Abstract:

Water flow and storage within the root zone constrains water availability and use in rain-fed crop production, especially in the dryland cropping systems, where farmers are resource-strained and are not motivated to practice soil and water management. A study was carried out in eastern Uganda (34° 0' E and 1° 40' N) to: a) evaluate the effect of tillage and cropping systems on soil water storage, b) establish the water use efficiency in cassava-sorghum based cropping systems, c) examine the fanners' perceptions and understanding of soil moisture availability and establish whether knowledge/competences on soil moisture availability is used in planning cropping cycles in the cassava-sorghum cropping systems. A field experiment was laid out in a randomised complete block design (RCBD) consisting of two tillage practices (mouldboard ploughing and ripping) and six cropping systems; i.e. i) sole cassava, ii) sole sorghum, iii) sole cowpea, iv) cassava + sorghum, v) cassava +cowpea, vi) sorghum + cowpea comprised the treatments and were replicated three times. Soil surface roughness was measured immediately after ploughing and two months later. Soil moisture content was measured fortnightly at 0-10 and 20-40cm depths. Evapotranspiration (ET) was estimated using the soil water balance approach. Yield of each crop was recorded at the end of each growing period. Water use efficiency (WUE) (kg ha" mm") was calculated as a ratio of yield (kg ha-I) to ET (mm). A household-level survey was designed to collect responses on household, production and field management characteristics and, knowledge on soil and water management in the cassava-sorghum cropping systems. Soil moisture content was higher under ripping than mouldboard ploughing but, the upper (0- lOcm) layer had more moisture under mouldboard ploughing, while ripping accumulated more moisture in the lower (20-40cm) layer of the root zone. Soil surface roughness did not differ two months after mouldboard ploughing giving rise to a relatively negligible surface runoff. Water use efficiency (WUE) varied significantly (a= 0.05) between cropping systems with the highest observed in cassava (34.38kg ha-I mm") while the lowest was 3.76kg ha-I mm-I for sorghum. In both tillage practices WUE did not differ appreciably .. Also, ET varied (a= 0.05) between cropping systems but was similar in both mouldboard and ripper ploughed plots. Cassava + cowpea intercrop under mouldboard ploughing gave the best cassava yield (20,023 kg ha"), however tillage practice did not significantly (a = 0.05) affect the yield in sole cassava treatments. Cowpea yield was higher (8,397 kg ha') under mouldboard ploughing than ripper ploughing (5,771 kg ha'). Sorghum yield was highest (1679 kg ha-1) under ripper ploughing while the lowest was observed in sorghum + cowpea intercrop under mouldboard ploughing. The change in soil moisture content was more negative in the mouldboard ploughed plots than in ripped plots specifically for sole cassava (-4.215 mm) cassava + cowpea (-4.736 mm). The household is a major source of labour for the cassava and sorghum farms with 53.8 % of the households offering 4-6 persons to work on the farms. Up to 28% of the households did not offer anyone for off-farm labour. Labour and knowledge at household level was used to manage the land and most households derived their livelihood from exploiting land. Up to 65 and 59% of the farmers allocated a quarter of their land to sorghum and cassava respectively. Farmers viewed soil and water management to have long term benefits, reduce soil erosion, and likely to increase yields on the farm. Fanners' positively exploited their competence in using crop rotation plans, selecting the right seed and evaluating the soil fertility status on field. However, the competence in detecting water stress in crops and altering crop spacing to manage soil moisture was not utilized when planning cassava-sorghum cropping cycles.