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Sarat Centenary College

Dhaniakhali, Hooghly

Founded: 1976
Recognised Under UGC 2F&12B
WB Govt. Aided
Affiliated to The University of Burdwan

3RD CYCLE NAAC ACCREDITATION PROCESS-2024

CRITERIA: 3 RESEARCH, INNOVATIONS AND EXTENSION

Key Indicator: 3.5 Collaboration

Metric: 3.5.1- Number of functional MoUs/linkages with institutions/ industries in India and abroad for internship, on-the-job training, project work, student / faculty exchange and collaborative research during the last five years.

***Document of Collaborative Research between Sarat Centenary College and West Bengal Pollution Control Board**

SARAT CENTENARY COLLEGE * Estd. 1976 HOOGHLY * DHANIAKHALI *

[DR SANDIP KUMAR BASAK]
Principal, Sarat Centenary College
Principal & Secretary,
Sarat Centenary College
P.O.- Dhaniakhali, Dist.- Hooghly

West Bengal Pollution Control Board
(Department of Environment, Government of West Bengal)
"Paribesh Bhavan" 10A, Block – LA, Sector-III,
Bidhannagar, Kolkata- 700 106
Tel: 2335 9088/8100 & Fax 8073/2813

Memo No: 3398 -2022-RHRB/1/C. Lab Date: 05.12.2022

LETTER OF AWARD

To
Dr. Krishna Ray
Associate Professor, Deptt. Of Botany
West Bengal State University
Berunanpukuria, Malikapur,
Barasat, North 24 Pgs,
Kolkata 700 126

Sub: Project on "In Situ Bioremediation Approach at Two Drains Leading to Noai Khal (falling on the River Bidyadhari) and Khardah Khal (falling on the River Hooghly) Respectively for Effective Removal of Pollutants in Domestic Sewage"

Ref: Project proposal submitted by Dr. Krishna Ray, Associate Professor, Deptt. Of Botany West Bengal State University, Berunanpukuria, Malikapur, Barasat, North 24 Pgs, Kolkata 700 126

Madam,

With reference to above, this is to inform you that the West Bengal Pollution Control Board (WBPCB) is pleased to accept your proposal and award the project work mentioned under subject above under terms and conditions as detailed below.

1.	**Project Title:**	**In Situ Bioremediation Approach at Two Drains Leading to Noai Khal (falling on the River Bidyadhari) and Khardah Khal (falling on the River Hooghly) Respectively for Effective Removal of Pollutants in Domestic Sewage**
2.	**Principal investigator:**	Dr. Krishna Ray, Associate Professor, Deptt. Of Botany,West Bengal State University, Berunanpukuria, Malikapur, Barasat, North 24 Pgs, Kolkata 700 126 , E mail: kray91@gmail.com
3.	**Name of Co-Investigator**	Prof. Punyasloke Bhadury, Center for Climate and Environmental Studies, Indian Institute of Science education and Research Kolkata

4. **Name of Co-Investigator** Prof. Bhoopesh Mishra, Research and Development Director (Honorary), Aqua Avani Aerobio production unit (Mr. Watinuksung Jamir)

5. **Name of Co-Investigator** Dr. Sandip Kumar Basak, Sarat Centenary College, Dhaniakhali, Hooghly, WB, Pin -712302

3. **Project coordinator:** Dr. Anada Banerjee, Scientist WBPCB

3. **Duration of project:** Six (06) Months
Actual date of project initiation to be informed by Dr. Krishna Ray, Associate Professor, Deptt. Of Botany,West Bengal State University, Berunanpukuria, Malikapur, Barasat, North 24 Pgs, Kolkata 700 126

4. **Study matter:** Two major open drains through which municipal sewage are discharged directly into the Noai Canal falling on the Bidyadhari river as well as Khardah Canal falling on the River Hooghly on a daily basis.

5. **Project Objectives:**

(a). Onsite in situ novel free Water Surface (FWS) constructed Wetland approach to cause water quality improvement of domestic sewage water of Nohai and Khardah canal drains falling on the River Bidyadhari and falling on the River Hooghly respectively for effective removal of pollutants in domestic sewage.

(b). Onsite in situ novel application of functionalized biochar coated with metabolically superior bacterial consortia to cause water quality improvement of domestic sewage water of Nohai and Khardah canal drains falling on the river Bidyadhari and falling on the River Hooghly respectively for effective removal of pollutants in domestic sewage.

(c). Feasibility of the scaling up of these combined approach on in situ bioremediation of domestic sewage water of other canal drain sources.

6. **Methodology:**

I. **Onsite in situ novel free Water Surface (FWS) constructed Wetland approach to cause water quality improvement of domestic sewage water of Nohai and Khardah canal drains falling on the River Bidyadhari and falling on the River Hooghly respectively for effective removal of pollutants in domestic sewage.**

a. Constructed wetland is fully flooded with water, for which reason it can be similar to natural

wetland. The aim to plant selective hydrophytes in such way at the point sources of Nohai and Khardah canal drains with series of planted flooded beds so that it will resemble a natural wetland.

b. The pollutants are supposed to get flashed out by means of natural processes. The organic matter gets trapped during sedimentati9on process and eventually accumulates at the bottomof the beds.

c. The rhizospheric zones of these hydrophytes will attract decomposing bacteria. Contaminants present in wastewater are supposed to be reduced by microbial and plant absorption.

d. Usually free water surface constructed wetland is used in advance treatment followed by secondary and tertiary treatment processes.

e. A combination of native emergent macrophytes, submerged macrophytes and free -floating macrophytes will be plated onsite near the drain and up to some distance at preliminary level. Emergent species will be used are *Phragmites spp., Typha spp., Marsilea quadrifolia, Juncus spp. Acorus spp., Carex spp., & Eleocharis spp.* Submerged plants will be used are *Nelumbo, Nymphaea, Hydrilla, Ceratophyllum demersum, Vallisneria natans, Myriophyllum verticillatum, Potamogeton crispus.* Floating plants will be used are *Nymphoides, Trapa bispinosa, Hydrocharis dubia, Lamna minor.*

II. Onsite in situ novel application of functionalized biochar coated with metabolically superior bacterial consortia to cause water quality improvement of domestic sewage water of Nohai and Khardah canal drains falling on the river Bidyadhari and falling on the River Hooghly respectively for effective removal of pollutants in domestic sewage.

a. A novel in situ bioremediation approach for cleaning of point sources such as open drains through which municipal sewage are discharged directly into the Nohai Canal and Khardah Canal on a daily basis.

b. In particular, sewage released from these open drains have unusually high fecal coliform bacterial load.

c. The application of functionalized biochar coated with metabolically superior bacterial consortia. The biochars with bacterial consortia when applied in situ in theses drains will completely breakdown total dissolved solids, Suspended Solids, as well as inhibit growth of Fecal Coliforms, in addition to utilization of complex forms of carbon and

nitrogen present in effluents. Moreover, the activated biochar-based biopolymer hydrogels with engineered porosity can itself remove substantial amount and types of contaminants including pesticides, heavy metals, antibiotics, microplastic, among others that may be present in sewage of open drains.

III. **Feasibility of the scaling up of these combined approach on in situ bioremediation of domestic sewage water of other canal drain sources**

a. Dissolved Oxygen (By probe / by manual Winkler Azide Modification Method)
b. Biochemical Oxygen demand (3 days 27°C)
c. Chemical Oxygen Demand (Open refluxed Method)
d. Total Nitrogen (Persulfate Digestion Method)
e. Ammonia (Phenate Spectrophotometric)
f. Nitrate (spectrophotometer)
g. Total Phosphorus(spectrophotometer)
h. Multiple Tube fermentation Technique for Coliform Bacteria (MPN test)/ by kit
i. Membrane Filtration Method for total coliform and thermotolerant (fecal) coliforms
j. EC-MUG Tes for confirmation of E. coli.

7. **Submission of reports and deliverables:** (a). Final project report of Noahi Canal and Khardah Canal in five hard copies and one soft copy after completion of project.

8. **Project cost:** (a). **Total project cost for Six Months = Rs. 21,10, 000.00/- only (Rupees Twenty-one Lakh Ten Thousand only)**
(b). The project cost will be spent as per following schedule:

A. Non-Recurring (e.g. Equipments, accessories)
(One time)
West Bengal State University

Sl no	Items	Price in Rs.	Total Price in Rs
1.	Heating mantel	1800	1800
2.	BOROPURE GLASS FIOLTRATION ASSEMBLY with silicon stopper , 47 mm	13985	13985
3.	Vacuum Pump	15000	15000
4.	Desiccator Set with cover & Porcelain Plate	9515	9515
5.	COD digestion unit (with tube and condenser)	55000	55000
6.	Water Bath (for condensation with digital panel)	15000	15000

7.	Stirrers (Magnetic Hot Plate Stirrer)	8700	8700
8.	Transilluminator (for molecular identification of microbes)	141600	141600
9.	DO meter	55000	55000
10.	Centrifuge Mini Spin	94400	94400
Sub total of A			**410000**

B. Recurring (for 6 months)
West Bengal State University

B.1 Manpower

Sl no.	Position No.	Consolidated Emoulment	Total for 3 months in Rs
1	Project Fellow (2) @ 25000p.m *6 months	150000*2=300000	300000
2	Manual labour on daily wage needed at onsite for vegetationcollection, planting , maintenance and biochar+consortia charging	200000	200000
Sub Total of B .1			**5,00000**

B.2 Consumables
West Bengal State University

Sl no.	Item	In Rs	Total
1	Chemicals	200000	200000
2	Glassware	100000	100000
Indian Institute of Science Education and Research Kolkata			
1.	Chemicals	800000	800000
Sub Total of B .2			**1100000**

B.3			
Sl no.	Item	For 6 months in Rs	Total
1.	Travel (WBSU)	50000	50000
B.4			
Sl no.	Item	For 6 months in Rs	Total
1.	Contingency (WBSU+IISER kolkata)	25000+25000	50000
B.5			
Sl no.	Item	For 6 months in Rs	Total
1.	Overhead (If applicable)	0	0
Subtotal of B (B.1+B.2+B.3+B.4+B.5) = (5,00000+1100000+50000+50000+0) **=1700000**			
GRAND TOTAL = (A+B) = (410000+1700000) = 21,10,000/-			

Total project cost will include all activities under the project as mentioned in this Letter of Award and submission of final reports and other deliverables as mentioned in Clause 7 above.

9. Terms of payments

Payments will be made in A/c Payee cheque(s) favour of West Bengal State University or through Bank Transfer. The PI has to inform the Bank Account details of the Institution.

a. The 1st installment of payments of Rs. 10,30,000/- as mobilization advance will be paid after acceptance of letter of Award and submission of information on project start date and claim bill in triplicate for the said amount.

b. The 2nd installment of payments after 3 months of Rs. 10,30,000/- will be paid after acceptance of claim bill and utilization certificate of the mobilization advance for adjustment.

c. Final installment of Rs. 50,000/- of contingency will be paid after acceptance of the final reports and all other deliverables as per Clause 7 above, utilization certificate for entire project cost and claim bill in triplicate for the said amount.

10. Termination:

a. WBPCB shall have the right to change the scope of work including termination of the work as deemed fit case of any breach of contract.

b. If at any time it is noticed that project is discontinued without prior intimation to the WBPCB, the project may be cancelled without showing any further reason.

11. Other Terms Conditions:

a. In case of dispute, if any, decision of the Member Secretary of the WBPCB shall be final and binding.

b. The *data,* information generated and the instruments/hardware developed through the project being the WBPCB's property, its reproduction for publication or use after the project period in any form will require prior approval from the WBPCB, otherwise the WBPCB may take necessary action.

c. The WBPCB has no liability for any recruitment for this project work.

d. All Instruments and assets under this project shall be returned to the State Board after completion of the project and before payment of the final installment.

12. If you agree to the above terms and conditions, please return to the duplicate copy of this order duly signed and sealed as a token of your acceptance confirming us the date of commencement of this project and other documents as detailed above required for further processing.

Dr. Ram Krishna Saha
Chief Scientist, WBPCB