

Appendix 1: Mean Annual Rainfall of selected gauge stations

| Stations | mean annual RF (mm) | class |
|--------------|---------------------|---------|
| Aykel | 1628 | class-1 |
| Gonder | 1103 | class-1 |
| Amba giorgis | 976 | class3 |
| Maksegnit | 1096 | class-3 |
| Chewahit | 1020 | class-4 |
| Gorgora | 1085 | class-4 |

Appendix 2: Selected Weather Stations and their Respective Locations

| Station | latitude (degree) | longitude (degree) | Elevation a.s.l (m) | X-Coordinate (m) | Y-Coordinate (m) |
|--------------------|-----------------------|-----------------------|------------------------|---------------------|---------------------|
| Gorgora | 121500 | 371800 | 1830 | 315087 | 1354781 |
| Aykel | 123223 | 370331 | 2254 | 289055 | 1387012 |
| Ambagiorgis | 124600 | 373600 | 2900 | 348028 | 1411743 |
| Chewahit | 122007 | 371342 | 1925 | 307352 | 1364265 |
| Gonder | 123116 | 372555 | 1973 | 329618 | 1384684 |
| Maksegnit | 122318 | 373318 | 1912 | 342912 | 1369920 |

Appendix 3: Values of Soil parameters used for the study area

| SNAM | Haplic Nitisols | | | | Chromic Luvisols | | | | | | | |
|------------|-----------------|------|------|------|------------------|------|------|------|-----|------|------|--|
| NLAYERS | 4 | | | | 7 | | | | | | | |
| HYDGRP | C | | | | B | | | | | | | |
| SOL_ZMX | 2000 | | | | 1800 | | | | | | | |
| ANION_EXCL | 0.01 | | | | 0.01 | | | | | | | |
| SOL_CRK | 0.01 | | | | 0.01 | | | | | | | |
| TEXTURE | SICL | CL | SC | C | SIL | SIL | SIL | SILL | SIL | SIL | SIL | |
| SOL_Z | 200 | 900 | 1000 | 2000 | 200 | 260 | 460 | 650 | 950 | 1350 | 1800 | |
| SOL_BD | 1.1 | 1.27 | 1.28 | 1.22 | 1.45 | 1.46 | 1.45 | 1.49 | 1.5 | 1.49 | 1.47 | |
| SOL_AWC | 0.11 | 0.11 | 0.1 | 0.11 | 0.12 | 0.11 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | |
| SOL_K | 4.34 | 4.54 | 5.16 | 4.24 | 7 | 37.2 | 34.8 | 33.6 | 36 | 36 | 36 | |
| SOL_CBN | 2 | 1.5 | 1.3 | 0.5 | 0.5 | 0.3 | 0.21 | 0.2 | 0.2 | 0.12 | 0.1 | |
| CLAY | 50 | 23 | 60 | 71 | 25 | 14 | 19 | 22 | 17 | 17 | 16 | |
| SILT | 33 | 50 | 25 | 20 | 31 | 66 | 59 | 56 | 57 | 57 | 59 | |
| SAND | 17 | 27 | 15 | 9 | 44 | 20 | 22 | 22 | 26 | 26 | 25 | |
| ROCK | 5 | 0 | 0 | 0.13 | 0.01 | 0 | 0 | 0 | 0 | 0 | 0 | |
| SOL_ALB | 0.13 | 0.13 | 0.13 | 0.22 | 0.13 | 0.13 | 0.13 | 0.13 | 0.1 | 0.13 | 0.13 | |
| USLE_K | 0.22 | 0.22 | 0.22 | 0.22 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | |

| SNAM | Eutric Leptosols | | Urban | | | Eutric Vertisols | | | | | | |
|----------------|-------------------------|------------|--------------|-------------|------------|-------------------------|-----------|------------|------------|------------|------------|----------|
| NLAYERS | 2 | | 3 | | | 7 | | | | | | |
| HYDGRP | C | | D | | | D | | | | | | |
| SOL_ZMX | 650 | | 1500 | | | 2422 | | | | | | |
| ANION_EXCL | 0.01 | | 0.01 | | | 0.01 | | | | | | |
| SOL_CRK | 0.01 | | 0.01 | | | 0.03 | | | | | | |
| TEXTURE | CL | SCL | SIL | SICL | SIC | CL | CN | SIL | CNV | FSL | UWB | C |
| SOL_Z | 200 | 650 | 280 | 737 | 1500 | 250 | 363 | 847 | 1029 | 1392 | 1635 | 2422 |
| SOL_BD | 1.1 | 1.13 | 1.13 | 1.45 | 1.6 | 1.08 | 1.27 | 1.28 | 1.22 | 1.13 | 1.1 | 1.1 |
| SOL_AWC | 0.13 | 0.1 | 0.22 | 0.11 | 0.16 | 0.12 | 0.11 | 0.1 | 0.1 | 0.1 | 0.11 | 0.09 |
| SOL_K | 25 | 13 | 6.6 | 10.7 | 5.33 | 6.8 | 4.54 | 5.16 | 4.24 | 4.34 | 4.24 | 4.04 |
| SOL_CBN | 2 | 1.1 | 1.49 | 1.02 | 0.15 | 1.6 | 1.37 | 1.41 | 0.88 | 1.17 | 1.24 | 0.34 |
| CLAY | 50 | 66 | 26.5 | 37.5 | 45 | 53.6 | 60.6 | 62.6 | 62.8 | 62.6 | 60 | 63.6 |
| SILT | 34 | 14 | 20 | 55 | 47.6 | 25.7 | 18.6 | 17 | 8.4 | 9.4 | 12.7 | 16.6 |
| SAND | 17 | 20 | 23.5 | 7.47 | 7.37 | 20.7 | 20.8 | 20.4 | 28.8 | 28 | 27.3 | 19.8 |
| ROCK | 5 | 0.01 | 1.09 | 0.08 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SOL_ALB | 0.13 | 0.13 | 0.13 | 0.03 | 0.17 | 0.13 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 |
| USLE_K | 0.22 | 0.22 | 0.32 | 0.49 | 0.49 | 0.23 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |

Appendices 4: Definition of Weather Generator statistical parameters

| | |
|-----------------|---|
| tmpmx | Average or mean daily maximum air temperature for month (°C) |
| tmpmn | Average or mean daily minimum air temperature for month (°C) |
| tmpstdmx | Standard deviation for daily maximum air temperature in month(°C) |
| tmpstdmn | Standard deviation for daily minimum air temperature in month(°C) |
| pcpmm | Average or mean total monthly precipitation (mm H ₂ O) |
| pcpstd | Standard deviation for daily for daily precipitation in month(mmH ₂ O/day) |
| pcpskw | Skew coefficient for daily precipitation in month |
| pr_w(1) | Probability of a wet day following a dry day in month |
| pr_w(2) | Probability of a wet day following a wet day in month |
| pcpd | Average number of days of precipitation in month |
| solarav | Average daily solar radiation for month(MJ/m ² /day) |
| dewpt | Average daily dew point temperature in month(°C) |
| windav | Average daily wind speed in month(m/s) |

Appendix 5: Weather generator statistics and probability values of Gonder Station

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-----------------|-------|-------|-------|-------|-------|--------|--------|--------|--------|-------|-------|-------|
| tmpmx | 28.21 | 29.83 | 30.28 | 30.38 | 29.17 | 25.70 | 23.15 | 23.36 | 25.45 | 26.78 | 27.53 | 27.71 |
| tmpmn | 11.41 | 12.90 | 13.99 | 15.00 | 14.69 | 13.70 | 13.07 | 13.03 | 12.45 | 12.08 | 11.78 | 11.42 |
| tmpstdmx | 1.35 | 1.48 | 1.99 | 2.03 | 2.36 | 2.04 | 1.57 | 1.53 | 1.51 | 1.36 | 1.18 | 0.96 |
| tmpstdmn | 2.40 | 2.76 | 3.07 | 3.12 | 3.50 | 2.65 | 2.62 | 2.49 | 2.53 | 2.55 | 2.58 | 2.26 |
| pcpmm | 3.65 | 3.11 | 14.18 | 31.67 | 88.26 | 191.86 | 329.81 | 318.89 | 116.46 | 88.16 | 21.21 | 8.50 |
| pcpstd | 1.15 | 0.87 | 2.46 | 3.41 | 6.67 | 10.50 | 11.69 | 11.38 | 6.97 | 7.93 | 3.12 | 2.06 |
| pcpskw | 12.59 | 10.78 | 11.74 | 5.77 | 3.87 | 3.02 | 2.10 | 2.02 | 2.84 | 4.45 | 6.82 | 11.57 |
| pr_w(1) | 0.02 | 0.03 | 0.09 | 0.16 | 0.28 | 0.59 | 0.91 | 0.84 | 0.42 | 0.25 | 0.09 | 0.04 |
| pr_w(2) | 0.25 | 0.20 | 0.31 | 0.49 | 0.58 | 0.73 | 0.92 | 0.90 | 0.59 | 0.46 | 0.36 | 0.32 |
| pcpd | 0.76 | 0.95 | 3.52 | 6.86 | 12.33 | 20.43 | 28.38 | 27.71 | 15.71 | 10.14 | 3.81 | 1.62 |
| solarav | 9.34 | 9.08 | 7.95 | 7.72 | 7.23 | 4.78 | 4.42 | 5.14 | 6.99 | 7.75 | 8.35 | 9.02 |
| dewpt | 10.20 | 9.76 | 10.63 | 11.25 | 13.65 | 16.20 | 16.92 | 16.79 | 16.53 | 14.68 | 12.56 | 10.79 |
| windav | 1.51 | 1.68 | 1.73 | 1.73 | 1.73 | 1.72 | 1.30 | 1.26 | 1.26 | 1.22 | 1.24 | 1.41 |