



**SUMMARY REPORT
OF THE INTERNATIONAL WORKSHOP-cum-TRAINING PROGRAMME**

ON

“IRRIGATION SYSTEM AND WATER MANAGEMENT”

ISLAMABAD, PAKISTAN, 21 – 30 JANUARY 2014

**AFRICAN-ASIAN RURAL DEVELOPMENT ORGANIZATION (AARDO)
NEW DELHI**

I. INTRODUCTION

African-Asian Rural Development Organization in collaboration with the Establishment Division, Government of Islamic Republic of Pakistan and Akhtar Hameed Khan National Centre for Rural Development organised the International Workshop-cum-Training Programme on "Irrigation System and Water Management" at Islamabad, Pakistan during 21-30 January 2014 with the following objectives:

II. OBJECTIVES

1. To familiarize participants with prevailing situation of water resources in African and Asian regions;
2. To identify the major issues in management of water resources;
3. To discuss about the different methods/technologies for efficient usages of water resources;
4. To deliberate on the government policies and strategies with regard to water resource management; and
5. To share experiences and best practices in irrigation and water management and suggest measures for overcoming challenges.

III. METHODOLOGY

The programme consisted of two parts, namely, the plenary meeting and field trip. The meeting included presentations of papers by resource persons, country reports and discussions. A field trip to Satrameel Sub-watershed project was arranged on 25 January 2014 and to High Efficiency Irrigation System in Hazro tehsil of Attock district on 26 January 2014. Eleven resource persons from various Pakistani institutions and research organizations delivered presentations on various facets of irrigation systems and water management in Pakistan. Besides, participants from seven countries presented their country report on water management.

IV. PARTICIPATION

The programme was attended by ten international participants from seven member countries, namely, People's Republic of Bangladesh, Republic of Ghana, Republic of Iraq, Hashemite Kingdom of Jordan, Federal Republic of Nigeria, Democratic Socialist Republic of Sri Lanka and Republic of the Sudan. Besides, 18 participants from Islamic Republic of Pakistan representing irrigation department of various provinces and institutions/universities also attended the programme. A large number of dignitaries representing NGOs, government officials and others were present in the inaugural session. Two AARDO officials also attended the programme.

V. OPENING CEREMONY

The inaugural session of the programme started on 22 January 2014 in the morning at 10.00 hours in the Conference Hall of the NCRD. The ceremony started with the

recitation of verses from the Holy Quran. Dr Zafar Iqbal Qadir, Director General, NCRD welcomed the participants. It was followed by an Address by Mr Aslam Khan, Representative of H.E. Eng. Wassfi Hassan El-Sreihin, Secretary General of AARDO. Thereafter, Dr Rajeshwar Dyal from AARDO gave a brief introduction of the Organization to apprise the Chief Guest and others. At the end, Mr Shahid Rashid, Honorable Secretary, Establishment Division, Government of the Islamic Republic of Pakistan and the Chief Guest delivered his Inaugural Address. The participants had a group photograph with the Chief Guest.

VI. ADDRESSES

The following addresses were delivered during the Inaugural function:

Welcome Speech of Dr Zafar Iqbal Qadir, Director General, AHK National Centre for Rural Development

Honourable Secretary, Establishment Division, Shahid Rashid Sahib,
Mr. Aslam Khan Sahib, Head Finance Division, AARDO
Dr. Rajeshwar Dyal Sahib from AARDO
Participants from AARDO's Member Countries
Distinguished invited Guests, Ladies and Gentlemen,

On behalf of officers and staff of NCRD and my own behalf I welcome you all to the Inaugural Session of AARDO – NCRD Collaborative Training Workshop on “Irrigation System and Water Management”. I am particularly thankful to the Honorable Secretary, Establishment Division for sparing time to inaugurate the Training Programme. The presence of senior AARDO Officials strengthens our belief that AARDO is committed to the cause of Rural Development and Poverty Alleviation in our two Continents. My thanks to the invited guests who are here with us. I appreciate the presence of participants from AARDO Member Countries who have taken great pains and travelled over long distances to participate in the Training Event. Their participation is a positive sign to demonstrate that Pakistan is now slowly but surely getting out of the clutches of terrorism that engulfed the country during the last few years. We whole-heartedly welcome and thank for your presence in NCRD.

Let me say a few words about AARDO and NCRD:

The African- Asian Rural Development Organization (AARDO) is an international inter-government non-political organization, established in 1962 for promoting regional cooperation in various aspects of rural development in Asia and Africa with its headquarters in New Delhi. The Charter of the organization is to promote understanding amongst the member countries in Africa and Asia and formulating strategies and projects for promoting the rural development process. AARDO works in collaboration with international and regional organizations including UN and its specialized agencies to achieve its objectives. AARDO has a total membership of 29 countries and one Associate member. It works with Member Countries through Contact Ministries/Divisions and Link

Institutions. In Pakistan, Establishment Division is the Contact Division and NCRD is the Link Institution. NCRD has been collaborating with AARDO since 1994.

We jointly organized training programmes funded by International Fund for Agriculture Development (IFAD) in 1994-96.

NCRD became a Link Institution of AARDO in May 1997.

This Institution was raised in 1979 to meet the needs for capacity building of the stakeholders engaged in Rural Development in Pakistan through its awareness courses that are conducted on weekly basis on various subjects. Participants are drawn from district and municipal administrations, government departments, NGOs working in the rural areas, elected representatives both at the provincial level and the grass root level i.e. local government functionaries. So far NCRD has trained over 21,000 persons. NCRD remained an attached Department of Ministry of Local Government and Rural Development from 1988 to 2010.

AARDO provided a grant of US \$ 28,000/- in the years 1999-2002 to undertake Action Research Pilot Project on "Provision of Micro Credit Facility and Enhancement of Local Level Savings for Poverty Alleviation in Pakistan" in the district of Chakwal. The programme was successfully launched and completed.

On 7th December 2010 NCRD was declared a Constituent Unit of NSPP after devolution of Ministry of Local Government and Rural Development to the provinces. This relationship opened a window of opportunity to raise NIM Wing in Islamabad for the training of Grade-18 officers of Civil Services.

On 29th July 2011 NCRD became an Attached Department of the newly raised Ministry of Professional and Technical Trainings, now renamed as Ministry of Education and Trainings.

NCRD again became an attached department of Establishment Division during March, 2013.

Greater interaction with AARDO started in 2010 when Secretary General of AARDO Dr. Abdalla Yahia Adam visited NCRD in June 2010. This visit of the Secretary General came after over a decade. During this visit, many decisions were taken for the capacity building of NCRD that included conduct of fully funded courses for Pakistan based participants. One such course was run in April 2011. During this visit, it was decided that NCRD may be declared a Regional Office of AARDO in South and Central Asia. I am glad to inform that:

- AARDO's Sixth Regional Office has been approved and is being set up in NCRD.
- NCRD has also been declared Centre of Excellence of AARDO for organizing Collaborative Training Programmes for the participants of Member Countries.
- Pakistan has been elected for 2 years as a member of AARDO's Executive Committee that takes major Administrative and Financial decisions.

In January, 2012 first ever NCRD–AARDO Collaborative Training Programme was organized on "Impact of Globalization on Rural Development in Afro-Asian Countries".

In November 2012 second Collaborative Training Programme on "Irrigation System and Water Management" was organized.

In November, 2013 AARDO funded US \$ 4,000 for in-country Training Programme on "Waste Management" in which 45 participants from all over Pakistan participated.

Today we are organizing second Collaborative Training Programme on "Irrigation System and Water Management".

It is a great day in the history of NCRD that today NCRD-AARDO Collaborative Training Programme is being inaugurated in which our colleagues from so many countries have joined us. For me personally it is dream coming true. I always wanted NCRD's interaction at the international level. NCRD looks forward to a greater interaction with AARDO during years ahead particularly for the capacity building of Local Government and Rural Development Institutions at the Federal Level and in the Provinces.

Dear Participants of the Course NCRD will make all efforts to see that your stay here is comfortable, enjoyable and rewarding. It will be our pleasure to take you around in Islamabad and surrounding areas.

I welcome you all once again and thank you for coming to Pakistan on this Inaugural Session.

I once again thank the Secretary, Establishment Division and all the guests for being with us at this Inaugural Session.

Thank you.

**Address of H.E. Eng. Wassfi Hassan El-Sreihin, Secretary General, AARDO
(as read by AARDO Representative)**

Mr. Shahid Rashid, Honourable Secretary, Establishment Division
Government of Islamic Republic of Pakistan and our Chief Guest

Dr Zafar Iqbal Qadir, Director General

A H K National Centre for Rural Development, and Hony. Regional Representative of
AARDO for South and Central Asia

Mr. Mohammad Ikram Kiyani, Director, Training, NCRD

Mr. Ayyaz Ansari, Director, Administration, NCRD

Distinguished Participants, Resource Persons and Invited Guests,
Ladies and Gentlemen,

On behalf of the African-Asian Rural Development Organization (AARDO) and on my own behalf, I have the pleasure to welcome you all to this important International Workshop-cum-Training Programme on "Irrigation System and Water Management" being organised by AARDO in collaboration with the National Centre for Rural Development at Islamabad. I sincerely wish to express my gratitude Mr. Shahid Rashid, the Secretary, Establishment Division, Government of Islamic Republic of Pakistan and the Chief Guest today for sparing his invaluable time to come to inaugurate the programme.

I convey my gratefulness to Dr Zafar Iqbal Qadir, Director General of NCRD and his able faculty members and staff for making excellent arrangements for the organization of this programme. I also take this opportunity to congratulate Dr Zafar Iqbal Qadir for having taken over the charge of the Director General of NCRD and Honorary Regional Representative of AARDO for South and Central Asia. I am sure that under his able and dynamic leadership, relations between AARDO and NCRD will be strengthened further to attain greater heights. AARDO will continue to extend all possible support in improving rural livelihood in Pakistan.

I wish to convey my sincere thanks to the esteemed Government of Islamic Republic of Pakistan for providing us wholehearted support in organizing this training in the country. The esteemed Government has always been very active in participating and contributing both in technical and organizational activities of AARDO ever since joining the Organization. The present programme is second in the series and AARDO wishes to continue it on regular basis as Pakistan really possesses one of the best irrigation systems in the world that I feel is very useful for our member countries.

Ladies and Gentlemen

May I now give you a brief introduction about the African-Asian Rural Development Organization (AARDO) which is one of the earliest examples of Afro-Asian solidarity and South-South cooperation in rural development. AARDO was established in 1962. Its membership strength presently stands at thirty – fifteen from Africa, fourteen from Asia as full members and one associate member from Africa. AARDO headquarters are assisted by its six regional offices – three each in Africa and Asia - to implement the technical work programmes. Location of one of regional offices of AARDO in Pakistan for South and Central Asia region is a testimony of this country's commitment to support AARDO's efforts to enlarge its membership strength. More information on AARDO will be presented by my colleague.

Ladies and Gentlemen,

Coming to the theme of this important workshop-cum-training programme, let me share with you the initiatives that AARDO has already taken to sensitize policy makers, planners and implementers in managing water resources. AARDO has been sponsoring participants from its member countries to attend the international training programme on "Land and Water Management", in Egypt and "Management of Rural Drinking Water and Sanitation Projects" and "Water Resource Management for Sustainable Development" at NIRD, India. Besides, AARDO has organised a number of international workshops on water related issues like "Approaches to Watershed Management", "Management of Natural Resources", "Role of Modern Irrigation Techniques in Improving Food Security", "Promotion of Aquaculture in Family Farming", "Planning and Management of Minor Irrigation Schemes", etc. A number of Development Projects have also been financed by AARDO to promote water conservation and management programmes in the member countries. These projects, among others, include: "Water Network of El-Sireef Town" in Sudan, "Improvement of Irrigation Water Use Efficiency" in Lebanon, "Water Harvesting" in Jordan, "Nkiito Water Harvesting" in Kenya and "Supply of Potable Water" in Morocco.

All these initiatives have been taken with the objective to build capacity and promote integrated management of water resources. I wish to reiterate here that the present programme on “Irrigation System and Water Management” in Pakistan should be viewed from this broader AARDO perspective.

Ladies and Gentlemen,

As you may kindly be aware, management of water resources has become one of the crucial concerns in the new millennium. According to the World Bank website, around 700 million people live in those countries that are experiencing water stress or scarcity and their number is likely to touch 3 billion by 2035. Growing demand of water by the increasing population and economic growth are likely to put additional pressure for its efficient management. The ever increasing use of water by the manufacturing sector poses serious threat to the farm sector which is the main user of water. Impact of climate change is another important factor compelling the users’ community to review perennial water supply sources. Altered river course, changes in ground water recharge, intensity of floods and longer spells of droughts are some of the factors portending climate change impact. Besides, scarcity of water is felt more acutely by rural communities particularly women and the poor who are under constant stress. All these problems call for urgent review of existing water policies and programmes in managing water resources.

Ladies and Gentlemen,

The increasing pressure on water resources is compelling international community to accord priority to this problem. Some of the challenges that require urgent attention are:

- First and foremost, Afro-Asian countries need to develop hydraulic infrastructure in the form of dams, canals, bunds, inter-linking of rivers, etc., in order to avoid wastage of this precious resource.
- Afro-Asian countries should restore traditional methods of rain water harvesting which had long been in vogue mainly in rural areas.
- Regulatory frameworks needed to be created for enacting laws and building institutions for managing water resources.
- There is a need to evolve proper mechanisms for participation of all the stakeholders in water management projects.
- The economics of water should also be calculated in terms of cost-benefits analysis as well as incentives to encourage or constrain more productive and sustainable use of water resources.
- While undertaking these measures, we must not forget the interest of vulnerable groups like women, poor, physically challenged, old people, etc., who are at the periphery of development agenda but need priority attention.

This training programme, I hope, will address the above and other related challenges during the course of deliberations in the next few days. The field visits to some of the irrigation systems will also provide an opportunity to the participants to study and learn from the rich and varied Pakistani experiences.

Ladies and Gentlemen,

We have among us here the 11 international participants from seven AARDO member countries, namely, People's Republic of Bangladesh, Republic of Ghana, Republic of Iraq, Hashemite Kingdom of Jordan, Federal Republic of Nigeria, Democratic Socialist Republic of Sri Lanka and Republic of the Sudan. Besides, we have good number of participants from Pakistan who, along with international participants can prepare an Action Plan by converging their experiences. I suggest that the proceedings of this programme, including expert and country papers could be brought out in the form of a report for wider dissemination among our member countries.

Finally, on behalf of AARDO and on my own behalf, may I repeat our gratitude to Mr. Shahid Rashid, the Honourable Secretary, Establishment Division, Government of Islamic Republic of Pakistan for being with us during the Inaugural session of this workshop-cum-training programme. I also thank Dr Zafar Iqbal Qadir, Director General and his Team especially the Programme Coordinator, Mr Mubashar Zaman Khan for the meticulous planning and untiring efforts to ensure smooth conduct of the programme.

I, once again, wish fruitful deliberation and rewarding experiences to all the distinguished participants and resource persons. I am sure that you will enjoy your stay in this beautiful, historic and friendly country.

Thank you for your kind attention.

**Inaugural Address by Mr Shahid Rashid, Secretary, Establishment Division,
Government of Islamic Republic of Pakistan**

Dr. Zafar Iqbal Qadir, Director General, NCRD
Participants from Pakistan and AARDO's Member Countries
Faculty of NCRD
Distinguished invited Guests, Ladies and Gentlemen,

It gives me great pleasure to be here today at the official opening of African-Asian Rural Development Organization and National Centre for Rural Development, Islamabad's collaborative International Training Programme on "Irrigation System and Water Management".

I am delighted to welcome the participants of the Training Programme particularly the Foreign Delegates, Honorable Guests and all other dignitaries gathered here for the Inaugural Session.

As you are aware Pakistan has been a victim of terrorism for many years. Thankfully the situation has now improved to a large extent. It is gratifying to note that this Training Event has attracted participants from Africa, Middle East and South Asia and senior officers from Irrigation and Agriculture departments of Pakistan. While you are here, I am sure you will have some time off from the busy schedule and NCRD can take you around to show Islamabad and surrounding areas.

I would like to thank His Excellency Eng. Wassfi Hassan El-Sreihin, Secretary General, AARDO for selecting Pakistan to host this International Training Programme. Pakistan has greatly benefitted in the past from its association with AARDO. The fully funded courses and workshops organized in different Member Countries have helped in the capacity building of stakeholders in various departments. We look forward to AARDO's continued support not only in the training of a large number of persons but also for improvement in the system of training and infrastructure of our Rural Development Institutions engaged in capacity building of all those working for Rural Pakistan. I also thank the Secretary General AARDO for establishing 6th Regional Office of AARDO in NCRD. It is a big leap forward for the institution.

The theme of this Training Programme "Irrigation System and Water Management" is interesting as water related issues will have an important impact on agriculture and Rural Development in our region. Pakistan is an agricultural country and agriculture is the main stay of our economy. More than 80% of our agriculture output depends on water provided by rivers. Pakistan has one of the World's largest Canal System. Our Irrigation System mainly consists of three multipurpose big dams namely Warsak, Mangla and Tarbela, five Barrages and elaborate Canal Network. However Pakistan is facing water shortage due to growing and expanding agriculture sector. New and innovative methods are being adopted to maximize use of existing water resources.

I am sure during this Training Programme exchange of best practices adopted by various Member Countries to meet water challenges will help to address irrigation and water related problems in our region.

The participation of senior officers from Pakistan and other countries and eminent Resource Persons will greatly help in evolving AARDO's recommendations for the Management of Water Resources in our region.

I know the NCRD with its modest resources has worked hard to see that participants are comfortable in the Hostel and have conducive learning environment during the proceedings of the Training Programme.

I wish you all frank, candid and informative exchange of ideas and deliberations for the well being and enhancing livelihoods of rural people in our continents.

I would like to thank the Member Countries for sparing their senior officers to attend this Training Event. I would also like to thank invited guests for sparing time to participate in the Inaugural Session.

I now have great pleasure in declaring this International Training Programme officially open.

Thank you

VII TECHNICAL SESSIONS

The technical sessions of the workshop-cum-training programme were held in the Conference Hall of NCRD, Islamabad, Pakistan during 22-24 and 27 – 29 January 2014. During the session, eleven expert papers and seven country papers were presented which focussed on different sub-themes of the training workshop.

PRESENTATION OF EXPERT AND COUNTRY PAPERS

Following is the summary of expert and country papers along with the interventions made by the participants:

Day One (22 January 2014)

On Day One, three expert papers were presented, that is, one in the morning and two in the afternoon.

The first two expert papers on "*Water Resource Management in African Asian Region*" and "*Water Governance: Concept and Issues*" were presented by Dr. Shahid Ahmad, Former Member (Water Resources), Pakistan Agricultural Research Council and Senior Water Expert, International Union for Conservation of Nature, Pakistan on 22 January 2014. In his first paper, Dr. Shahid stated that water resources are under pressure and without major investment, many economies in developing countries cannot grow. In terms of per capita availability of water, Africa is in a better position than Asia. Dr Shahid further stated that pricing is very important tool to use water efficiently. While concluding his paper, he stated that solutions to waters' problems can be found but costs may be higher. If we have to remove poverty and achieve economic growth rate, we have to de-link rain from the economy. In response to a question from the participant of Pakistan as to why we are not utilizing our own water resources, Dr Shahid stated that we have to raise investment and for which Pakistani economy has to be strengthened further.

In his second presentation on "*Water Governance: Concept and Issues*", in the afternoon on 22 January 2014, Dr Shahid Ahmad, the Resource Person from Pakistan while highlighting definition of 'Governance' as advocated by different organizations, stated that there is no one blueprint for good governance which is both complex and dynamic but it should include adequate institutions – nationally, regionally and locally – that are strong

and effective legal framework. He also highlighted governance issues having bearing on river basin management, water supply and sanitation and agriculture as sub-sector of water use. He concluded by quoting that “world is thirsty as we are hungry and improvement is possible through good governance”.

Last paper of the day was presented by Mr Mirza Hamid Hasan on “*Water Policy: Rules and Regulations in African-Asian Region*”. In his presentation, Mr Mirza stated that there are two ways to meet water demand: by conserving it and by tapping new sources. This can become possible through awareness building. As availability of water per capita is continuously decreasing, there is a serious need for prudent water policies and judicious and sustainable strategy for water management. Mr Mirza also highlighted the salient features of the draft National Water Policy of Pakistan. Besides, he analysed different water and irrigation acts of Pakistan, namely, Indus River Water Authority Act, 1992; Canal and Drainage Act, 1873; Sindh Irrigation Act, 1879; Balochistan Canal and Drainage Ordinance 1980; and Provincial Irrigation and Drainage Authority Act, 1997. At the end of his presentation, Mr Mirza highlighted 13 rules that are covered under the Canal and Irrigation Act 1973.

Day Two (23 January 2014)

On second day, two expert papers and three country reports were presented. The expert papers were presented by the resource persons from Pakistan whereas country papers were presented by the participants of Bangladesh, Ghana and Jordan.

The first expert paper of Day Two (23 January 2014) was presented by Mr Ashfaq Mahmood on “*Trans-boundary Waters*”. In his presentation, Mr Ashfaq Mahmood while highlighting the importance of water as well as global water challenges, described case studies of Indus Water Treaty 1960, Nile River Basin and Meokong River Basin with reference to the rights of trans-boundary waters by the riparian states. He advocated the need for settling trans-boundary water issues in the spirit of cooperation and most optimal use of water. In this context, hydro-diplomacy can play important role. Besides, building of institutional capacity for better understanding of technical, social, cultural, environmental and economic dimensions is needed. He also advocated the need for consulting stake-holders and disseminating information on water resources among them.

The second expert paper was presented by Mr Naseer Gillani on “*Irrigation Water Management in Pakistan: Government’s Perspective*”. Mr Naseer, who is Chief of Ministry of Planning, Development and Reforms, Government of Pakistan, started his presentation by highlight future scenario of water requirement. To meet future demand, there is a need to augment surface water through dams; through conservation of water by lining of canals and water courses; and by efficiency enhancement through rehabilitation and better operation of existing systems. Mr Naseer Gillani argued the need for knowledge based interventions to chalk out water management strategies, namely, integrated water management, saline water for sanitation and recycling of drainage effluent. He also spoke on the reform agenda for better governance and optimum use of existing infrastructure.

Besides the expert papers, three country papers were presented on the second day. First country paper on **Bangladesh** was presented by Mr Abdul Kadir. In his presentation, Mr Abdul stated that Bangladesh is a lower riparian state. 92 per cent of the catchment area is outside the country. Since ground water level in Bangladesh is falling rapidly, farmers are urged for surface water irrigation, raised bed irrigation and sprinkler/drip irrigation. The challenges before the country to meet water demand included: efficient management of water by introducing new variety of crops; farmers friendly production and marketing centres; proper sharing of trans-boundary waters; and combating adverse impact of climate change. The second country paper on **Ghana** was presented jointly by Mr. Paul Amoh Korang and Ms. Afua Asenso Owusu-Ansah. In their presentation, the speakers stated that in Ghana, three types of irrigation is practiced, namely, formal irrigation (10,668 ha.), large scale commercial farming (10,200 ha.) and informal irrigation (186,000 ha.). Growing population and urbanization, changing dietary habits and commercial farming inputs are major factors affecting water availability in the country. Ghana Irrigation Development Authority was set up to plan and meet the challenges like enhancing productivity to increase production, optimal natural resource use and develop new irrigation areas. The last country paper on **Jordan** was presented by Mr Musa Mahmoud Eid Alhawarat, the participant from Jordan. In his presentation, Mr Musa stated that in Jordan, 58 per cent of the water is used by the agriculture sector followed by 37 per cent by the domestic sector. In terms of source of irrigation, 57 per cent is irrigated through ground water and 27 per cent through surface water. Jordan Valley Authority was formed in 1977 for integrated development of Jordan valley by monitoring water quality, supplying drinking water and operating and managing the irrigation system.

Day Three (24 January 2014)

On the Day Three, two expert papers were presented in the forenoon and one country paper on Iraq was presented in the afternoon.

The first expert paper of Day Three on "*Innovative Water Utilization for Agriculture*" was presented by Eng. Malik Mohammad Saleem, Programme Leader of Integrated Water Management Program at Climate Change, Alternate Energy and Water Resource Institute, Pakistan. In his paper, Mr Saleem stated that per capita availability of water in Pakistan is decreasing and therefore, there is a need, among others, to focus on small water harvesting structures as large dams could not be constructed due to socio-political reasons and lack of funding. Eng. Saleem gave a case study of Potohar region where innovative and integrated water resource management project has been implemented. The main focus of the project is use of solar energy for pumping, direct installation of submersible pumps in the middle of water body, use of potable sprinkler, etc. However, if temperature exceeds 35 degree, solar panel needed to be cooled or otherwise its efficiency will go down. Solar energy is nearly 90 per cent reliable and can also be used for domestic purpose. At the end, Mr Salim advocated the need for dissemination of new technology through electronic media, capacity building of trainers, screening of documentary films, academic support, etc.

Second paper of Day Three was presented by Ms. Zaigham Habib on “Water Management for Agriculture in Pakistan: Issues and Policies”. In her presentation, Ms. Zaigham stated that 90% of river water is used for irrigation and 75% ground water for irrigation. There are different criteria to allocate water to different provinces. Provincial allocation makes it further flexible to withdraw water during crop seasons. With regard to water scarcity, Ms. Zaigham said that demand management, efficiency, conservation and augmentation of supply are critical.

In the afternoon, Mr. Mr. Abbas Hasan Majid, the participant from **Iraq** presented his country paper. In his paper, Mr Abbas stated that in Iraq, irrigation system is 4000 years old. There are three main rivers that are contributing water resources. Availability of water in Iraq may go from plentiful to critically low. Similarly, quality of water is also deteriorating as sewage water is pumped into Tigris river. He also highlighted the role of Ministry of Water Resources and its plans in water management.

Day Four (27 January 2014)

On the Day Four, two expert papers were presented in the forenoon and one country paper on Iraq was presented in the afternoon.

Mr Hassnain Shah, the resource person from Pakistan presented his expert paper on “*Water As Social and Economic Resource*”. In his presentation, Mr Shah explained socio-economic aspects of water in the context of agriculture. He stated that water should be treated as a economic good and an integrated product. There are various water valuation techniques adopted. Mr Shah also explained economics of virtual water and stated that 7 out of 10 importing countries are poor in water resources. Efficiency-Equity-Sustainability are the three important determinants in viable water solution across the sectors.

Dr Muhammad Aashiq of National Institute of Bio-remediation, Pakistan gave brief information on bio-remediation that mean how with the help of indigenous aquatic plants like penny worth, water lettuce, duck weed, Pakistan has been treating waste water. Thereafter, Dr Aashiq led the participants to a on-site demonstration of waste water treatment plant located in campus of Pakistan Agricultural Research Council. He showed them various water reservoirs where waste water passes through the stages and finally become usable for irrigation and other purposes. The participants keenly watched the project and asked a number questions that were duly responded by Dr Muhammad Aashiq.

Day Five (28 January 2014)

On Day Five, three expert papers and one country paper were presented, of which two expert papers were presented in the forenoon and one expert paper and one country paper on Nigeria was presented in the afternoon.

First expert paper of Day Five was presented on “*Vulnerabilities of Pakistan Water Resources to the Changing Climate and Some Adaptation Strategies*” by Mr Ghanzafar Ali of Global Impact Change Study Centre, Islamabad. While defining basic information on climate change related terminologies like biosphere, hydrosphere, green house gases, etc., Mr Ghanzafar stated that global temperature has increased during last century by 0.6 degree Celsius. This was accompanied by much increased impact on global precipitation and extreme events like flood and drought. There has been a fluctuation in temperature in Pakistan during 1951-1990 but this fluctuation has been higher from 1991 to 2012 indicating impact of climate change on water resources and other sectors. Northern Pakistan is getting more warm than southern Pakistan. Concern for climate change in Pakistan is increasing due to uncertain availability of water in the future and low response capacity of the country.

The expert paper on “*Solar Powered Irrigation System Design Concepts and Procedure*” was presented by Eng. Malik Mohd. Saleem. In this presentation, Mr Saleem while describing about energy constraints for agriculture sector, stressed on the need for harnessing solar energy in Pakistan. In this context, south and south-western parts of the country possess immense potentials. Around 3000 sunshine hours are available in a year. In designing a solar panel, position of solar plate like latitude, face and angle are important. Demand of water determines location and selection of panel. While concluding, Mr Saleem stated that initial investments are required to install the panel but cost can be recovered in a year or two.

The paper on “*Water Tariff and Recovery*” was presented by Dr Usman Mustafa of Pakistan Institute of Development Economics. In the presentation, Dr Usman focussed on water scarcity, water tariff, global trends in cost recovery from water tariff, criteria for water tariff and issues in implementation of charging policies. Around 1.8 billion will live in water scarcity by 2025 as against 700 million in 43 countries at present. There is enough water for 7 billion but problem is of distribution accompanied by wastage, pollution and unsustainable management. Dr Usman also explained criteria for setting tariff that, among others, included financial, economic, environmental and socio-political considerations. At the end, he narrated the issues that affect implementation of charging policies like lack of political will and motivation, vicious circle of operation and maintenance, insufficient resources for planning, etc.

The last paper of Day Five was presented jointly by Mr. Oyeyemi Kazeem Bisiriyu and Mr. Mohammed Ibn Yahaya, the participants from **Nigeria**. In their presentation, the speakers explained through map the hydrology of Nigeria and inland water resources. Besides, they narrated four types of irrigation systems that are followed in Nigeria, namely, surface irrigation, trickle/local irrigation, sprinklers irrigation and homestead irrigation by giving illustration from different parts of the country.

Day Six (29 January 2014)

On Day Six or the last day, three country papers were presented by the participants of Pakistan, Sri Lanka and Sudan.

The country paper on **Pakistan** was presented jointly by three participants. In their presentation, the speakers highlighted the irrigation system of Khyber Pakhtunkhwa by giving information on rivers passing through the region and water charging pattern followed in the province. Besides, they discussed about surface and ground water challenges in Pakistan like inefficient water conveyance and distribution system, lack of holistic management, etc. and advocated the need for water productivity enhancement.

The country paper on **Sri Lanka** was presented by Mr. Chinthaka Samarawickrama Lokuhetti. In his paper, Mr. Chinthaka stated that the area in his country is divided into three zones, namely, dry, intermediate and wet zones. He highlighted the historical perspective of irrigation in Sri Lanka. All rivers, contributing in the irrigation in Sri Lanka, originate from within the country and hence efficient irrigation management. Gal Oya scheme and Walawa Ganga scheme are the major irrigation system in the country.

The last country paper of the Morning session on **Sudan** was presented by Mr. Dafa Alla Saeed Elhaj, the participant from Sudan. While explaining topography of Sudan with the help of ppt in his presentation, Mr Dafa dwelt at length on the challenges faced by the irrigation sector in Sudan. Efficient and economic use of water, investment and funds for sustainable management of water, high sedimentation rate in canals, dams and inlet water bodies, weed growth in canals, spatial and temporal variability of rain fall, inadequate water resource data, research and development capacity were the major factors that needed to be dealt with in the country in order to achieve optimal irrigation.

VIII GROUP DISCUSSION AND RECOMMENDATIONS

In order to arrive at appropriate recommendations, the participants of the training workshop were divided into three groups, each group had a Chairperson and a Secretary. The groups discussed on specific topics in view of the objectives of the programme and presented their reports in a session held on 29 January 2014. The reports of the groups are as follow:

Group 1

Topic: "Water Management: Issues and Challenges"

Members

- 1 Mr. Mousa Mhmoud Alhawarat, Jordan
- 2 Mr. Yahaya Mohammed Ibn, Nigeria
- 3 Mr. Paul Amoh Korang, Ghana
- 4 Mr. Md. Habibul Islam, Bangladesh
- 5 Mr. Muzaffar Ali Talpur, Pakistan
- 6 Mr. Sohail Khan, Pakistan
- 7 Dr. Muhammad Asad Ghufuran, Pakistan - **Presenter**
- 8 Mian M. Afzal Farooq, Pakistan
- 9 Mr. Mubashir Hussain, Pakistan

The findings of the Group are as follows:

Issues

Illegal Use of water (in case of Asia and Africa)

- Prime issue is lack of Water Storage capacity.
- Excessive Use of water for Mining in Ghana, 60% illegal use for Gold Mine industry.
- 40% drinking Water loss in Jordan
 - 30% Water theft for Drinking water supplies
 - 10% water theft during irrigation
- Waste of water resources-Practice in Nigeria
- Water tariff is quiet low in Nigeria 1 \$ /Month
- For trans boundary issues with Neighbor Countries in spite of the existing Treaties.
- Watershed management is core issue on the major catchments of our river-Deforestation
- Conveyance losses from head to tail in watercourses is common every country.
- Water logging & Salinity.
- Depletion of Ground water Level
- Deprivation of irrigation and even drinking water in trans boundary rivers.
- Increase in demand of irrigation water and Persistent drought
- Demand of water in domestic and industrial needs
- Deterioration of groundwater quality
- Deprivation of irrigation and even drinking water in trans boundary rivers.
- Increase in demand of irrigation water and Persistent drought
- Demand of water in domestic and industrial needs
- Deterioration of groundwater quality

- **Challenges- irrigation**
- High cost of development of irrigation schemes
- Colossal loss of land due water and wind erosion
- Undulated topography
- Prevailing poverty
- Ever increasing Population and Immigrants
- Limited infrastructural facilities
- Frequent weather/climate changes
- Heavy farm machinery requirements for cultivation
- Scattered and small holdings
- Shortage of skilled and unskilled labour

- Poor access to inputs
- **Recommendations**
- Supply of canal water to the desert/semi-desert areas
- Establishment of mini dams, check dams, wells, lift irrigation schemes etc.
- Construction and renovation of water storage ponds, underground tanks and water courses by use of cost effective lining materials (e.g. HDPE/plastic sheets etc.)
- Adoption of Resource Conservation Technology
- Use of alternative energy sources (solar and wind) powered pumps for conveyance of water from source.
- Use of drip/sprinkler and Flexible Gated Pipes
- Management of groundwater by treated, cyclic and conjunctive use
- Use of alternative energy sources (solar and wind) powered pumps for conveyance of water from source.
- Use of drip/sprinkler and Flexible Gated Pipes
- Management of groundwater by treated, cyclic and conjunctive use

Group 2

Topic: "Viable Irrigation Practices in Afro-Asian Countries"

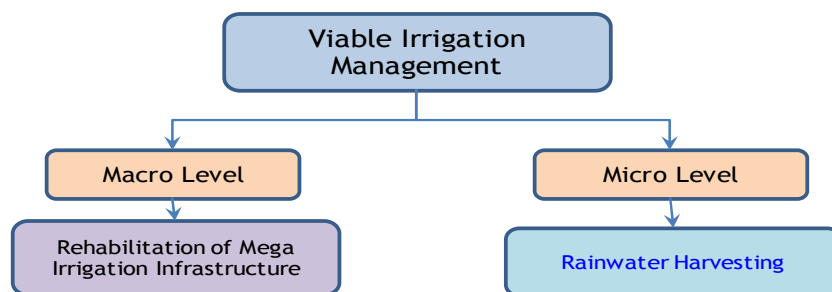
Members

- 1 Mr. Bisiriyu Oyeyemi Kazeem, Nigeria
- 2 Mr. Dafa Alla Saeed Elhaj, Sudan
- 3 Mr. Md. Abdul Kader, Bangladesh
- 4 Mr. Abdul Rauf, Pakistan
- 5 Eng. Muhammad Irfan Malik, Pakistan
- 6 Mr. Sher Jahan, Pakistan
- 7 Mr. Amir Mumtaz Wattoo, Pakistan
- 8 Engr. Muhammad Asif, Pakistan
- 9 Mr. Hafiz Qaisar Yasin, Pakistan - **Presenter**
- 10 Mr. Mubashar Zaman Khan, Pakistan

The findings of the group are as follow:

Mission Statement: Water, Food And Energy Secured Future

Agreed Action Plan



Recommendations

- Promotion of water and energy efficient irrigation systems e.g. solar powered high efficiency irrigation system
 - Climate smart irrigation and agriculture development programs
 - Bilateral and multilateral cooperation among Afro-Asian Countries on trans-boundary water sharing issues
 - Interaction among AARDO experts and information sharing for viable irrigation practices
- Use of improved/latest technology and make arrangements for its transfer among AARDO countries for viable irrigation practices

Group 3

Topic : "Impacts Of Climate Change On Irrigation Management"

Members

- 1 Mr. Abbas Hasan Majid, Iraq
- 2 Mr. Chinthaka Samarawickrama Lokuhetti, Sri Lanka - **Presenter**
- 3 Ms. Afua Asenso Owusu-Ansah, Ghana
- 4 Mr. Muhammad Hassan, Pakistan
- 5 Mr. Imtiaz Ahmad Sipra, Pakistan
- 6 Mr. Gul Junejo, Pakistan
- 7 Engr. Bareerah Fatima, Pakistan
- 8 Dr. Jabar Zaman Khan Khattak, Pakistan
- 9 Mr. Muhammad Hanif, Pakistan
- 10 Dr. Rajeshwar Dyal, AARDO

The findings of the group are as follows:

Definition

The drastic changes in the climate parameters induced by heat in an unpredicted way is known as climate change. It may be increase or decrease in temperature, rain, snowfall etc.

Challenges of Climate Change

- De-glaciation is going to result in inadvertent mining of the water banks of the Himalayas. This is going to result in increased runoff (and silt loads) for a few decades, to be followed by major, permanent, reductions in runoff.
- The area affected by flooding, is likely to increase substantially in coming decades as the glaciers melt and as rainfall intensity increases
- The widespread water scarcity, given the fact that changing water use habits takes decades to effect, is just around the corner. The next few decades offer a window of opportunity, in which there is likely to be more water, to prepare for a future in which the quantity of water available is likely to be substantially reduced.

Characteristics

- Rise of temperature.
- Significant & lasting change in the distribution of weather patterns appeared over time in a certain area.
- The uncertain or unpredicted increase or decrease in the temperature.
- Due to climate change there may occur extreme conditions of floods or drought

Impacts of climate change on irrigation management in case of drought conditions:

- The soil will be dry and compact.
- The soil will be vulnerable to wind erosion.
- The consumption of energy will be increased.
- Production of crops will reduced

Suggestions

- The ground water management will be more efficient by applying best irrigation practices e.g. by drip irrigation system etc.
- Introduction of drought resistant variety of crops.
- Precision land leveling.
- Lining of water courses.
- Research and development should be strengthened.

Impacts of climate change on irrigation management in case of high rain:

- There will be a high floods.
- There will be more soil erosion due to surface water runoff.
- Damage of water structures and irrigation system.
- Water logging and salinity in low lying areas.
- Damage of crops and households.

Suggestions

- The water shed area should be managed by planting more trees to control the surface erosion and control of sedimentation.
- More reservoirs may be constructed to store maximum water for agricultural use.
- All the irrigation system should be strengthened to avoid the damages of crops and other public property.
- The network of irrigation system should be increased to cover maximum area to be brought under cultivation.
- Research and development on how to convert sea water and used water into usable water, effectively and efficiently.
- Awareness programs.

IX FIELD VISIT

The field visits were organized during 25-26 January 2014 to provide the participants with first hand information on the on-going irrigation projects in Pakistan. Following two places were visited by the participants:

Satrameel Sub-watershed Project

Satrameel sub-watershed project was visited by the participants on 25 January 2014 in the morning. Eng. Malik Mohd Saleem, Head of the project briefed the participants about objectives and functioning of the project area. He lead the participants to show them different components of the project like solar panel to irrigate the area, water harvesting structure, catchment area, measures to check sedimentation in the water, green houses for vegetables, etc. At the end of his presentation, the participants asked a number of questions that were duly answered by Eng. Malik Mohd Saleem. Before departing, the AARDO representative thanked Eng. Malik Mohd. Saleem and his team and gave him a set of information literature on AARDO.

The Satrameel sub-watershed project was established in 1988 and located around 17 miles from Islamabad city. The project is under the supervision of Pakistan Agricultural Research Council (PARC). The funds for the projects have partly been received from United States Department of Agriculture (USDA).

High Efficiency Water Irrigation System at Attock District

On 26 January 2014, the participants visited two private farms in Hazro Tehsil of Attock district that were located around 70 Kms. from Islamabad city. The participants were welcomed and guided by Eng. Bashir Ahmad, Regional Project Director of Agriculture Department of Government of Punjab. The farms are developed with the financial support of the Agriculture Department. Two farms visited by the participants, are spread over in an area of 28 acre and 7 acre respectively. The government provided them with subsidy in the form of inputs up to 80% and 60% respectively. Both the farms are in the preliminary stage and so far, no yield has taken place. Citrus trees have been planted

and drip irrigation is used to water them. The pipes are monitored from source level with application of fertilizers and water filters to check and control the supply. The participants interacted with Eng. Bashir Ahmad and other officials and asked them a number of questions that were duly answered. Before departing, the AARDO representative thanked Eng. Bashir Ahmad and his team and gave them a set of information literature on AARDO.

X. CLOSING CEREMONY

The closing ceremony of the programme was held on 29 January 2014. First of all, all the participants introduced themselves to the Chief Guest. It was followed by closing remarks by Dr Zafar Iqbal Qadir, Director General, NCRD and Honorary Regional Representative of AARDO for South and Central Asia. Dr Zafar thanked the participants and wished them good journey back home. He further stated that the participants are better informed about the irrigation practices in Pakistan after this training programme. Thereafter, Dr Rajeshwar Dyal, AAARO explained the complete stages followed in implementing this programme stating from course objectives, participation, deliberation, field visit and highlights of the irrigation system in Pakistan. Thereafter, on behalf of the participants, Mr. Musa, the participant from Jordan thanked the organisers for all the necessary logistics and help in smooth conduct of the programme. He also expressed his happiness over the arrangements especially the warm hospitality extended by the people of Pakistan. Mr Aslam Khan, AARDO Representative gave his closing remarks by thanking the esteemed Government of Pakistan, Director General, NCRD and his team members, the participating countries, the resource persons from Pakistan and organisers of the field visit in making this programme a great success.

H.E. Eng. Balighur Rehman, Minister of State for Ministry of Education, Training and Standard in Higher Education and Minister of State for Interiors, Government of Islamic Republic of Pakistan, who was the chief guest in the closing ceremony, in his address, thanked AARDO and NCRD for successfully concluding the programme and reiterated that the topic chosen for the training was very important. The Honourable Minister further stated that we should implement the Pakistani best practices not only in other countries but also in different regions of the country. He also advocated the need for allocating more resources for efficient utilization of water resources. At the end, Honorable Minister gave away the certificate of participation to the all the participants.

XI LIST OF DELEGATES

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