BIODATA

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ACADEMIC QUALIFICATION

EXAM PASSED	**BOARD/UNIVERSITY**	**YEAR**	**SUBJECTS**	**% OF MARKS/ OGPA**	**CLASS/DIVISION**
MADHYAMIK (10^{th})	WBBSE	2004	Bengali,English,Math, Life Science. Physical Science,History,Geography Biology(Addl)	78.5	1st
HIGHER SECONDARY (10+2)	WBCHSE	2006	Bengali,English, Physics,Chemistry Math,Biology	72.7	1st
B.Sc(Ag) Hons	VISVA-BHARATI	2010	Agriculture, (Soil Science & Agril. Biochemistry as special paper),	7.21	1st
M.Sc(Ag)	BCKV	2013	Agricultural Meteorology, (Soil Science & Agril. Statistics as minor and supporting subject)	7.74	1st (**ICAR-JRF in Agricultural Meteorology**)
Ph.D	BCKV	2018	Agricultural Meteorology (Agronomy & Soil Water Engineering as minor)	7.82	1st

WORKING EXPERIENCE	A. RESEARCH WORK CARRIED OUT DURING M.Sc(Ag) PROGRAMME B. WORKED AS S.R.F UNDER AICRPAM-NICRA (ICAR) PROJECT C. WORKED AS S.R.F UNDER NICRA-TDC (ICAR) PROJECT AT ATARI-KOLKATA
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- **TITLE OF M. Sc. (Ag) DISSERTATION** : Climate of West Bengal: Assessment of the observed change and its future projection
- **TITLE OF Ph.D Thesis :** Optimizing Evapotranspiration and Water Budgeting for *Boro* Rice in Lower Gangetic Plain of West Bengal
- **Qualified National Eligibility Test (NET) in Agricultural Meteorology, conducted by Agricultural Scientists Recruitment Board (ASRB), ICAR.**

SEMINAR/SYMPOSIUM ATTENDED

a) Attended 5th Indian Youth Science Congress from December 6-9, 2013 held at Visva-Bharati, Santiniketan, West Bengal.

b) Attended International Tropical Meteorology Symposium (INTROMET-2014) 21st – 24th February, 2014, at SRM University, Kattankulathur, Tamil Nadu, India.

c) Attended National Symposium on Sustainable Agriculture for Food and Nutritional Security in East and North East India: Prospect and Future organized by Association for Plant Breeding and Improvement (APBI) & Institute of Agricultural Science, University of Calcutta & West Bengal Academy of Science and Technology (WAST) on 1st March, 2014, at University of Calcutta Ballygunge Science College Campus, Kolkata-700019, West Bengal.

d) Presented poster at "New Dimensions in Agrometerology for Sustainable Agricultuire" (NASA-2014) held at GBPAU&T during October 16-18, 2014.

e) Presented poster at "International Seminar on Integrating Agriculture & Allied Research:Prioritizing Future Potentials for Secured Livelihoods (ISIAAR)" held at BCKV, during 6th-9th November, 2014.

f) Participated in the National Seminar on " Sustainable Agriculture for Food Security and Better Environment" organized by Department of Agronomy, BCKV, during 17th-18th December, 2015

g) Participated in the National Seminar on "Resource Based Inclusive Agriculture & Rural Development: Opportunities and Challenges" organized by Faculty Centre of Integrated Rural Development and Management (IRDM) Ramakrishna Mission Vivekananda University (RKMVU), 15th-16th January, 2016.

h) Actively participated in Networking Session: Indian Youth Poster Session of APN 22nd IGM-SPG Meeting held at New Delhi from 24th – 27th April, 2017.

i) Presented poster at International Seminar on "Agriskills for Convergence in Research, Industry & Livelihood (ACRIL)" organized by the Crop & Weed Science Society (CWSS) held at BCKV, during 28th November – 1st December, 2019.

j) Participated (oral presentation) in International Conference on Sustainable Water Resource Management under Changed Climate organized by School of Water Resource Engineering, Jadavpur University, Kolkata during 13th - 15th March, 2020.

TRAINING/COURSE ATTENDED

1. Participated in the SERB sponsored training programme on "Agrometeorological techniques for risk assessment and management of extreme events", held at CRIDA, ICAR, Hyderabad, during 1st-21st September, 2015.
2. Participated in the Agromet Research Explicate Programme (AREP) organized by AICRP on Agrometeorology, BCKV, Mohanpur, during 10th -19th February, 2016.
3. Participated in the Global Initiative in Academic Network (GIAN) Course on "Climate Change Impact Analysis" held at IIEST, Shibpur, during 23rd May to 3rd June, 2016.

Book:

1. Agroclimatic Atlas of West Bengal published by Lahor Publication House B-5/44, Kalyani, Nadia, W.B. 741235. **Authors**: Asis Mukherjee, Saon Banerjee, Suman Samanta, Monotosh Das Bairagya, **Pramiti Kumar Chakraborty**, Dibyendu Mahata.
ISBN: 978-81-929475-6-3

Booklet/Technical Bulletin:

1. Extreme weather events and trends of climatic variable in West Bengal: Analysis and occurrence published by AICRPAM-NICRA (Mohonpur Centre).

Book Chapter:

1. Effect of Climate Change on Agricultural Productivity-Some Mitigation Options in Agriculture: Innovation, Strategy & Technology in 21st Century. **Authors**: P.K. Chakraborty, Shrabani Basu, **Pramiti Kumar Chakraborty**, Srijani Maji, Sarika Jena, Swaraj Kumar Dutta, R. Nath and P. Bandyopadhyay Volume 2. (Editors: Dr. Anukrati Sharma and Megha Goyal) (2015); **Archers & Elevators Publishing House**. 131 AGB Lay

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3. Maji, S.,Bhowmick, M., Basu, S., **Chakraborty, P**., Jena, S., Dutta, S.K., Nath, R.,Bandopadhyay, P., and Chakraborty, P.K. (2014). Impact of agro-meteorological indices on growth and productivity of potato (*Solanum tuberosum* L.) in Eastern India. ***Journal of crop & weed***, 10(2): 183-189.

4. Basu,S., Dutta, S.K., Maji, S., **Chakraborty, Pramiti K**., Jena, S., Nath, R., and Chakraborty, P.K. (2014). Photosynthetically active radiation variation across transplanting dates and its effect on rice yield in tropical sub-humid environment. ***Oryza***, 51(3):241-246.

5. Jena, S., Basu, S., Maji, S., Bandopadhaya, P., Nath, R., **Chakraborty, Pramiti K.,** and Chakraborty, P. K. (2015). Variation in absorption of photosynthetic active radiation (PAR) and PAR use effiiciency of wheat and mustard grown under intercropping system. ***The Bioscan***, 10(1): 107-112.

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8. **Thermal and helio-thermal times – their impact on growth and yield of *Boro* rice under varying dates of transplanting and water regimes**. **Pramiti Kumar Chakraborty**, Suman Samanta, Saon Banerjee and Asis Mukherjee. 2016, p60; Published in Abstracts – National Symposium – AGMET 2016, Climate Driven Food Production Systems: Agrometeorological Interventions. Held at TNAU, Coimbatore during 20th – 22nd December, 2016. ISBN:978-93-84234-89-8
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10. **Deficit irrigation management in summer rice – a way to conserve water in Lower Gangetic Plain under changing climate. Pramiti Kumar Chakraborty,** Saon Banerjee and Suman Samanta – at International Conference on Sustainable Water Resource Management under Changed Climate organized by School of Water Resource Engineering, Jadavpur University, Kolkata during 13th - 15th March, 2020.

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Long-term temperature analysis and its future projection during post-monsoon and winter season in the alluvial, red laterite and costal region of West Bengal

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ABSTRACT

Nine IMD stations (Alipore, Krishnagar, Sagar Island, Midnapore, Berhampore, Bankura, Contai, Shantiniketan, Haldia), distributed randomly in alluvial, red-laterite and coastal regions of West Bengal, were selected for studying the temperature change. First five stations have database of 105 years, sixth, seventh and eighth stations have database of 45years and the ninth station has the database of 15 years during the period of 1901-2005. Six GCMs simulations wore used for the purpose of model validation and future temperature change for the year 2050. First five stations showed drastic rise of temperature ranging from 1.24-3.67°C in 105 years in the post-monsoon season whereas the stations in the red laterite zone recorded a nominal change of temperature ranging from 0.26-0.98°C during 1961-1990. The winter seasons showed the similar warming trend (0.75-2.81°C in 105years) alike post monsoon in the first five stations. Abrupt warming (~0.05-3.03°C) was recorded in last 15 years in the remaining four stations. All GCM models showed a rise of post-monsoon temperature by 0.8-1.8 °C indicating slightly under estimate the observed warming whereas the winter warming is well simulated by GCMs as 1.4-2.4°C. Irrespective of these two seasons, future temperature may rise by 1.4-1.8°C with reference to 1961-90 at end of 2050. This temperature may rise have an important effect on growth and productivity of crops sown during October-March.

Keywords: Future projection, global circulation models (GCMs), IMD stations, post-monsoon

In the context of global warming and climate change, assessing the exact amount of temperature change in the centennial scales as well as 30 years periods over a sub-regional or local scale pay more attention to the policy maker as well as Government agencies. Assessing the seasonal temperature change and its future projection over a small scale or in a point location (station level) is very essential for the impact study leading to agricultural crops as well as hydrological planning. Indian agriculture largely depends on the variability of temperature and rainfall pattern. During post monsoon and winter season wheat, oilseeds, pulses and potato are the major crops, grown in the *Gangetic* plains of West Bengal. Besides, summer rice is also grown across the large tract of the state. All these crops show high sensitivity to the temperature change during the post monsoon and winter season. Rise in temperature reduces the duration of phenophases (Parya *et al.*, 2010), increases evapotranspiration (Cuddeford, 2002), thus lead to lower productivity of winter crops (Banerjee *et al.*, 2007; Dash *et al.*, 2007). The temperature change also caused the variation in GDD requirement for growth phases in winter crops (Basu *et al.*, 2012). Average temperature of this region has shown an increasing trend. Lal (2001) projected a rise in temperature to the tune of 3.5-5.5°C by 2080 over the Indian sub-continent. Das and Lohar (2005) also projected an increase in average temperature to the tune of 0.3-0.7°C per °C global change over *Gangetic* West Bengal (GWB). All mentioned studies are not adequate to provide suitable pictorial representation with a higher confidence for the exact amount of temperature warming so far occurred over the *Gangetic* West Bengal regions where diverse *kharif* and *rabi* crops are grown and developed throughout the year but have sharp climate variability and change from the extreme hot period in pre-monsoon to extreme cold in the winter. None of these studies assessed the warming trends using the modern tool of the global circulation model outputs over such a small domain of GWB. In this present study an attempt has been made to assess the warning trends at regional scale as well as each station location for the 20th century and it future predictions for the 21st century using the station data of IMD and GCMs simulations from CMIP3. The outputs of this research work will help the farmer and agricultural policy makers to adopt suitable measures for growing winter crops in this region.

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MATERIALS AND METHOD

Present study used two different types of data sources namely observed station data from India

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JANS

Rainfall trend analysis and its future projection over Gangetic West Bengal (GWB) region of India during post-monsoon and winter season

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Abstract: Studying the variability of rainfall and its future projection during post-monsoon and winter season is important for providing the information to the farmers regarding crop planning. For evaluating rainfall scenario, long (1901-2005) and short term (1961-2005 and 1991-2005) rainfall data of nine selected IMD stations of South Bengal was collected and subdivided into 30 year period up to 1990 and a 15 year period from 1991 to 2005. The data were subjected to trend analysis and available GCM data were compared with the observed rainfall data. The post-monsoon and winter rainfall changes during 1901-2005 were positive (except Krishnangar, -47.67 mm) and negative (except Alipore and Berhampur) respectively. During 1991-2005 all the stations recorded a positive change during post-monsoon, while reverse was true for winter. Among the different GCMs, INGV-ECHM4 estimated the post-monsoon rainfall at the best, whereas winter rainfall successfully estimated by MIROC-Hi. Future projection of both post-monsoon and winter rainfall over the region showed an increasing trend. This will help in policy formulation for water management in agriculture.

Keywords: Gangetic West Bengal, GCMs, Post-monsoon, Rainfall, Winter

INTRODUCTION

The GWB is the granary of the state. The 70% of agricultural land depends on rainfall. The rainfall during post-monsoon and winter season plays an important role for raising a large number of crops in the area which lacks irrigation facilities. Moreover, a caveat has been sounded by environmental activist on arsenic pollution because of over exploitation of ground water in the Gangetic Plains of West Bengal(Mukhopadhyay and Sanyal, 2004; Das *et al.*,2005). Under this situation study of rainfall pattern and its future projection should be the priority of agroclimatic research. Variability pattern in rainfall is greatly important for agricultural activities. Several authors analyzed the assured distribution of weekly rainfall at a specified probability level for identifying the crop growing seasons in GWB (Chakraborty 1990, Chakraborty *et al.*, 1990, Chakraborty and Chakraborty 1991). Srivastava *et al.*, (1992) analyzed the decadal trends of rainfall over India. . Lohar and Pal (1995) examined the modification of climatic variables due to change in land use pattern during the pre-monsoon season over Southern part of West Bengal. A few authors (De 2001 , Kolli *et al.*, 2002 Rupa Kumar *et al.*, 2002 , Dash and Rao 2003 , Prakas Rao *et al.*, 2004 , Kothawale and Rupa Kumar 2005) studied the climatic changes using observed data as well as model results.. Das and Lohar (2005) investigated the climate change information over GWB using General Circulation Models (GCMs). Dash *et al.*, (2007) observed that the amount of rainfall is decreasing in different seasons. Patra *et al.*, (2012) examined the long term changes in rainfall characteristics by using parametric and non-parametric tests over Odisha. Mehrotra *et al.*, (2013) projected an increase in pre-monsoon and post-monsoon rainfall over Karnataka. Parth Sarathi *et al.*, (2015) compared the rainfall pattern in Gangetic Plains of India through different simulation models.

The present study centered on the trend analysis of rainfall and its future projection during post-monsoon and winter season in Gangetic West Bengal. The information will be helpful to the farming community to frame their cropping programme during this period.

MATERIALS AND METHODS

The present study has been carried out over the state of West Bengal with a special focus on Gangetic belt. The state is situated in eastern part of the country between coordinates 21°20′N to 27°32′N and 85°50′E to 89°52′E. Nine IMD stations are selected, most of which lie in the southern districts of West Bengal (Table 1). We considered our study domain extending from 20-26°N and 83-89°E where all available GCMs grid points are located.

Two types of data are used in this study, namely, observed station data from IMD Kolkata and the CMIP3 GCMs outputs downloaded from the Program for Climate Model Diagnosis and Intercomparison (PCMDI)

Chapter 4
Impact of Climate Change on Coastal Agro-Ecosystems

Saon Banerjee, Suman Samanta, and Pramiti Kumar Chakraborti

Abstract Climate change is a major threat for ecosystems, food security, forests and other natural resources. Proper steps must be taken to reduce the vulnerability of the farming communities living in coastal areas, especially in the developing countries. This chapter reviews the impact of climate change on the coastal agro-ecosystem, and practices to improve sustainability. We found that 27 countries are the most vulnerable due to accelerated sea level rise. In some coastal areas, up to 40% biodiversity loss has already been observed. About 70% income is generated from crop cultivation and the rest is from fisheries and other animal husbandry activities. Hence, climate resilient agriculture can secure the rural livelihood. Adaptation measures may include agro-forestry practices, establishment of orchards, nutrient recycling, salinity management and rational use of water. Techniques of climate resilient agriculture vary with techniques available, needs of the farming community, resources and infrastructure.

Keywords Coastal ecosystem · Climate resilient agriculture · Climate change · Sea level rise · Cyclone

4.1 Introduction

Agriculture can be viewed as one form of ecological engineering for manipulation of populations, communities and ecosystem for human purposes. This concept considers the agricultural operations as ecosystem manipulation instead of only

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Deriving PAR use efficiency of wet season rice from bright sunshine hour data and canopy characteristics

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सार – शुद्ध प्राथमिक उत्पादकता की तुलना में फसल विकास दर मुख्य रूप से विकिरण उपयोग दक्षता (RUE) पर निर्भर है। विकिरण उपयोग दक्षता मापने वाले उपकरणों की कमी को देखते हुए महत्वपूर्ण फसलों की विशेषता का निर्धारण करने के लिए अप्रत्यक्ष दृष्टिकोण विकसित किया जाना चाहिए। इस बात को ध्यान में रखते हुए वैश्विक सौर विकिरण (GSR) का निर्धारण अप्रत्यक्ष दृष्टिकोण के माध्यम से किया गया था और वर्ष 2013-2015 के दौरान विधान चन्द्र कृषि विश्वविद्यालय, पश्चिम बंगाल, भारत के विश्वविद्यालय फार्म में प्रकाश विलुप्त गुणांक प्लस का निर्धारण करने हेतु इस क्षेत्र के चावल की दो लोकप्रिय किस्मों की विकिरण उपयोग दक्षता के लिए क्षेत्र-प्रयोग किया गया था। इसके अलग-अलग भूखंड तैयार किए गए, मुख्य भूखंड में रोपाई के लिए चार तिथियाँ निर्धारित की गई और चावल की दो किस्मों (V1 *स्वर्ण*, V2 *शताब्दी*) की रोपाई के लिए छोटे-भूखंड तैयार किए गए। सांख्यिकीय परीक्षणों से पुष्टि होती है कि इस क्षेत्र के लिए वैश्विक सौर विकिरण (GSR) का आकलन करने के लिए एंग्सट्रम समीकरण उपयोगी हो सकता है। सभी डेटा सेट के लिए धरातल कर फसल बायोमास रैखिक रूप से इंटरसेप्टेड फोटोसिंथेटिकली एक्टीविटी रेडिएशन (IPAR) से जुड़ा है। किसी वर्ष विशेष की गणना किए बगैर चावल की *स्वर्ण* प्रजाति ने *शताब्दी* प्रजाति की तुलना में विकिरण का अधिक कुशलता से उपयोग किया। विकिरण उपयोग दक्षता (RUE) का औसत मान *स्वर्ण* और *शताब्दी* प्रजाति के लिए क्रमश: 2.75 और 2.57 gmMJ^{-1} थे।

ABSTRACT. The net primary productivity, *vis-à-vis* crop growth rate is mainly dependent on radiation use efficiency (RUE). Considering the scarcity of instruments to measure RUE, the indirect approaches should be evolved to determine this important crop characteristic. Keeping this point in mind, Global Solar Radiation (GSR) was determined through indirect approach and field experiment was conducted during 2013-2015 at University Farm of Bidhan Chandra Krishi Viswavidyalaya, West Bengal, India to determine the light extinction coefficient plus RUE of two popular rice cultivars of the region. In the split-plot design, four dates of transplanting were allotted as main plot treatment and two rice cultivars (V_1: *Swarna*, V_2: *Satabdi*) were considered as sub-plot treatment. Statistical tests confirmed that Angstrom equation can be useful for estimation of GSR for this region. Above ground crop-biomass was linearly related to Intercepted photosynthetically active radiation (IPAR) for all of the data sets. Irrespective of years, *Swarna* cultivar used the radiation more efficiently than the *Satabdi* cultivar. The mean RUE values were 2.75 and 2.57 gm MJ^{-1} IPAR for *Swarna* and *Satabdi* cultivars respectively.

Key words – Rice, Photosynthetically active radiation, Solar radiation, Light extinction coefficient, Radiation use efficiency.

1. Introduction

Agricultural productivity is influenced mainly by combination of different inputs like seed, soil, water, management etc. and prevailing weather conditions. Rice (*Oryza sativa*) is the staple food crop in eastern India. India contributes 26 percent in world rice production and ranks just after China, the largest producer of rice.

The total cultivated area of rice in India is 43.4 million ha and the country produced 157.2 million tons of rice in 2014. West Bengal is the top-most rice growing state in India. Normally rice is water loving crop and requires a mean temperature range of 17 to 33 °C. Good rice production is associated with exposure to the light of optimum intensity, quality and duration during different phenological stages of the crop. Duration of reproductive

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Long-term temperature analysis and its future projection during pre-monsoon and monsoon seasons in South Bengal

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ABSTRACT

The temperature during pre-monsoon and monsoon seasons has immense influence on growth and productivity of crops growing in the seasons. For evaluating temperature scenario long (1901-2005) and short term (1961-2005 and 1991-2005) temperature data of nine selected IMD stations of South Bengal were collected and subdivided into 30 year period up to 1990 and a 15 year period from 1991 to 2005. The data were subjected to trend analysis and GCM model outputs are compared with the observed data. The linear trend in temperature showed that Alipore and Berhampore recorded a positive change of 0.92 and 1.23°C during 105 years in pre-monsoon season. During 1991-2005, eight stations of South Bengal recorded an increasing trend during monsoon season. The results clearly showed that the temperature has been rising since 1991 in South Bengal. During 1901- 2005 all the major IMD stations in South Bengal recorded an increasing trend in monsoon temperature ranging from 0.03 to 1.04 °C. During pre-monsoon, the models INGV-ECHAM4 and MIROC-Hi performed better than others. Whereas, in the monsoon period MIROC-Hi was the best performing model. The future projection indicates that the temperature will rise in the range of 1.2 to 2.5 °C during 2001 to 2050 irrespective to GCM models and seasons. Pre-monsoon season will be warmer than the monsoon season. The result invites urgent attention of the crop planner during pre-monsoon season.

Key words: Future projection, GCM model, IMD stations, South Bengal, temperature, trend analysis

INTRODUCTION

Climate change is likely to have an adverse impact on most of the economic sectors in India. Rupakumar *et al.* (2002) observed an increase in temperature to the tune of 0.04 and 0.02° C during pre-monsoon and monsoon season for a period of 1901-2000 in central India region. The temperature during the pre-monsoon and monsoon season has an important effect on the crops grown in summer and *kharif* seasons. Zacharias *et al.*(2014) projected yield reduction in rice and wheat crop in the Indo Gangetic Plain region due to climate change. In West Bengal, sesamum, groundnut and mungbean are grown during the summer season and rice is the principal crop grown during the kharif season. High temperature (above 35°C) during summer season initiates flower drop in mungbean (Tzudir *et al.*, 2014). The information on the trend of temperature change during pre-monsoon and monsoon season and its future projection are necessary to understand the impact of the temperature on crop growth behaviour in the Gangetic plains of West Bengal. In the present study we have analysed the changes in temperature during pre-monsoon and monsoon seasons based on long term data and projected temperature change scenario based on GCM models.

MATERIALS AND METHODS

Study area

Nine India Meteorological Department (IMD) stations located in the southern districts of West Bengal were selected for the present study. Among the nine stations, Alipore, Krishnagar, Sagar Island, Midnapore and Berhampore have the database for the period 1901-2005; Bankura, Contai and Shantiniketan have the database for the period 1961-2005 and Haldia has the database for 1991-2005.

Methodology

Two types of data were used in this study namely observed station data, which was collected from Regional Meteorological Centre, Kolkata, and the CMIP3 (Coupled Model Intercomparison Project phase 3) Global Climate Model(GCM)outputs downloaded from the Programme for Climate Model Diagnosis and Inter comparison