

UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI – 110002.

Final report of the work done on the Major Research Project.

- 1. Project Report No. 1st/2nd/3rd/Final :** Final
- 2. UGC Reference No.F. :** F.No. 43-99/2014 (SR) date 13.02.2016
- 3. Period of report :** from 01.07.2015 to 30.06.2018
- 4. Title of research Project :** *Vegetation study of tropical dry deciduous forests in relation to soil N- transformations in the lateritic zone of West Bengal.*
- 5. (a) Name of the Principal Investigator :** Dr. Hema Gupta (Joshi)
- (b) Department :** Department of Botany
- (c) University/ College where the work has progressed:** Visva-Bharati (a Central University)
- 6. Effective date of starting of the project :** 17.07.2015
- 7. Grant approved and expenditure incurred during the period of the report:**
- (a) Total amount approved :** Rs.6,93,200/-
- (b) Total expenditure :** Rs. 6,90,000/-
- (c) Report of the work done:**

(i) Brief objective of the project:

The primary aim was to prepare a comprehensive account of community structure, species distribution and productivity of the differently managed dry deciduous forests with particular reference to soil N transformation. The **specific objectives** were:

1. To study vegetation structure, species distribution and productivity in a protected planted forest and a natural community forest.
2. To quantify the soil physico-chemical properties, nitrifier population size, rates of N mineralization and nitrification, and microbial N immobilization; and study their seasonal variations.

3. To study the relationships between nitrifier population size, microbial N immobilization and rate of N-mineralization; and also the affects of other variables like soil moisture, pH, C: N ratio etc. on these.
4. To study the ultimate effect of microbial N immobilization and N transformation rates on vegetation structure and productivity of the differently managed forests.

(ii) Work done so far and results achieved and publications, if any, resulting from

the work: Please see Annexure-I for work done.

Summary of the findings (in 500 words):

The work done in this project provides a comparative analysis of two forests under different management regime - a created protected area (Ballavpur Wildlife Sanctuary, Birbhum) and an old natural forest considered sacred among local people (Garh Jungle, Durgapur) - with reference to soil N-transformation through microbial population which contribute to the soil fertility and biomass production of the forests. The whole work was divided into three phases - vegetation analysis, soil physico-chemical analysis and study of soil N-transformations.

Vegetation analysis:

21 species from 12 families were recorded from Ballavpur while 14 tree species from 12 families were recorded from Garhjungle. Garhjungle forest was dominated by *Shorea robusta* and Ballavpur by *Acacia auriculiformis*. However, dipterocarpaceae got the highest family importance value (FIV) in both the forests. Dominance-diversity curves of both the forests followed log-normal distribution. A reverse J-shaped diameter density distribution in both the forests indicated young or regenerating population of tree species. All the species of tree, shrub and herb layers had clumped dispersion.

Tree layer was less diverse than shrub or herb layer. Alpha diversity of trees (H' , E , M , β) was higher in Ballavpur. Beta diversity (β_d) was within the reported range of 0.40 to 1.00 in different forests of India. Herb layer had highest similarity between the two forests. In Ballavpur, 2 tree species occurred only as regeneration and 6 were without regeneration, while in Garhjungle 9 tree species occurred only as regeneration and 1 was without regeneration. Success of seedling conversion to sapling was low in Ballavpur, while in Garhjungle, the production of seedlings from trees was low. So presence or absence of natural regeneration may change the future species composition in both the forests.

Principal Components Analysis classified 4 different communities in Ballavpur and 7 in Garhjungle forest indicating habitat heterogeneity in both the forests. Garhjungle had slightly lower density, diversity and aboveground biomass than Ballavpur.

Soil analysis:

Soils in both the forests were nutritionally poor, sandy with very low available phosphorus. Available N and K were higher in Garhjungle while moisture content and organic carbon was higher in Ballavpur.

Soil gradients meaningfully explained species distribution patterns in Canonical Correspondence Analysis. The first two axes explained 68 to 70 % variation in species composition. Sand, clay, available- N, P, K- were important determinants in Ballavpur, while organic carbon, EC, available-K and silt in Garhjungle. However, soil parameters did not explain much variation in vegetation parameters, except density, for which 36.8% variation was highly significantly explained by stepwise multiple regression analysis.

Soil N-transformations:

The seasonal range of N-mineralization ($9.3 - 29.8 \mu\text{g g}^{-1} \text{mo}^{-1}$) and nitrification ($5.6 - 26.1 \mu\text{g g}^{-1} \text{mo}^{-1}$) rates is within the reported seasonal range in other dry deciduous forests of India. The rates of N-transformations and microbial immobilization varied significantly under different ecosystems and under different seasons, but interaction of ecosystem and season did not produce significant variations. However, nitrifier population counts significantly varied under all the three conditions with maximum in rainy season.

Soil N-mineralization and nitrification rates were highest in rainy season and lowest in summer, and reflected a reciprocal relationship with the mineral-N content, but positively correlated with soil moisture content. Protected forests of Ballavpur had higher rates of both N- mineralization and nitrification than Garhjungle. High soil organic carbon and moisture content might be responsible for this observation.

Microbial biomass N was higher in Garhjungle.

(iii) Has the progress been according to original plan of work and towards achieving the objective:

Yes, the progress has been accordingly to original plan of work.

(iv) Please indicate the difficulties, if any, experienced in implementing the project:
N.A.

(v) If project has not been completed, please indicate the approximate time by which it is likely to be completed: N.A.

(vi) Any other information which would help in evaluation of work done on the project. At the completion of the project, the first report should indicate the output, such as

(a) Manpower trained: One scholar

(b) Ph.d. awarded: One

Sangita Ganguli (2017). *Comparative Study of Forest Structure, Biomass production and Soil N-transformation in two dry deciduous forests of West Bengal*. Ph.D. thesis, Visva-Bharati.

(c) Publication of results: Three publications:

1. Sangita Ganguli, Hema Gupta (Joshi) and Kashinath Bhattacharya. 2016a. Vegetation structure and species diversity in Garhjungle sacred forest, West Bengal, India. *International Journal of Environmental & Agriculture Research*, **2(9)**: 72 – 79.
2. Sangita Ganguli, Hema Gupta (Joshi) and Kashinath Bhattacharya. 2016b. Vegetation Structure, Species Diversity and Regeneration Status in Ballavpur Wildlife Sanctuary, West Bengal, India. *Elixir Environment & Forestry*, **99**: 43067-43074.
3. Sangita Ganguli, Hema Gupta (Joshi) and Kashinath Bhattacharya. 2016c. Soil N-transformation Rates in Two Differently Managed Dry Deciduous Forests of West Bengal, India. *World Journal of Research and Review*, **3(4)**: 45-49.

(d) Other impact, if any: N.A.

Hema Gupta (Joshi) 14/9/18

Signature of the PRINCIPAL INVESTIGATOR

Forwarded

N. C. Mandal
14.09.18

प्रफेसर एवं विभागाध्यक्ष / Professor and Head
बनस्पति विज्ञान विभाग / Department of Botany
विश्वभारती / Visva-Bharati
शान्तिनिकेतन / Santiniketan-731235

अग्रेषित
Forwarded

अध्यक्ष/Principal
शिक्षा-भवन / SIKSHA-BHAVANA
(विज्ञान-संस्थान) / (Institute of Science)
विश्वभारती, शान्तिनिकेतन
Visva-Bharati, Santiniketan

REGISTRAR/ PRINCIPAL

कुलसचिव (कार्यवाहक)
(Seal)
विश्वभारती

Registrar (Acting)
Visva-Bharati

13/9/18

Utilization Certificate

Certified that the total grant of Rs. 6,90,000.00 (Rupees Six lakhs ninety thousand only) received from the University Grants Commission under the scheme of support for Major Research Project entitled "*Vegetation study of tropical dry deciduous forests in relation to soil N- transformations in the lateritic zone of West Bengal*" vide UGC letter No. F.No. 43-99/2014(SR) Dated 13.02.2016 and 7.8.2017 has been utilized for the purpose for which it was sanctioned in accordance with the terms and conditions laid down by the University Grants Commission.

If as a result of check or audit objection some irregularity is noticed at later date, action will be taken to refund, adjust or regularize the objected amounts.

Hema Gupta (Toshi)
4/11/18

SIGNATURE OF THE P.I.
DEPARTMENT OF BOTANY
VISVA-BHARATI

Accounts Officer
VISVA-BHARATI
Accounts Officer / Joint Registrar
Visva-Bharati, Santiniketan

Finance Officer (Offg.)
VISVA-BHARATI
वित्त अधिकारी (आपात्र)
विश्व भारती

Visva-Bharati / विश्व भारती
Santiniketan / शान्तिनिकेतन

REGISTRAR
VISVA-BHARATI
कुलसचिव (कार्यवाहक)
विश्वभारती

Registrar (Acting)
Visva-Bharati



For APURBA & ASSOCIATES
Chartered Accountants

A. MUKHERJEE
Proprietor
M.No.-078675

STATEMENT OF EXPENDITURE IN RESPECT OF MAJOR RESEARCH PROJECT

1. Name of Principal Investigator: Dr. Hema Gupta (Joshi)
2. Deptt. of Principal Investigator: Department of Botany
University/ College VISVA-BHARATI
3. UGC approval Letter No. and Date: F.No. 43-99/2014(SR) dated 13.02.2016
4. Title of the Research Project: *Vegetation study of tropical dry deciduous forests in relation to soil N- transformations in the lateritic zone of West Bengal*
5. Effective date of starting the project
6. a. Period of Expenditure: From 17.07.2015 To 18.05.2018
b. Details of Expenditure:

S. No.	Item	Amount Approved (Rs.)	Expenditure Incurred (Rs.)
i.	Books & Journals	Rs 10,000.00	Rs 10,000.00
ii.	Equipment	Rs. 6,50,000.00	Rs. 6,50,000.00
iii.	Contingency	Rs. 10,800.00	Rs. 10,800.00
iv.	Field Work/ Travel (Give details in the proforma at Annexure – IV).	Rs. 18,000.00	Rs. 18,000.00
v.	Hiring Services		
vi.	Chemicals & Glassware		
vii.	Overhead	Rs. 1,200.00	Rs. 1,200.00
viii.	Any other items (Please specify)		
	Total	Rs. 6,90,000.00	Rs. 6,90,000.00

c. Staff

Date of Appointment: Not Applicable

S. No.	Items	From	To	Amount Approved (Rs.)	Expenditure Incurred (Rs.)
1.	Honorarium to PI (Retired Teachers)@ Rs. 18,000/- p.m.				
2.	Project Fellow: i) NET/GATE qualified – Rs. 16,000/- p.m. for initial 2 years and Rs. 18,000/- p.m. for the third year. ii) Non-GATE/ Non-NET – Rs.14,000/- p.m. for initial 2 years and Rs. 16,000/- p.m. for the third year.				

1. It is certified that the appointment(s) have been made in accordance with the terms and conditions laid down by the Commission.
2. If as a result of check or audit objection some irregularity is noticed at later date, action will be taken to refund, adjust or regularize the objected amounts.



3. Payment @ revised rates shall be made with arrears on the availability of additional funds.
4. It is certified that the grant of Rs. 6,90,000.00 (Rupees Six lakhs ninety thousand only) received from the University Grants Commission under the scheme of support for Major Research Project entitled "*Vegetation study of tropical dry deciduous forests in relation to soil N-transformations in the lateritic zone of West Bengal*" vide UGC letter No. F.No. 43-99/2014(SR) Dated 13.02.2016 and 7.8.2017 has been utilized for the purpose for which it was sanctioned in accordance with the terms and conditions laid down by the University Grants Commission.

Hema Gupta (Joshi)
4/11/18
SIGNATURE OF THE P.I.
DEPARTMENT OF BOTANY
VISVA-BHARATI

[Signature]
4/11/18
ACCOUNTS OFFICER
VISVA-BHARATI Registrar
Visva-Bharati, Santiniketan
[Signature]
18

Lalit Nay
4/11/18
FINANCE OFFICER
Finance Officer (Offg.)
VISVA-BHARATI
वित्त अधिकारी (स्थानापन्न)
Visva-Bharati / विश्व भारती
Santiniketan / शान्तिनिकेतन

[Signature]
4/11/18
REGISTRAR
VISVA-BHARATI
कुलसचिव (कार्यवाहक)
विश्वभारती
Registrar (Acting)
Visva-Bharati



For APURBA & ASSOCIATES
Chartered Accountants

[Signature]
4/11/18
(A. MUKHERJEE)
Proprietor
M.No.-078675

Name of Principal Investigator: Dr. Hema Gupta (Joshi)

STATEMENT OF EXPENDITURE INCURRED ON FIELD WORK

Date of Journey	Name of the place visited	Duration of the visit		Mode of Journey	Expenditure Incurred (Rs.)
		From	To		
29.07.2015	Santiniketan to Gonpur, Muhammabbazar, etc. and return	7.30 a.m.	5.30 p.m.	To collect data on vegetation & soil samples for research work	1920.00
23.08.2015	Santiniketan to Garhjungle, Durgapur, Bankati, etc. and return	7.00 a.m.	5.30 p.m.	-do-	1800.00
16.09.2015	Santiniketan to Illambazar, Dubrajpur forests, etc. and return	7.00 a.m.	5.30 p.m.	-do-	1440.00
29.11.2015	Santiniketan to Elevenmiles, Panggarh forests, etc. and return	7.30 a.m.	5.30 p.m.	-do-	1440.00
16.12.2015	Santiniketan to Dubrajpur, Bakreshwar via Illambazar and return	7.00 a.m.	5.30 p.m.	-do-	1800.00
20.01.2016	Santiniketan to Garhjungle, Durgapur, Bankati, etc. and return	7.00 a.m.	5.30 p.m.	-do-	1800.00
				Total	10,200.00
				Less(-)	200.00
				Total for first installment	10,000.00
20.02.2017	Santiniketan to Bolpur Railway station	12.00 p.m.		To attend the UGC Mid Term Evaluation meeting on 22.02.2017 at New Delhi	40.00
20.02.2017	Bolpur Railway station to Howrah Railway station	1.10 p.m.		-do-	300.00
20.02.2017	Howrah Railway station to Belgachhia (residence)	5.00 p.m.		-do-	200.00
21.02.2017	Belgachhia to Kolkata Air Port	7.00 a.m.		-do-	250.00
21.02.2017	Kolkata Air Port to New Delhi	9.30 a.m.		-do-	5726.00
23.02.2017	New Delhi to Kolkata Air Port	1.35 p.m.		-do-	250.00
23.02.2017	Kolkata Air Port to Belgachhia	4.00 p.m.		-do-	200.00
24.02.2017	Belgachhia to Howrah Railway station	9.00 a.m.		-do-	200.00
24.02.2017	Howrah Railway station to Bolpur Railway station	10.10 a.m.		-do-	300.00
24.02.2017	Bolpur Railway station to Santiniketan	12.30 p.m.	1.00 p.m.	-do-	40.00
		DA for three days (21.02.2017 to 23.02.2017)			700.00
				Total	8006.00
				Less(-)	6.00
				Total for second installment	8,000.00
				Total (overall)	18,000.00

Certified that the above expenditure is in accordance with the UGC norms for Major Research Projects.

Hema Gupta (Joshi)
 SIGNATURE OF THE P.I. 4/11/18
 DEPARTMENT OF BOTANY
 VISVA-BHARATI

ACCOUNTS OFFICER
 VISVA-BHARATI
 Joint Registrar
 Visva-Bharati, Santiniketan

[Signature]
 4/11/18

FINANCE OFFICER
 VISVA-BHARATI
 Officer (Offg.)
 वित्त अधिकारी (स्थापना)
 Visva-Bharati / विरभ भारती
 Santiniketan / शान्तिनिकेतन

REGISTRAR
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 विरभ भारती
 Visva-Bharati

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