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2w |
| *F&St* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N1w |

Land suitability for overhead irrigated citrus cultivation

| Land qualities or land characterstics/ Suffixes | FACTOR RATING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | c | | m | x | d | | n | | z | | r | | | | | w | | | | k | | | t | | d' | | | f | e | | Final suitability class and sub-class |
| | Climate | | Moisture availability | Toxicity | Oxygen availability | | Nutrient retention | | Nutrient availability | | Rooting condition | | | | | Workability | | | | Potential for mechanization | | | Land preparation & clearance | | Drainage | | | Flood hazard | Erosion hazard | | |
| Land units | t 0c | R. H | AWC | $CaCO_3$ | S.DC | Flo. | OC | CEC | PH | Texture | Depth | Stones | Texture | Com. | OC | Slope | Stones | OC | Texture | Slope | Stones | Texture | Stones | Texture | I.N | D.G.W | H. C | Flo. | Sheet | Slope | |
| *G1b-1* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S3d[1]e |
| *G1b-4* | S1 | S2 | S2 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S3d[1]e |
| *G2d-1* | S1 | S2 | S3 | S2 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S2 | S3wd[1] |
| *G2d-2* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S3 | S1 | S1 | S1 | S2 | S3 | S1 | S1 | S2 | S3 | S1 | S3 | S1 | S3 | S1 | S1 | S1 | S3 | S2 | S3wd[1] |
| *Sg-6* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S1 | S1 | N2 | S3 | S1 | S1 | S1 | N1 | S3 | S1 | S1 | N1 | S3 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | N1 | N1 | N2r |
| *U1e-4* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S3 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S3wk |
| *U1e-5* | S1 | S2 | S3 | - | S1 | S1 | S1 | S2 | S3 | S1 | N2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | N2r |
| *U2f-9* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | N1 | N1 | N1wk |
| *V1b-3* | S1 | S2 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S3 | S1 | S3 | S1 | S1 | S3 | S1 | S1 | S1 | S3dwk |
| *V2a-7* | S1 | S2 | S2 | - | N1 | S1 | S1 | S1 | S3 | S3 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S3 | S1 | S3 | S1 | S2 | S3 | S1 | S1 | S1 | N1d |
| *V3c-8* | S1 | S2 | S2 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S2 | S3d[1] |
| *G3d* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2 | - | - | - | N2 | - | N2 | - | - | - | - | - | - | - | N2wk |
| *R* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2w |
| *F&St* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N1w |

Land suitability for surface irrigated maize cultivation

| Land qualities or land characterstics/ Suffixes | FACTOR RATING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | c | | m | x | d | | n | | z | | r | | | | | w | | | | k | | | t | | d' | | | f | e | | Final suitability class and sub-class |
| | Climate | | Moisture availability | Toxicity | Oxygen availability | | Nutrient retention | | Nutrient availability | | Rooting condition | | | | | Workability | | | | Potential for mechanization | | | Land preparation & clearance | | Drainage | | | Flood hazard | Erosion hazard | | |
| Land units | t 0c | R. H | AWC | $CaCO_3$ | S.DC | Flo. | OC | CEC | PH | Texture | Depth | Stones | Texture | Com. | OC | Slope | Stones | OC | Texture | Slope | Stones | Texture | Stones | Texture | I.N | D.G.W | H. C | Flo. | Sheet | Slope | |
| *G1b-1* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S3md[1] |
| *G1b-4* | S1 | S2 | S2 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S3z d[1] |
| *G2d-1* | S1 | S2 | S3 | S1 | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | N1z |
| *G2d-2* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S1 | S1 | S3 | S3 | S1 | S3 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | N1z |
| *Sg-6* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S2 | S1 | S2 | S3 | S1 | S1 | S1 | N1 | S3 | S1 | S1 | N1 | S3 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | N1 | N1 | N1wk |
| *U1e-4* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S2 | S1 | S1 | S1 | N1 | S2 | S1 | S1 | N1 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | N1 | N1zk |
| *U1e-5* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | N1 | S1 | S2 | S1 | S3 | S1 | S1 | N1 | S1 | S1 | S3 | N1 | S1 | S3 | S1 | S3 | S3 | S1 | S1 | S1 | S3 | N1 | N1zk |
| *U2f-9* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | N1 | N1 | N1wk |
| *V1b-3* | S1 | S2 | S2 | S1 | S2 | S1 | S1 | S1 | N1 | S2 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S2 | S1 | S1 | S3 | S1 | S1 | S1 | N1z |
| *V2a-7* | S1 | S2 | S2 | - | S3 | S1 | S1 | S1 | N1 | S2 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S3 | S1 | S1 | S1 | N1z |
| *V3c-8* | S1 | S2 | S2 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S3wk |
| *G3d* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2 | - | - | - | N2 | - | N2 | - | - | - | - | - | - | - | N2wk |
| *R* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2w |
| *F&St* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N1w |

Land suitability for overhead irrigated maize cultivation

| Land qualities or land characterstics/ Suffixes | FACTOR RATING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | c | | m | x | d | | n | | z | | r | | | | | w | | | | k | | | t | | d' | | | f | e | | Final suitability class and sub-class |
| | Climate | | Moisture availability | Toxicity | Oxygen availability | | Nutrient retention | | Nutrient availability | | Rooting condition | | | | | Workability | | | | Potential for mechanization | | | Land preparation & clearance | | Drainage | | | Flood hazard | Erosion hazard | | |
| Land units | t 0c | R. H | AWC | $CaCO_3$ | S.DC | Flo. | OC | CEC | PH | Texture | Depth | Stones | Texture | Com. | OC | Slope | Stones | OC | Texture | Slope | Stones | Texture | Stones | Texture | I.N | D.G.W | H. C | Flo. | Sheet | Slope | |
| *G1b-1* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S3zd[1] |
| *G1b-4* | S1 | S2 | S2 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S3zd[1] |
| *G2d-1* | S1 | S2 | S3 | S1 | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S2 | N1z |
| *G2d-2* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S3 | S1 | S1 | S1 | S2 | S3 | S1 | S1 | S2 | S3 | S1 | S3 | S1 | S3 | S1 | S1 | S1 | S3 | S2 | N1z |
| *Sg-6* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S2 | S1 | S2 | S3 | S1 | S1 | S1 | N1 | S3 | S1 | S1 | N1 | S3 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | N1 | N1 | N1wk |
| *U1e-4* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S2 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S3 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | N1zwk |
| *U1e-5* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | N1 | S1 | S2 | S1 | S3 | S1 | S1 | S3 | S1 | S1 | S3 | S3 | S1 | S3 | S1 | S3 | S3 | S1 | S1 | S1 | S3 | S3 | N1z |
| *U2f-9* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | N1 | N1 | N1wk |
| *V1b-3* | S1 | S2 | S2 | S1 | S2 | S1 | S1 | S1 | N1 | S2 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S2 | S1 | S1 | S3 | S1 | S1 | S1 | N1z |
| *V2a-7* | S1 | S2 | S2 | - | S3 | S1 | S1 | S1 | N1 | S2 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S3 | S1 | S1 | S1 | N1z |
| *V3c-8* | S1 | S2 | S2 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S2 | S3m d[1] |
| *G3d* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2 | - | - | - | N2 | - | N2 | - | - | - | - | - | - | - | N2wk |
| *R* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2w |
| *F&St* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N1w |

Land suitability for surface irrigated sesame cultivation

| Land qualities or land characterstics/ Suffixes | FACTOR RATING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | c | | m | x | d | | n | | z | | r | | | | | w | | | | k | | | t | | d' | | | f | e | | Final suitability class and sub-class |
| | Climate | | Moisture availability | Toxicity | Oxygen availability | | Nutrient retention | | Nutrient availability | | Rooting condition | | | | | Workability | | | | Potential for mechanization | | | Land preparation & clearance | | Drainage | | | Flood hazard | Erosion hazard | | |
| Land units | t 0c | R. H | AWC | $CaCO_3$ | S.DC | Flo. | OC | CEC | PH | Texture | Depth | Stones | Texture | Com. | OC | Slope | Stones | OC | Texture | Slope | Stones | Texture | Stones | Texture | I.N | D.G.W | H. C | Flo. | Sheet | Slope | |
| *G1b-1* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S2 | S3zd[1] |
| *G1b-4* | S1 | S2 | S2 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S2 | S1 | S1 | S2 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S2 | S3zd[1] |
| *G2d-1* | S1 | S2 | S3 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S3zwd[1] |
| *G2d-2* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S1 | S1 | S3 | S3 | S1 | S3 | S1 | S3 | S1 | S3 | S1 | S3 | S3 | S3zwk |
| *Sg-6* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S2 | S1 | S3 | S3 | S1 | S1 | S1 | N1 | S3 | S1 | S1 | N1 | S3 | S1 | S3 | S1 | S1 | S1 | S2 | S1 | N1 | N1 | N1wk |
| *U1e-4* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S2 | S1 | S1 | S1 | N1 | S2 | S1 | S1 | N1 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | N1 | N1wk |
| *U1e-5* | S1 | S2 | S3 | - | S1 | S1 | S1 | S2 | N1 | S1 | S3 | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | S1 | S3 | S1 | S2 | S1 | S3 | N1 | N1zwk |
| *U2f-9* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | N1 | N1 | N1wk |
| *V1b-3* | S1 | S2 | S2 | S1 | S2 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S1 | S2 | S2 | S1 | S2 | S1 | S2 | S1 | S1 | S3 | S1 | S1 | S2 | S3zd[1] |
| *V2a-7* | S1 | S2 | S2 | - | S3 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S2 | S1 | S2 | S3 | S1 | S1 | S1 | S3dd[1] |
| *V3c-8* | S1 | S2 | S2 | S2 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S3 | S1 | S2 | S1 | S3 | S3 | S3wkd[1] |
| *G3d* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2 | - | - | - | N2 | - | N2 | - | - | - | - | - | - | - | N2wk |
| *R* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2w |
| *F&St* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N1w |

Land suitability for overhead irrigated sesame cultivation

| Land qualities or land characterstics/ Suffixes | FACTOR RATING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | c | | m | x | d | | n | | z | | r | | | | | w | | | | k | | | t | | d' | | | f | e | | Final class and sub-class |
| | Climate | | Moisture availability | Toxicity | Oxygen availability | | Nutrient retention | | Nutrient availability | | Rooting condition | | | | | Workability | | | | Potential for mechanization | | | Land preparation & clearance | | Drainage | | | Flood hazard | Erosion hazard | | |
| Land units | t 0c | R. H | AWC | $CaCO_3$ | S.DC | Flo. | OC | CEC | PH | Texture | Depth | Stones | Texture | Com. | OC | Slope | Stones | OC | Texture | Slope | Stones | Texture | Stones | Texture | I.N | D.G.W | H. C | Flo. | Sheet | Slope | |
| *G1b-1* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S3zd[1] |
| *G1b-4* | S1 | S2 | S2 | S1 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S3zd[1] |
| *G2d-1* | S1 | S2 | S3 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S2 | S3zd[1] |
| *G2d-2* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S3 | S1 | S1 | S1 | S2 | S3 | S1 | S1 | S2 | S3 | S1 | S3 | S1 | S3 | S1 | S3 | S1 | S3 | S2 | S3zm |
| *Sg-6* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S2 | S1 | S3 | S3 | S1 | S1 | S1 | N1 | S3 | S1 | S1 | N1 | S3 | S1 | S3 | S1 | S1 | S1 | S2 | S1 | N1 | N1 | N1wk |
| *U1e-4* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S2 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S3 | S2 | S1 | S2 | S1 | S3 | S1 | S1 | S1 | S3 | S3 | S3zwk |
| *U1e-5* | S1 | S2 | S3 | - | S1 | S1 | S1 | S2 | N1 | S3 | S3 | S1 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S3 | S1 | S1 | S1 | S1 | S3 | S1 | S2 | S1 | S3 | S3 | N1z |
| *U2f-9* | S1 | S2 | S3 | - | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | N1 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | N1 | N1 | N1wk |
| *V1b-3* | S1 | S2 | S2 | S1 | S2 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S2 | S1 | S1 | S3 | S1 | S1 | S1 | S3zd[1] |
| *V2a-7* | S1 | S2 | S2 | - | S3 | S1 | S1 | S1 | S3 | S2 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S2 | S1 | S2 | S1 | S2 | S3 | S1 | S1 | S1 | S3zd[1] |
| *V3c-8* | S1 | S2 | S2 | S2 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S2 | S1 | S1 | S1 | S1 | S3 | S1 | S2 | S1 | S3 | S2 | Swkd[1] |
| *G3d* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2 | - | - | - | N2 | - | N2 | - | - | - | - | - | - | - | N2wk |
| *R* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N2w |
| *F&St* | S1 | S2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | N1w |

# APPENDIX 5I: AUGER HOLE DESCRIPTIONS (ON CD-ROM)

# APPENDIX 5J: PHOTOGRAPHS

Clearing for crop production

Dense forest being cleared

Deep boring

Dense forest about to be cleared

Rock outcrops and boulders (TORS)

Cleared area ready for cultivation

Trees killed by removal of bark at foot

Mango trees, 10-15 years old. Planted before recent settlement of Harar people

# APPENDIX 5K: ABBREVIATIONS AND USEFUL CODES & DATA BASE

# Keys for Auger and Profile Pit Descriptions at Dinger Bereha

## SITE DESCRIPTION

| Major land form | | Slope % | Rock out crops | | | |
|---|---|---|---|---|---|---|
| W | Flat / Wet land | 0_2 | N | None | 0 | % |
| F | Flat almost flat | 2_4 | V | Very few | 0-2 | % |
| E | Flat Elevated flat land | 2_4 | F | Few | 2-5 | % |
| G | Gently Undulating Plain | 4_6 | C | Common | 5-15 | % |
| V | Valley floor | 0-2 | M | Many | 15-40 | % |
| U | Strongly sloping side | 5_15 | A | Abundant | 40-80 | % |
| S | Moderately steep hill side | >15 | D | Dominant | >80 | % |

## Parent materials, unconsolidated

| | |
|---|---|
| FL | Fluvial deposits |
| AL | Alluvial deposits |
| VA | Volcanic ash |
| OR | Organic deposits |
| CO | Colluvial deposits |
| WE | In situ weathered, residual |
| U | Unknown |

## Slope

| | |
|---|---|
| Percentage | Clinometer measurement |
| Aspect | Direction of Slope |
| Length | Length of slope breaks |

## Slope Form

| | |
|---|---|
| U | Uniform |
| C | Concave |
| V | Convex |
| I | Irregular |

## Drainage Classes

E. Excessively drained - Water is removed from the soil very rapidly. The soils are commonly very coarse textured or rocky shallow or on steep slopes.

S. Somewhat excessively drained- Water is removed from the soil rapidly. The soils are commonly sandy and very pervious.

W. Well drained-. Water is removed from the soil readily but not rapidly. The soils commonly retain optional amounts of moisture, but wetness does not inhibit the growth of roots for significant periods.

M. Moderately well drained- Water is removed from the soil somewhat slowly during some periods of the year. The soils are wet for short periods within the rooting depth. They commonly have an almost impervious layer, or periodically receive heavy rainfall

I. Imperfectly drained- Water is removed slowly so that the soils are wet at shallow depth for significant periods. The soils commonly have an almost impervious layer, a high water table and additions of water by seepage, or very frequent rainfall.

P. Poorly drained- Water is removed so slowly that the soil is wet at a shallow depth for considerable periods the soils commonly have a shallow water table which is usually the result of almost impervious layer seepages or very frequent rainfall.

V. very poorly drained- Water is removed to slowly that the soils are wet at a shallow depth for long periods. The soil have a very shallow water table and are commonly in level or depressed sites or have very high rainfall most days.

## External Drainage

E. Extremely slow: Water ponds at surface. Large parts waterlogged for over 30 days
S. Slow: Water drains slowly; most of terrain is not waterlogged for more than 30 days continuously.
W. Well: Water drains well but not excessively; nowhere does terrain remain waterlogged for a continuous period of >48 hours.
R. Rapid: Excess water drains rapidly, even during periods of prolonged rainfall.
V. Very Rapid: Excess water drains rapidly; the terrain does not support growth of short-rooted plants, even if there is sufficient rainfall.

## Micro topography

GI. Gilgai- Micro- relief produced by expansion and contraction of montmorillonitic clay with changes in moisture; found in Vertisols; in nearly level areas a succession of micro-basins and micro-knolls; on sloping and micro-valleys and micro- ridges parallel to the direction of the slope.
GL. Low Gilgai- Height difference (within 10m) <20 cm
GM. Medium Gilgai- Height difference (within 10m) 20-40 cm
GH. High Gilgai- Height difference (within 10m) >40 cm
AT. Animal tracks.
AB. Animal burrows.
H. Hummocks- Meso-relief (2.5-2.5m) showing a very complex pattern of slopes, extending from somewhat rounded depressions of various sizes to irregular conical knolls or knobs.
R. Ridges- Coverage at least 5 & by parallel, sub parallel, or intersecting usually sharp- crested ridges or elongated narrow elevations
T. Terraced - Level areas <2% slope bounded on one side by a steep slope >2.5m high with flat surface above it.

## Surface coarse fragments (cm)

| | |
|---|---|
| F | Fine gravel 0.2-0.6 |
| M | Medium gravel 0.6-2.0 |
| C | Coarse gravel 2-10 |
| S | Stones 10-20 |
| B | Boulders 20-60 |
| L | Large boulders 60-200 |
| FM | Fine and medium gravel |
| MC | Medium and coarse gravel |
| FC | Fine to coarse gravel |
| SB | Stones and boulders |

## Type of erosion

N- None
B- River bank erosion
C - Undercutting
S- Sheet and splash
R. Rill
G- Gully
T- Tunnel
U- Unknown.

## Other Erosion and Deposition

P-Deposition
A- Active erosion
W-Water and wind
R.-Active in recent past
H- Active in historical times
U-Period of activity unknown

## Area affected by erosion

1- 0-5%
2- 5-10%
3-10-25%
4- 25-50%
5- >50%

## Soil Depth

| | | |
|---|---|---|
| Vd | 0_25 | Very Shallow |
| S | 25_50 | Shallow |
| M | 50_100 | Deep |
| D | 100_125 | Very Deep |

## Mottling

Abundance

| | | | |
|---|---|---|---|
| N | None | 0 | % |
| V | Very few | 0-2 | % |
| F | Few | 2-5 | % |
| C | Common | 5-15 | % |
| M | Many | 15-40 | % |
| A | Abundant | 40-80 | % |
| D | Dominant | >80 | % |

## Size

| | | | |
|---|---|---|---|
| V | Very fine | <2 | mm |
| F | Fine | 2-6 | mm |
| M | Medium | 6-20 | mm |
| C | Coarse | >20 | mm |

## Contrast

| | | |
|---|---|---|
| F | Faint | The mottles are evident only on close examination. Soil colors in both the matrix and mottles have closely related hues, chromas and values. |
| D | Distinct | Although not striking, the mottles are ready seen. The hue chroma or values of the matrix are easily distinguished from those of the mottles. |
| P | Prominent | The mottles are conspicuous and mottling is one of the outstanding features of the horizon. |

## Boundary

| | | | |
|---|---|---|---|
| S | Sharp | 0-0.5 | mm |
| C | Clear | 0.5-2 | mm |
| D | Diffuse | >2 | mm |

## Colours: As per Munsell colour charts

## Soil Textural Classes

C - Clay
L - Loam
CL - Clay Loam
SL - sandy Loam
SIC- Silty Clay
SICL - Silty Clay Loam
SIL - Silt Loam
SC - Sandy Clay
SCL- Sandy Clay Loam
SL - Sandy Loam
FSL- Fine Sandy Loam
LS - Loamy Sand
LVFS- Loamy very Fine Sand
LFS - Loamy fine Sand
VFS- Very Fine sand
FS - Fine sand
MS- Medium Sand
CS - Coarse sand
US- Unsorted sand
S - Unspecified sand

## Consistence when dry

LO- Loose
SO- Soft
SHA- Slightly hard
HA- Hard
VHA- Very hard
EHA- Extremely hard
SSH- Soft to slightly hard
SHH- Slightly hard to hard

## Consistence when moist

LO- Loose
VFR- Very friable
FI- Firm
VFI- Very firm
EF - Extra firm
FVF- Firm to very firm
VFF - Very friable to firm
FRF- Friable to firm

## Consistence when wet

NST- Non sticky
SST- Slightly sticky
ST- Sticky
VST- Very sticky
SSS - Slightly sticky to sticky
SVS - Sticky to very sticky

## Plasticity

NPL- Non-plastic
SPL - Slightly plastic
PL- Plastic
VPL- Very plastic
SSP- Slightly plastic to plastic
PVP- Plastic to very plastic

## Soil Cutanic Features

Abundance

| | | |
|---|---|---|
| N | None | |
| P | Patchy | Small scattered patches of cutan |
| B | Broken | Cutans cover much but not all pore or ped faces |
| C | Continuous | Cutans cover entire ped faces or line pores and channels |

Contrast

| | | |
|---|---|---|
| F | Faint | Surface of cutan shows little contrast in colour, smoothness or any other property to the adjacent surface. Any lamellae are <2 mm thick. |
| D | Distinct | Surface of cutan is distinctly smoother or different in colour than the adjacent different in colour than the adjacent different in colour tha the adjacent surface. Any lamellae are between 2 & 5 mm thick. |
| P | Prominent | Surface of cutan contrast strongly in smoothness or colour with adjacent surface. Outlines of the sand grains are not visible. Any lamellae are > 5mm. |

Nature of Cutans

| | | |
|---|---|---|
| C | Clay cutans | Coating of clay. Field criteria are observed thickness, an abrupt boundary between the coating and the interior of the ped, as seen in cross section on a broken surface and a waxy luster when observed in reflected light |
| PF | Pressure faces | Pressure faces or stress cutans are formed when peds press against each other during soil wetting. Ped surface is smooth. When peds press against each other during and coating has no observable thickness. |
| S | Slickensides | Special type of stress cutan. A slickenside is is smoothed surface with parallel striae and grooves |
| SF | Shiny faces | (as in nitic properties) |

## Carbonates

| | | |
|---|---|---|
| N | Non- calcareous | No detectable or audible effervescence |
| SL | Slightly calcareous | Audible effervescence but not visible |
| MO | Moderately calcareous | Visible effervescence |
| ST | Strongly calcareous | Strong visible effervescence (bubbles) |
| EX | Extremely calcareous | Extremely strong reaction (thick loam) |

## Cementation and Compaction

Grade

| | |
|---|---|
| N | Non-cemented and non-compacted; neither cementation nor compaction observed (slakes in water) |
| Y | Compacted: compacted mass is appreciably harder or more brittle than other comparable soil mass (slakes in water). |
| W | Weakly cemented: cemented mass is brittle and hard, but can be broken in the hands. |
| M | Moderately cemented: cemented mass cannot be broken in the hands - but is discontinuous (less than 90% of soil mass). |
| C | Cemented: cemented mass cannot be broken in the hands & is discontinuous (>90% soil mass) |

## Structure

| | | |
|---|---|---|
| N | None | The structure is massive without recognizable orientation. |
| P | Platy | The compacted or cemented parts are plate- like and have a K K (sub) horizontal orientation |
| V | Vesicular | The layer has large, equidimensional voids which may be filled with uncemented material |
| P | Pisolithic | Thelayer is constructed from cemented speherical nodules. |
| D | Nodular | The layer is largely constructed from cemented bodies or irregular shape. |

## Pores. Abundance (Per $dm^2$)

| | | Very fine/fine | Medium/coarse |
|---|---|---|---|
| N | None | 0 | 0 |
| V | Very few | 1-20 | 1-2 |
| F | Few | 20-50 | 2-5 |
| C | Common | 50-200 | 5-20 |
| M | Many | > 200 | >20 |

## Size (diameter) for elongate or tubular voids

| | |
|---|---|
| F | Fine |
| M | Medium |
| C | Coarse |
| FM | Fine and medium |
| MC | Medium and medium |
| FC | Fine to coarse |

## Mineral Nodules: Abundance by volume as class for Mottling

Colour: as for mottling
Classes as for Mottling

Hardness

| | | |
|---|---|---|
| H | Hard | Cannot be broken in the fingers. |
| S | Soft | Can be broken between forefinger and thumb nail. |
| B | Both hard and soft | |

Nature

Mineral classes as for cementation

Kind

| | | |
|---|---|---|
| C | Concretion | A discrete body with a concentric internal structure. |
| S | Segregation | Differs from the surrounding soil mass in colour and composition but is easily separated as a discrete body. |
| N | Nodule | A discrete body without any internal organization. |

Horizon Boundary

| Width | | | Code | Topography |
|---|---|---|---|---|
| A | Abrupt | Boundary less than 2cm | S | Smooth |
| C | Clear | Boundary 2_5cm | W | Wavy |
| G | Gradual | Boundary5_12 | I | Irregular |
| D | Diffuse | Boundary >12cm | B | Broken |

LAND COVER & LAND USE

LAND COVER

| Major class | Sub-Class | Code |
|---|---|---|
| SETTLEMENT | Village Tukul | ST |
| CULTIVATED LAND | | CL |
| | Intensively cultivated land | CL2 |
| | Predominantly cultivated | CL3 |
| | Moderately cultivated | CL4 |
| | Sparsely cultivated | CL5 |
| | Perennial crop cultivated | CL6 |
| FOREST LAND | | FL |
| | Dense coniferous high forest | FL1 |
| | Dense mixed high forest | FL2 |
| | Disturbed high forest | FL3 |
| WOOD LAND | | WL |
| | Dense Woodland | WL1 |
| | Open Woodland | WL2 |
| RIPARIAN WOOD LANDS | | RL |
| BUSH LANDS | | BL |
| | Dense bush land | BL1 |
| | Open bush land | BL2 |
| SHRUB LANDS | | SL |
| | Dense shrub land | SL1 |
| | Open shrub land | SL2 |
| GRASS LANDS | | GL |
| | Open grass land | GL1 |
| | Bushed shrub grass land | GL2 |
| | Wood grass land | GL3 |
| WET LANDS | | WEL |
| | Perennial swamp | WEL1 |
| | Perennial marsh | WEL2 |
| | Seasonal swamp | WEL3 |
| | Seasonal marsh | WEL4 |
| BARELAND | | BA |
| | Exposed rock surface | BA1 |
| | Exposed sand and soil surface | BA2 |
| | Exposed sand and soil surface | BA3 |
| WATER BODY | | WB |
| Other (specify) | If there is any observation | OB |

LAND USE

| Major class | Sub-Class | Code |
|---|---|---|
| SETTLEMENT | | ST |
| | Shifting cultivation | CA1 |
| | Fallow sys. cultivation | CA2 |
| | Lay system cultivation | CA3 |
| | Rain fed arable cultivation | CA4 |
| | Wet rice cultivation | CA5 |
| | Irrigated cultivation | CA6 |
| | Non- Irrigated | CP1 |
| | Irrigated tree crop cultivation | CP2 |
| ANIMAL | Nomadic | HE1 |
| HUSBANDRY | Semi-nomadic | HE2 |
| | Ranching | HE3 |
| | Animal production | HH |
| FORESTRY | Exploitation of natural forest | F |
| MIXED FARMING | | MF |
| EXTRACTION | Timber production | EX1 |
| | Wood collection | EX2 |
| | Charcoal production | EX3 |
| HUNTING & FISHING | | EH |