Template/Pro forma for Submission

NMHS-FINAL TECHNICAL REPORT (FTR)

Demand-Driven Action Research Project Grant

NMHS Reference No.:	NMHS/SG-2016/018/381/182/121	**Date of Submission:**	2	4	0	7	2	0	1	9
			d	**d**	**m**	**m**	**y**	**y**	**y**	**y**

PROJECT TITLE (IN CAPITAL)

DEVELOPMENT OF PSYCHROPHILIC EARTHWORMS FOR BIOWASTE CONVERSION & UTILIZATION IN GURAZ &TULIAL VALLEYS OF JAMMU & KASHMIR

Project Duration: *from* 01-04-2016 *to* 31-03-2019.

***Submitted to*:**
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NMHS-Final Technical Report (FTR) *template*

Demand-Driven Action Research Project

DSL: Date of Sanction Letter

3	1	0	3	**2**	**0**	**1**	**6**
d	d	m	m	y	y	y	y

Completion

DPC: Date of Project

3	1	0	3	**2**	**0**	**1**	**9**
d	d	m	m	y	y	y	y

Part A: Project Summary Report

1. Project Description

i.	Project Reference No.	NMHS/SG-2016/018/381/182/121							
ii.	Type of Project	Small Grant	✓	Medium Grant		Large Grant			
iii.	Project Title	Development of Psychrophilic earthworms for biowaste conversion & utilization in Guraz & Tulial Valleys of Jammu & Kashmir.							
iv.	State under which Project is Sanctioned	JAMMU AND KASHMIR							
v.	Project Sites (IHR States covered) (Maps to be attached)	Gurez & Tulial Valleys (J&K) 							
vi.	Scale of Project Operation	Local		Regional		Pan-Himalayan	✓		
vii.	Total Budget/ Outlay of the Project	14.40 lacs (in Cr)							
	Lead Agency	Sher-e-Kashmir University of Agricultural Sciences and Technology, Shalimar, Srinagar, J&K							

	Principal Investigator (PI)	Dr. Tahir Ahmad Sheikh, Assistant Professor (Agronomy), Sher-e-Kashmir University of Agricultural Sciences and Technology,Shalimar, Srinagar, J&K
	Co-Principal Investigator (Co-PI)	Dr. Zahoor Ahmad Baba Sr. Scientist (Soil Microbiology) Sher-e-Kashmir University of Agricultural Sciences and Technology, Shalimar, Srinagar, J&K
ix.	Project Implementing Partners	Sher-e-Kashmir University of Agricultural Sciences and Technology, Shalimar, Srinagar, J&K
	Key Persons / Point of Contacts with Contact Details, Ph. No, E-mail	1. Dr. Feroze Ahmad Paray Asstt. Professor (Olericulture) Mountain Agricultural Research & Extension Station-Gurez Mobile no: +916005386824
		2. Mr. Ab. Rehman Samoon Sub Divisional Agricultural Officer-Gurez Mobile No: 9419897816

2. Project Outcome

2.1. Abstract (not more than 500 words) [it should include background of the study, aim, objectives, methodology, approach, results, conclusion and recommendations).

Background:

The physiographic location of Guraz & Tulial valleys of Jammu & Kashmir possess a greater challenge to crop improvement programmes due to deteriorated soil quality, decrease in vegetation abundance enables this region most vulnerable to environmental degradation. Agriculture is one of the major economic sectors that is most vulnerable to environmental degradation, simply because it has only a single cropping season from May to Oct. & directly dependent on natural systems and resources of Himalaya. Rajmash, potato, Maize, Turnip are major crops grown. Solid waste is a major problem especially in Guraz & Tulial towns, tourist sports, road sides etc.. Unsystamic open dumping of wastes can pose a serious threat to groundwater resources human health. Destroyed soil structure due to lake of availability of organic soil amendments. During an official tour to the Guraz & Tulial valleys of Kashmir on July 2014, where we observed volumes of degradable waste heaped on road sides dispose of fresh cow dung into the Krishan Ganga River because of the lake of awareness & methodologies for its beneficial use.These wastes can be collected and bio-composted to improve the soil health.

Aim: Protection and conservation of Himalayan ecosystem by recycling the emerging waste generation using locally indigenous earthworm species.

➢ ***Objectives:***

- Collection, identification and maintenance of dominant species of earthworms from different habitats of Guraz &Tulial valleys of the region
- Screening & development of efficient Psychrophilic earthworm species for their exploitation in sustainable biowaste degradation within the valleys and utilization of vermicompost for agricultural land to quickly regenerate and improve the soil structure.
- Demonstrate methodologies employed & skill development among farmers.

➢ ***Methodologies:***

- Collected house hold garbage from 10% of residential houses coming under cold environments Guraz &Tulial valleys of Kashmir. collection sources may include residential houses, schools, colleges & hostels.
- Collection of earthworms from different cold habitats of Guraz and Tulial for development of cold tolerant vermiculture which was/will used for recycling of domestic and agriculture Bio-wastes for recycling of plant nutrients and organic matter into the soil under extreme environments of Jammu & Kashmir. Local earthworms were collected from different habitats which includes Sheikhpora, Tarbal, Chorwan, Jelindora, Masten, & Dawar areas of Guraz & Tulial.
- The earthworms collected were identified as *Esenia fetida* and *Aporrectodea calignosa* on the bases of physical features.
- Their maintenance and development was carried out under prevailing environmental conditions of proposed areas at two locations (Chorwan & Tarbal villages) to develop adaptation and acclimatization in the vermiculture
- Capacity building programmes for awareness regarding recycling of wastes
- The below mentioned Table indicates the treatment details for evaluating the performance of most dominant earthworm species in Gurez and Tulial valleys

Treatments	Substrate combination	Species employed
T_1	cow dung - vegetable + fruit waste	*Esenia fetida*
T_2	cow dung – crop trashes + paper waste	*Aporrectodea calignosa*
T_3	cow dung - vegetable + fruit waste	*Esenia fetida*
T_4	cow dung – crop trashes + paper waste	*Aporrectodea calignosa*

- **Approach*:***

  The project activities were started by awareness and demonstration of biowaste management among tribal families of Gurez. Local partner from Department of Agriculture were also involved in the training programmes, identification of beneficiary farmers and dissemination of project outcomes. Simultaneously collection locally available earthworms were also collected for development and utilization in Biowaste conversion at beneficiary units established under project.

- ***Results*:**

1. Objective 1: Collection, identification and maintenance of dominant species of earthworms from different habitats of Guraz &Tulial valleys of the region. With reference to objective 1st following results have been achieved.

Deliverables	Overall Achievements
• Development of six (05) pilot scale cost effective models/units to convert biodegradable wastes	• Five (05) cost effective model units have been established at *i) Tarbal ii) Julindora iii) Izmarg* *iv) Churwan v) Burnio* *(Photographs attached)*
• Collection	• Earthworms were collected from 15 cold habitats of Guraz and Tulial
• Exploration and utilization of psychrophilic earthworm species .	• Two major cold tolerant species were explored and identified as: *i) Esenia fetida* *ii) Aporrectodea calignosa*

Objective 2: Screening & development of efficient Psychrophilic earthworm species for their exploitation in biowaste degradation within the valleys and utilization of vermicompost for sustainable agricultural development.

Deliverables	Overall Achievements
• Development of Vermiculture	• *Esenia fetida* was found efficient with high conversion rate
• Data base on exploration and utilization of psychrophilic earthworm species	• *Esenia fetida* was further developed & maintained for biowaste conversion at the Unit first established at Chorwan village
• Assessment and best utilization of eartworms	• Biowaste conversion efficiency was assessed through experimentation
• Distribution of cold tolerant vermiculture	• Vermiculture of *E. fetida* was disseminated to all other units.

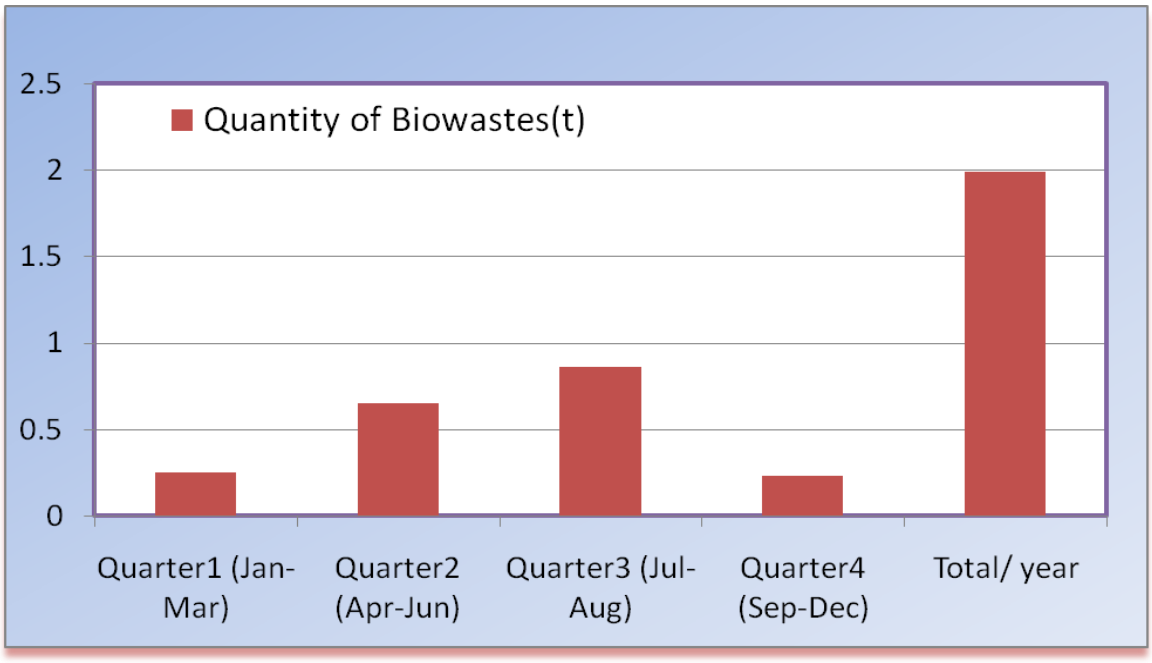
Objective 3: Demonstrate methodologies employed & skill development among farmers

Deliverables	Overall Achievements ***(No.s' in parenthesis)***
• Capacity building of farming communities	1. *Farmer -scientist interaction (01)* 2. *Demonstrations for biowaste conversion (26)* 3. *Out reach programmes (31)* 4. *Famer meetings/* Awareness programmes (*09*)
• Women Empowering	*1. Promoting proactivity , learning and ability of Tribal women on biowaste recycling* *2. Demonstration on vermiculture developed (15)*
• Dissemination of project outcomes	*1. Involvement of Deptt. Agril as a project partner* *2. Development of literature(3)*

Quantity of Biowaste Recycled through unit established under project on quarterly basis:

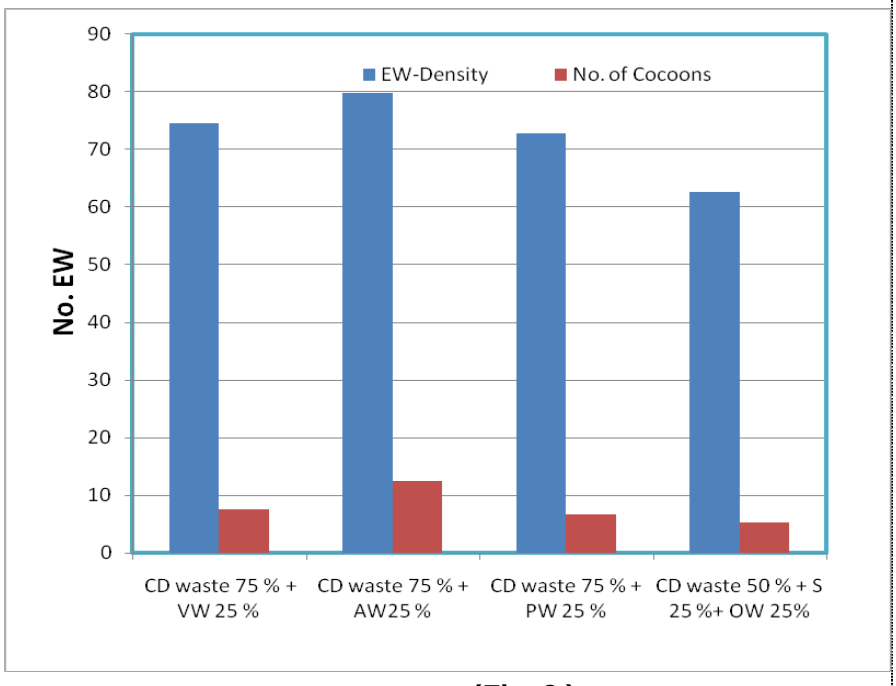
The biowaste conversion unit established through the project has a potential to convert 2.0 tonnes of biowaste per year under Guraz and tulial valyyes of Himalayan ecosystem. (Fig-1).

Fig. 1: Quantity of Biowaste Recycled through unit established under project on quarterly basis



Reproductive performance of Earthworm under different waste substrates:

The sexual development and multiplication rate of earthworms in various feed stocks has been depicted through Fig 2. The initial stocking of 50 young worms were uniform to each feed stuff under same management practices. However, the maximum number of hatchlings was produced after 12 weeks in Cow dung+ agriculture waste (80.9 ± 2.81) and the minimum in Cow dung+ vegetable waste (76.3 ± 2.67). After 12 weeks maximum cocoons were found in Cow dung + agriculture waste (14.92 ±0.89) and minimum in Cow dung+ other waste (5.23 ± 0.29).



(Fig. 2)

The below mentioned Table-1 shows the costs and returns from production and sale of 0.7 tonnes of vermicompost from established small unit of size 3m L x 1.5m W x 0.75m D *(production capacity 0.7 t/quater)* facilitated by the project.

S.n.	Particulars	Rate	1st quarter	2nd quarter	3rd quarter	4th quarter
01.	**Fixed cost**	One Time	Rs.70000.0	0.00	0.00	0.00
02	**A. Total cost of production**	--	Rs.1200.0	Rs.1200.0	Rs.1200.0	Rs. 1200.0
03.	**B. Selling price** **C. Avg. production from unit.** **D. Total amount realized= (B x C)**	Rs. 12000/t (0.35 t / quarter) • Rs.4200/quarter • Vermiculture= 26 kg@800/kg/yr	4200.0 -- --	4200.0 5000.0	4200.0 6000.0	4200.0 10000.0
04.	**Net returns per tonn (D-A)**	-	Rs. 3000.0	Rs.8000.0	Rs.9000.0	Rs.13000.0

(Table-1)

One time fixe cost of Rs.75000/unit compensated from the project will also be recovered gradually out of the net returns from within the proposed project period. The **economical breakeven drop** of the unit will be after three years of startup to realize that enterprise will leads to positive returns at a tune of Rs.33000/year. Besides development & increments in its own vermiculture. After the initial years following, the improvement in productivity effect can create employment opportunities not only for themselves but for others as well.

Involvement of Sub Divisional Agricultural Officer (SDO) located at Gurez as a partner:

The SDO-Gurez facilitated the identification of progressive farmers under study area. The deparment helped in conducting the capacity building of local farmers and encourages them to use the bio wastes for improvement in soil health and minimizing the environmental pollution. The department also facilitated the construction of biowaste conversion units. Later, extension & dissemination the outcomes of the project among hill farmers for which printed literatures was supplied for distribution among farmers. However, there was no direct sharing of funds with the department of agriculture.

Conclusion:

This study can be useful to enumerate a sustainable approach to convert biodegradable wastes (animal, vegetable, other biowastes) into a useful soil amendment that could be added to agricultural land to quickly regenerate and improve the soil structure which is destroyed due to lake of availability of organic soil amendments. The utilization of biodegradable wastes blended with cow dung for vermicomposting using earthworm *Eisenia fetida* could be a feasible eco-friendly technology for management of emerging wastes menace in Gurez and Tulial valleys of Jammu and Kashmir.

Recommendations:

Earthworm (*Esenia fetida*) locally isolated from Gurez and Tulial can be potentially utilized for management of Biowates under Himalayan ecosystem. The costs and returns from production and sale of 2.0 tonnes of vermicompost from small unit of size 3m L x 1.5m W x 0.75m D (production capacity 2.0 t/ year) facilitated by the project can startup to realize that enterprise will leads to positive returns at a tune of **Rs.33000/year,** besides supporting the ecosystem services.. Besides sustainable development & increments in its vermiculture. The economical breakeven drop of the unit will be achieved after three years of time span.

2.2. Objective-wise Major Achievements

S. No.	Objectives	Major achievements (in bullets points)
01	Collection, identification and maintenance of dominant species of earthworms from different habitats of Guraz &Tulial valleys of the region	Earthworms were collected from Tarabal, Julindora, Dawar, Chorwan, Burnoi, Sheikhpora, locations of Gurez and Tulial valleys, which were placed placed for development and multiplication under the same cold ecosystem and after multiplied to the sufficient were distributed among all the identified beneficiaries.
02	Screening & development of efficient Psychrophilic earthworm species for their exploitation in sustainable biowaste degradation within the valleys and utilization of vermicompost for agricultural land to quickly regenerate and improve the soil structure.	The composted material after the conversion employing cold tolerant earthworms was applied to the farmers agriculture field after demonstrating the methodologies and practices for improving the soil health. Two (02) earthworm species were identified as: • ***Eisenia fetida*** • ***Aporrectodea calignosa*** Out of two, *Eisenia fetida* showed best performance in conversion of biowaste. Therefore *E.fetida* was selected to be employed for biowaste conversion under different units both at Gurez & Tulial Valleys
03	Demonstrate methodologies employed & skill development among farmers.	• Five (05) composting demonstration model Units established in five different villages of Guraz. • Twenty six (26) capacity building training programmes were carried out among tribal farmers of Gurez and Tulial valleys during the project period. • Thirty one (31) outreach training programmes were carried out at farmers field among tribal farmers of Gurez and Tulial valleys during the project period. • Nine (09) Awareness programmes on management & conversion of biowastes were conducted among tribal women at Chorwan and Tarabal Julindora Burnoi villages of Gurez and Tulial valleysduring the project.

2.3. Outputs in terms of Quantifiable Deliverables*

S. No.	Quantifiable Deliverables*	Monitoring Indicators*	Quantified Output/ Outcome achieved	Deviations made, if any, and Reason thereof:
	Development of pilot scale cost effective model to convert biodegradable wastes (animal, vegetable, other bio wastes) into a useful soil amendment that could be added to agricultural land.	Pilot-scale Model for Biodegradable Waste Conversion into Useful Soil Amendments along with supporting knowledge/ information products developed.	Five (05) pilot scale cost effective biowaste conversion units are established at Burnoi, Chorwan, Tarabal, Dawar and julindora villages of Gurez and Tulial	
	Data base on exploration and utilization of psychrophilic earthworm species under extreme environmental conditions.	Assessment Reports and best utilization practices of psychrophilic earthworm species under extreme environmental conditions	Two (02) earthworm species were identified as: 1. *Eisenia fetida* 2. *Aporrectodea calignosa*	
	Development of cold tolerant vermin culture.	Cold tolerant vermin culture developed	Earthworms were collected from Tarabal, Julindora, Dawar, Chorwan, Burnoi, Sheikhpora, locations of Gurez and Tulial valleys, which were placed placed for	

			development and multiplication under the same cold ecosystem and after multiplied to the sufficient were distributed among all the identified beneficiaries.	
	Capacity building of farming communities.	•Communities engaged in awareness workshops/ meetings/ programmes. • Women participation in capacity building programmes	• Twenty six (26) capacity building training programmes were carried out among tribal farmers of Gurez and Tulial valleys during the project period. • Thirty one (31) outreach training programmes were carried out at farmers field among tribal farmers of Gurez and Tulial valleys during the project period. • Nine (09) Awareness programmes on management & conversion of biowastes were conducted among tribal women at Chorwan and Tarabal Julindora Burnoi villages of Gurez and Tulial valleysduring the project.	

(*) As stated in the Sanction Letter issued by the NMHS-PMU.

2.4. Strategic Steps with respect to Outcomes (in bullets)

S. No.	Particulars	Number/ Brief Details	Remarks/ Enclosures
1.	New Methodology developed		
2.	New Models/ Process/ Strategy developed		
3.	New Species identified	Two (02) earthworm species were identified as: *1. Eisenia fetida* *2. Aporrectodea calignosa*	
4.	New Database established	The information was generated on locally dominating earthworms	*1. Eisenia fetida* *2. Aporrectodea calignosa*
5.	New Patent, if any		
	I. Filed (Indian/ International)	--	--
	II. Granted (Indian/ International)	--	--
	III. Technology Transfer(if any)	Recycling of biowastes for nutrient recovery an emerging technology for waste management was transferred to tribal communities of Gurez and Tulial valleys of Jammu and Kashmir	
6.	Others (if any)		

3. Technological Intervention

S. No.	Type of Intervention	Brief Narration on the interventions	Unit Details (No. of villagers benefited / Area Developed)

1.	Development and deployment of indigenous technology	Identification of locally available earthworms and their future application for wates management under cold climates of Himalayas	Demonstration Composting model units established in five villages. Awareness programmes conducted in nine villages
2.	Diffusion of High-end Technology in the region		
3.	Induction of New Technology in the region	Popularization of vermicomposting technology in these Himalayan valleys	
4.	Publication of Technological / Process Manuals	1 research paper 3- literatures for famers 1- Manual	
	Others (if any)		

4. New Data Generated over the Baseline Data

S. No.	New Data Details	Status of Existing Baseline	Additionality and Utilisation New data
01.	Identification and development indigenous earthworm species	Nil	The new earthworm species is a cold tolerant species and has potential for utilization under cold climates of Indian Himalayan region
02	Modified vemicomposting unit	Nil	The modified model of compositing unit established through project is highly suitable local climatic conditions as the vermin bed two feet depth to give full protection to the vermiculture during harsh winter of the region. The unit is completely surrounded by the metal sheets to avoid the inlet of snow inside the unit

5. Demonstrative Skill Development and Capacity Building/ Manpower Trained

S. No.	Type of Activities	Details with number	Activity Intended for	Participants/Trained			
				SC	**ST**	**Woman**	**Total**
1.	Workshops	01	Recycling of wastes & Income generation	**0**	**76**	**10**	**76**
2.	On Field Trainings	31		**0**	**790**	**70**	**790**
3.	Skill Development/ Demonstrations for biowaste conversion	26		**0**	**450**	**50**	**450**
4.	Famer meetings/ Awareness programmes	09		**0**	**370**	**50**	**370**
5.	Out reach programmes	31		**0**	**380**	**60**	**380**
6.	Academic Supports	01		**0**	**40**	**18**	**40**
	Others (if any)			**--**	**--**	**--**	**--**

6. Linkages with Regional & National Priorities (SDGs, INDC, etc)/ Collaborations

S. No.	Linkages /collaborations	Details	No. of Publications/ Events Held	Beneficiaries
1.	Sustainable Development Goal (SDG)	The project is itself sustainable as it is a biotechnological process involving indigenous cold tolerant earthworms. Moreover the multiplication rate of earthworms is very high which is fundamental baseline for its sustainability under cold ecosystems of Indian Himalayan Region.		

2.	Climate Change/INDC targets	Long term sustainability of project will have positive implications on mitigation of green house gases (GHG) by addressing the management of waste menace under Himalayan ecosystem. Management of wastes will help in mitigating the adverse impact of waste lechates on soil, water and air and keeping healthy ecosystem for tribal families of Himalayas.		
3.	International Commitments			
4.	Bilateral engagements			
5.	National Policies	The project is linked in agreement of national policy of "Swachh Bharat"		
6.	Others collaborations	The project linked with the department of Agriculture whose nodal as sub-district Agricultural officer is based at Gurez. The Department of Agriculture-Gurez is agreed to dissemination the benefits and outcomes of the project at mass scale among tribal families of Himalayan ecosystem		

7. Project Stakeholders/ Beneficiaries and Impacts

S. No.	Stakeholders	Support Activities	Impacts
1.	Gram Panchayats		
2.	Govt Departments (Agriculture/ Forest)	The project linked with the department of Agriculture whose nodal as sub-district Agricultural officer is based at Gurez. The Department of Agriculture-Gurez is agreed to dissemination the benefits and outcomes of the project at mass scale among tribal families of Himalayan ecosystem	The department of Agriculture is highly desirous to disseminate the project outcomes among tribal farmers
3.	Villagers		
4.	SC Community		
5.	ST Community	The tribal communities based on the project location belong to schedule tribes and are residing in close	The concerned people have started to minimize the waste

		vicinity of actual line of control(ALC). The project helped them trough demonstration and awareness to explore avenues of livelihood based on the locally available resources.	generationa to protect their ecosystem. They also got motivated to convert cow dung into vermicompost rather than throwing it into the river as earlier they were doing.
6.	Women Group	Tribal women were found more involved in agricultural activities. They were given repeated demonstration of collection and recycling of biowates in to a usefull soil amendment. They were given demonstration of raising buckwheat with application vermicompost.	Since agriculture labour mostly constitute the tribal women folk, so they showed keen intrest in increasing the soil fertility by application of vermicaompostin
	Others (if any)		

8. Financial Summary (Cumulative) (RS.)

S. No.	Financial Position/Budget Head	Funds Received	Expenditure/ Utilized	% of Total cost
I.	Salaries/Manpower cost	432000.00	328295.00	75.0
II.	Travel	195514.00	195514.00	100
III.	Expendables &Consumables	275000.00	275000.00	97.60
IV.	Contingencies	68259.00	68198.00	99.99
V.	Activities & Other Project cost	149743.00	147650.00	98.60
VI.	Institutional Charges	162000.00	162000.00	100
VII.	Equipments	0.00		
	Total	1282516.00	1176657.00	
	Interest earned	21184.00	--	
	Grand Total	**1303700.00**	1183398.00	

* Please attach the consolidated and audited Utilization Certificate (UC) and Year wise Statement of Expenditure (SE) separately, *ref*. **Annexure I.**

9. Major Equipment/ Peripherals Procured under the Project (if any) Nil**

S. No.	Name of Equipments	Cost (INR)	Utilisation of the Equipment after project
1.			
2.			
3.			
4.			
5.			

Details should be provided in details **(*ref* **Annexure III &IV).**

10. Quantification of Overall Project Progress

S. No.	Parameters	Total (Numeric)	Remarks/ Attachments/ Soft copies of documents
1.	IHR States Covered	*Jammu and Kashmir*	
2.	Project Site/ Field Stations Developed	*Gurez and Tulial Valleys of Jammu & Kashmir*	
3.	New Methods/ Modeling Developed	*Recycling of wastes for income generation*	
4.	No. of Trainings arranged	*26*	
5.	No of beneficiaries attended trainings	*790*	
6.	Scientific Manpower Developed (Phd/M.Sc./JRF/SRF/ RA):	One candidate as Field assistant got excellent exposure to recycling of wastes and organic crop production	
7.	SC stakeholders benefited		
8.	ST stakeholders benefited	2106	
9.	Women Empowered	*258*	
10.	No of Workshops Arranged along with level of participation	*01* *76* (Participants)	
11.	On field Demonstration Models initiated	*26*	
12.	Livelihood Options promoted	*05-Vemicompost production* *100 Kg Development of vermiculture*	
13.	Technical/ Training Manuals prepared	1-Research paper 3- Literatures for famers 01-Manual	
14.	Processing Units established	 	

		  	
15.	No of Species Collected	*05*	
16.	New Species identified	*02*	
17.	New Database generated (Types):	1. *Eisenia fetida* 2. *Aporrectodea calignosa*	
	Others (if any)		

11. Knowledge Products and Publications:

S. No.	Publication/ Knowledge Products	*Number*		*Total Impact Factor*	*Remarks/* Enclosures
		National	International		
1.	Journal Research Articles/ Special Issue:	01			
2.	Book Chapter(s)/ Books:	01			
3.	Technical Reports	01			
4.	Training Manual (Skill Development/ Capacity Building)	01			

S. No.	Publication/ Knowledge Products	Number		Total Impact Factor	Remarks/ Enclosures
		National	International		
5.	Papers presented in Conferences/Seminars	02			
6.	Policy Drafts/Papers				
7.	Others:				

* Please append the list of KPs/ publications (with impact factor and further details) with due Acknowledgement to NMHS.

12. **Recommendation on Utility of Project Findings, Replicability and Exit Strategy**

Particulars	Recommendations
Utility of the Project Findings	The project findings have immense potential as a baseline information to help tribal youth/woman farmers to explore livelihood options in vermin-technology
Replicability of Project	The outcomes of the project have vide replicability for waste management in other areas of Indian Himalayan Region, because the technology is based on locally available inputs including indigenous earthworm.
Exit Strategy	The project is self sustaining; the outcomes of the project will further be disseminated among the farmers through the Department of Agricultutre-Gurez. The compositing model units will under the project will always inspire the tribal farmers especially the youth for developing entrepreneurship in vermitechnology. So sharing the outcomes of the project with Department of Agriculture and by support of beneficiary farmers under the project will give a strategic exit.

(PROJECT PROPONENT/ COORDINATOR)

(Signed and Stamped)

(HEAD OF THE INSTITUTION)

(Signed and Stamped)

Vice-Chancellor

Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir

ce: Wadura

e: 24.7.2019