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COPING WITH CLIMATE EXTREMES: DEVELOPMENT INTERVENTIONS THROUGH STRATEGIC COLLABORATION – A CASE FROM ODISHA

Odisha State is well-known for both – its frequent incidents of natural disasters as well as its preparedness to deal with these challenges. In this Good Practice Note, Dr Bidhan K Mohapatra, Dr PN Ananth, Dr NC Banik, Mr S Singh, Dr Sreenivas Ch. and Mr AK Dash share their experience from the joint initiative of Cereal Systems Initiative for South Asia-CSISA project and ICAR-KVK-Khordha where they introduced innovations such as stress tolerant varieties and mechanical transplanting in rice. This Note offers several lessons on how to partner and share expertise to support farmers in recovering from extreme climate events.

CONTEXT

Odisha is one of the states in India with climate extremes as a regular phenomenon. Odisha State suffers from many natural hazards; climate extremes such as flood, cyclone, monsoon variability, drought and so on occur regularly. Well-documented evidence shows that many cyclones turn and steer in from the Bay of Bengal to make Odisha a customary landfall target (Dasgupta and Priyadarsini 2019). In the period between 1981 to 2018 Odisha has been affected by 110 cyclones and many have also been shared by the neighbouring states of West Bengal and Andhra Pradesh. The larger impacts of these climate extremes fall on farmers who are highly affected through crop damages. Farmers growing cereals, pulses, oil seeds, fruits and vegetable are the most affected. Significantly, the infrastructure of small poultry farms, fish hatcheries and enterprises are also frequently affected.

As a recurring activity Odisha was again hit by cyclone *Fani* on 3 May, 2019. The losses to agriculture and natural resources impacted the state's economy and farmers' livelihoods. Many agencies, predominantly the government, worked on relief measures and restoration activities. Rice is the major crop of the state. The life of farmers in Odisha depend upon rice. The Cereal Systems Initiative for South Asia-CSISA project partnered with the Krishi Vigyan Kendra, Khordha, under the ICAR-Central Institute of Freshwater Aquaculture (hereafter CIFA), Bhubaneswar, in the aftermath of the cyclone to support farmers cultivating rice (Box 1).

Box 1. CSISA and KVK as Research and Development Actors

CSISA is a project jointly implemented by the International Maize and Wheat Improvement Center (CIMMYT), the International Food Policy Research Institute (IFPRI), and the International Rice Research Institute (IRRI). CSISA works to increase the adoption of various resource-conserving and climate-resilient technologies, and improve farmers' access to market information and enterprise development. CSISA supports women farmers by improving their access and exposure to modern and improved technological innovations, knowledge and entrepreneurial skills. CSISA also works in synergy with regional and national institutions, collaborating with myriad public, civil society and private-sector partners.

KVK-Khordha the 'Farm Science Centre' of the Indian Council of Agricultural Research (ICAR), New Delhi, works under the administrative control of ICAR-CIFA, Bhubaneswar, for the mandated district of Khordha in Odisha State. The KVK works on technology assessment refinement and transfer of agricultural and allied sector technologies, and training of farmers/farmwomen of the district. The KVK has a proven institutional convergence record despite being constrained with manpower and low investments, and helps in bringing change in the life of farmers (Ananth et.al. 2019).

THE CSISA AND KVK STRATEGY FOR COPING WITH CLIMATE EXTREMES

To address the consequences of extreme climate events in rice farming, CSISA has been promoting resource conserving practices and sustainable intensification technologies (Box 2), which are need to be taken forward for wider adoption and sustainability. Many farmers are yet to be well informed and trained about these vital technologies. As an example, in the district of Khordha there are only four farmers who own a rice transplanter. Even major organisations in the districts, like KVKs, also have very little awareness of transplanters. Thanks to ICAR at least two ICAR-KVKs of Odisha were fortunate to have this modern farm implement for farmer demonstrations during 2019-20.

Box.2 Technologies in rice cultivation targeted through this collaboration

Stress Tolerant Rice Varieties (STRVs): Rice varieties that are tolerant to the major abiotic stresses (drought, flooding, salinity and high temperature) and provide some protection against the adverse effects of climate change. Some of such varieties are Swarna-Sub1, CR 1009-Sub1, BINA dhan 11, DRR 44, Sahbhagi dhan, etc.
Mechanical rice transplanting: Transplanting young rice seedlings which have been grown in a mat nursery through a self-propelled rice transplanter. It saves lots of labour cost and time and results in higher grain productivity.
Young and healthy rice seedling: To ensure higher grain productivity in rice transplanting young and healthy rice seedlings need to be transplanted. Age of the rice seedling depends on the duration of rice varieties. Healthy rice seedlings can be supplied by rice nursery entrepreneurs/ rice seedling factories.

During 2019, CSISA collaborated with KVK-Khordha to organise a survey on collecting field-based information on rice agronomy of the district. It was during this period that cyclone *Fani* hit Odisha State and Khordha district was not spared either. As a short term intervention, KVK-Khordha and CSISA worked together to enhance agricultural resilience by supporting rice farmers of Khordha district. The aim was to support farmers to learn and better cope with climate extreme incidents such as monsoon variability, flood, cyclone, drought, etc., which are a regular occurrence in the district.

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It has been estimated that over 1.5 lakh ha of agricultural land was damaged in Odisha due to *Fani* cyclone. Majority of farmers lost their saved seeds which they had kept for sowing in the upcoming season. The situation was further aggravated as the monsoon rain occurred late in coastal Odisha on June 21, which normally happens in the first week of June, and caused erratic rainfall the whole of

July 2019. The situation made it difficult for farmers to grow rice seedlings – particularly the long duration varieties for low to medium land areas.

Under these circumstances, KVK-Khordha and CSISA worked collaboratively with a few farmers in managing the risk caused because of climate extremes, as budget and manpower were inadequate. Interestingly, in the entire existence of KVK (since 1976), this is the first time an action plan was developed to support farmers of the district to recover from the effect of the cyclone. The earlier attempts in such situations only included provision of inputs like seeds, fertilizers, agro chemicals, planting materials and others as hand-outs.

Consultation and Planning Meeting: On May 21, 2019, KVK-Khordha organised a consultation and planning meeting with its partners (CSISA, IRRI-Odisha, ICAR-National Rice Research Institute, National Innovation Foundation, National Freshwater Fish Brood Bank, and others) to collaborate on post-cyclone activities. In the meeting it was clearly spelled out that any development intervention as a relief for the cyclone will have core innovations that can help farmers revive from the shock, and also for future farming in the next season. CSISA joined in the meeting and talked about the use of STRVs with technology layering and data management for proper planning and monitoring.

Box 3. Data management & Technology Layering

Data management is a process that comprises collecting, validating, storing, protecting, and processing needed data to ensure the accessibility, reliability, and timeliness of the data for its users. In our collaboration, we intended to collect data through the 'Open Data Kit (ODK) Collect' digitally, which is known for its speed, quality and cost efficiency benefits.

Technology layering is adding one or more new technologies with other existing practices in the agriculture production cycle. For example, line sowing/transplanting could be technology layered with the use of STRVs. Further it can be layered with other technologies, such as nutrient management or integrated weed management (IWM), etc.

Introduction of STRVs: On June 11, 2019, CSISA through the KVK provided medium duration flood tolerant rice variety Swarna Sub-1. CSISA and KVK decided to select 40 farmers from 11 villages of the district to demonstrate selected innovations in rice cultivation. This demonstration had two objectives. First, it was aimed to help farmers as a relief measure from cyclone; and second, to disseminate technologies that can serve as coping strategies during climate extremes. The lowland areas of the district are generally prone to flash flooding due to heavy rain during the months of August and September. The paddy variety Swarna Sub-1 being a flood tolerant variety acts as a safeguard against such flood damage.

Introduction of Mechanical Transplanter: To overcome the problem of labour shortage in the aftermath of climate extremes, CSISA and KVK strategically introduced Mechanical Transplanting of Rice (MTR) among the selected farmers in the district. During this process farmers were made aware of MTR, economic benefits of better crop establishment methods with healthy seedlings, and adopting STRVs. Both the organisations worked together to organise an awareness programme on the above thematic areas in order to create awareness and thus continue adopting scientific management practices. CSISA scientists explained the constraints in rice production, the importance and management of a healthy rice nursery, better management practices in mechanically transplanted rice, etc. Moreover, discussions were also held on the productivity and profitability of healthy rice seedlings obtained from nursery enterprises. The awareness programme also enlightened the farmers on the concept, and how it works in imparting agricultural resilience under climate extremes. Another new form of an agriculture enterprise – 'custom hiring services for farm mechanisation' as a new business area – was also presented to the farmers.

Exposure Visit: On July 24, 2019, an exposure visit was organized jointly by CSISA and KVK-Khordha for the same farmers who attended the awareness programme earlier. The farmers were exposed to the CSISA-supported Rice Seedling Factory (RSF) of a farmer, Mr Lingaraj Bhol, a successful rice nursery entrepreneur located at Subarnapur village in Gop block of neighboring Puri district. Since 2014, Mr Bhol has been working with CSISA which had initiated his rice nursery raising and

mechanical rice transplanting service around five years ago. Motivated and trained by CSISA, now he is successfully practicing nursery business and provides different services around rice transplantation. During 2019, the target of nursery raising was about 1000 acres of main land in the

district and neighboring districts. The visiting farmers also got an opportunity to directly interact with a nursery entrepreneur – Mr Bhol.

Demonstration of MTR: Stepwise method of rice nursery preparation, growing nursery in trays, care of seedlings, nursery management practices, and plant protection measures were also discussed and demonstrated to the farmers. The farmers were also exposed to a nearby farmer's field for live demonstration of mechanical rice transplanting by a six-row four wheel riding type rice transplanter. All queries from the farmers were addressed by the service provider and the CSISA-KVK team. The farmers, upon completion of the visit, were very much interested in mechanical transplanting of rice and have shown keen interest in adopting mechanical transplanting of rice from the next season.

During 2019, KVK received grants from ICAR to procure modern farm implements and one of them was the rice transplanter. Since then KVK has planned to work on promotion of 'Nursery Enterprise' through demonstration and custom hiring. Even some of the farmers have planned to buy a paddy transplanter. At the end of the programme all the farmers were convinced that technologies can support farmers during climate extremes through a series of activities such as providing STRVs, creating awareness on better management practices, exposure to a successful rice nursery entrepreneur, and live demonstration of mechanical transplanting and others.

Crop Cutting: CSISA-KVK, Khordha, conducted crop cutting exercise for the STRV Swarna Sub-1 that had been distributed to farmers who were affected by *Fani* cyclone, and compared it with a popular farmer variety used as control. The data obtained from the crop cutting exercise was interpreted using simple statistical analysis, and this is presented below (Table 1).

Table 1: Results of mass cropping experiment for treatment and control varieties

Variety	Avg. plant height (cm)	Avg. panicle length (cm)	Effective tillers/hill (no.)	Plant population (hills/sq. mt)	Biomass (q/acre)	Yield at 14% grain moisture (t/ha)
Swarna Sub-1	97.87	22.00	12.96	25	65.50	5.59
Pooja	108	21.20	10.57	26	50.80	5.37

From the above table it could be inferred that the yield of STRV variety Swarna Sub-1 was 5.59 t/ha compared to the local variety adopted Pooja, which yielded 5.37 t/ha. The demonstrated STRV had a higher biomass of 65.50 q/ha compared to that of local check Pooja with only 50.58 q/ha. Though the yield of demonstrated variety and local check did not vary much, farmers became aware of the potential of STRV that can serve both purposes – of production as well as ability to withstand climate extremes. It has also been observed that in Odisha once cyclone falls the next episode would be floods due to excess rainfall during cyclone. In October 2013, when Odisha was battered by cyclone *Phailin* the rice crop was submerged for a few days (10-16 days depending upon the elevation of the land) due to the floods that followed upon the heels of the cyclone (Dar et al. 2017). Farmers who cultivated Swarna Sub-1 started to recover immediately after the water receded and were relatively unaffected.

LESSONS LEARNT AND CONCLUSIONS

The foremost lesson learnt by KVK was on the decision to select right technologies during climate extremes as an extension organization, instead of distributing critical inputs to a few farmers which has been the approach used by many organisations immediately after an event. Quite often these inputs are what the government has with it and are not preferred by the farmer. In this work, CSISA and KVK have influenced the community to try and experiment with most relevant technologies, and engaged with them on a long term basis to provide hand-holding support to enable continuous adoption.

The technologies promoted by CSISA and KVK were new to the farmers of the district. However, these influenced farmers to test them in their fields and they were supported with sufficient knowledge in this endeavor.

While upscaling new technologies is the role of other mainstream extension agencies, organisations like KVKs characterized by limited budgets and manpower can create more impact, if it partners with others possessing expertise and resources. Our experience also revealed that extreme climate events are a good opportunity to promote new technologies.

In this development intervention, both the partners – CSISA and KVK – knew their strengths and weaknesses. While the expertise of KVK has been its longstanding presence in the district, its capacity to mobilize farmers and its understanding of varied extension approaches, the expertise of CSISA has been its access to new technologies in rice and its flexibility in working. These types of partnerships are thus critical for promoting sustainable livelihoods development after every climate extreme event.

A successful intervention has to be repeated for at least 3-4 years until it gets traction and is adopted by farmers at a scale or to become an innovation. Most of the time one successful intervention gets discontinued because organizations themselves leave and switch to the next development intervention with other potential innovations. Reasons for such discontinuance are many, but they have to work on scaling up through convergence. KVK-Khordha worked on introduction and popularization of an improved variety of pointed gourd (var. Swarna Alaukik) for more than seven years, a new crop of capsicum took more than eight years to get larger adoption, CIFABROOD - a carp brood diet for fish hatcheries took more than six years to reach many. It is always a limitation for small extension organizations like KVKs to scale up new technologies and best practices without collaborating with other agencies.

With their experience of working with CSISA, KVK has formulated an approved action plan for 2020-21, to work again with 40 farmers to introduce the innovations in a cluster. Farmers will hire the rice

transplanter from KVK to transplant rice seedlings with minimum labour in a short time. The KVK has also decided to have process documentation on the proposed activities. To conclude, one can scale up new knowledge if organizations having complementary expertise collaborate in introducing and promoting that knowledge.

References

Ananth PN, Babu S, Barik NK, Dash AK and Sundaray JK. 2019. An institutional convergence for agricultural development: The changing role of extension. AESA Blog 96. (https://www.aesanetwork.org/blog-96-institutional-convergence-for-agricultural-development-the-changing-role-of-extension/)

Dar MH, Chakravorty R and Waza SA. 2017. Transforming rice cultivation in flood prone coastal Odisha to ensure food and economic security. *Food Sec.* **9,** 711–722. https://doi.org/10.1007/s12571-017-0696-9

Dasgupta A and Priyadarshini S. 2019. Why Odisha is sitting duck for extreme cyclones. Nature India. doi:10.1038/nindia.2019.69. Published online 29 May 2019.

Mohapatra BK. 2018. Agricultural development and food security in Odisha. Indian Journal of Economics and Development 14(2):213-224.

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