

South Africa Research Update

Tim Motis

Does a planting basin, like a zai pit, make much of a difference in soil moisture on a sandy soil? Because water leaches through sand rather quickly, you might expect that planting depressions would not have a significant impact on soil moisture. With the soil in ECHO research plots in South Africa being comprised of 87% sand, it was important for us to address this.

To do so, we measured volumetric water content (VWC) over time, to a 12 cm depth in the zai pits. Within a given amount of soil, VWC is the ratio of the volume of water to the total soil volume. Expressed in terms of percent, the VWC at saturation will equal the percentage of the soil that is pore space. The VWC of a saturated soil is typically around 50%.

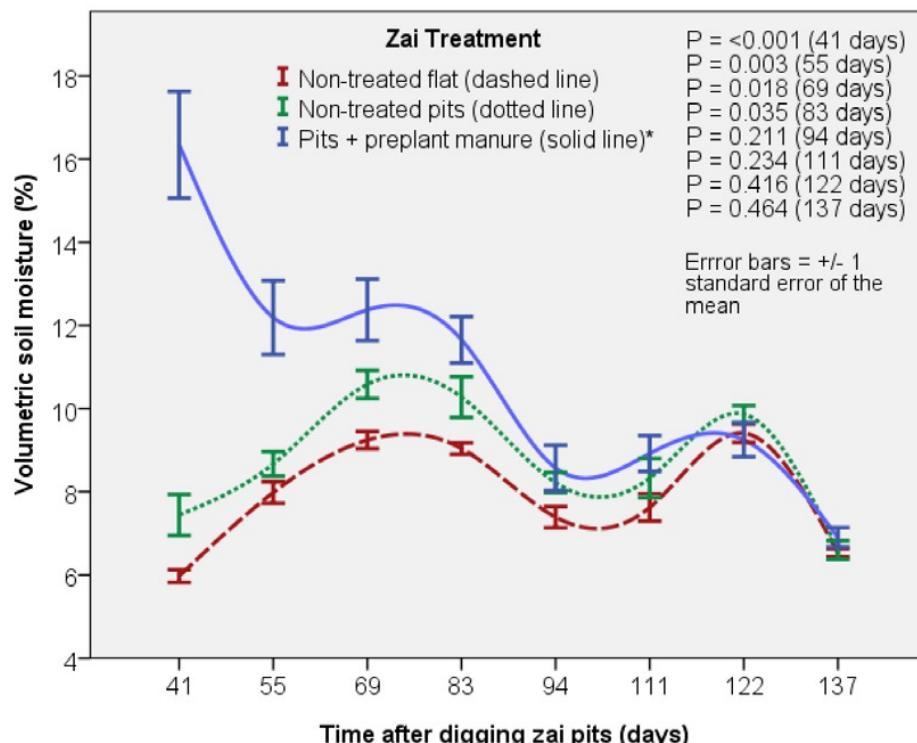
Overall, the growing season was dry, with only 485 mm of rain received. Even with 111 mm of supplemental irrigation, limited primarily to early-season applications to ensure sorghum seed germination and crop establishment, the combined amount of water (596 mm) was consistent with semi-arid conditions [in which annual rainfall averages as high as 700 mm (CASL, 2006. Arid and Semi-arid lands: characteristics and importance. Community Adaptation and Sustainable Livelihoods)].

The data are summarized in Figure 5, which shows soil moisture with 1) non-manured flat ground, 2) non-manured zai pits, and 3) manured zai pits. A few key points are: Even though soil moisture tended to be higher with non-manured pits than non-manured flat ground, the difference was not that large. This was expected, since rainwater passes quickly through a sandy soil, regardless of the water catchment capacity of the zai pits.

Adding manure to the zai pits substantially increased soil moisture, in comparison to plots with no manure, up until 83 days after the pits were dug (nearly 2 months after sowing sorghum seeds in the pits).

Differences in soil moisture were more pronounced early than later in the season, likely an effect of early-season sprinkler irrigation for crop establishment. By day 137, coinciding with sorghum harvest, soil moisture was nearly the same with all treatments. This could be an effect of the zai pits filling in with sand over time, increased crop demand for moisture over time, and/or less and less rainfall towards the end of the rainy/growing season.

The most important observation here is that the targeted placement of manure, in a zai pit, greatly increased moisture retention near crop plants. These results illustrate the beneficial role that manure can have in improving soil water-holding capacity. In dry environments where irrigation is not an option, maximizing the efficiency of rainfall harvested in planting pits can be crucial to the success of food crops. Furthermore, targeted applications of manure provide an added benefit of increased soil fertility (see EDN 119-5). Figure 5. Soil moisture on flat ground versus zai pits, from 41 to 137 days after the pits were dug during mid September, 2012. Data are the average of four replications.



*Each manured zai pit received 400 grams of cattle manure applied at the time the pits were dug, 1 month before sorghum seeds were planted on 15 October 2012.

Differences in soil moisture were more pronounced early than later in the season, likely an effect of early-season sprinkler irrigation for crop establishment. By day 137, coinciding with sorghum harvest, soil moisture was nearly the same with all treatments. This could be an effect of the zai pits filling in with sand over time, increased crop demand for moisture over time, and/or less and less rainfall towards the end of the rainy/growing season. The most important observation here is that the targeted placement of manure, in a zai pit, greatly increased moisture retention near crop plants. These results illustrate the beneficial role that manure can have in improving soil water-holding capacity. In dry environments where irrigation is not an option, maximizing the efficiency of rainfall harvested in planting pits can be crucial to the success of food crops. Furthermore, targeted applications of manure provide an added benefit of increased soil fertility (see EDN 119-5). Figure 5. Soil moisture on flat ground versus zai pits, from 41 to 137 days after the pits were dug during mid September, 2012. Data are the average of four replications.

Cite as:

Motis, T. 2013. South Africa Research Update. *ECHO Development Notes* no. 121

© 2013 ECHO Inc.

<http://edn.link/eh7ypm>