# Avocados.

Avocados are shallow to moderately rooted, 80 - 90 % of their roots are found in the upper 60 cm of the soil. In Cameroon 65 – 80 % of the roots were found to be in the top 15 cm of the soil (Acland, 1972). The crop is grown in areas which receive 1800 mm of annual rainfall. Avocados are also grown in areas which receive 665 – 1475 mm annual rainfall. Temperature requirements range from 12.8 to 28.3oC. Soils should be light textured, like sandy loam and at least one meter deep. An impervious layer or water table within 90 cm of the surface will cause the trees to die in a few years due to water logging which limits oxygen availability to the roots. Preferred pH range is 5.0 - 7.0. Avocados are sensitive to salinity and sodicity.

**Moisture holding capacity (mhc)**

The soil moisture holding capacity was rated using soil texture (Table 1).

**Table 1: Rating soil moisture holding capacity rating**

|  |  |  |
| --- | --- | --- |
| Rating | Class | Texture description |
| 1 | Very High | clay, clay loam, Loam |
| 2 | High | Sandy clay loam |
| 3 | Moderate | Sandy clay |
| 4 | Low | Loamy sand, Sandy loam |
| 5 | Very low | Sand |

**Susceptibility to erosion (Eh)**

Susceptibility to erosion is generally determined by slope steepness and slope length. Slope steepness however is the main determinant of susceptibility of land to erosion, irrigation and the type of irrigation method to be use. Table 2 shows the slope rating and the expected vulnerability to erosion.

**Table 2: Rating slope steepness**

|  |  |  |
| --- | --- | --- |
| **Rating** | **Slope %** | **Description** |
| 1 | 0 – 2 | Very low |
| 2 | 2 – 5 | Low |
| 3 | 5-8 | Moderate |
| 4 | 8-16 | High |
| 5 | 16-30 | Very high |
| 6 | >30 | Extremely high |

**Oxygen availability (oa)**

Oxygen availability to the plant roots is essential for root respiration. This land quality was reflected by rating soil drainage classes (Table 3).

**Table 3: Rating soil drainage for oxygen availability**

|  |  |  |
| --- | --- | --- |
| **Rating** | **Class (oa)** | **Drainage class** |
| 1 | Very High | Excessively and somewhat excessively drained |
| 2 | High | Well drained |
| 3 | Moderate | Moderately well drained |
| 4 | Low | Imperfectly drained |
| 5 | Very low | Poorly drained |

**Availability of foothold (af)**

Soil depth was used to rate the availability of foothold. The depth of the soils in each of the soil mapping units was considered in the evaluation of availability of foothold. The classification of soil depth is as shown in table 4.

**Table 4: Rating rooting depth**

|  |  |  |
| --- | --- | --- |
| **Rating** | **Depth to limiting layer (cm)** | **Class name** |
| 1 | > 120 | Very deep |
| 2 | 80-120 | Deep |
| 3 | 50-80 | Moderately deep |
| 4 | 25-50 | Shallow |
| 5 | < 25 | Very shallow |

**Salinity hazard (sa)**

Salinity hazard is normally given with reference to data on electrical conductivity of saturated soil paste (Ece). Ece measurements are used as indications of total quantities of soluble salts in soils. Since the laboratory data available is for electrical conductivity (EC) (1:2.5 soil-water ratio) the approximate corresponding EC2.5 values were used to rate this land quality (Table 5).

**Table 5: Rating salinity hazard**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rating | Class name | Ece mS cm | Approximate corresponding EC2.5 mS cm | Crop reaction |
| 1 | Non saline | 0 – 4 | 0 – 1.2 | Mostly negligible |
| 2 | Slightly saline | 4 – 8 | 1.2 – 2.5 | Negligible except for the most sensitive plants |
| 3 | Moderate saline | 8 – 15 | 2.5 – 5.0 | Yields of many crops restricted |
| 4 | Strongly saline | 15 – 30 | 5.0 – 10.0 | Only very tolerant crops yield satisfactorily |
| 5 | Excessively saline | > 30 | > 10.0 |

**Sodicity hazard (so)**

The presence of excessive amount of exchangeable sodium in soil promotes the dispersion and swelling of clay minerals. The soil becomes impermeable to both air and water. The infiltration and hydraulic conductivity decrease to the extent that little or no water movement occurs. The soil is plastic when wet and becomes hard (brick-like) when dry. Tillage becomes difficult and soil crusting occurs.

Sodicity has therefore two distinct effects on crops. Firstly through direct toxicity of the sodium ion and secondly through destruction of soil structure by giving rise to massive or coarse columnar structure and low permeability. The exchangeable sodium percentage (ESP) is used for the rating as shown in table 6.

**Table 6: Rating sodicity hazard**

|  |  |  |  |
| --- | --- | --- | --- |
| Rating | Class name | ESP % | Plant growth |
| 1 | Non sodic | 0 - 6 | Not affected |
| 2 | Slightly sodic | 6 – 10 | Some stunted growth |
| 3 | Moderately sodic | 10 – 15 | Most plants show injury |
| 4 | Strongly sodic | 15 – 40 | Few plants survive |
| 5 | Excessively sodic | >40 | Bare ground |

**Temperature regimes**

Plants vary greatly in their temperature requirements. Growth ceases below a critical temperature, varying with the plant, but typically below 6.5°C. The rate of growth varies with temperature. Adverse effects of high temperatures only occur for most plants above 30° - 35°C. The ratings are as in table 7.

Table 7: Rating of land quality temperature (use 1st column only)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Rating | Mean annual  Temp. 0 C | Mean maximum temp. | Mean minimum temp. | Absolute minimum temp. | Changes of night frost |
| 1 | 24 – 30 | 30-36 | 18-24 | 10-16 | None |
| 2 | 22 – 24 | 28-30 | 16-18 | 8-10 | None |
| 3 | 20 – 22 | 26-28 | 14-16 | 6-8 | None |
| 4 | 18 – 20 | 24-26 | 12-14 | 4-6 | None |
| 5 | 16 –18 | 22-24 | 10-12 | 2-4 | very rare |
| 6 | 14 – 16 | 20-22 | 8-10 | 0-2 | Rare |
| 7 | 12 – 14 | 18-20 | 6-8 | -2 to 0 | Occasional |
| 8 | 10 – 12 | 16-18 | 4-6 | -4 to –2 | Common |
| 9 | < 10 | < 16 | < 6 | < -4 | very common |

**(Source A. Weeda, 1987)**

**Soil pH**

Table 8: **Nutrient retention (nr)**

Soil pH

|  |  |
| --- | --- |
| Rating | pH levels |
| 1 | 6.5-7.5 |
| 2 | 5.5-6.0, 7.5-8.0 |
| 3 | 5.0-5.5, 8.0-8.5 |
| 4 | <5.0, >8.0 |

**Moisture availability (MoA)**

Besides moisture storage capacity for rainfed agriculture it is necessary to evaluate rainfall availability in order to see whether it meets the crop requirements. Agro-climatic zones are used to rate moisture availability (Table 9).

**Table 9: Rating of moisture availability**

|  |  |  |  |
| --- | --- | --- | --- |
| **Rating** | **Description** | **ACZ** | **Name** |
| 1 | Very high | I | Humid |
| 2 | High | II | Sub humid |
| 3 | Moderate | III | Semi humid |
| 4 | Low | IV | Semi humid to semi-arid |
| 5 | Very low | V | Semi-arid |
| 6 | Extremely low | VI | Arid |

**Suitability class - defining criteria**

Crops/plants have different land use requirements. These are rated according to the land qualities selected for the area. Table below shows the land use requirements (Conversion table) for Avocado crop for a given land quality (Kamoni, 1987).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Crop | Suitability class | Availability of Oxygen | Rooting depth | Salinity hazard  (Ece) | pH | Sodicity hazard (ESP) | MHC | Slope | temp | Rainfall (MoA) |
| Avocado | S1  S2  S3  NS | 1, 2  3  4  5 | 1,2  3  4  5 | 1  2  3  4, 5 | 5-7  4.5-5,7-7.5  4-4.5,7.5-8  >8 | 1  2  3  4, 5 | 1  2  3  4,5 | 1,2  3  4  5 | 3,4  2,5  1,6  7,8,9 | 1,2  3  4  5,6 |