

# NMHS Progress Report

(Period from April, 2017 to October, 2017)

[ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora, Uttarakhand]

## 1. Project Information

Project ID:	NMHS/2015-16/SG03/03	Sanction Date:	31-03-2016
-------------	----------------------	----------------	------------

Project Title:	<b>Identification, assessment and enhancement of soil carbon and nitrogen sequestration potential of different ecosystems in the central Himalayan through a community participatory approach</b>
BTG: 2	Environmental Assessment & Management

PI and Affiliation (Institution):	<b>Dr. Vijay Singh Meena</b> ICAR- Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora, Uttarakhand	
Name & Address of the Co-PI, if any:	Dr. Brij Mohan Pandey Dr. Anirban Mukherjee Dr. RP Yadav Dr. Tilak Mondal Dr. Nawal Kishore Singh	ICAR- Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora, Uttarakhand
	Dr. Harish Chandra Joshi	Krishi Vigyan Kendra, ICAR-VPKAS, Sinduri-Baskhola, Kafligair-263628, Bageshwar, Uttarakhand
	Pankaj Nautiyal	Krishi Vigyan Kendra, ICAR-VPKAS, Chinyalisaur-249196, Uttarkashi, Uttarakhand
	Gaurav Papna	
Structured Abstract - detailing the current year progress [Word Limit 250 words]:	A thorough knowledge of the effects of land use types on the soil carbon pool and soil total nitrogen (STN) are critical to planning effective strategies for adaptation and mitigation in future scenarios of global climate and land use change. This study conducted with the objectives of investigating soil carbon, nitrogen sequestration and carbon management index (CMI) under different land use systems under middle Indian Himalayan ecosystem, four land use systems: barren land (BL), cultivated land (CL), grass land (GL) and forest land (FL) were selected in Indian mid-Himalaya. A total of 111 composite soil samples [4 treatment (land use systems) 3- soil depths (0-15, 15-30 and 30-45 cm) and 8, 11, 8 and 10 replication for BL, CL, GL and FL systems, respectively] were collected for laboratory analyses. Forest land use system has the highest Walkley-Black organic carbon (WBC), total carbon (TC), total nitrogen (TN), carbon & nitrogen (C & N)-sequestration and carbon management index (CMI) values while barren land use system having least amount of WBC, TC, TN, CN-sequestration and CMI. Land use system had minimum effect on non-labile carbon (NLC), lability of carbon (LC), lability index (LI) and carbon pool index	

(CPI) of the ecosystem. Moreover, TC and TN were increase in the grass and forest land as compared to barren and cultivated land. The TC concentration was highly correlated with TN ( $R^2 = 0.88$ ,  $p < 0.01$ ) and soil N-sequestration ( $R^2 = 0.93$ ,  $p < 0.01$ ) concentrations. However, carbon sequestration and NSP relationship ( $p < 0.01$ ) was  $NSP = 0.0916x + 0.7088$  ( $R^2 = 0.93$ ). Overall results indicated that land use system and C-sequestration were associated with N-sequestration and CMI. These results suggest restoration of degraded barren and cultivated land to grass and forest land and decrease in intensity of land use could increase carbon and nitrogen sequestration in the study area as well as other similar mountainous regions of Indian mid-Himalayas.

Project Partner Name	Affiliations	Role & Responsibilities
Partner 1	ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora-263601, Uttarakhand	Responsibilities for mid hills (Balta cluster, Hawalbagh, Almora)
Partner 2	Krishi Vigyan Kendra, ICAR-VPKAS, Sinduri-Baskhola, Kafligair-263628, Bageshwar, Uttarakhand	Responsibilities for higher hills (Shama cluster, Kapkot block, Bageshwar district) and all analysis part is going on with nodal center
Partner 3	Krishi Vigyan Kendra, ICAR-VPKAS, Chinyalisaur-249196, Uttarkashi, Uttarakhand	Responsibilities for lower hills (Badethi cluster, Chinyalisaur, block, Uttarkashi) and all analysis part is going on with nodal center

## 2. Project Site Details

Project Site	1. Lower hills (Badethi cluster, Chinyalisaur, block, Uttarkashi)	Long. & Lat.	30° 36' 10.89 N 78° 18' 58.75 E 990 above MSL
	2. Mid hills (Balta cluster, Hawalbagh block, Almora)	Long. & Lat.	29° 37' 55.7 N 79° 40' 51.1 E 1367 above MSL
	3. Higher hills (Shama cluster, Kapkot block, Bageshwar)	Long. & Lat.	29° 58' 47.5 N 80° 01' 26.6 E 2007 above MSL
Site Maps	It will be prepared in last year of project		
Site photographs			

### 3. Project Activities Chart w.r.t. Timeframe [Gantt or PERT]

PROJECT ACTIVITIES	WORK UNDERTAKEN					OUTPUT
	Year 2016-17					
	Qtr 1	Qtr 2	Qtr 1	Qtr 2		
Identification and collections of soils, base line survey of selected site						Baseline survey three selected sites completed
Soil analysis with standard procedure						CMI, CN-Sequestration of mid hills were calculated, rest of the soil analysis is going on
Field experiment						Experiments are going on
BMPs and RMPs						On the basis of field experiment BMPs and RMPs recommended to farming communities

### 4. Project Beneficiary Groups

Beneficiary Groups [Capacity Building]	Target	Achieved
No. of Beneficiaries with income generation:	325	170
No. of stakeholders trained, particularly women:	50	32
No. of capacity building Workshops/ trainings:	05	02
No. of Awareness & outreach programmes:	12	06
No. of Research/ Manpower developed:	10	05

### 5. Project Progress Summary (as applicable to the project)

Description	Total (Numeric)	Description
<i>IHR States Covered</i>	01	Three district (Almora, Bageshwar and Uttarkashi)
<i>Project Site/ Field Stations Developed:</i>	<i>Please see the attached</i>	

	<i>files</i>	
<i>No. of Patents filed (Description):</i>	00	NIL
<i>Article/ Review/ Research Paper/ Publication:</i>	02	Communicated
<i>New Methods/ Modellings Developed(description in 250 words):</i>	00	NIL
<i>No. of Trainings (No. of Beneficiaries):</i>	06 (270)	Importance of Soil Health Card, Farmers from Balta cluster in occasion of world soil day celebration
<i>Workshop:</i>	02	Mridaparikshak Mini Lab and Soil testing
<i>Demonstration Models (Site):</i>		
<i>Livelihood Options:</i>		
<i>Training Manuals:</i>	00	Under process
<i>Processing Units:</i>	00	NIL
<i>Species Collection:</i>	00	NIL
<i>Species identified:</i>	00	NIL
<i>Database/ Images/ GIS Maps:</i>	03	All three selected site

*Note:* Photos/ maps should be attached in high quality in compatible formats viz., JPEG, .JPG, .PNG, .SHP, etc. along with a suitable figure legend/ caption.

## 6. Project Concluding Remark

Kindly update the following Progress Parameters for the Reporting Period:

Project Objectives	Project Output against each objective	Progress made against Monitoring Indicators (specified in sanction letter)	Remarks
1. To assess the soil organic carbon (SOC) and soil total nitrogen (STN) under different land use, land cover and cropping system (forest to agricultural	<ul style="list-style-type: none"> <li>➤ SOC and STN of two sites were estimated.</li> <li>➤ Mid and High Hill details nutrient monitoring field experiments setup.</li> </ul>	<ul style="list-style-type: none"> <li>➤ No. of long-term monitoring systems established Nos/ Area in ha).</li> </ul>	<ul style="list-style-type: none"> <li>➤ Soil analysis of another selected site will be started this season crop harvest</li> </ul>

ecosystem) in lower, middle and higher Himalayas of Uttarakhand state			
2. To estimate C and N sequestration potential under selected pilot sites in community and measure the socioeconomic and environmental benefits of improved land management practices	<ul style="list-style-type: none"> <li>➤ C and N sequestration of mid and higher hills were estimated</li> </ul>	<ul style="list-style-type: none"> <li>➤ Article under process for publication</li> </ul>	Socioeconomic survey for lower is going on
3. To provide capacity building and training on the optimal land use and land management options to promote environmental awareness, to sequester C and N, enhance land productivity to combat land degradation in central Himalayas	<ul style="list-style-type: none"> <li>➤ Approximately 350 farming community from all three pilot sites.</li> <li>➤ Three training programme under proposed condition</li> </ul>	<ul style="list-style-type: none"> <li>➤ Information under compilation</li> </ul>	It will be continued for next year
4. To provide information and policy options for the use of carbon (C) and nitrogen (N) sinks in transferring C and N from the atmosphere to soil system	<ul style="list-style-type: none"> <li>➤ Four awareness programme on Improving farmers income (participated by 150 farmers)</li> </ul>	<ul style="list-style-type: none"> <li>➤ Fifteen master trainers including women representative</li> </ul>	It will be continued for next year
<b>Methodology (in brief):</b>	<p>Soil carbon and nitrogen sequestration (<math>\text{Mg ha}^{-1}</math> in a single land use system was calculated as follows: :</p> $\text{C storage (Mg C ha}^{-1}) = [\text{SOC (\%)} \times \text{BD (Mg m}^{-3}) \times \text{d (m)} \times 10^4 \text{ m}^2 \text{ ha}^{-1}] / 100$ <p>where C storage at 0-0.45 m depth (d) (<math>\text{Mg C ha}^{-1}</math>), TOC concentration (%) and BD is the bulk density of 0-0.45 m (<math>\text{Mg m}^{-3}</math>). Likewise, total soil nitrogen (TSN) content and sequestration (<math>\text{Mg N ha}^{-1}</math>) determined.</p>		NIL
<b>Major Research Achievements:</b>	<ul style="list-style-type: none"> <li>➤ Three awareness programme and two field days were conducted.</li> <li>➤ Continuing four nutrient monitoring experiments</li> <li>➤ C-storage was reported in following order <math>\text{FL} &gt; \text{GL} &gt; \text{CL}</math> and <math>\geq \text{BL}</math> of the ecosystem</li> </ul>		NIL
<b>Brief Conclusion-the current</b>	<ul style="list-style-type: none"> <li>» At 0-15 cm depth, carbon pool index (CPI)</li> </ul>		NIL

<b>year progress-during the reporting period (point-wise):</b>	of forest and grass land was generally greater than those of cultivated and barren land. » Averaged across the depth, the CMI of the 0-45 cm depth were 49.80, 49.62, 56.90 and 58.94% (P = 0.05) for forest, grass, cultivated and barren land, respectively.	
<b>Progress Achieved (%):</b>	55	
<b>Remaining work to be done:</b>	<ul style="list-style-type: none"> <li>● C and N-sequestration for lower and higher hills</li> <li>● Farmers training programmes</li> <li>● Nutrient monitoring experiment will be continued</li> </ul>	

Submitted to:

Nodal Officer, NMHS-PMU  
National Mission on Himalayan Studies (NMHS)  
G.B. Pant National Institute of Himalayan Environment and Sustainable Development, Kosi-Katarmal,  
Almora 263643, Uttarakhand  
E-mail: [nmhspmu2016@gmail.com](mailto:nmhspmu2016@gmail.com)

Submitted by:

Project PI (Vijay Singh Meena:  
Scientist-Soil Science  
ICAR-VPKAS, Almora

---

Please fill the NMHS Progress Report pro forma as applicable with respect to time and other requirements and return *via* post/ e-mail. In case of any query, please contact at: [nmhspmu2016@gmail.com](mailto:nmhspmu2016@gmail.com)