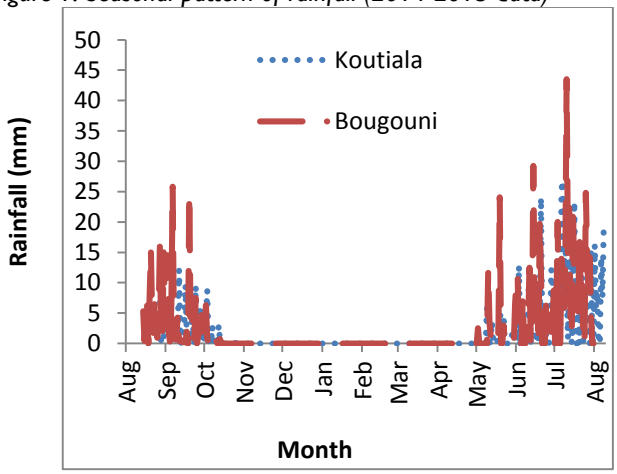
Shallow Wells: An untapped resource to improve agricultural productivity in southern Mali

Smallholder agricultural production in rural Mali is dominated by rainfed production of millet, sorghum and maize for food consumption and cotton production for the market.

A major constraint to agricultural productivity is the amount of rainfall and its intra and inter-annual variability. The rainy season is short and varies in length, with the number of rainy days varying from year to year. High evaporation losses (up to 50% of annual rainfall) results in soil water shortage during the growing season, when rains are erratic. Hence water scarcity is rampant heightening the risk of agricultural productivity. Farmers have little control over the environment and they mostly can neither irrigate nor drain excess water. As an effort to improve agricultural productivity through water availability in different seasons, a study was conducted to understand the recharging capacity of shallow wells in different seasons in southern Mali.

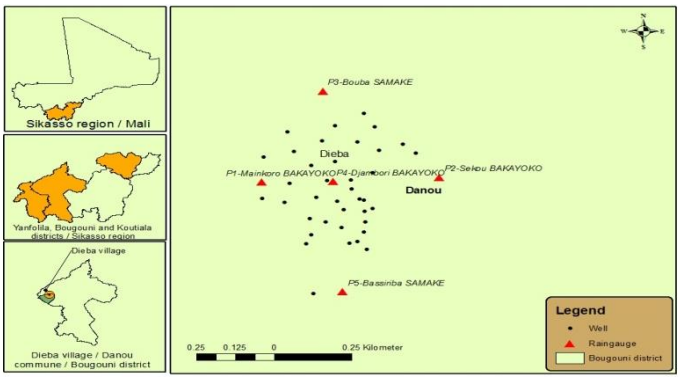
Figure 1: Seasonal pattern of rainfall (2014-2015 data)



Methodology

The study was conducted in ten Africa RISING intervention villages in Sikasso region. Fifty ordinary rain gauges were installed in the intervention village in August 2014. Following field inventory and geo-referencing, biophysical characterization of shallow wells was conducted. In total 485 shallow wells were studied (150 for Bougouni and 335 for Koutiala). All wells were inventoried and geo-referenced in the target villages along with installed rain gauges (Figure 2).

Figure 2: Geo-referencing and mapping wells and rain gauges



Young boys draw drinking water for cattle from a shallow well in Koutiala District. Photo: International Crops Research Institute for the Semi- Arid Tropics (ICRISAT)/Birhanu Zemadim

Results summary

The rainy season was from June to September followed by a longer dry *season* (eight months) from October to May. The computed mean annual rainfall was 553mm and 809mm for Koutiala and Bougouni districts respectively. Though data was only collected for a short duration it shows the increasing rainfall amount southwards. During the dry season, nearly half of the wells (45% in Bougouni and 48% in Koutiala) had a water level depth between 5.5m to 13.5m. In the rainy season majority of wells (83% in Bougouni and 86% in Koutiala) experience a rise of water level in the depth range from 0 to 8m (Figure 4 & 5). This implies that water is available at a reasonable depth from the ground surface to intensify agricultural productivity in both rainy and dry seasons.

Figure 3: Dry season depth of water level in Bougouni

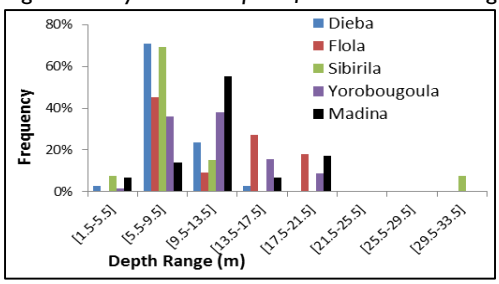


Figure 4: Dry season depth of water level in Koutiala

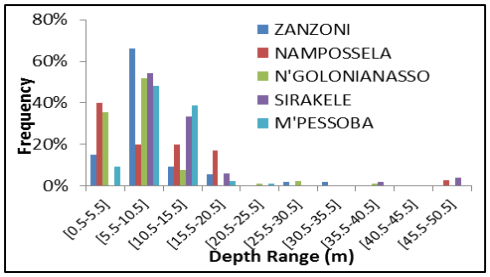


Figure 5: Rainy season depth of water level in Bougouni

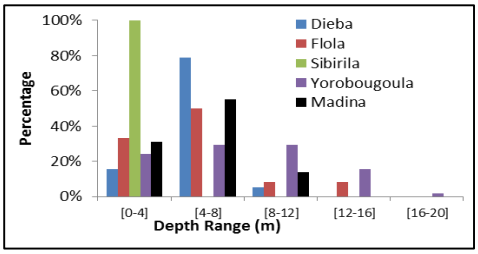
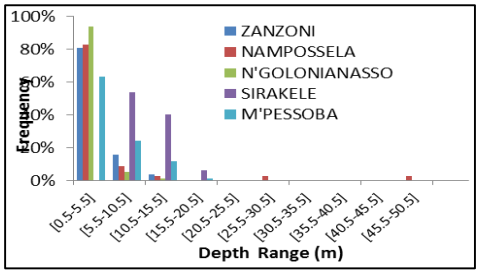


Figure 6: Rainy season depth of water level in Bougouni



Conclusions

Excess water and flooding was frequent during the rainy season, but water scarcity was reported by smallholder farmers in both seasons in the studied villages. Results show that the natural recharging capacities of most wells were found to be satisfactory, meaning wells can be recharged easily with the available rainfall input and water is available in the sub-surface soil. Even if accessing water from shallow wells was labour intensive and mostly done by women and the youth, water is available within a reasonable depth from most studied shallow wells in different seasons. Thus the issue of water scarcity was attributed to accessibility which is due to lack of appropriate water lifting mechanisms, because of this wells were not fully utilized in the rural community. Ground water was also an untapped resource in Mali and we suggest that ground water management be given key consideration in the sustainable intensification program to improve agricultural productivity

Africa RISING scientists collecting data about shallow wells in Koutiala district. Photo: ICRISAT/Cédrick Guedessou

The Africa Research In Sustainable Intensification for the Next Generation (Africa RISING) program comprises three research-for-development projects supported by the United States Agency for International Development as part of the U.S. government's Feed the Future initiative.

Through action research and development partnerships, Africa RISING will create opportunities for smallholder farm households to move out of hunger and poverty through sustainably intensified farming systems that improve food, nutrition, and income security, particularly for women and children, and conserve or enhance the natural resource base.

The three projects are led by the International Institute of Tropical Agriculture (in West Africa and East and Southern Africa) and the International Livestock Research Institute (in the Ethiopian Highlands). The International Food Policy Research Institute leads an associated project on monitoring, evaluation and impact assessment.

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