

## Climate Innovation Challenge Pro Nature Alliance R&D- Sustainable Agriculture Technology

### INTRODUCTION

Agriculture is the backbone of Pakistan's economy (48% labor and 70% dependent as main source of income), and the country is mostly self-sufficient in plant and animal-based foods. The current agriculture production system in Pakistan is a major contributor to greenhouse emissions contributing 42% of total emissions due to its conventional and nonproductive nature. In the current system, tilling is exposing the conserved carbon and moisture towards the atmosphere together with disrupting the soil physiology due to which extra fortification is required in the form of inputs which are resulting in high costs of production (input costs account for more than 50% of the cost of production). Furthermore, water wastage is high with a few crops consuming more than 90% of available surface water. Currently, Pakistan has low productive soils, high costs of production, low productivity of crops and ultimately a production system which is noncompetitive, unsustainable, and non-climate smart.

### EXISTING SITUATION

To tackle these issues, Pro Nature Alliance Research and Development with the support of Pakistan's National R&D organization, the Pakistan Agriculture & Research Council has adapted and formed a package of technology based on Regenerative Agricultural Practices (RAPs). The SAT machines backed by practices have already been tailored for the Pakistani context. Both on farm and on station trials have been conducted successfully at PARC/NARC, and they can now be rolled out into larger trials using different crops.

RAPs like no tilling, organic mulching etc. and machines like raised bed makers, precision planters etc. are not new and are being used all around the world including in Pakistan to some extent. PNA's innovation is the combination of these practices backed by machines (with high precision) which can be used for different crops, and which have been adapted and localized for Pakistan.

### CONCLUSION

We at PNA believe that the Sustainable Agriculture Technology is the first practical step towards the revolution in the agriculture sector of Pakistan. Upon successful completion of the CIC grant at end of July 2022, PNA would like to request that additional funding be provided to roll out and trial the SAT on Wheat, on a larger scale in Punjab and Sindh. For successful adaptation, on a large scale especially amongst small holders in Pakistan, seeing is believing and learning by doing is essential.

### ACKNOWLEDGEMENTS

The PNA team would like to thank the World Bank, FCDO and ADPC for giving it the opportunity to roll out and trial it's Sustainable Agriculture Technology (SAT).

### MAIN ISSUES HAMPERING PROPAGATION

- Small holder farmers are generally risk averse, since farming is their only source of both sustenance and income. For these farmers seeing is believing and they learn best by doing.
- Lack of authenticated and validated data
- Reliance on expensive imported machines and lack of locally manufactured machines having good precision
  - o Imported machines are unaffordable for most farmers
  - o Locally made raised bed makers do not make permanent raised beds and can only be used for 1 crop
  - o Locally made precision planters only have 40-50% precision and are unaffordable for most farmers since they can only be used for one crop

### SUSTAINABLE AGRICULTURE TECHNOLOGY (SAT)

Based on Regenerative Agricultural Practices (RAPs). SAT is a climate-smart technology that has been developed and customized keeping in view the Pakistani context. SAT is a combination of 3 innovative technologies backed by climate smart practices:

- a) The customized raised bed maker which makes 42-inch permanent raised bed with water furrows on soft soil. The raised bed maker can be used with the most common type of tractor in Pakistan.
- b) Customized precision planter which can be adjusted for different crops. The precision planter has a fixed (7 by 7) row to row distance and adjustable seed to seed distance (Wheat 7 inches, Maize 9-11 inches, Cotton 15-18 inches)
- c) Organic mulcher which makes organic mulch which reduces weeds and saves the soil from heat and cold stress. The organic mulcher is mounted on the same machine as the precision planter. With the organic mulcher on the front and precision planter on the back.

### ACTIVITIES UNDER CIC

SAT is a transformative set of technology backed by practices which will be easily propagated in neighboring areas after success has been demonstrated. In Pakistan propagation is easiest when based on "seeing is believing". Once farmers of the areas witness firsthand the success that other farmers have had in adapting SAT, they will also be more willing to adapt SAT to grow their agricultural produce.

Therefore, PNA will undertake the SAT trail for different crops covering the entire crop cycle from sowing to harvest. A baseline will be conducted to assess the existing situation of different indicators (situation of water use, cost of production, productivity and other parameters) before SAT was employed in that area for a particular crop. Then an impact assessment will be conducted upon harvest of the crop using SAT in comparison to the baseline. If SAT results in lower water usage, lower land development costs, lower input costs, lower cost of production, production of food safe items and lower GHG emissions then the pilot will be deemed a success. As a part of the CIC, PNA will

- o Select up to five (5) clusters in different agro-ecological zones in Punjab and Sindh. The trial will be undertaken on a total of 1,000 acres of land. PNA will train a total of 100-200 farmers who will participate with PNA in the SAT pilot activity. PNA will ensure adequate participation and access of women to the SAT. For this purpose, PNA will ensure that of the 100-200 farmers that it trains at least 20-30 are women.
- o Given the timing of the CIC grant (End Dec 2021 to End July 2022), the Wheat crop cannot be targeted therefore, PNA will focus on Maize, Vegetables, Cotton and Fodder Crops for the trials.

### KEY METRICS

- a) Reduced water usage of crop in comparison to baseline - 20-30% reduced quantity of water used
- b) 30-40% less input cost for the crop in comparison to baseline.
- c) Lower land development cost due to no tilling
- d) Reduced usage of seed in comparison to the baseline (at least 10% less Maize seed use in comparison to the baseline)
- e) 20-30% less cost of production in comparison to the baseline for the concerned crop
- f) Lower GHG emission through no till and conservation of moisture and carbon in the soil (Qualitative)
- g) Production of safer food and ultimately revival of soil physiology/ biota (Qualitative)

### SUSTAINABLE AGRICULTURE TECHNOLOGY (SAT)

Customized Raised Bed Maker



Organic Mulcher



Customized Precision Planter

