EDITORIAL COLUMN

Conceptual Strategy to Increase Crop Productivity under Sustainable Agriculture

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Increasing global warming associated with constant emission of green house gases mainly CO_2, illegal logging, expansion of agricultural land and indiscriminate human activities and increasing abiotic stresses have direct impact on climate change; thereby affecting crop productivity and aggravating hunger and life security. In this respect, about 2/3rd of arable land are affected with salinity and 1/3rd of it under semiarid conditions, thereby reducing crop productivity under these stress prone areas. To mitigate carbon pollution, several strategies are adopted such as sequestration of carbon dioxide from the atmosphere from the factory sites and injecting it deep in the soil profile using sophisticated technology in advanced countries, reforestation of plants, carbon fixation by plants. EPA in USA has recommended the plantation of trees in carbon polluted areas to reduce carbon pollution. We selected several native trees and shrubs in Northeast Mexico with carbon sequestration capacity ranging from 45 to 51% carbon namely; *Eugenia caryophyllata* 51.66%, *Litsea glauscensens* 51.34%, *Rhus virens* 50.35%, *Forestiera angustifolia* 49.47%, *Gochantia hypoleuca* 49.86%, *Forestiera angustifolia* 49.47%, *Pinus arizonica* 49.32%, *Cinnamomum verum 49.34%. Bumelia celastrina* 49.25%, *Tecoma stans 48.79%, Acacia rigidula* 48.23%, *Eryobotria japonica* 47.98%, *Rosamarinus officinalis* 47.77%. Some of these species may be selected for plantation in highly carbon dioxide polluted areas in cities, road sides and factory areas with high emisssion of carbon dioxide (paper in press).

With respect to crop production, thanks to the breeders, crop protection scientists, high yielding crop cultivars have been bred under high input situations, but very negligible progress has been achieved under low input situations. Even Bt crop cultivars failed to achieve reasonable yield under heavy insect situations, namely of Bt- Cotton. Molecular technology failed to achieve success under sustainable agriculture in the farmers' fields. Various technologies have been adopted to obtain reasonable crop yield such as such moisture conservation, soil compaction, no-tilth and other agrotechnological tools, but failed to achieve success. There is an urgent necessity to enhance multidisciplinary research team including agronomists, breeders, soil scientists, crop protection experts to address this vital issue.

In this juncture, we developed low cost technology in mass scale screening of pipe line crop cultivars/varieties for selection of crop cultivars tolerant to drought, salinity, heat stress, flooding. In place of germplasm, we used high yielding crop cultivars for mass scale screening and selecting cultivars for tolerance to these stress factors and have achieved reasonable success in various filed crops such as cotton, maize, pearl millet, rice, wheat, sunflower, castor and few vegetable crops such as tomato, chilli, okra etc., The techniques are cheap and simple. Seed companies as well as research institutes can contribute a lot to achieve this goal. The pipe line crop cultivars are evaluated and selected over multi-location trials for their adaptation and high yields by seed companies.

In our study, genotypic variability was found to exist among crop cultivars for tolerance to abiotic stresses such as salinity and drought. Crop cultivars tolerant to salinity and drought in the case of cotton, sunflower and maize were found to be well adapted with reasonable yield. With an increase in salinity, salt tolerant crop cultivars showed an increase in root length and root number functioning as osmotic adjustment. Drought tolerant crop cultivars had deep long root system. Small thick leaves with compact palisade cells, dense trichomes and strong thick petiole with thick collenchyma are related to drought resistance in the case of cotton, sunflower and castor. These could be used as selection criteria in the case of cotton. Salt and drought tolerant crop cultivars in the case of cotton and sunflower selected in the green house or laboratory were found to be well adapted to these stress prone areas in the farmers' field. Therefore, these crop cultivars tolerant to drought and salinity under these stress prone areas revealing therefore the transfer of technology from the lab to land. Using this technique it may be possible to increase crop productivity under sustainable agriculture.

