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## Effect of Organic Farming on Input and Income in Eastern States of India

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**ABSTRACT:** Organic agriculture practices play a pivotal role in the improvement of soil physicochemical activity and ecosystem balance. This study deals with the effect of farmer training conducted as per the guideline of Agriculture Skill Council of India (ASCI) & National Skill Development Cooperation (NSDC) on organic farming input and income of small as well as marginal scale farmers of Assam, Bihar, Jharkhand and West Bengal. ASCI trained 24 scientist of Patanjali Organic Research Institute (PORI). The PORI scientists trained 96 farmers in selected states and they in turn trained 8413 farmers. Farming inputs showed that the maximum profit i.e. Rs. 35,300 for rice in Assam and 30,500 for paddy hybrid in Jharkhand followed by Bihar and West Bengal. The study concluded that the current training module supports farmer to improve their life style by organic farming practices.

**Keywords:** Farming input, Livelihood improvement, Organic farming, Training programme.

### INTRODUCTION

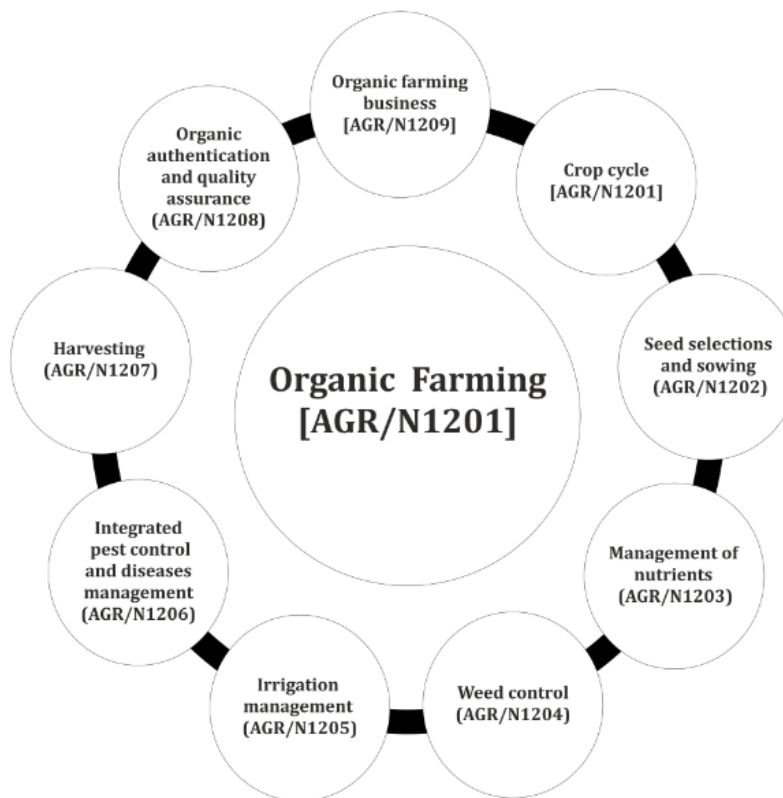
Agriculture plays an important role in the Indian economy in reducing poverty from 90 to 15%, which accounts for only 48.9% of India's workforce (Acharya, 2020). Since the ancient times, agriculture has established significantly in the manifold epochs with different stages of multiple areas. The major credit is given to the emerging agricultural sector for the current socio-economic expansion which has adequately satisfied individual needs (Gulati *et al.*, 2020; Balkrishna *et al.*, 2021). Agriculture has been successfully providing livelihood to almost 70% of rural families in India (Juttu *et al.*, 2021). According to statistics, agriculture in India has been consistently progressing in an impressive manner. Indian agriculture is not only providing a healthy livelihood to its workforce but also ensure food and nutritional security across the globe. But the irony is despite this abundance, the farmers do not attain economic satisfaction, nor there is any food or nutrition security for the malnourished population (ICAR, 2019). Therefore, leaving India to rank 71 out of 113 countries in the Global Food Security Index (GFSI 2020). Extensive use of chemical fertilizers exerts several negative impact on soil health such as nitrogen leaching, soil degradation, soil compaction, reduction in organic matter and carbon content and ultimately the total crop yield gets decrease with the time period and also causes negative effects on human health (Brevik and Burgess 2014; Lin *et al.*, 2019).

In this context, organic farming is non-traditional method of crop cultivation, which has become prominent due to its extensive benefits on income

generation, environment and heritage in the near past (Morshedi *et al.*, 2015; Balkrishna *et al.*, 2021). Organic farming is also considered as a sustainable and eco-friendly technique because of its ability to restore carbon and other nutrients in the soil leading to higher crop yield (Srivastava *et al.*, 2018), and it plays an important role in ecological fortification and conservation (Gills and Sharma 2021). However, some challenge is associated with organic farming such as high production cost of management, labor charges even for low crop production. In many cases, farmers experienced little change in production, but horticultural crops such as tree fruits have significant differences in production. Organic farming status in eastern states like Assam, Bihar, Jharkhand and West Bengal is accessibility to suitable varieties is a most important issue, lack of awareness, availability of labor and in some place political issues. This study mainly focuses on the effects of organic farming input and its relativeness with profitability of the farmers of eastern states of India mainly; Assam, Bihar, Jharkhand and West Bengal.

### METHODOLOGY

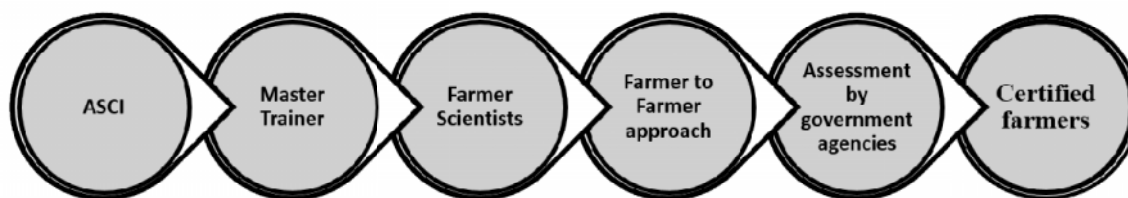
During September 2018, 8 days training was conducted by ASCI at PORI, Haridwar India. Briefly, 24 individuals from Patanjali Organic Research Institute (PORI) were trained by experts from ASCI and they are referred as master trainers. The training is based on the guidelines of the National Skill Development Corporation (NSDC) and ASCI as documented in Organic farming document, QP-AGR/Q1201 as shown in Fig. 1.



**Fig. 1.** Content of the training programme.

In this study, four states (Assam, Bihar, Jharkhand, and West Bengal) of the eastern regions of India were selected for the implementation of organic farming practices. Regarding this, some farmers are trained for 8

days by master trainer in ICAR Institutions and universities and they are referred as farmer scientists. The detail about various steps involved in training programme is depicted in Fig. 2.



**Fig. 2.** Various steps involved in the farmer training programme.

Farmer scientists agreed to give 1 acre of land for experiments on organic farming. The experimental land area is termed as farm lab which well maintained by farmer scientist with the help of PORI scientists. To the farmer scientist, a soil testing kit named 'Dharti ka Doctor' (an indigenous kit of PORI), as well as various biofertilizers, were supplied by PORI. The soil testing kit contains various reagents for measuring the pH, organic carbon and NPK. The bio fertilizer's recommendations vary from area to area based on the soil testing report. These farmer scientists trained other farmers of the area under farmer to farmer training approach. Finally, farmers practicing organic farming methods were assessed by various agencies of the Government of India and classified as failed and passed on the basis of their knowledge and practice. PORI interviewed various farmers and their success stories were recorded

(Ref.[http://patanjali farmers samridhi.com/img/Flip%20Book/tu mjs4/samples/basic/Organic\\_Farming.html](http://patanjali farmers samridhi.com/img/Flip%20Book/tu mjs4/samples/basic/Organic_Farming.html)).

## RESULTS AND DISCUSSION

### A. Trainers and Trainees detail

In this study, a total 96 farmer scientists (18, 32, 27 and 19 from Assam, Bihar, Jharkhand and West Bengal, respectively) were trained by PORI and state wise detail is shown in Fig. 3. The total 8413 farmers have been trained by farmer scientist, out of them only 6066 are certified by the various government agencies (Fig. 4).

### B. Soil analysis and input recommendation by PORI

The well drained, deep acidic alluvial soils of upper Assam with good proportion of Phosphorous are mostly for plantations. Alluvium of the plains offers excellent opportunity for cultivating rice and vegetables.

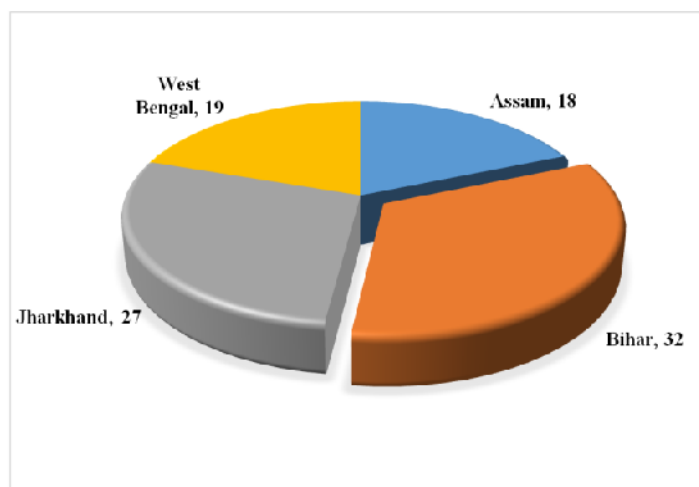


Fig. 3. State wise number of farmer scientist trained by PORI.

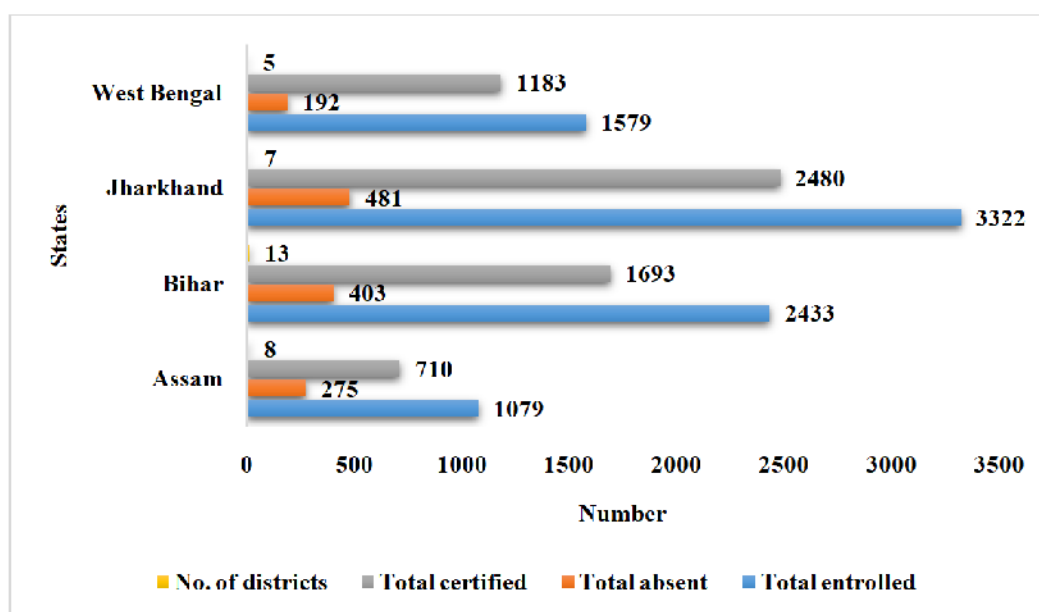


Fig. 4. State wise detail of trainees.

New alluvial soils occurring in charlands of Brahmaputra are most suitable for growing oilseeds, pulses and rabi crops. The soil analysis in the farm labs revealed that the soil was mild acidic in Nalbari and Biswanath district. The other farm labs were mildly alkaline (pH 8). Organic carbon was medium to low (0.75-0.31%) except at a location at Kazidahar, Cachar, where it was high (1.1-1.3%). Nitrogen was mostly medium (281-420 Kg/Ha), but low (141-280 Kg/Ha) in Bamunkura and Khalisatari of Dhubri district. Phosphorus (17-6 Kg/Ha) and potash (200-101 Kg/Ha) were medium to low. Farmer trainers were supplemented with PROM (Phosphate rich organic fertilizer), Poshak, Jaivik Khad, PSB (Phosphate solubilizing bio-fertilizer), KMB (Potassium mobilizing Biofertilizer), Rhizobium and FYM (Farmyard manure) to be applied in the fields and Trichoderma and Pseudomonas to control fungal diseases (Rai *et al.*,

2021). However, due to serious flooding conditions, farmers received the inputs in September 2019. Likewise, in Bihar soil testing revealed a low to medium status of Nitrogen, Phosphorus and Potash in all the farm labs with pH ranging from 6.5 to 6.8. Soil Organic Carbon was observed 0.5-0.6 in the soils of both AESRs (Agro ecological sub regions). Paddy was taken in farm labs by the farmer trainers. Most of the farm labs are irrigated by tube wells (Department of Agriculture: 2014; PORI. 2019; EnviStats India, 2019). In Jharkhand, soils of the area where most of the farm labs are established, are Alfisols with low pH (Acidic) followed by Entisols and Inceptisols with pH ranging from 6.5 to 7.5. The districts of Giridih, Ranchi, Dhanbad, Hazaribagh the soils have medium to low available Nitrogen, almost (6 - 10 Kg/Ha) phosphorus and (101-150 Potash Kg/Ha) levels. The soil organic carbon is observed as low as 0.5-0.6 in the areas under

paddy. The soils are rich in micronutrients. 4 farm labs in Deoghar district and AESR 13.1 have (281- 220 Kg/Ha) medium range of available Nitrogen and Phosphorus (11-17 Kg/Ha) but high (251-300 Kg/Ha) Potash. The micronutrient status is also high except copper. The soil organic carbon is low in the AESR. On the other hand, in West Bengal, soils in the area of farm labs are mainly alluvial soils Entisols (Fluvaquents), Inceptisols (Eutropepts) and Alfisols (Endoaqualfs) which are imperfectly to poorly drained and remain moist most of the time in the year. Illuviation of clay is a feature and sesquioxides accumulation in the lower horizon has been observed. Soil testing revealed a medium status of available Nitrogen (281-420 Kg/Ha) and (151-200 Kg/Ha) Potassium and (6-10Kg/Ha) levels of Phosphorus in all the farm labs with pH ranging from 6.2 to 6.8. Soil Organic Carbon was observed 0.5-0.6 in the soils. Paddy was taken in farm labs by the farmer trainers (Directorate of Economics and Statistics. 2019; PORI. 2019).

#### C. Impact of training on input cost and profitability

PORI provides instant support for crop cultivation so that which organic grower can grow selected crop by using organic fertilizers that ultimately provide low cost input and high profit. However, in some states this cannot be achieved due to lack of labour, variety of traditional seeds and political interruption. For example, in Assam, the net profit was maximum in Kazidahar, Cachar (Rs 180,000/-) in farm labs under rice, cowpea,

livestock, fishery etc. followed by INR. 107,000/acre at Udalguri with rice, litchi and arecanut and INR 100,000 in Baksa with tea, lemon, Banana, arecanut and livestock as shown in Table 1.

In the study of Durham and Mizik (2021) stated that Small-scale tea farmer commonly used unmanageable agricultural practices. However, at present several tea farmers showed their interest in organic farming practices. In Assam, to evaluate the economic sustainability, a collective case study was designed by using mixed methodology of organic tea cultivation (Deka and Goswami 2021). Surplus income could be garneted through the good management practices with maximum that finally gives good quality of tea leaves. Furthermore, Forster *et al.*, (2013) examined that agronomic and economic data collected during 2007–2010 revealed that rotational practice on cotton-soybean- wheat cultivation showed significant yield gap between organic and conventional farming systems. Concluded that organic farming systems required less expense than conventional ones which may be attract smallholder farmers with bed financial conditions. Brookes and Barfoot (2018), showed effect of organic farming on GM (genetically modified) crops during 1996 to 2016 and found that in an 18.2 billion USD increase of the global farm income in 2016 owing to higher productivity (up to 15% higher yields on average) and efficiency.

**Table 1: Corp wise input cost and profit details in eastern states of India.**

Sr. No.	State	Crop	Cultivation cost (INR)	Net profit (INR)
1.	Assam	Rice and straw	Rs 10,000	35,300
2.	Bihar	Mentha and vegetable	8500 to 11500	4400 to 8000
3.	Jharkhand	Paddy hybrids	10,000	30,500
4.	West Bengal (4 farm labs)	Rice	10,500 to 5000	15,300 to 20,000
			5000 to 6000	3,200 to 3,000

#### D. Organic farming: Farmer's perspective

The farmers were already familiar with organic crop production. In Assam accessibility of suitable varieties of seed in adoption of organic farming is a major issue. The farmer trainers have been motivated to make good networks and search reliable seed companies, from whom they and the farmers who have been trained by them under RPL (Recognition of Prior Learning) may get good quality seed of crop varieties in advance before sowing. On the other hand, Bihar lack of awareness among both farmers and the consumers about quality and benefits of organic produce is a serious concern. A few entrepreneuring farmers could sell their produce directly by developing customer base, but most of the farmers have been struggling to access the customer/market for their premium produce.

In Jharkhand, availability of labor is of course an emerging issue as Organic farming practices require more labor than conventional one. Farmers have started organic farming practices after the training. But more information on indigenous seed availability and bio-fertilizers availability is required. Likewise, in West Bengal, Organic farming is being adopted but not very enthusiastically due to political reasons.

Good quality seed and market accessibility for selling the organic produce are also major challenges. These result were compared with existing literature another program was organized by ICAR in Guwahati a “Virtual 4<sup>th</sup> Annual Zonal Workshop for the KVKs of Zone - VI spread across the States of Assam, Arunachal Pradesh and Sikkim” from 22-24 July, 2021. The workshop emphasized on prioritizing some enterprises and expanding them widely under the ARYA (Attracting Rural Youths in Agriculture) to all the Krishi Vigyan Kendras. The ICAR experts stressed on sustainable/conservation agricultural practices by focusing on the organic farming and zero budget agriculture (ICAR 2021).

#### E. Impact evaluation of PORI's training programme by OP&HS

This is a questionnaire based approach of OP & HS which focused on the training as understood as achieving or targeting an outcome (OP & HS, 2021). Assessment of the trainee farmers built in a sense of discipline and seriousness among the candidates where the purpose was to retain, recall and implement what they had presented to them in terms of teaching as well as practical demonstration. Among the questionnaire in

the eastern region, 92% felt that trainers gave the necessary handholding. On the basis data, 41% of the trainers are benefited by this approach (Fig. 5). The trainees adopted practices based on the findings of the soil testing results and added fertilizers as well as nutrients. In the eastern states, 78% had adopted organic enrichment practice. Analysis shows 77% respondents received knowledge about frequency, quantity and specificity to crop. In Assam, Bihar, Jharkhand and West Bengal 93% land used in irrigation, 72% of farmers switch to organic pesticides and 70% farmers resorted to water saving techniques like reduction in water usage and adoption of modern irrigation (Impact assessment report, 2021). In same way, ICAR has organized all India network programme on Organic Farming organized a Mass Awareness

Campaign on “Organic Farming” from 2-7 August, 2021 in Meerut, Uttar Pradesh inside this program 1,776 participants including farmers, students, entrepreneurs, certified farm advisors, extension agents and stakeholders involved in the organic farming campaign. The campaign aimed at sharing the production and protection technologies, certification and marketing aspects of organic farming to the different stakeholders was organized as a part of the “Bharat Ka Amrut Mahotsav”. In this campaign, experts from ICAR emphasized on the soil health management including the crop residue management and organic nutrient management in the organic farming (ICAR. 2017).

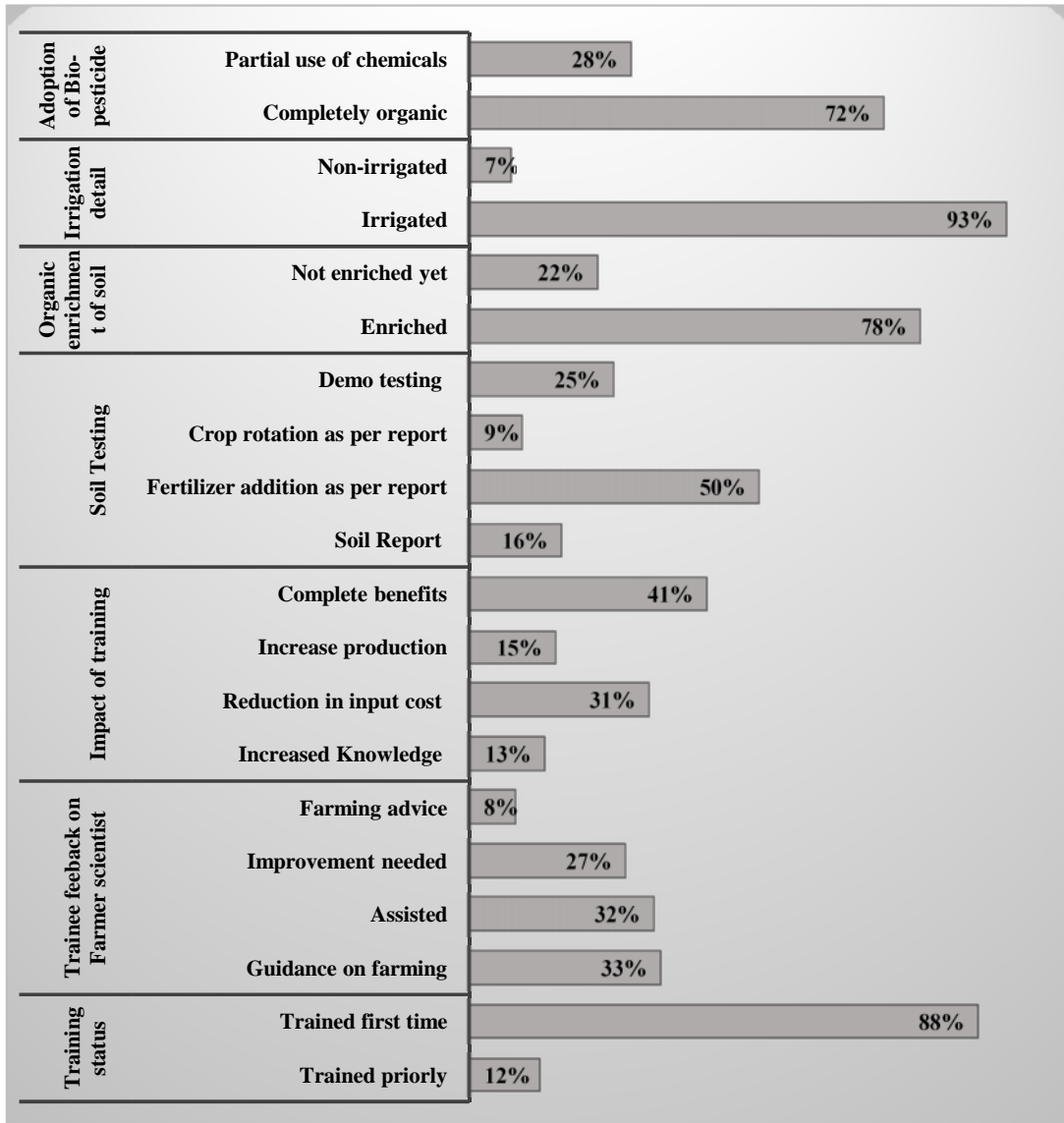


Fig. 5. Impact evaluation of training programme.

## CONCLUSION AND FUTURE SCOPE

PORI provide immense support in organic farming for doubling of farmer’s income with maintenance of ecosystem and reduce heavy metal contamination. However, it state that more rigorous scientific

*Balkrishna et al., Biological Forum – An International Journal*

assessments at both experimental as well as field level are needed in order to cope up organic agricultural system with clear sets of management.

In Assam, tea, litchi, areca nut, strawberry and mushroom were seen high profit fetching crops. Rice

alone cannot compensate the cost of cultivation. As a thumb rule, legumes like green gram, Black gram Subabul, fodder crop may be included in the system. In states like Jharkhand, organic farming is recommended for the farmers in rainfed area in the state with some support of inputs like seed and bio-fertilizers through National scheme or state organic policy. More mechanization by developing and supplying low cost implements may help the farmers to address the labor issue. More efforts can be made to promote organic farming by making clusters and self-help groups.

In Bihar, paddy, mentha and vegetables are well remunerative crops in the region if grown with organic practices. Apart from direct cash profit, the long-term benefits of soil and human health are numerous. Northern part of the state covered in AESR (Agro ecological sub regions) is moderately suitable for Bengal gram, black gram and green gram. Adoption of one legume after one cereal can be promoted extensively in the region except swampy area of Terai to improve the soil health. On the other hand, in West Bengal Less water requiring crops like wheat may give higher returns than summer rice. Resource conserving technologies like less tillage, zero tillage, bed planting of wheat could be more effective. The area is on the shores of Bay of Bengal and is prone to cyclones and other climate challenges. Contingency plans could be developed for the growers who are on high risk of losing crops due to calamities.

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**Conflict of Interest.** The authors declare that they have no conflict of interest regarding this study.

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