
SUMMARIES OF GROUP DISCUSSION

Subject I

Coping with Risks and Climate Change through Conservation of Natural Resources with Particular Reference to Agriculture: Appropriate Technologies and Practices

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The papers presented in this session focused mainly on issues such as accelerating agricultural output and farmers' income through diversification; technology adoption and input use efficiency; marketing of produce through alternative channels and efficient utilisation of bio-waste.

There was a lot of enthusiasm among the researchers in addressing the issues of risks of climate change with particular reference to agriculture by harnessing appropriate technologies and practices. The following are the recommendations flowing from the papers presented in the session as well as in the deliberations held:

- Banning paddy sowing till June 15 precipitated stubble burning problem in Punjab. Among the available methods, sowing with happy seeder was found to be the best option to circumvent this menace and the resultant pollution. Apart from a 2 per cent rise in net income, it can save 732 cumt/ha of water and 8.76 tonnes of carbon dioxide. Farming community needs support for this with significant investment subsidies for the machines as well as upgrading the tractor capacity.
- Meta-analysis of the studies shows that employing zero tillage or minimum tillage without mulching and crop rotation reduced yields. Harnessing all the three techniques simultaneously increase yields. Also, yields in minimum tillage are higher than those in the zero tillage.
- The study on climate resilient zero budget natural farming (CRZBNF) in Andhra Pradesh concludes that the yield normalisation did not happen by third year and the profits are not encouraging. Therefore, farmers may not readily adopt CRZBNF and residue free farming through precision farming can be the middle path.
- SRI- reduces water usage by 40 per cent, apart from increasing yields by 46 per cent, reducing costs by 23 per cent and profits by 3.75 times. There is no price premium. It will take more than three years to normalise the yields. Without state

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support, SRI is not profitable but economically efficient and environmentally sustainable.

- The key finding from SRI cultivation in dry land region is that these farmers find it difficult to control water in view of the uncertainty in rains and narrow window of less than a month for sowing. Disadoption after the state subsidies is the norm with 76 per cent wanting to disadopt.
- Climate change is likely to impact sorghum yields by 218 kg/ha in sorghum and 274 kg/ha in pearl millet and the yield vulnerability will be higher during 2071-98 than 2021-2050. The problem however is disparate impacts across districts. The study also concludes that encouraging agricultural research through investments can mitigate these impacts.
- Zero tillage not spreading because of machinery costs. A study from UP found that it can decrease carbon emission by 15-19 kgs and water use by 528-1424 cumt/ha. Deliberations indicate that caution has to be taken to factor in the production and use of by-products in both the systems while comparing them.
- Crop insurance products need to be designed in such a manner that it not only acts as a risk transfer tool but also a potent device to reduce risk and crop loss by inducing the desirable proactive and reactive responses among insurance users. Delayed settlement of claims is serious problem. On the other hand, the covariance of risk is an issue for delivery for service providers.
- Protected cultivation of rose under polyhouses helps enhance yield price and income. With a 12 per cent discount rate, profits can go up by 23-74 per cent with an internal rate of return of 17.21 to 23.79 per cent. Given these huge benefits, it is necessary to continue capital subsidy for their installation in farmers' fields.
- Climate change has increased monsoon maximum as well as minimum temperatures impacting crops yield adversely in the north-eastern states. Evidence indicates positive role for technology in mitigating these effects. Therefore, more emphasis has to be placed on development of varieties and their diffusion.
- Analysis reveals that annual rainfall has shown declining trend in all north-eastern states like Assam, Manipur Mizoram, Nagaland Tripura and Sikkim, except Arunachal Pradesh. The near non-existent irrigation infrastructure in these states need attention.
- Wheat cultivating farmers in Uttar Pradesh identify harnessing short duration variety as the most effective strategy to mitigate climate change.
- Mitigating farm level risk need micro management like regular weather advisory services disease or pest attack forecasting because weather aberrations are more the critical factors than climate change as far as farm-level production management is concerned. Cropping system intensification and crop diversification are the suitable options for risk mitigation at the farm level and can increase farm incomes.

- Direct seeded rice in Odisha is found to afford a cost benefit of 2.2 and enhance farm labour skill to adopt zero tillage operations and related practices.
- Pollination management intervention in Kashmir Valley increased farm gate value output of apples by 40 per cent with more number of 'A' grade apples compared to non-managed orchards. The total estimated pollination service value is 1260 crores.

A roadmap for sustainable intensification for addressing groundwater balance concludes that SRI, precision farming and laser levelling are the technologies for unsustainable paddy in the north-western region, permanent raised-bed planting, happy seeders etc for wheat in the Indo-Gangetic plain; and sustainable sugarcane initiative drip and furrow irrigation for sugarcane in states like Maharashtra, Tamil Nadu and Uttar Pradesh.