

**IMPROVING SKILLS FOR PROMOTING
SUSTAINABLE WATERSHED MANAGEMENT
PRACTICES IN SOUTH ASIA**



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Group Photo of Inception Workshop participants in Islamabad on Dec 26 to 28, 2017



Group Photo of Second Workshop participants in Kathmandu on March 27 to 29, 2018



Group Photo of third Workshop participants in Sri Lanka on September 20 to 22, 2018



Group Photo of project end Workshop at Islamabad on March 19 to 21, 2019



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Project Overview

Project Duration : 2 Years

Funding Awarded : US\$ 23,090 for Year 1; US\$ 26,910 for Year 2 (Received US\$ 40,000)

Key organizations involved :

1. Climate, Energy and Water Research Institute, National Agricultural Research Centre, Pakistan, Dr. Ghani Akbar (project leader) and Dr Muhammad Munir Ahmad
2. Global Climate Change Impact Study Centre, Pakistan, Mr. Aftab Ahmad Khan.
3. Nepal Academy of Science and Technology, Nepal, Prof Dr. Madan Lall Shrestha.
4. Central Department of Environmental Science, Tribhuvan University, Kathmandu Nepal, Dr. Sudeep Thakuri.
5. Small Earth Nepal, Nepal
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6. Natural Resource management center, Sri Lanka, Dr S.H.S.A De Silva. And Dr.B.V.R. Punyawardena.

Project Summary

Climate change is severely impacting the socio economic conditions of small watershed in south Asia thus leading to increasing poverty and food insecurity. The existing traditional practices are not capable to cope with the rapidly emerging climate change risks in these climate change risk vulnerable areas. Sustainable watershed management practices may enhance the resilience of natural resources to climate change risks (floods/droughts) but lack of knowledge, training, resources and awareness are the main impediments in changing the local community attitude and behaviour towards a positive change. Nevertheless, significant funding has been allocated by the international donors for climate research involving simulation modelling for forecasting and assessments of climate risks and impacts but promoting climate risk reduction/mitigation through adaptation practices on farm were largely overlooked. Therefore, stimulated adoption of climate risk resilient practices are urgently required to cope with the emerging climate risks. Addressing these issues, this project is aimed to pursue sustainable management practices on climate risk vulnerable watersheds of south Asia through capacity building of key stake holders (professionals, farmers and service provider) and sharing of regional knowledge, innovative practices and strengthening linkages for promoting sustainable management of climate change vulnerable watersheds in Pakistan, Sri Lanka and Nepal.

Keywords: Climate Change, Watershed Management, Capacity Building, Awareness

Project outputs and outcomes

The overall objective is the capacity building of professionals for promoting best/innovative and site specific interventions for sustainable watersheds in Pakistan, Nepal and Sri Lanka.

Project outputs:

- Preliminary country reports for all three collaborating countries were developed;
- A three days (Dec 27 to 29, 2017) international workshop was organized in Islamabad for skills on prioritizing the best watershed management practices;
- A second three days (March 28 to 30, 2018) international workshop was organized in Kathmandu for skills on prioritizing the best watershed management practices;
- A third three days (September 18 to 20, 2018) international workshop was organized in Kandy Sri Lanka for skills on prioritizing the best watershed management practices.
- A fourth three days (March 19 to 21, 2019) project end workshop was conducted at Islamabad for sharing project outcome and formulating recommendation.

Project outcomes:

- Increased regional knowledge of watershed management interventions;
- Increased regional linkages by networks of 20 professionals in collaborating countries each;
- Long listing of 47 improved watershed management practices for collaborating countries;
- Development of mechanism for identifying climate change vulnerability risk rating of watersheds and proposing site specific interventions with the help of a proforma;
- Improved knowledge and expertise by prioritization of four best watershed management practices for specific watersheds in Pakistan, Nepal and Sri Lanka each;
- Improved knowledge of promising watershed management interventions in Pakistan, Nepal and Sri Lanka using local and regional expertise;
- Dissemination of knowledge of improved watershed management technologies to more than 100 farmers/agricultural service providers in each collaborating country;
- Awareness raising through development of three brochures, one each for each collaborating country.

Key facts/figures

- Long listing of 47 improved watershed management technologies for the region;
- A network of sixty (60) professionals, with 20 each per collaborating country from local lined departments was developed. These professionals were refreshed with the latest development in climate change risks and improved technologies and their local knowledge was used in short listing of site specific interventions to mitigate climate change impacts;
- Development of climate change risk vulnerability rating calculation proforma for watersheds;
- Short listing of ten promising interventions for each collaborating country;
- Dissemination of knowledge to 100 farmers/agricultural service providers in each country.

Potential for further work

The project has explored important aspects for institutional and community actions which can be helpful in informed decision making regarding the selection and installation of appropriate watershed management technologies and interventions according to local risks. There is huge potential for the project collaborators to further expand the project outcome through local and regional cooperation and strengthen future follow-up programs in this important subject area.

Publications

- Three brochures were developed, one each for Pakistan, Nepal and Sri Lanka.
- A research paper titled "*Decision Support Tool for Improving Climate Change Resilience of Watersheds*" has been submitted to peer reviewed journal.
- A science bulleting on "*Improving Decision Support Skills for Climate Change Resilient Watersheds in South Asia*" for publishing on APN website.

Awards and honours

The project was appreciated by majority of policy makers and professionals from all the three collaborating countries.

Pull quote

- I am feeling pleasure that this project is focused on a very important subject of promoting sustainable watershed management practices in South Asia. I am hopeful that this project will be a source of effective skill development on improved watershed management practices, strengthening regional linkages, especially with Nepal and Sri Lanka. I am also very grateful to Asia Pacific Network (APN) Japan for providing us financial resources for this important project. (Mr Fazal Abbas Maken, Secretary Ministry of National Food Security and Research, Pakistan: While addressing the Inaugural session of training workshop at Pakistan on December 26, 2017).



Figure 1: Mr Fazal Abbas Maken, Federal Secretary for MinNFS&R, Dr Yusuf Zafar^{T.I.}, Chairman PARC and Dr Amir Muhammad, Ex-Chairman PARC& SPG member of APNgr are sitting on stage during the Inaugural Session of the Workshop in Islamabad on Dec 26th, 2017

- I am feeling glad in mentioning that PARC/CEWRI has envisaged both technological demonstrations to improve overall water productivity, watershed sustainability and more importantly on human resource development aspect to make efficient use of advanced water-smart technologies. I am thankful to our project collaborators from Nepal and Sri Lanka for their interest and grateful to Asia Pacific Network (APN) Japan for providing us financial resources for conducting this training program and expect that in future more such capacity development initiatives will be worked out and materialized. (Dr Yusuf Zafar, Chairman PARC; while addressing the inaugural session of training workshop at Pakistan on December 26, 2018).

- Funding from Asia Pacific Network for Global Change Research (APNgr) is very competitive, which pass through a very systematic and transparent review process. I congratulate the project proponent and whole project team for winning a project funding from APN in a very high priority area. Hope this project will be helpful in exploring further avenues of cooperation and support among the regional countries. (Dr Amir Muhammad, SPG member APN and Ex- Founder Chairman of PARC; while addressing the inaugural session of international training workshop in Pakistan on December 26, 2017).



Figure 2: Speakers in the Inaugural session of training workshop in Islamabad (Dec 26, 2017)

- I appreciate the project leader from Pakistan in Making Nepal and my organization as a collaborator. (Prof. Dr Rejna Maskey, Head of Central Department of Environmental Science (CDES), Tribhuvan University Kathmandu Nepal in her inaugural address in workshop at Nepal on March 27, 2018). I expect more projects of similar nature from the young professionals from Nepal (Dr Madan Lal Shrestha, Nepal Academy of Science and Technology (NAST) on March 27, 2018).



Figure 3: Speakers in the Inaugural session of training workshop in Kathmandu (March 28, 2018)

- In his inaugural address, Dr R.S. Keerthiesena, Acting Director General of Agriculture Sri Lanka, highlighted the water sector and watershed management under the current climate change scenario of Sri Lanka and appreciated the project leader for having a project on such an important subject area and for Making Sri Lanka as project collaborator.



Figure 4: Speakers in the Inaugural session of training workshop in Kandy (Sept 18 to 20, 2018)

- Her Excellency Ms Sewa Lamsal (Nepalese Ambassador to Pakistan), commended the project team for the successful completion of the project and highlighted the importance of watershed management under the climate change scenario of Nepal and asked for strengthening further research collaboration in this field and ensured her full support for such endeavours in the future.

-Climate change, degrading natural resources and lack of knowledge and awareness under Sri Lankan perspective was nicely depicted by His Excellency Mr Noordeen Mohammad Shahied (Sri Lankan High Commissioner to Pakistan) and extended full support in strengthening regional cooperation in the subject areas of watershed management.



Figure 5: Speakers in the Inaugural session of project end workshop in Islamabad (March 19 to 21, 2019) (Dr Ghani Akbar (project leader) on the dice, Ms Sewa Lamsal (Ambassador of Nepal, Dr Munir Ahmad (Chairman PARC), Mr Noordeen Mohamed Shhied (Sri Lankan High commissioner), Dr Madan Lall Shrestha (Nepal project collaborator) and Dr S.H.S. Ajantha Desilva (Sri Lankan project collaborator)).

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The financial support by APN ger is very highly appreciated.

We are very much thankful to Ms Sewa Lamsal: Ambassador of Nepal to Pakistan, Mr Noordeen Mohamed Shaheid: Sri Lankan High Commissioner to Pakistan, Mr Fazal Abbas Maken: Secretary Ministry of National Food Security and Research, Dr Amir Muhammad: Ex founder chairman Pakistan Agriculture Research Council (PARC) and SPG member of APN, Dr Yusuf Zafar: Chairman (PARC), Dr Munir Ahmad: New Chairman PARC, Collaborators from each country and all participants of the workshops for making this project a success.

Introduction

The rapidly depleting freshwater resources and frequent floods pose a serious threat for sustaining agriculture of the rapidly populating and climatically changing south Asian region (Gupta and Deshpande, 2004; Rafiq and Blaschke, 2012). Notwithstanding, the present apparent symptoms of climate change causing non-availability of water at the right time, the existing traditional practices, skills and drought/flood risks mitigation practices on watersheds are not appropriate (Ahmad et al., 2004; Prabhakar and Shaw, 2008) to cope with the huge emerging issues and risks. Consequently, a significant impact of climate change on livelihood of remote watersheds has been reported, especially in south Asia (Ashraf et al., 2011; Nelson et al., 2009; Rafiq and Blaschke, 2012). Therefore, skilled human resource development and improved knowledge of flood/drought risk mitigation strategies are urgently needed for sustaining food production and improving livelihood in South Asia. Numerous attempts have been made to address the drought/flood issue locally (Aftab et al., 2012; Ahmad et al., 2004; Akbar, 2013; Alam et al., 2012; Revi, 2008) but these efforts can only be effective once the communication gaps, lack of knowledge regarding innovative climate resilient practices for sustainable management of watersheds and limited regional linkages issues are resolved.

South Asia is comprised of eight countries i.e., Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan and Sri Lanka, which is home to over one fifth of the world's population. In the recent past, climate change has been emerged as the single most pressing issue facing society on a global basis generally but particularly with more serious implications for the food security of South Asian region. Nevertheless, the climate change is severely impacting the socio-economic conditions of the small watershed communities in south Asia but community resilience and resources are poor, thus leading to increasing poverty and food insecurity. The existing traditional practices are not capable of coping with the rapidly emerging climate change risks in these climate change risk vulnerable areas. Sustainable watershed management practices may enhance the resilience of natural resources to climate change risks (floods/droughts) but lack of knowledge, training, resources and awareness are the main impediments in adapting to climate change impacts. Therefore, stimulated adoption of climate change resilient practices are urgently required to cope with the emerging climate risks and to promote best watershed management practices. Therefore, the poor watershed management issues need to be addressed on priority basis.

Addressing these issues, this project was aimed to promote sustainable management practices on climate risk vulnerable watersheds of south Asia through capacity building of key stakeholders (professionals from lined departments, farmers and service provider) and sharing of regional knowledge, innovative practices. Local and regional linkages development for promoting sustainable management of climate change vulnerable watersheds in collaborating countries is one of the main aim of this project. For this purpose, four workshops, one at Islamabad, one at Kathmandu and one at Kandy Sri Lanka were conducted for prioritizing and promoting the best watershed management practices according to the local climate change scenario of Pakistan, Nepal and Sri Lanka to increase awareness of farmers and agricultural service providers and then a project end workshop was conducted at Islamabad to share the project outcome and recommendations.

Methodology

The project collaborators prepared detailed country reports of their respective countries on local climate change scenarios (focussing on climate change induced water scarcity, runoff losses, erosion, sedimentation etc), existing watershed management practices, ongoing government program/subsidies for watershed management, soil and water conservation practices, using available information from local, national and international reports, local climate data and published articles prior to conducting the first inception cum training workshop. This information was used for apprising the project partners regarding the existing watershed management practices and local climate change scenario in all three collaborating countries. This information was also used for developing training and dissemination materials. The improved watershed management interventions were then long listed for the whole region using the country reports, as per general climate change scenario of the region, particularly for Sri Lanka, Pakistan and Nepal. A mechanism of identifying climate change risk vulnerability rating and proposing best/innovative watershed management technologies was developed. For this purpose a proforma was developed, which can be easily used to assess a particular watershed, identify its climate risk vulnerability rating e.g. excellent, good, fair and poor and to propose the best/innovative site specific watershed management technologies as per local climate change scenario. The project collaborators also supported in developing the training materials (presentation, interactive group discussion materials and learning by doing arrangement on local sites) highlighting the local climate change scenarios, existing practices vs prioritised best watershed management practices to cope with the local climate change issues. The watershed management interventions largely included; soil, water and energy conservation practices (rainwater harvesting at watershed, farm, household and micro catchment levels), soil erosion control measures, potential use of harvested rainwater for ground water recharge, surface storage, kitchen gardening, nursery raising, house hold use, animal use, while utilizing solar/electric/diesel powered high efficient irrigation systems (drip, sprinkler, furrow bed irrigation systems) as per site specific conditions. The training sessions in each country was facilitated by the respective project collaborators in organizing travel, venue and conducting the training sessions as resource persons.

The project collaborators selected around 20-25 project partners/master trainers (hydrologists/climate scientists/agriculturists/community workers) from lined departments based on criteria that the intended activities fall in the trainees domain of official responsibilities while confirming that the trainees have the necessary resources to access and train at least five local farmers on their farms and/or agricultural service providers (who provides relevant watershed management services to farmers on payment) after the training, as per given timeline. The initial sessions during the trainings covered updated knowledge of climate change, sustainable watershed management practices, climate resilience and food security issues by the country experts. Latter on more interactive sessions were conducted by utilizing the existing knowledge of training participants on local climate change impacts. The project partners were divided into three groups for watershed vulnerability assessment exercise and recommending the best watershed management practices using the proforma and their regional knowledge and expertise. The groups were given one hour time for finalising their assessments and proposing recommendations, which was followed by a short presentation by each group leader for sharing the outcome and provide justification for their recommendations. Each presentation was followed by a question and answer session between groups. The cumulative recommendations from three groups were used for developing a list of ten technologies for each country where workshop was conducted and using the number of occurrence of each technology as criterion for sorting the priority of a particular technology. These technologies were further prioritized using voting by putting red, green and yellow colour tags for indicating number 1, 2 and 3 most suitable technologies by each project partner. Thus four most suitable best/innovative technologies were finalised for both countries.

A brochure containing written and graphical details of top four recommended technologies was prepared for each country. The brochures were shared with project partners/trainees latter on for distribution and sharing the knowledge of prioritised technologies to at least 5 farmers/service providers (100 per country). The project partners then started providing progress feedback to the project collaborator. The progress feedback from project partners covered the name and contact details of farmers and agricultural service providers and any suggestions for future follow-up programs. These, recommendations were used for presentation in policy workshop by each project collaborator in Islamabad, Pakistan at the end of the project.

Results & Discussion

3.1 Prioritizing of the Best Watershed Management Practices

The best watershed management practices should conserve soil, water, environment and improve soil health. These practices should also protect the water quality by controlling the discharge of sediment, nutrient, animal waste, salinity and other pollutants into freshwater. The best practices for sustainable watershed management for the South Asian region were categorized in the following manner:

3.1.1 Field and Buffer Practices

Bed planting – Growing crops on beds rather than flat. For instance, in rice producing areas plant wheat in beds to improve irrigation management efficiencies and yields;

Buffer Planting (Filter strips, field borders etc.)- Planting strips of grass or trees on the bottom edge of fields and/or around the edge of water bodies, drainage ditches or well heads to filter and purify runoff;

Cover and green manure crops– Use of cover crops between cropping periods to reduce runoff/erosion provide nutrient and improve soil health;

Contour Farming– Farming sloped land on the contour to reduce erosion, control water flow and increase infiltration;

Critical Area Planting– Plan perennial vegetation on highly erodible areas and slopes subject to excessive soil erosion and runoff;

Crop Residue Use– Leave taller stubble or leave all crop residue in the field after harvest after harvest rather than removing in order to return nutrients to the soil and to protect cultivated fields from erosion and runoff;

Crop Rotation – Diversify crop rotation, to improve the soil health and fertility and reduce erosion;

Grasses and Legumes– Use of grasses and/or perennial legumes in crop rotation for livestock, forage and grazing;

Mulching – Applying residue to the soil surface to reduce evaporation, water runoff and soil erosion;

Riparian Buffers/Management– Strip of perennial grasses and trees/grasses to filter sediment in runoff adjacent to streams;

Stubble Burning Replacement– Eliminate burning of crop stubble/residue to protect soil, reduce air pollution and save soil moisture;

Zero tillage/no till – Plant directly into previous crop residues with planting devices that only disturb the planting zone e.g. zero till seeder.

3.1.2 **Water/Erosion Control Measures**

Check dams –Retention of water for irrigation use, reduce runoff quantity, retain nutrients and pesticides and prevent sediments and other pollutants from reaching watercourses;

Diversions –To divert runoff or irrigation water;

Grassed Water ways – Installed in concentrated flow areas subject to erosion by shaping and seeding to perennial grasses that prevents erosion;

Gully Farming – Farming areas where sediments deposits directly above check dams that were formerly gullies. This practice stabilizes gullies and prevents sediments losses due to gullies;

Ponds – Retention or detention of water for irrigation use, human use, fisheries or other purposes;

Pond Sealing or Lining – Installing a fixed lining of impervious materials or treating the soil in a pond to reduce or prevent excessive water loss;

Sediment Basin – A basin constructed to collect and store sediments from runoff water;

Terrace – An earth embankment, channel or a combination ridge and channel constructed across a slope to control runoff.

3.1.3 **Irrigation water management**

Land Grading/Levelling – Reshaping the surface of land to improve surface drainage and/or irrigation water distribution;

Irrigation Water Conveyance – A pipeline or lined waterway constructed to prevent erosion and loss of water;

Drip Irrigation – Use drip irrigation to deliver small quantities of water to irrigate crops and plants more efficiently;

Irrigation Water Management – Manage the rate, amount and timing of irrigation water applied to crops;

Micro Catchments – Fabricated or excavated catchments installed around the base of trees, vines, orchards, shrubs, or individual plants to prevent rainwater runoff from trees/shrubs/vines to reduce irrigation water use and more efficient watering system;

Solar Powered Irrigation Pumping – To reduce energy use, air pollution and efficiently utilize the irrigation water uniformly;

Sprinkler Irrigation – Using a sprinkler irrigation to ensure timely germination and efficient use of irrigation water.

3.1.4 Drinking Water Treatment

Application Setbacks–Avoid application of fertilizers, manure, pesticides or other potential contaminants within designated buffer zone distance;

Drinking Water Treatment - Properly treat the water for making it safe for human and animal consumption;

Human Access– Eliminate human sewage, bathing and other activities that pollute water bodies;

Human Waste Management–Properly manage pollutants such as waste oil, paint, sewage and other contaminants associated with dwellings;

Rooftop rainwater harvesting – Collect rooftop rainwater runoff for irrigating crops, reduce runoff and kitchen gardening;

Septic System - Install proper septic tanks and management system;

Sewage treatment improvement – Treat sewage with a lagoon, septic system, leach field, improve sewage storage and avoid discharge of untreated sewage to surface water;

Water storage improvement– Improve the storage for drinking water;

Well head protection– Establish a buffer area around water well to avoid contamination from runoff, sediments, air or other sources of pollution.

3.1.5 Livestock grazing management

Fencing for livestock exclusion – Exclude livestock from environmentally sensitive areas such as stream banks, water bodies, well heads, erosion prone areas and areas not intended for grazing, so that protection against damage can be ensured;

Prescribed Grazing – Proper grazing management to improve vegetative conditions and reduce soil erosion;

Trough or Tank – Locate watering facilities a reasonable distance from watercourses and dispersing the facilities to encourage uniform grazing and to reduce livestock concentration, particularly near water courses;

3.1.6 Nutrients and Manure Management

Composting – Properly compost manure, household wastes and other wastes for application to agricultural fields. Monitor compost temperature closely when temperature reach 150 degrees for 3 consecutive days most pathogens will be eliminated;

Soil and water testing or plant analysis – Testing soils or plants to determine plant fertilizers requirements to avoid over fertilization and subsequent nutrient losses to runoff water. Test irrigation water for nutrient content;

Waste Utilization – Using farm yard manure and compost appropriately for fertilizer;

Waste Storage Structure – Storage of animal wastes or other organic agricultural wastes.

3.1.7 Salinity Management

Leaching - Leach excess salts with planned irrigation events;

Water testing – Testing irrigation water for the amount of salinity to avoid build-up of salts in irrigated fields

Skimming well – Salt level is closely monitored, while fresh water is skimmed off the surface by irrigation pumping to avoid mixing of freshwater with brackish water in aquifer and provide freshwater for intended use;

Salt tolerant crops/varieties – Use of crops tolerant and productive at current salinity levels.

3.2. Watershed Management and Risk Vulnerability Rating

The proforma developed for evaluating watershed management and risk vulnerability rating is given in Table 1. One among the four choices in each row can be selected, which Best describes the conditions of the selected watershed. The best practices, as per knowledge of section 3.1.1 to 3.1.7 can be recommended in the last column for each risk.

Evaluator: _____

Date: _____

Farm/ Field /Area Evaluated: _____

Total Score: _____

Table 1: Field Sheet for evaluation of Watershed Management and Risk Vulnerability Rating

Risk Rating	Excellent	Good	Fair	Poor	Recommended Practices
Erosion Potential	Minimal Sediment Movement; Some sheets& Rill erosion evident. Very few gully or minimal furrow erosion;	Minimal sediment movement; Some sheets, rill erosion evident, Very few gullies or minimal furrow erosion.	Significant sediment movement; Significant sheet & rill erosion Obvious gullies after storm events or significant furrow erosion	Heavy sediment movement; Severe erosion with topsoil eroded away; Many gullies, critical erosion areas, or severe furrow erosion.	
	10	6	3	0	
Runoff Potential	Low: 80% or more ground cover Sandy soils Very flat to flat terrain (0-5% slope) Rainfall (<8”). Even, gentle impact (scattered shower-type) of rainfall. Proper rainwater harvesting	Moderate: 60% or more ground cover Loam soils Flat to gently sloping (0.5-2.0% slope). Rainfall (8-15”). Even, gentle to moderate intensity rainfall.	Considerable: 30% or more ground cover Silty and clayey soils Gently to moderately sloping (2-5% slope). Rainfall (16-22”). Even but intense rainfall.	High: Little to no ground cover Clay soils Moderately sloping to steep (>5%). Rainfall (more than 22”) Intense uneven rainfall in seasons when soil is exposed.	
	10	8	4	0	
Management Systems on whole watershed	Excellent management, Utilize all four soil health principles: keep it covered by residue and crop canopy, living root/eliminate fallow add cover crops , little to no tillage disturbance; crop diversity by using cover crops and diverse rotations	Good management Most (80%) of the health planning principles.	Fair management About 50% of the soil health planning principles in place.	Poor management Few, if an, of the soil health Planning principles installed.	
	9	7	3	0	
Buffer Zone	More than 200 ft. of dense vegetation between filed edge and water course / waterbody; Ungrazed or dense grass like plants;	100 to 200 ft. of dense vegetation between filed edge and water course / water body; Moderate grazing or moderate density grass like plants.	Less than 100 feet of dense vegetable between filed edge and water course/water body No bank (riparian) vegetation.	Heavy grazing or cropping up to the water’s edge. Minimal bank (riparian) vegetation.	

	10	7	0	0	
Fertilizer Management Practices	Excellent Four R Management or no fertilizer necessary Well defined schedule as to frequency timing for inorganic or organic fertilizer depending on crop type, height of growth, etc. Application of exactly the proper (recommended) amounts according to soil tests. Pays close attention to weather forecasts. Never applies before a storm Fertilizer is injected or incorporated into the soil	Good 4R management Mainly follows a schedule but sometimes missed the best timing for the maximum utilization by the crop. Usually follows directions for proper dosages of fertilizer and has soil tested regularly. Follows weather forecasts but once in a while will risk applying when rain is forecast Fertilizer is mainly of the incorporated slow-release type. Occasionally uses soil test to base application rates	Average 4R management Follows a schedule about half the time. Application is based on convenience. Tends to “over fertilize” by using more than recommended dose. Occasionally uses much of application in a washout. More than half the fertilizer is applied to the surface.	Minimal 4R management Seldom follows a schedule Does not use soil test to base application rates and fertilizer type. Applications without heed to weather forecasts. Often loses most of the applied fertilizer in a washout Applies usually too little sometimes too much Most of the fertilizer is surface applied without injection or incorporation	
	9	7	3	0	
Potential for groundwater contamination (Wellhead Protection Area)	Low: Slow to very slow percolation in heavy soils such as clays, silty clays, or silty clay loams. Water depth is greater than 200 ft Well head has 200 ft buffer with no nutrients applied and very well protected from flooding. Backflow and protected from all potential hazards. Wellhead is excluded from grazing and livestock protected.	Moderated: Slow to moderate Percolating in clay loams or silts. Well depth is less than 100 ft. Nutrients applied within 100 feet of well or is not protected from flooding. Grazing occurs adjacent to well but wellhead has some protection such as a cover, or other protection from livestock grazing.	Considerable: Moderate to rapid percolation in silty loams, loams, or silts. Well depth is less than 100ft Nutrients applied within 100 feet of well or is not protected from flooding. Grazing occurs adjacent to well but wellhead has some protection such as a cover, or other protection from livestock grazing.	High Rapid percolation is coarse textured sandy soils, or subsoil sands or gravels or shallow water table. Well depth is less than 50 feet Nutrients applied next to well or grazing directly adjacent Unprotected wellhead open to runoff. Flooding, grazing or open to air.	
	9	6	4	0	
Irrigation management practices	Proper Irrigation Scheduling Use of high efficient irrigation systems (Sprinkler and drip) Conveyance losses are minimal Minimum irrigation water losses Lined water courses	Partially lined water courses Moderate maintenance Furrow bed irrigation system Sandy clay soil Proper irrigation schedule Moderate irrigation losses	Vegetative canals Little maintenance About 50% of needy practices Traditional irrigation scheduling Seepage losses Non uniform distribution	Earthen unlevelled canal bottom Poor management Few needed practices installed High irrigation losses Traditional irrigation scheduling No leaching management	
	10	7	3	0	
Add the circled Rating item sources to get a total for the filed			TOTAL		
Circle the ranking for the site based on the total field score.					
Ranking	Excellent (56-67)	Good (33-55)	Fair (9-32)	Poor (8 or less)	

3.3 Prioritized Best Watershed Management Technologies

The best watershed management technologies were finalised by each group and the results are summarised in table 2, table 3 and table 4 for Pakistan, Nepal and Sri Lanka respectively.

Table 2: Results of prioritizing best watershed management technologies for Pakistan

Object		Group 1	Group 2	Group 3
Watershed Name		Rawal Watershed		
Group members No		7	7	7
Ranking		17 (Fair)	25 (Fair)	28(Fair)
Prioritized technologies by the three groups	1	Grasses & Legumes	Contouring	Check dams
	2	Critical area planting	Terracing	Terraces
	3	Riparian buffers	Forestation	Fencing for livestock
	4	Green manuring	Gully Plugging	Grasses & legumes
	5	Crop residue use	Check dams	Mulching
	6	Crop rotation	Reservoirs	Crop rotation
	7	Stubble retention	Residue retention	Soil and water testing
	8	Check dams	Awareness	rainwater harvesting
	9	Diversions	Irrigation management	Spring shed management
	10	Grassed water ways	Rainwater harvesting	Plant analysis

Table 3: Results of prioritizing best watershed management technologies for Nepal

Object		Group 1	Group 2	Group 3
Watershed Name		Shivapuri	Malamchi	Rapti
Group members No		7	8	8
Ranking		30 (Fair)	21.5 (Fair)	21(Fair)
Prioritized technologies by the three groups	1	Waste Utilization	Check Dams	Check dams with bioengineering
	2	Drip Irrigation	Terrace Farming / Contour Farming	Buffer Planting
	3	Irrigation Water Conveyance	Critical Area Planting	Conservation Ponds
	4	Ponds	Irrigation Water Management	Inter-cropping And Agro-forestry
	5	Mulching	Micro Catchments	Mulching
	6	Fencing for Livestock Exclusion	Sewage Treatment Improvements	Livestock grazing Management
	7	Riparian Management	Composting	Application of fertilizer based on soil & water test
	8	Check Dams	Mulching/ Crop Rotation	Micro Catchment
	9	Terrace	Rain Water Harvesting	Well-head Protection
	10	Critical Area Planting	Salt Tolerant Crops	Grass Water ways

Table 4: Results of prioritizing best watershed management technologies for Sri Lanka

Object		Group 1	Group 2	Group 3
Watershed Name		Mahaweli	Thirapani	Upper Kothmale
Group members		7	8	8
Ranking		16 (Fair)	21 (Fair)	22 (Fair)
Prioritized technologies by the three groups	1	Critical area planting	Irrigation management	Ground cover crop
	2	Contour farming	Solar powered pumping	Minimum tillage
	3	Check dams	Soil & water testing	Check dams
	4	Terracing	Terrace/contour/bed	Soil conservation
	5	Irrigation Management	Land leveling	Mulching
	6	Raised bed planting	Crop rotation	Organic manure us
	7	Micro catchment	Well head protection	No overuse of IPN
	8	Buffer planting	Mulching/residue retention	Waste management
	9	Soil & plant testing	Buffer planting	Fertilizer
	10	Waste management	Waste Utilization	Irrigation
	11	Composting	Salinity management	
	12	Drinking water treatment		

The ten best technologies prioritized on the basis of number of occurrence by the three groups. To further identify and refine the three most appropriate technologies the participants were again asked to vote for the three most effective technologies (1, 2 and 3) out of ten using three colour sticky tags. The results are summarised in table 5, 6 and 7 for Pakistan, Nepal and Sri Lanka, respectively.

Table 5: Most effective watershed management technologies prioritized using voting for Pakistan

S. No.	Prioritized technologies	Category wise number of votes				Most Effective
		First	Second	Third	Total	
1	Terrace farming	2	2	1	5	5
2	Grasses and legumes	0	1	2	3	7
3	Rainwater harvesting	4	3	1	8	3
4	Check dams & structures	7	2	2	11	1
5	Crop rotations	0	3	2	5	6
6	Mulching	1	0	0	1	9
7	Soil and water testing	0	1	0	1	10
8	Forestation	4	3	4	11	2
9	High efficient irrigation	0	3	4	7	4
10	Crop residue management	0	0	2	2	8

Thus based on results of table 4 the top most effective technologies prioritized for Pakistan are:

- 1: Check dams and structures
- 2: Forestation
- 3: Rainwater harvesting
- 4: High efficient irrigation

Table 6: Most effective watershed management technologies prioritized using voting for Nepal

S.No.	Prioritized technologies	Category wise number of votes				Effective Ranking
		First	Second	Third	Total	
1	Check Dams / Bioengineering	11	3	1	15	1
2	Conservation Pond	3	1	4	8	3
3	Mulching	0	0	0	0	10
4	Micro Catchment	0	0	1	1	9
5	Irrigation Management	0	7	0	7	4

6	Terracing	0	2	1	3	8
7	Fertilizer Management	0	0	6	6	5
8	Human Waste Management	0	2	2	4	7
9	Grasses & Cropping Management	3	2	4	9	2
10	Critical Area Planting	2	2	0	4	6

Thus based on results of table 5 the top most effective technologies prioritized for Nepal are:

- 1: Check dams /Bioengineering
- 2: Grasses & Cropping
- 3: Conservation Pond
- 4: Irrigation Management.

Table 7: Most effective watershed management technologies prioritized using voting for Sri Lanka

S. No.	Prioritized technologies	Category wise number of votes			Effective Ranking
		First	Second	Total	
1	Irrigation Management	9	1	10	1
2	Critical area planting	3	2	5	2
3	Waste Management/Utilization	0	5	5	3
4	Micro catchment management	3	2	5	4
5	Soil, water and plant testing	0	4	4	5
6	Rainwater harvesting	2	1	3	6
7	Crop rotation	1	0	1	7
8	Drinking water treatment	1	0	1	8
9	Buffer planting	0	1	1	9
10	Terrace/contour/bed planting	0	1	1	10

Thus based on recommendations of training participants as per results of table 5, the top most effective technologies prioritized for Sri Lanka are:

- 1: Irrigation Management
- 2: Critical area planting
- 3: Waste Management/Utilization
- 4: Micro catchment management

3.4 Dissemination of Prioritized Technologies

The prioritized technologies were demonstrated on a model site in each country, as per pictorial details given for Pakistan, Nepal and Sri Lanka in Figure 5, 6 and 7 respectively. In Pakistan the training participants were provided field visit of Rawal watershed field station of PARC as shown in Figure 5, where majority of interventions discussed during the training sessions were demonstrated.



Figure 6: Field demonstration to training participants at Rawal Watershed on December 29, 2017

In Nepal, the improved watershed management interventions were demonstrated on third day of workshop at Kathmandu at Godavari knowledge park of ICIMOD, as shown in Figure 6. All the training participants were provided on hand training of improved watershed management practices, as per pictorial details given below.



Figure 7: Field demonstration at Godavari Knowledge Park, Kathmandu on March 30, 2018

In Sri Lanka, A field visit was organized on third day to Agriculture Technology Park, Gannoruwa, Paradeniya (Figure 7) where different soil and water conservation, watershed management interventions including terracing, runoff water management, agricultural and soil management, livelihood improvement activities and rainwater harvesting were demonstrated. Prior to this visit another short visit to tea farm was conducted where soil fertility improvement, terracing, check dams and ground cover management interventions were demonstrated.



Figure 8: Field visit to Agriculture technology park, Gannoruwa, Paradenya, on Sept 20, 2018

A field visit was organized to two progressive farmers fields at Fathejang area, at around 50 km away from Islamabad as shown in Figure 9, where the command area of mini dams were developed through integrated watershed management practices using solar water pumping systems coupled with high efficient irrigation systems for raising high value agriculture. One of the model site was developed by PARC using participatory approach. The model site was extensively used for demonstration and capacity building under a USAID funded project through ICARDA, Pakistan. The model site was replicated on 200 more mini dams by the government of Punjab while the solar pumping systems have now been widely adopted in the surrounding areas and in the whole country.



Figure 9: Field visit to two progressive farmer fields at FatehJang on March 21, 2019

Brochures were prepared for the prioritized technologies where all technical and graphical details were presented in easy understandable language. The brochures were shared with the project partners for sharing with farmers and agricultural service providers. The names and list of farmers trained by the project partners are listed in Appendix C.

3.5 Recommendations from project end workshop

The project end workshop participants were apprised of the project outcome for all the three countries by the project collaborators and then the workshop participants from all the three countries come up with the following recommendations regarding the three countries respectively:

3.5.1 Pakistan

- Formation of Watershed Management Authority for strengthening coordination & Cooperation among the lined departments;
- More funding for enhancing capacity of lined institutions and end-users;
- Up-gradation of watershed data base and its convenient availability;
- Development of watershed policy and its integration with water, forest, climate and food security /agriculture policies;
- Participatory demonstration of improved watershed practices for up-scaling;
- Enhance govt funding by launching a national watershed management program;
- Resource use planning, management and legislation for sustainable use of natural resource at watershed level;
- Watershed community based organizations (WCBOs) to ensure equitable distribution for upper and lower riparian & dispute resolution;
- Strengthening of regional cooperation, linkages & research collaborations.

3.5.2 Nepal

- Plan and manage the watersheds as per the 3E pillar (environment, economic, & equitable sharing) principles of the IWRM;
- Prioritize the watershed management technologies and ensure their proper dissemination;

- Embrace climate-smart practices in all activities in the watershed (agriculture practices, water resource management, hazard management);
- Small farmers participation should be enhanced through improved coordination among local, provincial, national governments, private sectors and CBOs;
- Strengthen research for sustainable watersheds through increased funding and facilitation of public private partnership;
- Develop scientific mechanism based on evidence for transparent sharing of resources among various watershed users;
- Establish payment mechanism for the upstream-downstream services over the upper and lower riparian rights in the use of water.

3.5.3 Sri Lanka

- Formulation of a national agency for watershed management having coordination with all stakeholders and lined departments;
- Strengthen the acts and regulations governing watershed management and strict enforcement of laws;
- Establishment of data shearing platform related to watershed parameters (soil Erosion, land use, rainfall etc.);
- Equitable distribution of watershed resources among upstream, middle and downstream users and ecosystem payment;
- Rehabilitation and manage all tanks, water ways, and their watersheds and increase the water productivity at all levels.

Conclusions

- Climate change is a reality and its impacts are more pronounced in South Asia due to lack of focus, awareness of end users and resources, thus the traditional watershed management practices on farm are not sustainable;
- There is plenty of expertise available locally but lack of government funding, coordination, resources, institutional mechanism, local and regional linkages are negatively affecting their effectiveness in utilizing their skills in mitigating climate change impacts;
- The best and innovative watershed management practices under the current climate change scenario should reduce the existing accelerated land and water degradation through engineering and ground cover management, control the rainwater runoff through rainwater harvesting and by ensuring improved and efficient utilization of harvested water for the livelihood of watershed communities.;
- The governments should enhance budget allocation for making the watershed more sustainable and utilise the existing research and development infrastructure

Future Directions

- Watershed management may significantly impact on natural resources under the current climate change scenario, thus demands for improved knowledge, training and skills of communities (professionals/farmers/service providers);
- Improving skills on identifying and prioritizing the best suited site specific interventions is urgently needed for enhancing sustainability of watersheds and food security but may also help in effectively utilizing the limited resources for livelihood;
- Climate change and degradation of natural resources is a regional issue which can be more effectively addressed through strengthening cooperation, linkages and research collaborations among the regional countries, especially Pakistan, Nepal, Sri Lanka and Japan, which demands for increasing funding for this sector.

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Appendix A: List of Workshop Participants/Project Partners

Table A1: Islamabad, Pakistan, December 26 to 28 2017

S.No	Name	Telephone/email	Affiliation
1	Miss Fouzia Irum SCO o/o ADSC Kahuta	0336-6329794 fouziairum75@gmail.com	Soil Conservation department
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Table A2: Kathmandu, Nepal March 28 to 30, 2018

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TableA3: Kandy, Sri Lanka September 18 to 20, 2018

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Table A4: List of registered Participants in project end workshop March 19 to 21, 2019

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Appendix B: Program Schedule of training workshops

Table B1: Pakistan Workshop Program Schedule (December 26 to 28, 2018)

Day – 1 Tuesday, December 26, 2017 (Venue : NARC, Auditorium-Chak Shahzad)		
	Activity	Resource Person
09.00-09.45	Registration	
Session-I: Inaugural Session		
09.45-09.50	Recitation - Holy Quran	Mr. Hafiz Muhammad Javed
09.50-10.00	Welcome note	Dr Sarfraz Ahmad, Director NRD PARC
10.00-10.05	Workshop Overview	Dr Muhammad Munir Ahmad, Director
10.05- 10.15	Project Overview	Dr Ghani Akbar, Project Leader
10.15-10.20	Remarks	Dr Muhammad Ashraf, Chairman PCRWR
10.20-10.25	Remarks	Dr Madan Lall Shrestha, NAST Nepal
10.25-10.30	Remarks	Dr Ajantha Desilva, NRMC Sri Lanka
10.30-10.35	Remarks	Dr Tariq Banuri, Executive Director GCISC
10.35-10.40	Key note address	Dr Yusuf Zafar T.I. Chairman PARC
10.45-10.50	Session Remarks	Dr Amir Muhammad, SPG member APN
10.50-10.55	Inaugural Address	Mr Fazal Abbas Maken, Secretary, MNFS&R
10.55-11.00	Vote of Thanks	Dr Tariq Mehmood, D.D.G., NARC
11.00-11.10	Group Photo	
11.10-11.30	Tea/ Coffee	
Technical Session-I: Climate Change and Sustainable Watershed Management practices		
11.30-12.10	Climate Change & Food Security issues in Pakistan	Mr. Arif Goheer, Program Head GCISC
12.10-12.50	Climate smart water management technologies for livelihood improvement	Dr. Muhammad Ashraf, Chairman PCRWR
12.50-13.30	Watershed management in Pakistan: PARC experience	Dr. Muhammad Munir Ahmad, Director CEWRI-NARC
13.30-14.00	Questions and Answers	
14.00-15.00	Lunch and prayer break	
Technical Session-II - Country Presentations (with working tea)		
15.00-15.15	Sri Lanka	Dr S.H.S.A De Silva
15.15-15.30	Nepal	Prof. Dr Madan Lall Shrestha
15.30-15.45	Pakistan	Mr. Aftab Ahmad Khan, GCISC
15.45-16.00	Questions & Answers	
Day – 2 Wednesday, December 27,2017 (Venue – Dreamland Hotel Islamabad)		
Technical Session –III: Sharing of regional knowledge on best watershed management practices		

09.00-09.30	An assessment of site specific best climate resilient watershed management practices for Sri Lanka	Sri Lankan Collaborator (Dr B.V.R. Punyawardena)
09.30-10.00	An assessment of site specific best climate resilient watershed management practices for Nepal	Nepalese collaborator (Mr. Dilli Ram Battarai)
10.00-10.30	An assessment of site specific best climate resilient watershed management practices for Pakistan	Pakistani collaborator (Mr Aftab Ahmad Khan)
10.30-11.00	Methodology for Prioritizing the best watershed management practices for Pakistan	Project Leader (Dr Ghani Akbar) (Dr Ghani Akbar)
11.00-11.30	Tea/Coffee	

TableB2: Schedule of Kathmandu, Nepal Workshop (March 27 to 29, 2018)

Day – 1 Tuesday, March 27, 2018 (Venue : Hotel Mountain, Kathmandu Nepal)		
Day/Time	Activity	Resource Person
09:00-09:30	Registration and arrival of guests/participants	
Inaugural Session		
09:35-09:40	Welcome note	Dr. Madan Lall Shrestha, Project collaborator, NAST
09:40-09:50	Project Overview	Dr Ghani Akbar, Project Leader, CEWR-NARC
09:50- 10:00	Remarks	Dr Muhammad Munir Ahmad, Project collaborator. Director, CEWRI
10:00-10:10	Remarks	Dr. Archana Shrestha, Senior Divisional Meteorologist, DHM, Government of Nepal
10:10-10:20	Remarks	Dr. Bimala Devkota, Senior Scientific Officer, NAST
10:20-10:30	Vote of Thanks	Prof. Dr. Rejina Maskey, Head, CDES/TU
10:30-10:50	Group Photo followed by high tea/coffee	
Technical Session-I: Climate Change and Sustainable Watershed Management practices		
10.50-11.30	Climate Change & Food Security issues in Nepal	Prof. Khem Raj Dahal, Institute of Agriculture and Animal Science (IAAS) Tribhuvan University
11.30-12.10	Towards Climate Smart Agriculture: Enhancing Adaptive Capacity of Smallholder Farmers in Kavre, Nepal.	Muhammad Ismail, Karakoram-Pamir Landscape, NRM Specialist, Echo System Services, ICIMOD, Kathmandu, Nepal
12.10-12.30	Questions and Answers	
12.30-13.00	Lunch break	

Technical Session-II - Country Presentations (with working tea)		
13:00-14.20	Nepal	Dr. Sudeep Thakuri, CDES/TU
14:20-14:40	Pakistan	Dr. Muhammad Munir Ahmad NARC/CEWRI
14:40-15.00	Questions & Answers	
Day – 2 Wednesday, March 28,2018		
Technical Session –III: Sharing of regional knowledge on best watershed management practices		
09.00-09.40	An assessment of site specific best climate resilient watershed management practices for Nepal	Mr. Dilli Bhattarai, Neplai Collaborator
09.40-10.20	An assessment of site specific best climate resilient watershed management practices for Pakistan	Dr. Muhammad Munir Ahmad NARC/CEWRI
10.20-11.00	Methodology for Prioritizing the best watershed management practices	Project Leader (Dr Ghani Akbar)
11.00-11.30	Tea/Coffee	
Technical Session – IV: Short listing best watershed management practices for Pakistan		
11.30-12.30	Prioritizing the best watershed management practices for Nepal through consensus by project partners	Moderator: Dr Ghani Akbar, Project Leader
12.30-13:00	Short listing of best watershed management practices, as per majority decision	All project partners
13.00-14.00	Lunch break	
Technical Session V: Dissemination Responsibilities Sharing		
14.00-16.00	Sharing details of five potential farmers/service providers and dissemination mechanism by each participant/project partner through filling a proforma and discussion	Project partners/master trainers
Day -3 Thursday, March 29, 2018 (Field Visit)		
Technical Session-VI: Field visit for demonstration of shortlisted technologies		
10:00-10:20	High tea/Coffee on arrival to field site	
10:20-11:00	Introduction of ICIMOD Knowledge Park Godavri	ICIMOD Officer

09.00-11.30	Field visit to ICIMOD Knowledge Park, Godavari, Lalitpur for practical demonstration of some shortlisted technologies	Nepal project collaborators
11.30-12.00	Tea/Coffee	
Concluding Session: Session Chair, Dr Ghani Akbar, Project Leader		
12.00-13.00	Remarks	Dr Ghani Akbar, Project Leader
	Remarks	Dr Muhammad Munir Ahmad, Project Collaborator
	Views of the Participants	Training Participants
	Filling of workshop evaluation proforma	Each participant
	Filling of DSA proforma and distribution of DSA	Dilli Ram Bhattarai
	Vote of Thanks	Dr. Madan Lall Shrestha, Project Collaborator
	Distribution of certificates	Project Leader and project collaborators
Project Planning Session		
14.00-15.00	Meeting among Pakistani and Nepalese project collaborators regarding future project activities;	Project Proponent and Project Collaborators
15:00-17:00	Nepalese and Pakistani participants departed	Dr Ghani Akbar and Dr Muhammad Munir Ahmad left for the Tribhuvan airport

TableB3: Schedule of Kandy, Sri Lanka Workshop (September 18 to 20, 2018)

Day – 1 Tuesday, September 18, 2018 (Venue: Oak –Ray Regency Kandy Sri Lanka)		
	Activity	Resource Person
09.00-09.30	Registration	
Session-I: Inaugural Session		
09.30-09:40	Welcome note	Dr S.H.S.A De Silva , Natural Resources Management Centre (NRMC), Sri Lanka
09.40- 09.50	Workshop Overview	Dr.B.V.R. Punyawardena, Principle Agricultural Scientists, NRMC, Sri Lanka
09.50- 10:00	Project Overview	Dr Ghani Akbar, CEWRI-NARC
10.00-10.10	Remarks	Dr Muhammad Munir Ahmad, Director CEWRI
10.10-10.20	Remarks	Dr. R.S Keerthisena, Actg. Director General of Agriculture
10.20-10.30	Vote of Thanks	Dr.B.V.R. Punyawardena, Principle Agricultural Scientists, NRMC, Sri Lanka
10.30-10.35	<i>Group Photo</i>	
10.35-11.00	<i>Tea/ Coffee</i>	

<i>Technical Session-I: Climate Change and Sustainable Watershed Management practices</i>		
11.00-11.30	Climate Change & Food Security Issues in Sri Lanka	Dr. B.V.R. Punyawardena, NRMC, Sri Lanka
11.30-12.00	Climate Smart Water Management technologies for livelihood improvement	Dr S.H.S.A De Silva, NRMC, Sri Lanka
12.00-12.30	Watershed management concept in Sri Lanka	Prof. Nimal Gunawardena, Faculty of Agriculture, University of Peradeniya
12.30-13.00	Questions and Answers	
13.00-14.00	<i>Lunch break</i>	
<i>Technical Session-II - Country Presentations (with working tea)</i>		
14.00-14.30	An Assessment of Site Specific Best Climate Resilient Watershed Management Practices for Sri Lanka	Mr. K.M.A Kendaragama, Principal Agriculture Scientist, Natural Resources Management Centre
14.30-15.00	An assessment of site specific best climate resilient watershed management practices in Pakistan	Dr Muhammad Munir Ahmad NARC/CEWRI
15.00-15.30	Questions & Answers	
Day – 2 Wednesday, September 19, 2018 (Venue – Oak –Ray Regency Kandy Sri Lanka)		
<i>Technical Session –III: Sharing of regional knowledge on best watershed management practices</i>		
09.00-09.40	Methodology for Prioritizing the best watershed management practices for Sri Lanka	Project Leader (Dr Ghani Akbar)
09.40-11.00	Prioritizing the best watershed management practices for Nepal through consensus by project partners	Interactive session Project Leader and collaborators
11.00-11.30	<i>Tea/Coffee</i>	
<i>Technical Session – IV: Shortlisting best watershed management practices for Sri Lanka</i>		
11.30-13:00	Short listing of best watershed management practices, as per majority decision	All project partners/Participants
13.00-14.00	<i>Lunch break</i>	
<i>Technical Session V: Dissemination Responsibilities Sharing</i>		
14.00-16.00	Sharing details of five potential farmers/service providers and dissemination mechanism by each participant/project partner	Project partners/master trainers

	through filling a proforma and discussion	
Day -3 Thursday, September 20, 2018 (Venue: Agriculture Technology Park, Gannoruwa, Peradeniya)		
Technical Session-VI: Field visit for demonstration of shortlisted technologies		
08.30-10.00	Field visit to Agro technological park, Gannoruwa for practical demonstration of shortlisted technologies	Sri Lanka project collaborators
10.30-11.00	<i>Tea/Coffee</i>	NRMC, Peradeniya
Concluding Session		
11.00-12.00	Summary of the Workshop Proceedings	Dr. B.V.R. Punyawardena, NRMC, Sri Lanka
	Views of the Participants and satisfaction checklist form filling by each participant with working tea	Training participants
	Remarks by the Chief Guest	Dr. R.S Keerthisena, Actg. Director General of Agriculture
	Vote of Thanks	Dr S.H.S.A De Silva, NRMC, Sri Lanka
	Distribution of certificates	Dr. R.S Keerthisena, Actg. Director General of Agriculture
12.00-13.00	<i>Lunch Break – HORDI Circuit Bunglow</i>	
Project Planning session		
13.00-14.00	Meeting among Pakistani and Sri Lankan project collaborators regarding future project activities	Project proponent and Project collaborators

TableB4: Schedule of project end Workshop (March 19 to 20, 2019)

Day – 1 Tuesday, March 19, 2019 (Venue : Islamabad Hotel, G-6, Civic Centre, near Melody)		
	Activity	Resource Person
09.00-09.55	Registration	
Session-I: Inaugural Session		
9:55-10:00	Recitation from Holy Quran	Engr. Muhammad Asif, CEWRI-NARC
10:00-10:10	Welcome note	Dr Ghulam Muhammad Ali, D.G. NARC
10:10-10:20	Workshop Overview	Dr Muhammad Munir Ahmad, Director CEWRI-NARC
10:20-10:30	Project Overview	Dr Ghani Akbar, Project Leader, CEWRI-NARC
10:30-10:35	Remarks	Dr Madan Lall Shrestha, Project collaborator, Nepal
11.35-10.40	Remarks	Dr S.H.S. Ajantha De Silva, Project collaborator, Sri Lanka

10:40-10:50	Remarks	Ms Sewa Lamsal, Ambassador of Nepal to Pakistan
10:50-11:00	Remarks	Mr Noordeen Moamed Shaheid, High Commissioner of Sri Lanka to Pakistan
11:00-11:10	Inaugural Address	Dr Munir Ahmad, Chairman PARC
11:10-11:20	Vote of Thanks	Dr Sarfraz Ahmad, NRD, PARC
11:20-11:30	<i>Distribution of Shields to key speakers</i>	
11:30-12:00	<i>Group Photo, Tea/ Coffee</i>	
Technical Session-I: Project Progress and outcome (Venue: Islamabad Hotel, G-6, Civic Centre, near Melody)		
12:00-12:30	Project Outcome for Nepal	Dr Sudeep Thakuri
12:30-13:00	Project Outcome for Sri Lanka	Dr S.H.S. Ajantha Desilva
13:00-13:30	Project Outcome for Pakistan	Dr Ghani Akbar
13:30-14:00	Questions and Answers	
14:00-15:00	<i>Lunch break</i>	
Technical Session-II - Country wise Key Policy recommendations		
15:00-15:20	Nepal	Dr Madan Lall Shrestha
15:20-15:40	Sri Lanka	Dr S.H.S Ajantha Desilva
15:40-16:00	Pakistan	Dr Muhammad Munir Ahmad, CEWRI
16:00-16:30	Questions & Answers	
Day – 2: Wednesday, March 20, 2019 (Venue: Islamabad Hotel, G-6, Civic Centre, near Melody)		
Technical Session –III: Refinement of policy recommendations		
09:00-10:30	Groups discussion on country wise policy recommendations	Moderator, Dr Ghani Akbar And Dr Muhammad Munir Ahmad
10:30-11:30	Group leaders presentations on refining policy recommendations	
11:30-12:00	<i>Tea/Coffee</i>	
Technical Session – IV: Short listing of Country wise Key Policy recommendations		
12:00 - 13:00	Long listing of policy recommendations	Moderator, Dr Ghani Akbar
13:00 - 14:00	Short listing of key policy recommendations country wise	Moderator, Dr Ghani Akbar
14:00-15:00	<i>Lunch break</i>	
Concluding Session- Venue: Islamabad Hotel, G-6, Civic Centre, near Melody Islamabad		
15:00-16:00	Recitation from holy Quran	Engr. Muhammad Asif
	Summary of the Workshop Proceedings	Dr Ghani Akbar
	Summary of key policy recommendations	Dr Muhammad Munir Ahmad
	Participants views/suggestions	Workshop participants
	Concluding Remarks	Dr Munir Ahmad , Chairman PARC

	Vote of Thanks	Dr Muhammad Munir Ahmad
	Distribution of certificates	Dr Munir Ahmad , Chairman PARC
	Group Photo and tea	
Day -3 Thursday, March 21, 2019		
Venue: Visit to progressive Farmer Field at FatehJang Area		
Whole day (09.00- 16.00)	Exposure Visit to two Progressive Farmers Field at Fateh-Jang for demonstrating watershed management activities	Pakistani Project collaborators
	<i>Tea/Coffee and Lunch in Field and group photo</i>	

Appendix C: List of farmers/Agriculture service providers trained

Table C1: Farmers/Agriculture service providers trained by Pakistani project partners

S.No.	Project Partner	No	Name of farmer	Address	Contact
1	Engr. Adil Altaf (Research Assistant)	1	M. Akhtar	Lahore	03004926552
		2	Sajjad Hussain	Gujranwala	03008401687
		3	Shahid Mahboob	Lahore	03008462787
		4	Hussain Abad Khan	Multan	03008733010
		5	Naseer A. Ch	Faisalabad	03007280071
		6	Amjad Feel Ahsan	Faisalabad	03006982115
		7	M. Azeem	Faisalabad	03007203683
		8	Nazeer Ahmad	Multan	03027475269
		9	Aziz Rashid	Gulkin, Hunza, GB	03555313180
		10	Ghulam Murtaza	Nasir Abad, Hunza, GB	03456031742
		11	Muhabbat Kareem	Moorkhoon, Hunza, GB	03425225395
2	Mr Jalal Hayat Khan (Scientific Officer)	12	Biala H.Khan	Jalalia, Hazro, Attock	03015724042
		13	Rafaqat Khan	Jalalia, Hazro, Attock	
		14	Aqeel Khan	Jalalia, Hazro, Attock	03005498526
		15	Mehran Khan	Haji Shah, Attock	03315087230
		16	Muhammad Asif	Jalalia, Hazro, Attock	
		17	Mian Abid	Haji Shah, Attock	
		18	Naseer Ahmad	Hazro, Attock	
3	Miss Fouzia Irum SCO o/o ADSC Kahuta	19	Muhammad Banaras	Chak Mirza, Kallar Syedan	
		20	Ghulam Ahmad Kiani	Bishandot, Kallar Syedan	03015549880
		21	Tariq Mehmood	Kallarian, Kallar Syedan	03335446259
		22	Shahid Afzal	Paikan, Kallar Syedan	03315322586
		23	Haqdad	Bhalakar, Kallr Syedan	
4	Engr. Muhammad Israr Manager irrig & landscape	24	M. Hassan Raza	Gulberg Greens, Islamabad	03455883387
		25	Muhammad Abdullah	Gulberg Greens, Islamabad	03028521015
		26	Ashar	Gulberg Greens, Islamabad	03008730140
		27	Qamar	Gulberg Greens, Islamabad	
		28	Sheraz Muhammad	Gulberg Greens, Islamabad	03420010051
		29	Kashif,	Gulberg Greens, Islamabad	03366777889

		30	Adeel Zahid	Gulberg Greens, Islamabad	03416445595
		31	M. Zubair Mazhar	Gulberg Greens, Islamabad	03085476300
		32	Huzifa	Gulberg Greens, Islamabad	03013138971
		33	Mazhar	Gulberg Greens, Islamabad	03155347403
5	Engr Sher Shah Hassan Internee GCISC	34	Tajamul Shah	Mardan	03065556469
		35	Asif ur Rehman	Swabi	03459505391
		36	Fazl e Rabi	Swabi	03130992680
		37	Iltaf	Mardan	03459701769
		38	Mubbasir	Mardan	03456302633
		39	Saddam	Mardan	03438291568
6	Mr Shahzad Akhtar Assistant Director	40	Jabbar	Gujar Khan	
		41	Waqar	Gujar Khan	
		42	Dr Ashar	Rawalpindi	
		43	Imtiaz Ahmad	Rawalpindi	
		44	Qasim Hanif	Rawalpindi	
		45	Rifat Kamal	Rawalpindi	
7	Mr Shafiq Ahmad Agriculture Officer, Khuzdar	46	Qamar Alam	Khuzdar City, Balochistan	03337976996
		47	Mumtaz Ahmad	Zahid Abad, Khuzdar	03337745202
		48	Adeel ur Rehman	Zahid Abad, Khuzdar	03337982277
		49	Abdul Ghafoor	UC Tootak, Khuzdar	03332365360
		50	Usman	Kattan, Khuzdar	03363222131
8	Mr Nawab Khan Agriculture Officer	51	Azeem Khan	Valley Baghao, Barkhan	
		52	Basheer Ahmad	Valley Baghao, Barkhan	
		53	Meer Alam	Valley Baghao, Barkhan	
		54	Meer Ahmad	Valley Baghao, Barkhan	
		55	Jalal Khan	Valley Baghao, Barkhan	
9	Dr Ghulam Nabi (PSO)/ Dr Shahid Maqsood Gill PSO	56	Ghulam Haider	Dhok Miskeen, Fateh Jang	03445106857
10		57	Aslam Marth	Toti bun, Balkaser	03335728421
58		Amanullah	Saroba, Chakri	03328501602	
11	Noor Muhammad	59	Zia ur Rahman	Bajawar Agency (FATA)	03429380331
		60	Ihsanullah	Laki Marwat, KPK	03125853006
		61	Salah ud din	Peshawar	03077193531
		62	Habib Ahmad Jan	Dir Lower	03479261201
		63	Fai Rahman	Swat	03458842486
12	Mr Jameel Akhtar Program Officer	64	Naseer	Solar System, Islamabad	0335005022
		65	Mirza Mukhtar	Bhadana, Gujar Khan	03018515516
		66	Ali Raza	Gujar Khan	03005347098
		67	Muhammad Shehzad	Toka Mehran Khan, Chakwal, Talagang	03028582993
		68	Muhammad yar	Bhaghwal, Chakwal	03329670263
		69	Khalid	Lawa, Chakwal	03035980734
13	Mazhar Saleem Senior Engineer	70	M. Khalid	Vill Gohal, Lawa, Chakwal	03359556004
		71	M. Safdar	Vill Lawa, Chakwal, Talagang	03035980734
		72	Khurran Abbas	Izhar Energy Ltd. Chakwal	03034442308
		73	Ch. Azad Hussain	Pind Thikrian, Gujar Khan	03455593037
		74	Ch. Ali Raza	Bhadan, Gujar Khan	03005347098
		75	Mian Khalid Hussain	UC Thalli, Gujar Khan	03009568133
		76	Bashir Ahmad Bhatti	UC Jand Mahla, Gujar Khan	03335139020

		77	Mehboob Hussain	Duab Jallal saud mahla, Gujar khan	03126171514
14	Aftab Ahmad Khan (Scientific Officer)	78	Muhammad Amjad	D.I Khan	03449342491
		79	Kifayat Khan	Islamabad	03448958828
		80	Sohaib Raja	Islamabad	03338527188
		81	Salman Awais	Peshawar	03025992892
		82	Saifullah	Quaid e Azam University	03335428258
15	Mansoor Ali (Additional professional)	83	Saifullah Khan	Lakki Marwat	03139104778
		84	Khurram Shahid	Fateh Jang, Attock City	
		85	M. Sajjad	Jand Road, Attock City	
		86	M. Iftikhar	Soil Conservation Deptt. Punjab	
16	Rohail Khalid	87	Abdul Qadir	Mianwali, Punjab	
		88	Nusrat Shah	Chitral, Kpk	03335262662
		89	Rashid Hameed	96/6 R, Sahiwal	03006917496
		90	CH. Shahid	113/12 L. Chichawatni, Sahiwal	03006902443
		91	Muhammad Zahid	96/6R, Dis. Sahiwal	03367670421
17	Engr Muhammad Asif (SO)	92	Abdul Ghani	110/12 L. Chichawatni, Sahiwal	03007834481
		93	Abdul Hameed	96/6R, Dis. Sahiwal	03006920196
		94	Malik Akbar	Pindi Gaib	03315277077
		95	Malik Munawar	Jund	03465385165
		96	Sajjad	Fateh Jang	03005169007
		97	Iftikhar	Ummah Farm, Hazro	03315098418
		98	Haji Asim	Fateh Jang	03009862047
		99	Zafar Iqbal	Gaggan, Fateh Jang	
		100	Fazle Qadir	Arokus, Murree	

Table C2: Farmers/Agriculture service providers trained by Nepalese project partners

S.No.	Project Partner	No	Name of farmer	Address	Contact
1	Kapil Prajapati HIMGIRI eco-friendly Agriculture Cooperative Ltd.	1	Temba Gyalbu Sherpa	Helambu-1 Sindhupalkhor	
		2	Sange Dorje Sherpa	Helambu-1 Sindhupalkhor	
		3	Bhalu Sherpa	Helambu-1 Sindhupalkhor	
		4	Phurpa Sonam Sherpa	Helambu-1 Sindhupalkhor	
		5	Kancha Sherpa	Helambu-1 Sindhupalkhor	
		6	Sumjyo Sherpa	Helambu-7 Sindhupalkhor	
		7	Tsering Wangchu	Helambu-6 Sindhupalkhor	
2	Pasang Wangchu Sherpa HIMGIRI eco-friendly Agriculture Cooperative Ltd.	8	Maya Sherpa (Hyolmo)	Nuwakol – Betini- 4	
		9	Penjom Sherpa	Nuwakol – Gaunkhara – 2	
		10	Dame Sherpa	Nuwakol – Gaunkhara – 2	
		11	Gyalgen Sherpa	Nuwakol – Gaunkhara – 2	
		12	Sarki Sherpa	Nuwakol – Sehok - 7	
		13	Dorje Tamang	Nuwakol – Gaunkhara – 2	
		14	Dalwa Tamang	Nuwakol – Gaunkhara – 2	
		15	Suman Tamang	Nuwakol – Gaunkhara – 2	
		16	Dawa Tamang	Nuwakol – Gaunkhara – 2	
		17	Pemba Sherpa	Nuwakol – Gyapned – 1	
3	Lal Mani Wagle Clean Energy Nepal	18	Laxmi Kc	Kathmandu	
		19	Debendra Khatiwada	Bhakhapur	
		20	Dipole Dahal	Okhaldhunga	
		21	Shambhu Nepol	Bhojpur	

		22	Rama Poudel	Kathmandu	
4	Pooja Koirala Tribhuvan University	23	Govinda Sharma	Patlelchet, Dholikel	9841332443
		24	Nelson Pokharel	Illam	
		25	Laxman Singh Khati	Byas, Darchula	
		26	Hasera Organic Farms	Dhalikhel	
		27	Patiekhet, Dholikhel		
		28	Nabin Singh Khati	Byas, Danchula	
5	Ashmita Paudel LI-BIRD	29	Kalpna Subedi	Godavari, Lalitpur	9841652239
		30	Kanchi Bishta	Mahalaxmi, Lalitpur	9741206447
		31	Mira Thapa	Mahalaxmi, Lalitpur	9849164514
		32	Gita Acharya	Harisiddhi, Lalitpur	9851016424
		33	Sushil Paudel	Rupandehi Lalitpur	9759001033
6	Palpasa Prajapati CREEW	34	Duhitri Pachhai	Thiml, Bhaksapu	9741057325
		35	Tej Pachhai	Nayabazar, Kathmandu	01-4359433
		36	Nihita Pchhai	Chhauni, Kathmandu	9841270930
		37	Kanchi Prajapati	Thimi, Bhaktapur	01-6633147
		38	Shova Maharajan	Nayabazar, Kathmandu	9849711487
7	Tista Prasai Nepal Academy of Science & Technology	39	Sujan Maharjan	NAST	9841679294
		40	Priya Bhuju	Central Dept. of Microbiology	9849675743
		41	Pabitra Bhandari	Central Dept. of Microbiology	9847642486
		42	Shushila Gwacha	Khowpa College, Chaktapur	9843038926
		43	Rashmi Koju	Bhaktapur	9841900158
8	Anita Tuitui	44	Shushila Gwachha	Bhaktapur, Nepal	9843038926
		45	Ramita Bajracharya	Bhaktapur, Nepal	9841843309
		46	Rajan Maharajan	Kathmandu, Nepal	9849108203
		47	Sanju Satyal	Kathmandu, Nepal	9860754069
		48	Sabin Khyaju	Bhaktapur, Nepal	9841675806
9	Megha Bajaj SIAS	49	Aabhisekh Khadka	Chitwan	9804060681
		50	Sanjay Kumar	Dharan	
		51	Sita Tamang	Dharan	
		52	Ram Kumar	Dharan	
		53	Seema Kaur	Dharan	
		54	Madan Tamang	Dharan	
10	Dr. Dibas Shrestha Tribhuvan University	55	Krishna Shrestha	Gorkha, Nepal	9741201472
		56	Ram Gotame	Gorkha, Nepal	9849107279
		57	Arbindra Khadka	Nuwakot, Nepal	9849612143
		58	Prabesh Dhungana	Kathmandu, Nepal	9616476227
		59	Narayan Ghimire	Palpa, Nepal	9841652998
11	Niranjan bista	60	Purna Bdr Mijar	Dhulikhel 12 , Kavre	9841427701
		61	Yadav Prasad Gutam	Dhulikhel 13, Kavre	9841002142
		62	Basudev Badal	Dhulikhel 13 , Kavre	9841034389
		63	Ram Hari Badal	Dhulikhel 13 , Kavre	9841825531
		64	Harihare Badal	Dhulikhel 13 , Kavre	9843771860
12	Deepa Neupane	65	EkNath Neupane	Ratnanager-3 Chitwan	9845043450
		66	Purshwotam Guragain	Panauti, Kavre	9801155380
		67	Bidur Sapkota	Panchkhal, Kavre	9801012489
		68	Sita Karki	Thimi, Bhaktapur	9849273183
		69	Sarala Adhikari	Dhulikhel	9841510212
13	Suchita Shrestha	70	Bhimsen Dahal	Dhulikhel, Kavre	
		71	Krishna Prasad Ghimire	Dhulikhel, Kavre	

		72	Ganga Dahal	Dhulikhel, Kavre	
		73	Mukti Bajagain	Dhulikhel, Kavre	
		74	Bishnu Bajagain	Dhulikhel, Kavre	
14	Lakpa Sherpa	75	Maan Bahadur Danuwar	Panchkal Municipality, Kavre, Ward No. 5	
		76	Surya B. Danuwar	--do--	
		77	Raadi Danuwar	--do--	
		78	Shivaram Danuwar	--do--	
		79	Kancha Rai	--do--	
15	Bashudev Neupane	80	Subba Majhi	Bhimtar, Sindhupalchowk	
		81	Ashok Sherestha	Gorkha	
		82	Ramji Majhi	Bhimtar, Sindhupalchowk	
		83	Santa Bdr. Majhi	Bhimtar, Sindhupalchowk	
		84	Hari Majhi	Bhimtar, Sindhupalchowk	
16	Binod Thapa	85	Durga Lama	Barhabise-7	
		86	Ram Bahadur Tamang	Barhabise-9	
		87	Goma Timilsina	Barhabise -9	
		88	Kumar Timilsina	Barhabise-9	
		89	Lale tamang	Barhabise-9	
		90	Laxmi khatri	Barhabise-2	
		91	Sanu Tamang	Barhabise-9	
17	Raju Chauhan	92	Nagen Limbu	Letang, Morang	9810401494
		93	Anjana Chauhan	Dharan, Sunsari	9842099948
		94	Ram Bhattarai	Khandbari, Sankhuwasabha	
		95	Kaila Biswakarma	Khandbari, Sankhuwasabha	9860689819
		96	Ishwor Rai	Khandbari, Sankhuwasabha	
18	Udhab Raj Khadka	97	Bishnu Chapagain	Kathmandu	9851100095
		98	Pushkar Khadka	Kathmandu	
		99	Prakash Chandra Giri	Kathmandu	
		100	Kabindra Dangol	Lalitpur	9841444145
		101	Kabita Khadka	Sarlahi	9849242190

Table C3: Farmers/Agriculture service providers trained by Sri Lankan project partners

Sr. No	Project Partner	Name of farmer	Contact	Address
1.	M.R.A.K.B Rathnayaka	1. Miss Chammi 2. Mr. Ashoka 3. Mr. Gayan 4. Mr. Lahiru 5. Miss Lankapathi 6. Mr. Jeewan 7. Mr. Nuwan 8. Mr. Parakrama 9. Mr. Venara 10. Mr. Suranga (AI)	0778014868 0716073124 0765500209 0775163054 0775328659 0702005941 0719465348 0753939599 0718106756 0718261516	Hadabima authority of SL Gannoruwa, Peradeniya Kirioya Atharagallawa
2.	Sriyani Jenila Abeywickrama	11. R.P. Morawalge 12. Mrs. Indrani 13. Mr. Dickson 14. Seetha Kumari 15. Mrs. Gamage 16. Mrs. Shirani 17. Gs. Muruthalawa	0713568839 0715970025 0715155139 0777362177 0713475534 0772346132 0716351424	26 Aladeriya Rd. Muruthdawa 26 Aladeriya Rd. Muruthdawa 28 Aladeriya Rd. Muruthdawa 28 Kandewalla- Muruthdawa 27 AWTH BUNGA LAWA- Muruthdawa Agriculture Institute Edaduwwa 27A, Kandewalla-

				Muruthdawa
3.	H.M.A.M. Herath	18. M.G.R.C.K.K Gamlath 19. K.D.K Malaka 20. Project Manager- Murapola scheme 21. Nilanka Karunaratne 22. Wijenarayana	0703533222 0718101015 0716104931 0716081768 0719349867	Irrigation Office, Kandy Irrigation office, Polonnaruwa Resident Project management office Pothgoda, Marassane Irrigation Office , Kandy Neclawala Farmer Organization Neelawal, Marassana
4.	D.M.A.C.H Munasinghe	23. N.P. Koswatta 24. N. Maithree 25. Hewa P.Pathirana 26. H.M. Ghandrasir Herath 27. Dayalah Prema Chandra 28. W.M. D.S. Wijayasundra 29. Rajitha Premachundra 30. K.P. Gunnarathne	0714958450 0759747144 0773871772 0712571307 0715972649 0777526853 0784925088 0718447117	D.I.E.S Office M.C road Matule AI, Department of Agriculture Matale Uda Weragama, Kaithawla Matale Bandarapola, Udathanna Matale Udathunna, Matale D.I.E.S Office M.C Road Matale Panathadiya, Uduthanna Matale ITa, Balegoda, Ambathanu
5.	R.A.L.J. Perera	31. Mr. Basdhika- RA 32. Mr. Thejani –ADA (RA) 33. Dr. Nijamlea- PS 34. Farmer Society 35. Famer Society 36. Mr. Shanha 37. Mr. Irugel Bahan		FCRDI- Malaivirppallar do do Wagayakulan, Thirappane Meagassgan, Thirappane ISII, Malailppda Do
6.	M.G. Nilanka Danith Weerasphghe	38. Dir,WM, Eng. MS.G Thilanka Sawarhuga 39. Mrs. Nimanthi Manjula 40. Eng.Mr. Millan Mallana Rachchi 41. Eng. Mrs. Dulani Dundara 42. Mr. Samira Piyathalte	0717551212 0710353514 0718021996 0710857414 0718119011	Director, Water Management Secretariat , No.500 T.B. Jayah Mawatha Colombo 10 Dy Director, Water Management Secretariat Civil Engineer same the above address:Hydrologist , Same the above address GIS Specials for Climate & Remote Sensing.
7.	B.I.S.W	43. DMAB Dasanayaka 44. AM Sunsuntha 45. Nimal 46. Sanil Ui Knan 47. Atula Sanaviluthn 48. Onasavirasaria 49. Janaka Ariyunthi	0718109704 0719036233 0779096212 0779096221 07195107181 0718103960 0714477446	Acthority Hadabima. Sri. Lanka - - - - -
8.	R.W.C Gunawardana	50. Mr. Gayan Bogahwatta 51. Mr. Kusal Cooray 52. Mr. Binddhika Jayawardana 53. Ms. Anjalee 54. Mr. Indika	0711338941 0769689447 0777290056 0774005380 0770362275	Technical Officer, Mahaweli Authority of Sri. Lanka Kotmale dam -do- Engineering Assistant Mahaweli Authority of

		55. Mr. Roshan Gunawardam		Srilanka, Kotmale dam Technical Officer, Mahaweli Authority of Sri. Lanka Kotmale dam 08/56, Niyandagla, Maldniya Harankahawa
9.	M.H.B. P.H Madana	56. Ms. Resha Dayarathna 57. Mr. DPD Gnanasinghe 58. Ms. Gayani Rathnayalce 59. Mr. Shahtha Dissanayalce 60. Mr. Irugal Bandara	99753661045 94714536243 94703758997 94714456648 94718426140	Dept of Agriculture /NCP Anuradhapura Dept of Agriculture /NCP Anuradhapura Dept of Agriculture /NCP Anuradhapura Inservice Training Institute Mahailappallan Inservice Training Institute Mahailappallan
10.	B.H.K. Thankshila Kuman	61. Indika Amarakoon 62. Chaminda Herath 63. Dhanushka Dissanayalce 64. Ayomi Weerapana 65. D.S. Sirisooriya 66. Nirusha Jawawikrans 67. U.V.H.O udabage 68. A.M.A Anarakoun 69. W.G. Karanarathne	94759747361 94753660829 94759745312 94759747571 94759747184 94753660827 94718267288 94718153062 94759747198	Agriculture Instructor, Thalalhuongi A.I. Marassana A.I Galaha A.I Watthegama A.I Bowala A.I Ketawala A.I Hulugangh Subject matter office Subject matter office
11.	Aruni B. Abeeysekera	70. ADA Development 71. Development Officers 72. Agri Instructor 73. Sub Res. Assistant 74. ADA (Res) 75. ADA (Res)	094776661869 094714752326 094717138105 094812388355 094775969778 094714484140 094714395481	Plant Quarantine Service NRMC NRMC NRMC NRMC HORDI, Gannoruwa HORDI, Gannoruwa
12.	Dilan Amendra	76. L. Bandara 77. D.G.C.H Delpagoda 78. D.L. Vissundara 79. G. Gomas 80. E.M. A.K Ekanayake	0717873147 0765323654 0710450475 0718655659 0711061522	Becagala rd, Kegalle Hospital rd. Polghawela Maumal Verake, Karandupona, Kegalle Polwattha rd, Pannipitiye Nithulethenna, Kundasale
13.	M. G. S Liyanage	81. Padmini Pronaduga 82. Sampath Patnionnap 83. Ruchira Worasinjha 84. Surumya Lakshan 85. Sarula Edirishighe	0714462279 0452228851 0702673905 0702519904 0716561784	JRI, Ratnapira JRI, Ratnapira School or agoicide kundaba AII Labuduwa Faculty of Arid m university of Lugoh
14.	B.G.W Pushpa Kumara	86. Mr. Prabath Kumara 87. Mr. Thushara Prabats 88. Mr. Roshan Perera 89. Mrs. Kalpand bannajah 90. Mrs. Madurayh 91. Training Officers	0719223664 0702060671 0759476505 0718936220 0714519670	ISTI- Ganoruwa ISTI- Ganoruwa ISTI- Ganoruwa ISTI- Ganoruwa Agriculture Department
15.	D.M.P.T Dissanaale	92. Asaga Senuyale 93. Sujith Kulathunga 94. Thilini Bawwoyga 95. Lahra Adicari 96. S.D. Mangdi	0754614276 0717798741 0711762179 0714870120 0711929331	SCS, Pelwetriara SOA, Pelwehara Plant dvenke senee – Kutunyde SOA, Pelwehara

				SOA, Pelwehara SOA, Pelwehara
16.	P.G.K Jayatissa	97. Anura De Silva 98. Karalliyadda 99. Sujewa Desunayaka 100. Nuyomi desanayaka 101. Ms Ramani Gkanayaka	0718052207 0726583304 0714484109 0773167469 0711781920	Natural Resources Management Centre Peradeniya
17.	W.A M.P Wiakram Singhe	102. Mrs. Nilhani Kundyannaye 103. Mr. Chandann 104. Mr. Kulathanya 105. Mrs. Salugi 106. Mrs. Mandumali	0715889034 0714157602 0759251231 0712573119 0715720075	Agriculture School of Kunilascle W.R.M.C Department of Agriculture Paradaniya Extension at Training Center, DOA, Paradaniya
18.	M.C Janjasinghe	107. W. Sisira kumara 108. Suranjith Janaka 109. Mr. Bandara 110. Mr. Dissana yaka 111. Bharatha Wijewar Dona 112. Jogandha Jayasighe 113. Dmss Dissanayaka 114. Mrs. Amitha	0718038998 0759751159 0757161261 0712389756 0772111737 0772281896 0718153061 0753660416	Seed farm Pedro Seed Farm Seetha eliya Farm Manatu Meepi Limam Seed Farm Udavadella Seed farm Kandapola Seed farm Kahagolla SDMDC Numaraeliya SDMDC Numaraeliya

10. Young Scientists Involved

Engr. Roman Saeed Khan
Email: engr.rskhan@gmail.com
Research Assistant (APNgcr Project)
CEWRI, NARC, Islamabad Pakistan.

“As a research assistant I have to collect the data, coordinate with concern people for getting the required information which my personal capabilities. This project will provide basic information to people in the rural areas about the watershed management that will make the integrated environment eco friendly and will also derive best results nationally and regionally”.

Glossary of Terms

APNgcr	Asia Pacific Network for Global Change Research
PARC	Pakistan Agriculture Research Council
NARC	National Agricultural Research Centre (Pakistan)
NAST	Nepal Academy of Science and Technology
CEWRI	Climate, Energy and Water Research Institute
PCRWR	Pakistan Council of Research in Water Resources.
CDES, TU	Central Department of Environmental Sciences, Tribhuvan University.
NRMC	National Resource Management Centre.
SEN	Small Earth Nepal
GCISC	Global Climate Change Impact Study Centre, Pakistan
ICIMOD	International Center of Integrated Mountains Development
NRMC	Natural Resources Management Centre