CHAPETR 8

CONCLUSION AND RECOMMENDATION

8.1. Conclusion

Sugarcane cultivation and sugar industry is standing as the second most important farming enterprise in the area. The study area is one of the newly developing areas in sugarcane cultivation. Recently, although governmental organizations and departments have been encouraging to develop within the sector, the production potential that have to meet the demand of the mill is still as far as. Research and development have to be more efforts to fulfill the objectives of the national policy, but also to improve the interests of cane growers and mill, and regional development as well. Since realization of the full potential of sugarcane crop is the function of adequate and appropriate crop husbandry while the crop is the most exhaustive crop in continuous cultivation. The lower productivity of sugarcane crop comparing to national average cane yield, indicating that appropriate technologies transfer and effective extension services and adequate supplements to cane growers are essential requirements, and urgent. However, perfect requirements for its intensive cultivation is well high and quite hard to meet it. Based on the current situation of the sugarcane production system of the study area, the following conclusions could be drawn due to the results of the field survey and the field experiment.

In the study area, sugarcane has mostly being grown on the marginal soils, particularly sandy soils. Nearly almost of the cane growers form survey sites have been adopting on sugarcane based rotational production system. The results of the survey revealed that their practices on nutrient management could not able to replenish to soil while the crop removal is considerable high and native soil nutrients had relatively low content, particularly in nitrogen. The agroclimatic condition of the study area for the crop points out that sugarcane growth is suppressed by water deficit during the driest months. So that, water balance is prime factor for desirable crop growth and development while the others such as high solar radiation is peak, yet, it

enhances better utilization of additional N as well. Moreover, the native nitrogen level in sugarcane growing soils from the study sites is considerable lower than the other major nutrients. Therefore, additional appropriate amount of nitrogen application is needed depended on soil moisture retention status, in order to enhance certain level of growth and development of sugarcane crop during the early stages.

The depth and spread of roots in soil are matters of much important to grower not only for irrigation and fertilizer placement but also for an understanding of the plant's reactions to climatic circumstances and its environment. Therefore, to obtain the high sugarcane yield, it is essential to induce extensive root system a key to high sugarcane yield. The experiment results proved that basal urea application enhances the root growth and development in both of length and weight of mass through vigorous root-shoot system, leading to yield. The root length, density and dry weight were increased up to 200 kg N ha^{-1} in irrigation system, however, there was no significant different from 100 kg N ha^{-1}. On the contrary, the maximum yields of root density, root dry weight was obtained at 100 kg N ha^{-1} in rainfed system. The root growth under rainfed system was remarkably increased in all aspects when sufficient rain had occurred.

The yields of sugarcane above ground parts, dry matter, number of tillers and leaf area, were resulted as similar as root. The maximum dry matter of above ground was obtained at 200 kg N ha^{-1} in irrigation system and 100 kg N ha^{-1} in rainfed system, 89.51 and 11.85 gm $hill^{-1}$ respectively. The yields were not significant different from the yields obtained from the lower applications in irrigation system, but, it was significant under rainfed system in this manner.

Although the yield obtained by nitrogen application in both water management systems had increased, the efficiencies were respectively low. It obviously indicated that management skill over many factors contributing to get higher nutrient use efficiency have to be synchronized while it is paramount important due to escalating costs and the hazards of environmental pollution. However, the experiment

demonstrated that nutrient use efficiency was higher in irrigation system. Therefore, fertilizer use must be accompanied with water management.

The results of comparison between simulated and observed yields, and statistical analysis revealed that the model had low accuracy in prediction on the crop response to nitrogen application under both water management systems, in general. Reasons for the varied uptake response need further investigations. However, model could simulate dynamism of carbon and nitrogen in soil–plant system, allows tailoring with each applied fertilizer rates.

8.2. Recommendation

Some important findings of this study that may be helpful to policy makers, researchers, extension workers and cane growers in improving sugarcane production potential through addition of nitrogen synthetic fertilizer (Urea) as basal application. Moreover, the results allow adjusting rate and timing of further additional N fertilization for the next growth stages of sugarcane crop, as well as basal N fertilization itself. Based on the results of the field experiment, some keys could be figured out as recommendation.

The results of the field experiment pointed out that soil moisture retention is a key to get better yield of biomass accumulation and better nutrient use efficiency for additional N fertilizer. As for urea, 100 kg N ha^{-1}, could be recommended as basal application for the sandy loam soils containing clay minerals under irrigation system. However, it may be differed due to timing and amount of irrigation system. Therefore, further studies are needed to find the optimum N basal application at different irrigation systems depended on amount and timing not only with the aspect of crop yield but also for economic benefit aspect.

More research are needed to recommend appropriate rate of N basal application for rainfed system. The rate may be ranged, below 100 kg N ha^{-1}. Moreover, such practices must be paid attention to improve soil moisture retention

like manuring, mulching, etc., since most of cane growing soils are sandy soils in the study area. These practices should be introduced and encourage, especially in ZYC and TPC sites.

As for timing of N fertilization, beyond 100 kg N ha^{-1}, N fertilizer rate should apply as split. The rest of N fertilizer, fertilizer applied at basal subtracted from total required fertilizer, should be applied around the 85 DAS as second dressing in irrigation system. In the rainfed system, the second dressing should be added two weeks after sufficient rain occurred when the root system had well developed to be ready for uptake contributing to yield.

In order to get better nutrient use efficiency from nitrogen fertilization, further researches are needed with integrated approach. Regarding for CANEGRO-DSSAT model, further investigations are needed to develop N sub-model to improve accuracy.

For the aspect of consideration on agro-technology transfer strategy, policy makers, extension officers should pay attention on irrigation facilities for sugarcane crop to improve crop yield with better Nutrient Use Efficiency. In addition, the other agronomic practices: manuring, mulching, optimum sowing time, which can improve soil moisture retention, should encourage to cane-growers while the sugarcane growing area lacking from irrigation facilities, and where sugarcane grown on sandy soils. Besides, government and localized authorities should provide sufficient credits including fertilizers in proper time to sugarcane growers to improve interests of sugarcane growers. Current cane procurement system and transportation systems should effort to improve efficiency. Finally, agro-technology transfer through DSSAT using crop modeling technique, should be applied as a tool since it allow users to choose the optimization from several alternatives for management, including nitrogen and water management, from farm level to policy level.