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MANAGEMENT OF CALCAREOUS SOILS BOOSTS RICE PRODUCTION AND BENEFIT UWAWAKUDA FARMERS IN DAKAWA IRRIGATION SCHEME

CHOLLIMA AGRO

A success story

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A growing opportunity!!.It is now possible to offer credits to farmers, there are lots of changes in rice productivity particularly in Dakawa irrigation scheme for the past two years. This is a result of good relationship established between, Dakawa Research Center, Farmers association – UWAWAKUDA and Service providers (PASS, NAFAKA and CRDB).

Through this relationship some of the group members at the Dakawa Irrigation scheme has accessed bank loan that has helped them to apply good agriculture practices demonstrated by Dakawa research Centre – Chollima (Including the use of improved rice seeds, use of fertilizer as per soil requirement as well as proper planting and timely harvesting). This has enable farmers to increase their yield and therefore access to loan.The loans are extended to groups of producers under the Private Agricultural Sector Support (PASS) guarantee with the aim of commercializing the sector.

During the 2014/15 farming season, 30 members of Jikwamue Dakawa Farmers Group applied for and secured a Sh583 million loan from CRDB Bank through the PASS guarantee to intensify paddy production in the scheme. Due to the good returns and farmers commitments, the credit has been extended to greater than 1 billion in the 2015/16 growing season and the number of farmers group that have accessed the loan has been increased. (Ms Safia Mbamba - PASS –Morogoro, 2016).

Figure 1. Farmers demonstrated on the management of calcareous soils in Dakawa irrigation scheme rice fields

Summary

UWAWAKUDA farmers from Dakawa irrigation scheme in Morogoro have been fighting a wrong enemy for so long!. They used to understand that saline/sodic soil was the main cause for poor yields and land deterioration in their fields. Some fields were abandoned due to inadequate production. A soil characterization survey conducted by Dakawa Agricultural Research Institute (ARI Dakawa) under iAGRI within USAID Feed the Future Program in 2014 has indicated that some areas of Dakawa irrigation scheme have calcaric soils characteristics with crop symptoms that are similar to those of sodic soils. Some blocks were highly affected than others. ARI Dakawa conducted an awareness sessions to help UWAWAKUDA farmers realize the problem and developed different management options to overcome the challenge. A massive awareness creation program on the management options of calcaric soils combined with the use of improved rice varieties was done under Africa RISING, NAFAKA and TUBORESHE CHAKULA (TUBOCHA) project. This was done through demonstrations, field visits and both classroom and field trainings in 2015/16 growing season as a results, some have double and tripled their productivity from 2-5t/ha to 7 to 8.5 t/ha.

The Challenge

Dakawa irrigation scheme had some areas with calcareous layers of soil which are closer to the surface. Calcareous soils have often more than 15% $CaCO_3$ in the soil that may occur in various forms (powdery, nodules, crusts etc...). Soils with high $CaCO_3$ belong to the Calcisols and related calcic subgroups of other soils. They are relatively widespread in the drier areas of the earth and they have high pH. The potential productivity of calcareous soils is high where adequate water and nutrients can be supplied. The high calcium saturation tends to keep the calcareous soils in well aggregated form and good physical condition. However where soils contain an impermeable hard pan (petricalcic horizon) they should be deeply ploughed in order to break the pan. Calcareous soils generally have low organic matter content and lack nitrogen. Phosphorous is often lacking in calcareous soils. Amounts to apply depend on how deficient the soil is and the crop requirements. Application at the time of seeding has been found to be most appropriate since phosphorus is required mostly during the younger stages of plant growth.

Calcareous soils usually suffer from a lack of micronutrients, especially zinc and iron. Heavy applications of animal manure are helpful in preventing deficiency of iron and zinc. Farmer use to confuse the problem with sodicity of the soil, and therefore fail to have proper management of the problem resulting into increasing abandonment of the fields and frustrations due to inadequate returns from yield produced. To lower the pH of a calcareous soil, an amendment needs to be added to neutralize the excess lime. Natural processes that can slowly lower the pH of a calcareous soil – including organic matter mineralization, crop removal of lime and other bases, and natural weathering. But these processes can take hundreds or thousands of years to have any effect on the soil pH.

Solution

Elemental S is the most effective soil acidifier. Although not an acidic material itself, finely ground elemental S is converted quickly to H_2SO_4 in the soil through microbial action. In addition to supplying sulfur as a nutrient, S compounds are also used as soil amendments. These compounds act as soil acidifiers neutralizing $CaCO_3$ with acid; this, in turn, may lead to a lowering of soil pH and improved nutrient availability. Examples of S-containing acidifiers include elemental S, sulfuric acid (H_2SO_4), aluminium sulfate [$Al_2(SO_4)_3$] and ammonium and potassium thiosulfate [$(NH_4)_2S_2O_3$, $K_2S_2O_3$]. The rates of soil acidifiers required to cause a plant response depend on the amount of $CaCO_3$ in the soil.

ARI Dakawa demonstrate and train the farmer on simple technique of the use of sulphate of ammonium (SA) fertilizer as a top dressing in combination with P- fertilizer such as Diammonium phosphate (DAP) or farm yard manure (FYM) during planting. Application P-fertilizers at the time of seeding has been found to be most appropriate since phosphorus is required mostly during the younger stages of plant growth. The application of 2 bags of DAP,4bags of SA and 4 tonnes FYM gave three times higher yield of 4.9t/ha compared to 0.6t/ha of the control in highly affected plot. The practice allows farmers to maximize their yields through application of SA fertilizer in two splits (i.e during tillering and panicle initiating stages of the plants) and farm yard manure. These practices were not commonly used in the area.

"Before, I used to practice the broadcast seeding method and application of twosplits of Urea. With 80 kg of paddy rice seeds, I can harvest 20-25 bags of 80kg each for every one acre (i.e4-5t/ha). After I switched to the use of Diammonium phosphate (DAP) fertilizer during planting and the use of two splits of Sulphate of Ammonium instead of Urea in combination of the improved SARO5 rice variety, my harvest has reached 46 bags per acre 8.4t/ha. The majority of farmers have reached yields of 30 - 35bags per acre which is a big increase in some plots which farmer used to harvest 15 to 20 bags per acre said Nasibu Katoto". Explaining in front of Morogoro regional commissioner during farmers' field day Katoto said "There is nothing I would want to here now when it comes to these technologies. We always thank ARI Dakawa for helping us to know the problem and gave us solutions.It is my plan for the next planting season towork hard in these technologies and reach more than 9t/ha as mostof us are now in a position to return our credits comfortably..." said Katoto a rice grower and a beneficiary of CRDB credit through PASS. Cuba Iddi a rice farmer and ARI Dakawa driver also added that "Most farmers are thanking ARI Dakawa for helping to uncover the soil problem as most of the plots farmers used to struggle to have good yields are now full of rice in this 2016 growing season. We now feel proud of working at ARI Dakawa when we hear these testimonies coming from farmers".