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A case study approach to understand farm family fighting against climate change

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Abstract

Climate Change is now a days becomes a burning issue in agriculture sector and negative impact of which needs to be reduced. Therefore, the present study was undertaken in Jhola village, Gajapati district of Odisha in 2021 where case studies of two progressive farmers of that village were conducted. In these case studies, data analysis tool like sociogram analysis was used to investigate minutely, so that negative effect of climate change and their solutions can be determined properly. After analysis of data, various sources of information & social interaction pattern, it was revealed that farmers are facing severe problems of food & job security due to Climate change and they were fighting against them by means of i) using innovative 'low-cost technical strategy' ii) creating links with various Government & Non-Government Organizations to get support from them iii) reducing the costs of agricultural production by limited use of chemical inputs, iv) Implementing IFS and IPM, v) participating in state training programmes. Institutional networks can help in strengthening the farm families by means of capacity building so that food security at family level and empowerment at community level can be possible.

Keywords: Case study, climate change, farm family

Introduction

Changes in precipitation and temperature, driven by an evolving environment, have essentially influenced worldwide agribusiness as of late. Different reports from the Intergovernmental Panel on Climate Change (IPCC) and the United Nations Collaborative Program on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD) have recorded the general impacts of environmental change; the IPCC's fourth appraisal report demonstrates that most land regions will encounter an increment in normal temperature, alongside more continuous warmth waves, more focused on water assets, desertification, and times of substantial precipitation. (IPCC 2007). These super climate occasions could antagonistically influence numerous nations on the planet, particularly those with a significant portion of GDP coming from horticulture. The locales that could be most antagonistically influenced are Africa and South Asia; as indicated by Dinar *et al.* (2008), environmental change is relied upon to be unfavorable to the major farming items yields in generally tropical and sub-tropical districts. Precipitation is projected to diminish in most of African nations, with inconsistent conveyance and repartition in existence. These progressions are expected to contrarily affect the accessibility of horticultural land, the length of developing seasons, and the yields of significant harvests like millet, sorghum, and maize. The outcomes show that the ascent in mean yearly temperatures and the lessening of yearly precipitation will adversely influence agrarian creation in ESA nations. On the off chance that temperatures increment by 1.5 °C (separately, 2.5 °C), horticultural creation will decay by 4.04% (individually, 6.73%), holding any remaining elements consistent. On the off chance that yearly precipitation diminishes by 10% (separately, 20%), horticultural creation will diminish by 0.965% (individually, 1.93%), holding any remaining components steady (Belloumi, M., 2014) [2]. Climate or environmental change is a worldwide danger to the food and nourishing security of the world. One of the major causes of climate change is emission of greenhouse gases due to which the global temperature is increasing day by day and it is predicted to rise by 2 °C until 2100, which would cause tremendous loss economically at world level. No doubt CO₂ gas helps in photosynthesis which in turn results higher growth & productivity of plant but vigorous increase in CO₂ concentration leads to increase in temperature which ultimately affect negatively by means of increasing rate of respiration, pest infestation, evapotranspiration, weed, and reducing crop duration.

Microbial population as well as their enzymatic activities are also affected by climate change (Malhi, G. S. *et al.*, 2021) [5]. Therefore, different mitigation strategies were implemented by different organizations. The member states have consented to make critical moves to battle climate change and to foster national adaptation plans and other transformation arranging measures in the Agenda, 2030 for Sustainable Development of the United Nations (UN, 2019) [11].

Climate change compromises farming usefulness around the world, bringing about higher food costs. Related financial additions and misfortunes vary by district as well as among makers and purchasers and are influenced by market elements. Based on an effect displaying chain, beginning with 19 distinct environment projections that drive plant biophysical measure re-enactments and finishing with agro-financial choices, this examination centres around distributional impacts of top-of-the-line environmental change impacts across geographic areas and across monetary specialists. By assessing the progressions in overflows of shoppers and makers, we find that environmental change can inconveniently affect worldwide farming government assistance, particularly after 2050, in light of the fact that misfortunes in customer excess by and large offset gains in maker excess (Mendelsohn, R., 2008) [7].

The unimpeded development of ozone harming substance discharges is raising the world's temperature. The results incorporate melting glaciers, more precipitation, extreme weather events, and changing seasons. The speeding up speed of environmental change, joined with worldwide populace and pay development, compromises food security all over the place. Agriculture is amazingly powerless against environmental change. Higher temperatures at last decrease yields of advantageous harvests while empowering weed and bug expansion. Changes in precipitation designs improve the probability of short-run crop disappointments and since a long time ago run creation decreases. Despite the fact that there will be gains in certain harvests in certain areas of the world, the general effects of environmental change on farming are relied upon to be negative, compromising worldwide food security. Populaces in the creating scene, which are now helpless and food uncertain, are probably going to be the most truly influenced. In 2005, almost 50% of the financially dynamic populace in non-industrial nations 2.5 billion individuals depended on horticulture for its occupation. Today, 75% of the world's poor live in rural areas (Nelson, G. C. *et al.* 2009) [8]. Unit root test assessments affirm that all factors are fixed at the blend of $I(0)$ and $I(1)$. The outcomes show that CO₂ outflows significantly affect rural yield in both since a long time ago run and short-run examinations, while temperature and precipitation negatively affect rural yield over the long haul. Among different determinants, the land area under cereal crops, fertilizer consumption, and energy consumption have a positive and significant relationship with agricultural output in both since a long time ago run and short-run investigation. The estimated coefficient of the error correction term is also very much significant (Chandio, A. A. *et al.*, 2020) [3]. Because of the anthropogenic exercises the normal temperature has ascended by 0.9 °C since nineteenth century, fundamentally because of ozone harming substance (GHG) outflows in the air. According to gauges this ascent is relied upon to be 1.5 °C by 2050 or might be significantly more, the manner in which deforestation is happening, GHG emanation is expanding and soil, water bodies and air are being dirtied. The phenomenal climb in temperature has

brought about expanded occasions of dry spells, floods, sporadic examples of precipitation, heat waves and other outrageous happenings all through the globe (Arora, N. K., 2019) [1]. Asian agriculture is liable for 66% of worldwide farming GDP. There have been various examinations investigating the effect of environmental change on crops in explicit areas in Asia however no review has yet dissected harvests across the whole mainland. This review depends on a Ricardian investigation of China that assessed environment coefficients for Chinese yields. These coefficients are then used to introduce potential environment harms across the mainland. With carbon treatment, the model predicts little total impacts with a 1.5 °C warming yet harms of about US\$84 billion with 3 °C warming. India is anticipated to be particularly helpless (Delincé, J., *et al.* 2015) [4].

As indicated by the Intergovernmental Panel on Climate Change (IPCC) a dangerous atmospheric deviation forecast report, the worldwide mean temperature will be expanded by 1.0–3.5 °C by 2100, and CO₂ multiplying would be expanded temperature by 1.5–4.5 °C. Worldwide mean surface temperature oddities were likewise recorded to be expanding reliably with time since 1880 to the year 2019; 2016 positions as the hottest on record (NASA GISS). Subsequently, expansion in temperature and CO₂ can be a major test before ranchers and result in a significant danger to horticulture and food security. It can possibly influence horticulture emphatically just as adversely as far as yield, contingent on the varieties in different elements. The portion of farming in worldwide discharges, the requirement for additional worldwide alleviation endeavours, and proceeded with projected horticultural emanations development in numerous nations all joined together to underline the need for more grounded and more powerful arrangements (Yadav, P., *et al.* 2021) [12].

The biggest known financial effect of climate change is upon farming as a result of the size and affectability of the area. Warming makes the best mischief agriculture in developing nations essentially in light of the fact that many homesteads in the low scopes as of now suffer environments that are excessively hot (Mendelsohn, R., 2008) [7]. Asian agriculture is liable for 66% of worldwide farming GDP. There have been various examinations investigating the effect of environmental change on crops in explicit areas in Asia however no review has yet dissected harvests across the whole mainland. This review depends on a Ricardian investigation of China that assessed environment coefficients for Chinese yields. These coefficients are then used to introduce potential environment harms across the mainland. With carbon treatment, the model predicts little total impacts with a 1.5 °C warming yet harms of about US\$84 billion with 3 °C warming. India is anticipated to be particularly helpless (Mendelsohn, R., 2014) [6]. fish species in the KRW are more touchy to changes in the environment system than to changes in the land-the executives rehearses. In particular, the most probable rate changes in fish species uncovered a likely decrease in lavishness in all stream orders over the long haul with the most exceedingly terrible effects in the first and second request streams (- 5%– - 10% decade⁻¹) because of the reformist expansion in the temperatures (0.61 °C – 0.92 °C decade⁻¹) expected in the watershed. The drawn-out impacts on fish species lavishness might be inescapable if the proposed land-the executives options were not joined by extra measures explicitly configuration to ensure oceanic life (Triana, J. S. *et al.* 2021) [10].

The vast majority of the ranchers see there are unfavorable environmental change impacts on their agrarian creation. We likewise find that ranchers' variation gauges generously help rice yields. In addition, it is shown that such techniques would help the two connectors and non-connectors. Ranchers' admittance to environment related data, instruction, enrolment in rancher associations and size of plots are found to assume a critical part in the transformation cycle. By and large, this review gives exact proof of the positive effect of variations on food usefulness and ranch pay, accordingly recommending the requirement for strategy mediations that improve farmers take-up of techniques against environmental change impacts (Suresh, K., *et al.* 2021)^[9].

After several review, the present study entitled "A Case Study approach to understand Farm Family Fighting against Climate Change" was conducted in the year 2021 to find the grass root level mitigating strategies adopted by the farm families.

Objective of the Study: To understand "how the Farm Families Fighting against Climate Change".

Research Methodology

The present study was conducted in Jhola village of Gajapati District, Odisha, India in the year 2021. After discussion and guidance from professors and scientists this village was selected purposively. 30 farmers were selected randomly from that village for the purpose of study or investigation. With the help of Socio-metric technique, two key informants or leaders were selected from whom the farmers of that village would like to go for information & advice on problems, adaptations, solutions and betterment related to farming. The data were collected in the form of Sociometric matrix (Table-1) and two respondents were selected as key informants or leaders i.e. Respondent-6 (Simiyen Gomango) and Respondent-8 (Srimanta Mishra) as Simiyen Gomango has received maximum (18) choices followed by Srimanta Mishra 16 choices.

The Choice Status of Simiyen Gomango is $= \frac{18}{30-1} = \frac{18}{29} = 0.62$ or 62%

The Choice Status of Srimant Mishra is $= \frac{16}{30-1} = \frac{16}{29} = 0.551$ or 55.1%

After selection of key informant case studies were conducted where not only the information related to their profile but also the information related to "how the Farm Families Fight against Climate Change" were collected. The data were collected through Personal interview, Focussed Group Discussion and PRA and other research tools & techniques.

Results & Discussion

After personal interview, discussion, and analysis the information collected from the selected Key informants are analysed and discussed below:

Case Study-1: Information collected from Simiyen Gomango

Simiyen Gomango, of Jhola village, was a progressive farmer. Age is about 35 years, B.Sc. passed. His family was migrated from Andhra Pradesh and started agriculture in that area in about 1940. They were the land lords or *Zamindar* of that area. He was very much fond of diversified production. He ranked first in respect of resource integration in his farm. Wellbeing ranking revealed that he was the most 'Resource

Rich' farmer of the area. His farm was very much productive and the other neighbour farmers were following him regarding the adoption of modern technologies. It was revealed from the FGD that he was the key person with whom NGOs used to contact to disseminate a new technology.

Strength of Simiyen Gomango are:

- Cosmopolitan sources of information
- Risk taking ability higher than others
- Skilled and well-trained farmer
- Good marketing linkage
- Knowledge about farmer centric government schemes and policies
- Good connection with NGOs, KVK, and GOs.

"Since, 12 years I have been thinning out innovative 'low-cost technologies strategy' subsequent to creating links with various Government as well as Non-Government Organization (not only the organizations, working at my native place, but also with the organizations of other states). I attended several training programmes....Earlier... There was no government support for spread of new farming techniques aside from a couple of NGOs had some supporting initiative. But now we are getting support from Government. We had severe problems of food security – because of Climate change. I'm fighting against negative effect of climate change by means of experience, organizational linkages and support and the technologies that I have said"

– Simiyen Gomango

Case Study-2: Information collected from Srimanta Mishra

Agri-entrepreneur Srimanta Mishra opined 'I have reduced the costs of agricultural production by limiting the use of chemical inputs. IFS and IPM helped me a lot. I'm in this field since last 15 years. I attended more than 18 out of state training programmes. These practices and technologies are helped me a lot in mitigating negative climate change."

After social network analysis (Picture-1) it was found that:

The institutional networks and liaison at the grassroots, if utilized properly, can act as a change maker and able to strengthen the family-based farms. Capacity building of the farmers having small farms may reinforce the food security at family level and empowerment at community level.

Impact on Family Level: If properly adopted with investment in maintaining improved yields without depleting natural agriculture, organic farming improves the personal savings and health resources or destabilizing the environment. Integrated farming (as promoted by GO and NGOs) is a commonly and broadly used word to increased food production; social function in terms of explain a more integrated approach to farming as provision of employment opportunities for excess labour compared to existing monoculture approaches.

Both the key informants reported that the major impact of the climate change were:

Food insecurity & Joblessness. These problems can be solved only through implementation of advanced technologies and proper use of inputs, production & marketing. Both GOs and NGOs should extend their hands and support to the farmers during adverse situations. No doubt several programmes or schemes are being launched the government but that is only in written documents not happening in real sense. There is so many lacuna in

programme implementation like selection of appropriate beneficiaries, funds, corruptions, biasness, not in proper time

etc. Government should focus on these sectors also.



Pic 1: Social Interaction pattern of Srimanta Mishra

Table 1: Sociometric Matrix of 30 Respondents with two choices (30×30 matrix)

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30
R 1		1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
R 2	0		0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
R 3	0	0		0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
R 4	0	0	0		0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
R 5	0	0	0	0		1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
R 6	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	
R 7	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	
R 8	0	0	0	0	0	1	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
R 9	0	0	0	0	0	0	0	1		0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
R 10	0	0	0	0	0	1	0	1	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
R 11	0	0	0	0	0	1	0	0	0	0		0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
R 12	0	0	0	0	0	0	0	1	0	0	0		0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
R 13	0	0	0	0	0	0	0	1	0	0	0	0		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
R 14	0	0	0	0	0	0	0	1	0	0	0	0	0		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	
R 15	0	0	0	0	0	1	0	1	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
R 16	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	
R 17	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	
R 18	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	
R 19	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	
R 20	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	
R 21	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	
R 22	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	
R 23	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	
R 24	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0		0	0	0	0	0	
R 25	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	
R 26	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	
R 27	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	
R 28	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0
R 29	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0		0
R 30	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
Sum	2	2	2	0	1	18	0	16	1	1	0	0	2	0	2	0	2	0	1	1	1	2	0	1	0	2	0	1	0	0

*R= Respondents

Conclusion

Farmers are facing several problems due to climate change. Food & job security are the two important problems due to Climate change. Farmers are trying to solve problems of Climate change by means of adopting advanced technologies, IPM, IFS etc. They are fighting against them by using innovative ‘low-cost technical strategy, creating links with various Government & Non-Government Organizations to get support from them, reducing the costs of agricultural production by limited use of chemical inputs, participating in state training programmes. Institutional networks can help in strengthening the farm families to fight against climate change by means of capacity building so that food security at family level and empowerment at community level can be

possible.

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