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SAARC

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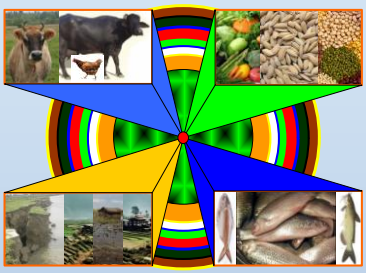
Content

Abbreviation

AAS	Agro-meteorological Advisory Services
AMIS	Agriculture Market Information System
APAARI	Asia-Pacific Association of Agricultural Research Institutions
ATC	Agricultural Technical Committee
ATIC	Agricultural Technology Information Centre
ATMA	Agricultural Technology Management Agency
AV	Audio-Visual
AVRDC	Asian Vegetable Research and Development Centre
BARC	Bangladesh Agricultural Research Council
BARI	Bangladesh Agricultural Research Institute
BBEP	Brood Bank Establishment Project
BDS	Basic Democracies System
BIID	Bangladesh Institute of ICT in Development
BRKB	Bangladesh Rice Knowledge Bank
BRRI	Bangladesh Rice Research Institute
BSMRAU	Bangobondhu Sheik Mujibur Rahman Agricultural University
BTV	Bangladesh Television
CIFA	Central Institute of Freshwater Aquaculture
CoRRB	Council for RNR Research of Bhutan
CSF	Classical Swine Fever
DADO	District Agriculture Development Office
DAE	Department of Agricultural Extension
DAM	Department of Agricultural Marketing
DEPC	District Extension Planning Committee
DYT	Dzongkhag Yargay Tshogtshung
ECC	Extension Coordination Committee
EPICC	Extension Policy Implementation Coordination Committee
FAO	Food and Agriculture Organization
FMD	Foot and Mouth Disease
FSMF	Fish Seed Multiplication Farm
FSRD	Farming Systems Research and Development
GB	Governing Board
GFAR	Global Forum for Agricultural Research
GYT	Geog Yargay Tshogtshung
HPAI	Highly Pathogenic Avian Influenza
HS	Haemorrhagic Septicaemia
ICAR	Indian Council of Agricultural Research
ICT	Information Communication Technology
IGCG	Inter-Governmental Core Group
IJSG	International Jute Study Group
IRDP	Integrated Rural Development Program
IRRI	International Rice Research Institute
IVR	Interactive Voice Response
JT	Junior Technician

JTA	Junior Technical Assistant
KVK	Krishi Vigyan Kendra
MIS	Management Information System
MoAF	Ministry of Agriculture and Forests
NAES	National Agricultural Extension System
NARIS	National Agricultural Research Information System
NARS	National Agricultural Research System
NATCC	National Agricultural Technical Coordination Committee
NATP	National Agricultural Technology Project
NCMRWF	National Centre for Medium Range Weather Forecasting
NDRI	National Dairy Research Institute
NEA	National Extension Agency
NHR	Northeastern Hill Region
PARC	Pakistan Agricultural Research Council
PPR	Peste des Petits Ruminants
QPM	Quality Protein Maize
RNR	Renewable Natural Resource
SAC	SAARC Agriculture Centre
SBAU	Sher- e-Bangla Agricultural University
SCPPC	Seed Certification and Plant Protection Centre
SDF	SAARC Development Fund
SJA	SAARC Journal of Agriculture
SMRC	SAARC Meteorological Research Centre
SPINet	SAARC Pesticide Information Network
SSF	SAARC Seed Forum
STRASA	Stress tolerant rice for poor farmers in Africa and South Asia
SVATNet	SAARC Vegetable Adaptive Trial Network
T&V	Training and Visit
TAD	Trans-boundary Animal Disease
TCARD	Technical Committee on Agriculture and Rural Development
TVDP	Tribhuwan Village Development Program
UNDP	United Nations Development Program
VAIDP	Village Agricultural and Industrial Development Program
VERCON	Virtual Extension and Research Communication Network
WHO	World Health Organization
WMO	World Meteorology Organization
WP	Water Productivity
ZADO	Zonal Agriculture Development Offices

4 Windows to food security, poverty alleviation and sustainable development



As the first regional centre under the auspices of SAARC, the SAARC Agriculture Centre located in Dhaka, Bangladesh under the guidance of all Member States and development partners aspire and rededicate to promote development of agriculture, livestock, fisheries and natural resource management in the region through networking, capacity development, coordination of research and policy propositions.

Message from the Director

The Sixth Governing Board Meeting of the SAC, was critical to reaffirm the relevance and impact of the Centre's programs. It emphasised the need to evaluate the services provided by SAC and initiate programs that are of common interest, immediate demand, and with high beneficiary impact.

Despite the remarkable development in agriculture sector in all SAARC Member Countries, it is unfortunate that the South Asia still is home to two-thirds of the world's poor and more than 60% of the world's undernourished population (ADB, 2012). Poverty as the principal driver of food insecurity, in conjunction with soaring food prices has further disabled resource poor population to move out of the poverty trap. This scenario projects the significance of poverty alleviation. As a regional institution, SAC upholds the mandate to promote agricultural research and development, technology dissemination for sustainable agriculture development and poverty alleviation in the region.

Since 2007, when erstwhile SAARC Agriculture Information Centre (SAIC) was reorganized into SAARC Agriculture Centre (SAC), it has come a long way to evolve itself as credible institution promoting agriculture research and development in the region. While it took almost two years to wean off from information related programs, the Centre initiated programs on hill agriculture, farm mechanization, seed quality, and strategies for arresting land degradation in 2009. In 2010 the Centre initiated a regional study on National Agricultural Research Systems. The quality seed programme in 2009 led to initiating SAARC Seed Forum in 2010 which aimed at promotion and coherent development of regional seed systems, promoting seed exchange and trade and other activities related to seed sector development. In the same year under the initiatives of

SAARC Secretariat, the Centre engaged in preparation of donor assisted project proposal related to food security with the ADB support. In 2011, an Australian Government funded project on "Developing capacity in application of cropping systems modelling to promote food security and sustainable use of water resources in South Asia" for use of irrigation water was launched. By 2011, the Centre had manpower to initiate regional studies on livestock and fisheries. During the same year, networks on adaptive vegetable trial and information network was initiated. The year 2012 identified work on public support systems, national agricultural extension system, education systems, value chain analysis and capacity developments. The Centre also started preparing quality synthesis of the regional papers and outlook of emerging issues like quality seed in SAARC countries. Over the years, Centre gradually made contacts and linkages with international donors and institutions to foster cooperation in agricultural development in the region.

The year 2013 brought in new energy with deployment of two professionals from Bhutan and Pakistan. With the increasing concerns on climate change, food safety and capacity development, the Centre initiated regional studies on climate change impacts on agriculture, genetic modification of crops, bio-pesticides, and conservation of farm animal genetics resources. Capacity development of national professionals on molecular techniques in diagnosis of diseases of farm animals and poultry was also done. It has been a long dream of SAC to provide access to SAC publications to all related to agriculture research and development. We have made a sincere effort to send digital copy of all SAC publications to relevant individuals and institutions. By the end of the year, we had circulated to 3784 individuals.

I am personally satisfied to see the impact of SAARC-Australia project in enhancing the capacity of researchers of the participating countries in their ability to apply cropping systems modelling using APSIM in enhancing the efficiency of water and fertilizer use in both irrigated and rainfed crops including rice.

Please allow me to express my heartfelt appreciation to the Government of Bangladesh, Member States, all SAC Governing Board Members for their constant guidance and consistent support in taking forward the mandate of the Centre. My sincere appreciation to Mr. Tareque Muhammad, Director (ARD), SAARC Secretariat for his guidance in all aspects of SAC operation.

All the successes of the year 2013 is fully credited to all professionals, officials of SAC and national focal point experts who have given their dedication and commitment to the programs. I personally look forward for similar collaboration and commitment to carry forward the visions of our leaders in alleviating poverty and attaining food and nutritional security.

The Centre looks forward for constructive suggestions to make the centre relevant to the concerns of the region.

Effects of climate change will vary by crop and location. Crop production in the arid and semi-arid tropics will be more affected by climate change than any other region. Since there is no significant trend in rainfall, climate impacts will largely be driven by rise in temperature. Better understanding of the overall impact on the production systems is crucial for mitigation and adaptation to climate change.

Dr. Abul Kalam Azad
Director

Executive Summary

The Agricultural education systems need to give more emphasis on the changing role of public and private sectors in agriculture and demand of the clients.

The **ANNUAL REPORT 2013** presents the progress of SAARC Agriculture Centre (SAC) between January to December 2013. Ever since SAIC was upgraded into a full-fledged SAARC Agriculture Centre in 2007, the Centre has solemnly pursued its goal of promoting agricultural research and development, technology dissemination for sustainable agriculture development and poverty alleviation in the region. There are two programs, (i) regular program that includes publication, information sharing and capacity development, and (ii) need-based program which emanates from higher SAARC forums and regional consultative processes. In pursuit of the goal, the Centre is organized into three divisions of Agriculture Management, Knowledge Management, and Policy Planning, manned by professionals both from the region and Bangladesh. The Governing Board of SAC represented by senior Ministry of Agriculture/Forests officials from the respective SAARC Member States with its chair rotated every two years, reviews, guides and clears the annual work plan of the Centre. Working closely with the technical and policy experts from the respective countries, Centre adopts all-inclusive participatory process in program implementation.

The Centre completed almost all the planned activities of 2013, except three activities on fisheries which had to be deferred to 2014 as the incumbent resigned by mid year. The year was grossly successful and following are some of the highlights of the year.

Program Highlights

2013 saw greater thrust on networking through technology exchange, information sharing, and skill development.

Centre with its small professional team managed to successfully implement 8 Regular program and 18 Need-based programs. These activities have far reaching benefits and wider beneficiary coverage.

A. Regular Programs

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(*Visit* ***http://www.banglajol.info/index.php/SJA/index***)

Knowledge Management

- **SAARC Journal of Agriculture**: In an effort to improve the quality of journal and its impact factor, two prong strategies were adopted. Firstly, a 17 member editorial board with subject matter specialists from Member States. Secondly, the SJA was made into an Online Journal for wider and easy access and to monitor impact factor of the journal. In 2013, a total of 29 high quality papers (18 related to crops and 2 on fisheries) were published in two issues of Vol. 11. Two papers of interest are *(i) Hydro-priming of seed improves the water use efficiency, grain yield and net economic return of wheat under different moisture regimes, and (ii) Virus elimination in potato through meristem culture followed by thermotherapy*.
- **SAARC AgriNews and Bulletins**: Centre publishes a quarterly bringing in brief highlights of agricultural development in the region. In 2013, four issues of *Vol. 7 were published and widely circulated. Volume 16 of food grain b*ulletins was published.
- **Information sharing**: To expand the readership of SAC publication, effort was initiated to individually send digital copies of past and present SAC publications to policy makers, scientists, researchers, extensions, academia, and donor community. By the end of the year more than 3500 copies were sent. To provide access to successful agro-technologies in the region, 70 video on Agro-technology were distribution to all Member Countries.
- **Seminar**: A seminar was held on two themes respectively (i) Increasing crop production through four crops based cropping system by Dr. Md. Rafiqul Islam Mondal, Director-General, BARI, and (ii) Problem and prospects of GM crops in Pakistan" by Dr. Shahid Mansoor, Director, National Institute of Biology & Genetic Engineering, Pakistan was organized in BARC.
- **Library service**: As a regular service to the researchers, faculty and students, SAC Library provided more than 150,000 abstracts and full text to support and facilitate research.

Capacity Development

- In 2013, SAC professionals and staff participated in 53 different meetings, seminars, trainings, and workshops. The participation in such forums is considered

as an important means to enhance technical capacity of the SAC personnel.

B. Need-based Programs

Networking

Regional networks on agricultural and allied disciplines, particularly among agricultural research and extension institutes, professionals, policy planners and stakeholders is considered important means to strengthen agricultural research and accelerate technology transfer. In 2013, Centre initiated a regional varietal adaptive trial network on pulses with an objective of sharing high yielding varieties of pulses to promote pulse production. A review of vegetable adaptive trial network revealed opportunity to identify better performing genotypes for breeding purposes. A multilocation data analysis of the trial is planned.

A information network on pesticides in SAARC region (SPINet) has been developed (http://spinetwork.org). It is planned to make it fully operational (with database) in 2014.

Regional studies

In 2013 ten regional collaborative studies were conducted which saw involvement of more than 60 national experts in the study. There were five studies related to agriculture covering a range of topics like multiple cropping innovations, potentials of bio-pesticide, adaptation to climate change, and prospects of genetically modified products. Two regional studies on livestock focused on dairy buffalo breed development and conservation of farm animal genetic resources. Natural resource management organized two studies on saline soil reclamation systems and use of Geo-information technology for mapping of land degradation. A cross-cutting study to analyze Agricultural education systems was conducted. All the studies have drawn very ambitious actions which needs concerted efforts of national, regional, and international agencies.

Capacity development

The Centre in collaboration with High Security Animal Disease Laboratory (HSADL), India organized 10 days regional training on "Molecular Techniques in Diagnosis of Diseases of Farm Animals and Poultry" at HSADL, Bhopal, India for participants from SAARC member states namely Bangladesh, Bhutan, India, Nepal, and Sri Lanka.

Policy support

The Centre coordinated with focal points of SAARC food bank in compilation of elaborate data and participated in the meeting in Bhutan. This program is coordinated by the SAARC Secretariat.

C. Donor funded project

A project on "Developing capacity in cropping systems modeling to promote food security and the sustainable use of water resources in South Asia" under the Government of Australia funding through Commonwealth Scientific and Industrial Research Organization (CSIRO) has been successfully in enhancing the capacity of regional researchers in application of modeling tool.

D. International Collaboration

As the only inter-governmental regional body on agriculture, SAC has been granted by the 6th and the 7th Governing Board Meeting to liaise and build partnership with international bodies to promote regional agricultural

agenda in regional and international fora. In 2013 the following MoUs were finalized and submitted to SAARC Secretariat for final clearance. Collaborations have been initiated with IRRI, ICRISAT, IFC, IJSG, ICIMOD, FAO, and APPARI.

MoUs finalized and ready for signing !

1. *International Finance Corporation (IFC) agrees to support strengthening of SAARC Seed Forum.*
2. *International Jute Study Group (IJSG) proposes to sharing of promising lines/varieties of fibres and technologies.*
3. *International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) offers to collaborate in reducing poverty, in the dryland tropics.*

E. Regional collaboration

In view of the overlapping mandates, SAC initiated collaborations with SAARC regional centres like SAARC Forestry Centre in Bhutan to jointly look at the land degradation in arable and forest ecosystems, and SAARC Meteorology Centre in Dhaka to share information on meteorology and collaborative in Monsoon initiatives.

F. Visitors

The Centre received 13 visitors during 2013. Apart from officials from SAARC, visitors from CIRDAP, CRISP, ICIMOD, WSPA came to learn more about the centre and explore possible collaborations. For instance, Dr. Rasheed Sulaiman, Director, Centre for Research on Innovation & Science Policy, India visited the Centre and developed a concrete plans to have a regional meeting in Kathmandu in 2014. The visit by Mr Birendra Bajracharya, Programme Coordinator, ICIMOD led to a joint planning meeting on application of geo-information for land degradation.

G. End of the Year

The year ended with much hype with rush of activities and preparing for the 44th Programming Committee Meeting in Kathmandu, Nepal. Over the reporting period, the Centre has substantially achieved the program objectives within its mandate. The regional collaborative studies yielded some noteworthy lessons on program development and implementation. Some of the prominent recommendations from regional initiatives which needs deserves future considerations are

- Establish regional gene bank for animal genetic resources
- Establish SAARC Agricultural university
- Publish compendium of multiple cropping systems in SAARC countries
- Develop spatio-temporal database on salt affected soil and water in the region.
- Initiate adaptive trial network on wheat for saline soils
- Harmonize policies on use of GM technology/products and its bio-safety
- Establish arboretum of plants with bio-pesticidal properties

Editorial Team
SAARC Agriculture Centre
www.saarcagri.org

AGRICULTURE MANAGEMENT

1 Agriculture Management

1.1 Crops

1.1.1 SAARC vegetable adaptive trial network (SVATNet)

SAARC Agriculture Centre (SAC) a regional centre of South Asian Association for Regional Cooperation (SAARC) initiated the adaptability trials of some selected vegetables i.e., tomato, brinjal, okra, cucumber and pumpkin since May 2012. The trials are being implemented in Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka. Best varieties of Bangladesh, India, Nepal, Pakistan and Sri Lanka are included in the program. The initial concept of the program emanated from the TCARD Meeting of 2009 as "Regional Workshop on Improvement of vegetables and Adaptive Trials in SAARC Countries". Later the feasibility of the program was discussed at a Regional workshop on "Improvement of Vegetables and Adaptive Trails in SAARC Countries" held on 8-9 October, 2010 in Dhaka, Bangladesh. At the workshop country representatives agreed to share improved cultivars of five vegetables and to test the adaptability in Regional Countries in a network approach. Subsequently, recommendation of the above workshop was submitted to the 6th TCARD meeting, 2010 where it was endorsed unanimously as a Regional activity and incorporated into the 2011 program of SAC and adaptive trials were implemented from May 2012.

The vegetables were chosen on the basis of their need and preference, for adaptive trials in the interested SAARC member countries. These five vegetables were chosen especially targeting small/ marginal farmers of the Region. It was agreed to include more vegetable crops in the future depending on the initial progress upon mutual consultation. Under the initiative

a) Elite varieties and germplasm as identified would be shared in a network approach;
b) Best practices available would be identified;
c) Overall knowledge base within the countries would be shared; and
d) Internship training would also be pursued.

Accordingly trials were established in research institutions[1] of Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka.

[1] **Bangladesh:** Horticulture Research Centre (HRC), Bangladesh Agricultural Research Institution (BARI), Joydebpur, Gazipur; **Bhutan:** Renewable Natural Resources (RNR) Research and Development Centre (RDC), RNR RDC, Bhur, Department of Agriculture, Bhutan; **India:** Indian Institute of Vegetable Research (IIVR), Varanasi, UP, India; **Nepal:** Horticulture Research Division (HRD), Nepal Agricultural Research Council (NARC), Kathmandu, Nepal; **Pakistan:** Horticulture Research Institute (HRI), National Agriculture Research Centre (NARC); **SRI Lanka:** Horticulture Crop Research and Development Institute (HORDI), Department of Agriculture (DOA), Gannoruwa, peradeniya 20400, Sri Lanka

Table 1. List of vegetable/varieties of SAARC member countries included in the SAARC Vegetables Adaptive Trials during 2013

Vegetable/Country	Variety
Brinjal/Eggplant *(Solanum melongena)*	
1. Bangladesh	1. BARI Begun 6
	2. BARI Begun 8
2. India	3. Arka Shirish
3. Nepal	4. Parwanipur (PS-1
4. Pakistan	5. Dilnasheen
	6. Nirala
5. Sri Lanka	7. SM 164
	8. Padagoda
Tomato *(Lycopersicon esculentum)*	
Bangladesh	1. BARI Tomato 14
	2. BARI Tomato 15
India	3. Hisar Arun
	4. Kashi Amrit
Nepal	5. NCL-1
Pakistan	6. Riogrande
	7. Nagina
Sri Lanka	8. Thilina
	9. Tharindu
	10. Ravi

Vegetable/Country	Variety
Okra *(Hibiscus esculentus)*	
1. India	1. Kashi Pragati
	2. Arka Anamika
2. Nepal	3. Parvati
3. Pakistan	4. Subz Pari
4. Sri Lanka	5. Haritha
Cucumber *(Cucumis sativus)*	
1. India	1. Swarna Ageti
	2. Swarna Sheetal
2. Nepal	3. Kulse
	4. Dhankuta
3. Pakistan	5. Sialkot selection
4. Sri Lanka	6. Champion
Pumpkin *(Cucurbita moschata)*	
Bangladesh	1. BARI Misti Kumra1
India	2. Kashi Harit
Nepal	3. Jante
Pakistan	4. Sialkot selection
Sri Lanka	5. Ruhunu (Local)

Accordingly 1st review meeting was organized in Indian Institute of Vegetable Research, Varanasi, UP, India. As per decision of the review meeting in India, the 2nd review meeting was organized in Thimphu, Bhutan organized by RNR ICS and Department of Agriculture and Forest in collaboration with SAARC Agriculture Centre, Dhaka Bangladesh on 28-29 December 2013 to review the trials result of 2013 and problems encountered by the member countries.

Second Review Meeting

Ms. Singye Wangmo, Program Director, RNR ICS and SAC GB member from Bhutan welcomed all the participants. In her welcome address, she emphasized the importance of vegetable in food and nutritional security in SAARC region. Dr. Muhammad Nurul Alam, Senior Program Specialist, SAARC Agriculture Centre briefly presented the progress about the SAARC Vegetable Adaptive Trials Network (SVATNet). He mentioned that problems of obtaining seeds from member countries had been overcome. Dr. H.H.D. Fonseka, Additional Director, HORDI, Peradeniya, Sri Lanka mentioned that SVATNet got the momentum and based on the success of the program SAC has initiated Pulse and oilseeds variety adaptability trials as well as in due course the centre will take program on rice and other crops. Therefore, he requested all country to highlight the problems they face during the implementation SVATNet program. Dr. N. K.

Krishna Kumar, DDG, Horticulture, ICAR, India pointed out that every citizen of the SAARC region have right to have food and nutrition security. He urged the vegetable scientists of the region to work on the demand. Therefore effort should be given on produce more from less land for more people. He also emphasized of the increasing diabetic problem in the region which could be address by producing and popularizing vegetable.

Mr. Chencho Norbu, Director General, DoFPS, MoAF, Bhutan, the Chief Guest remarked that diversification of vegetables in remote rural areas can offer more choice to rural communities not only for home consumption, but also for sale to generate cash income. He reiterated that per day per capita vegetable consumption in the region is reported to be 35 gm which should be more as rural people eat more vegetable that protein content food stuff. He urged the regional delegates to include more vegetables with disease resistance and high yielding characteristics. Finally he restated the important role of horticulture science and experts in achieving the goal of food and nutritional security.

Recommendations of the Review Meeting

1. Develop a matrix to prioritize crop and related problems
2. SAC need to harmonize the variety coding system and should come up with a methods as how to analyze the data from different countries.
3. Develop a common research protocol and reporting format and circulate to member countries.
4. Sufficient research fund from SAC and appropriate technical support from ICAR is sought.
5. Any resistance observed should be shared with other member countries
6. Seeds of exceptionally good quality and elite varieties should be shared on time (January and July of every year) by the member countries. Improve quality of materials internally as well as throughout sourcing.
7. Strict quarantine measures to be instituted and followed in sharing the trail materials within the country so that diseases do not spread from one country to another.

8. As various traits (size and colour) of brinjal are evaluated for adaptability trial, traits specific characterization should be carried out in case of brinjal.
9. Hand book of agriculture and horticulture / Disease management pamphlets to be shared by ICAR, India. SAC will also make APS publication available to member states.
10. Scale up the program to bigger project level as good beginning has already been made. Consultation with AVRDC, India for future linkage
11. SAC should facilitate to put M&E in place. Visits by country team to trial sites/premier vegetable institutes should be organized
12. Exposure visits and training of young breeders/researchers. SAC/respective government can recommend student exchange programs for post graduates course.

1.1.2 Popularizing multiple cropping innovations as a means to raise crop productivity and farm income

Agriculture is the backbone of South Asian countries. Share of agriculture in GDP of South Asia ranged from 11.5 to 34.9% during 2011-2012. The carrying capacity of our land resources has surpassed by the rapidly increasing population. To feed this vast population, it is necessary to utilize agricultural lands to the best of its capacities. Further, in the face of a constant decline in cultivable land due to requirements in housing, roads and other infrastructures, industries, etc., coupled with a booming population with ever-increasing demand for food, multiple cropping options provide a very prospective avenue to increase food and agricultural production. Multiple cropping is a practice of getting maximum production from a unit area in a certain time span.

All the SAARC countries provide an array of multiple cropping systems, and therefore pooling together the knowledge of these various practices for further dissemination and adoption will pave a significant path to increasing farm production. The said forms of multiple cropping systems assume further significance as they provide a way of risk mitigation if one of the component crops fails due to climatic or other hazards. The growing of two or more crops in a single stand is also known to account for a measure of mutual natural support in the form of high nutrient use efficiency, maintaining fertility, narrowing space for weeds growth and reduced pest incidence. As the threat of climate change effects looms large with flooding from rising sea levels for many parts of the SAARC region, popularizing multiple cropping practices assumes further importance.

Furthermore, lack of information, research, resource and skills are some of the other reasons for low adoption of multiple cropping. Keeping in view the economic benefits of multiple cropping, there is a need to promote it among the farming community.

Keeping in view the facts narrated above, a SAARC regional expert consultation meeting on "Popularizing multiple cropping innovations as a means to raise crop productivity and farm income" was organized to make an assessment of the prevailing multiple cropping systems and innovations and make recommendations for selected systems for popularization based on the prospects of further improvisation, increased production, income and resource-use optimization. SAARC Agriculture Centre (SAC), Dhaka and Department of Agriculture, Sri Lanka jointly

organized this meeting at Plant Genetic Resources Centre, Gannoruwa, Peradeniya, Sri Lanka during 31st October to 1st November 2013.

Hon'ble Director General, Department of Agriculture, Sri Lanka Dr. Rohan Wijekoon graced the inaugural session as Chief Guest. Hon'ble GB member of SAC for Sri Lanka, Dr. Hemal Fonseka graced inaugural session as Special Guest and Mr. K.B. Wahundeniya, Director, HORDI, Sri Lanka as Chairperson. Program Organizer, Dr. M. Musa, Senior Program Specialist (Crops), SAC presented the synopsis based on the country status reports submitted by focal point experts during inaugural session. Professionals from five of the SAARC member countries (Bangladesh, Bhutan, Nepal, Pakistan, and Sri Lanka) presented their respective country status reports in two technical sessions on 31th October 2013. To garner benefit of the regional consultation process and provide the perspectives from Sri Lanka, 4 local professionals were also invited to present their papers on research progress on multiple cropping innovations in session-III on the same day. Experts from IRRI were also invited to present their papers on the issue regarding characterizing the soil hydrothermal regime in the root zone using RS & GIS.

This consultation meeting covered discussion on the concept of multiple cropping, description of the different types of multiple cropping system, present status, their adoption in different zones, prerequisites, advantages and constraints for their wide spread use in the SAARC region. The crop based various traditional, innovative and potential multiple cropping systems and their effects on various productivity factors and socio-economic implications were also discussed.

24 professionals from 4 organizations of SAARC countries participated in this consultation meeting and collectively drafted regional perspectives on multiple cropping innovations and a way forward to R & D. Next day on 1st November 2013, recommendations were prepared by three thematic groups (Research, Extension and Policy) of the participants and discussed thoroughly. Mr. K.B. Wahundeniya, Director, HORDI, Sri Lanka graced the session as Chief Guest and Dr. Hemal Fonseka, GB member of SAC for Sri Lanka as Chairperson. Dr. Muhammad Musa, Senior Program Specialist (Crops), SAC presented the final recommendations in the closing session for approval.

Recommendations

Research

Very little research work is done on efficient use of natural resources including land, water & climate and expensive inputs like seed, fertilizer, pesticides, weedicides and labour. It is, therefore, recommended that these issues could be investigated under the umbrella of multiple cropping:

- Localization and improvement of various multiple cropping technologies available with the SAARC member countries is needed.
- A compendium of multiple cropping systems available in SAARC countries need to be prepared through including water saving irrigation techniques, high efficiency irrigation systems, use of various mulching materials and efficiency of nitrogen fixing bacteria, fungi and algae as well as phosphate solubilising bacteria as alternative to chemical fertilizer.
- Identification of suitable crop varieties for multiple cropping and include them in the exchange programs already established by SAARC Agriculture Centre, Dhaka.
- Breeding programs for all crops in SAARC countries should be oriented towards applicability of multiple cropping systems (Appropriate varieties with respect to genotypic and phenotypic adaptability to intensify cropping system).
- Characterization of areas suitable for adoption of multiple cropping systems for sustainable land management and climate smart agriculture by using remote sensing & GIS techniques and crop modelling.
- Emphasis should be given by research on multiple cropping considering important parameters of land equivalent ratio (LER), relative yield total (RYT) and income equivalent ratio (IER) to popularize mixed/intercropping systems in SAARC region.
- Development of models for vegetable based multiple cropping systems in the peri-urban areas.
- NARS should focus and allocate more resources and efforts for research on multiple cropping and come up with holistic research recommendations (costs/benefits, LER, recommendations on inputs, cropping intensity, long term sustainability of a system etc).

Extension:

- Sharing of existing/developed multiple cropping systems for disseminating among SAARC countries.
- Demand driven extension for multiple cropping system.
- Exposure visits of extension officers and researchers to other SAARC countries for observing promising multiple cropping technologies/innovations, applicable in their countries.

Policy:

- Considering the potentials of multiple cropping for small holder subsistence agriculture, food security and poverty alleviation, SAC should develop a convincing project proposal for funding to popularize multiple cropping in the SAARC region.
- Identify enabling policies to support farmers for multiple cropping systems through different forms of sustainable positive incentives.
- Recognize multiple cropping as one of the key strategies for developing the subsistence small holder agricultural system into an intensive subsistence market oriented agriculture system.

- Multiple cropping systems should find priority in peri-urban areas and also marginal ecosystems including disadvantaged group of farmers.

1.1.3 Regional initiative on improvement of pulses and adaptive trials in SAARC member countries

Pulses are an important protein source for Asian people, many of whom largely depend upon cereals and pulses for their daily requirements. South Asian countries together are the world's largest producers and consumers of pulses comprising mainly chickpea, pigeon pea and mungbean. Pulses or *'daal'* are an integral part of the average South Asian meal. A large proportion of the South Asian population is vegetarian and pulses form the main source of protein. The protein content in pulses is about 18-25%. This makes pulses one of the cheapest sources of protein for human consumption. Unfortunately, the production of pulse crops over the past few decades has declined in almost all traditionally pulse growing countries like India, Nepal and Bangladesh. Accordingly, the need for increasing production and productivity of pulse crops, are being felt acutely throughout the region. More adaptive trials on the released varieties, newer practices and cropping systems evolved in pulses need to be conducted in the farmers' field to re-evaluate their relative advantage, profitability and effectiveness.

A two day consultation meeting for inception on "Regional Initiation on Improvement of Pulses and Adaptive Trials in SAARC Countries" has been organized from 12-13 July 2013 at National Bureau of Plant Genetic Resources, Pusa Campus, New Delhi organized by SAARC Agriculture Centre and Indian Council of Agricultural Research, New Delhi, India. This meeting was organized as follow-up of the recommendations of the Regional SAARC Workshop held from 24-25 October 2011 in Kathmandu, Nepal.

Recommendations

General Recommendations:

- SAC is accepted as coordinating organization
- Coordination at three levels - Regional, National and Local

Regional level: National Focal Person

Director /country nominee of National Pulse /Crops/Research Center/Institutes as indicated below are selected as NFP for the adaptive trails

- Bangladesh: Director, Pulses Research Centre, Bangladesh Agricultural Research Institute (BARI),
- Bhutan: Director General, Department of Agriculture, Ministry of Agriculture and Forestry,
- India: Director, IIPR Kanpur
- Nepal: Program Director (Crops Development)
- Pakistan: National Coordinator (Pulse), NARC,
- Sri Lanka: Director, Field Crop Research and Development Institute

National Level: Research Team Leader (RTL)

- Bangladesh: Chief Scientific Officer, Pulse Research Centre, BARI
- Bhutan: National Coordinator for pulses, RDC Bajo
- India: Coordinator (MULLaRP), IIPR, Kanpur
- Nepal: Coordinator, Grain Legume Research Programme, Rampur, Nepal Agricultural Research Council (NARC)
- Pakistan: Senior Scientific Officer, National Agricultural Research Centre
- Sri Lanka: Deputy Director Research (Pulses)

Afghanistan and Maldives will be requested to indicate their interest in participation in the program and to nominate NFP and RTL accordingly.

- NFP will facilitate the implementation and RTL is responsible for execution of the program and submission of the reports to SAC
- Agreed to have 3 crops initially namely Lentil. Black gram and Mung bean and depending on the future needs the program can be extended to other pulse crops.
- It has been agreed to share only pure line elite varieties (Table 1 & Table 2).
- BARI will provide cold storage facilities to SAC for seed storage.

Adaptability Trials

- Each participating countries will conduct trials in defined cropping seasons
- There should be three (3) locations /Country and 3 Replications per trial and RCBD will be used as the experimental design. However first year there will be only one trial

- It is decided to have following population for each crop- Lentil: 300 g/per location/entry; Blackgram-250 g/per location/entry/; and Mung bean: 250 g/per location/entry/
- Cultural practices will be followed according to the national recommendations for respective crops. Participating countries will send their Seed materials of varieties to SAC, Dhaka by end of the August for Rabi and end of February for spring/summer. Seeds samples should accompany with germination reports. SAC is authorized to code/decode the varieties.
- The seeds provided during first year will be multiplied and maintained by the respective country for further trial during coming years.
- Quantities of seed provided by each country will be as follows for conducting the multi-location trial in SAARC member countries (Lentil: 2 kg seed/Variety; Black gram: 1.5 kg seeds/variety; and Mung bean: 1.5 kg seeds/variety)
- SAC will provide observations to be made, standard data sheets and other recording material in consultation. These data sheets will be circulated to participating countries for finalization.
- NFP/RTL is jointly responsible for sending duly filled data forms to SAC
- RTL should communicate with SAC at least two times (one month after planting/after harvesting) regarding the progress of the trials
- Signed MTA document of SAARC should be sent to the member countries

Funding and other matters

- All trials will run initially by the respective NARS of the participating countries.
- Monitoring Team from SAARC member countries at least three/four experts will visit for monitoring the activities to be funded by SAC once a year.
- One nominee from each SAARC country may be invited for the participation at the training program.
- SAC will develop project proposal for future funding issues related to Materials Transfer Agreement (MTA) will be coordinated and facilitated by SAC.
- Annual review meeting will be held once a year in every country by rotation. NFP and the RTL will attend the forum which will be held in mid November of each year.

1.1.4 Quality seed in SAARC countries: Production, processing, legal and quality control, and marketing system

The total requirement of seed of SAARC member countries is around 12.75 million tons whereas the supply is 2.49 million tons. In SAARC region, 80 per cent of the farmers rely on farm-saved seed and the average seed replacement rate (SRR) in this region is not exceeding 20 percent. The seed system of SAARC member countries in general consists of three distinct sub-systems namely (i) Formal (ii) Semi-formal and (iii) Informal (Figure 1). Seed flow in a system traverse areas like

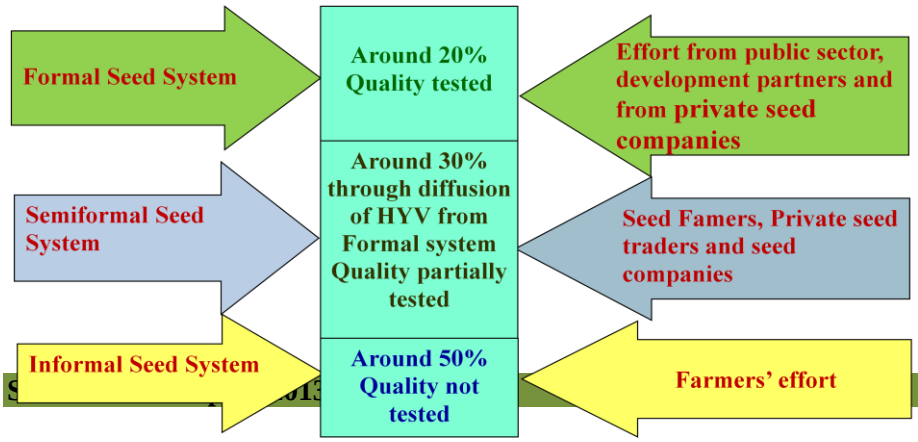


Figure 1. Seed sub-systems in the whole seed system of SAARC

receipt of breeder seed, multiplication in stages, processing & preservation, quality assurance and marketing. The system which cares for all these areas and makes seed available to farmers is formal system and managed by government, private seed companies and big NGOs.
The system which takes little care or no care of these areas is Informal System and mostly

SAARC Seed Forum (SSF)

SAARC Seed Forum (SSF) was established on 25 February 2010 by the SAARC Agriculture Centre (SAC) as per recommendation of the Regional Workshop on Quality Seed in SAARC Countries held in New Delhi, India during 16-18 December, 2009. The mandate of the SAARC Seed Forum is to promote sustainable and coherent development of Seed System of the SAARC Countries so that the farmers of the one country of the region can reap the benefit from the innovation of the other countries. The objectives of the SAARC Seed Forum are:

- To advocate and support development of harmonized and suitable policies and strategies and regulatory frameworks
- To help preparing action plan and pursuing of implementation for sustainable development of seed system of SAARC countries
- To act as a common platform to promote business among the countries of the region and
- To take up any other activities as may be necessary to fulfil the mandate.

managed by farmers in their traditional way. The Semi-formal System is the mixture of Formal and Informal System and managed by farmer, seed traders, small seed companies and small NGOs. In the seed system of SAARC all the three sub-systems are important and should the supported equally.

For the promotion of seed systems in SAARC Countries an independent body was deemed needed by the regional seed experts. Consequently, the SAARC Seed Forum was established through the participation of public private partnership and under the patronization of SAARC Agriculture Centre (SAC).

Lack of harmonization in seed regulation in SAARC countries hinders seed trade among the countries. This restricts movement of hybrids and varieties across the countries in the region. Therefore, harmonization of seed regulation is one of the key challenges and which is the first priority of the SSF to act with. Capacity development, adequate available varieties adaptive to the SAARC region, implementation of seed policies, seed technology dissemination, etc. are the challenging initiatives to be addressed by the SSF in order to achieve an effective and sustainable seed system in SAARC countries.

To operationalize the SSF in accomplishing the huge tasks the SSF needs to be strengthened in terms of organizational structure and activities in the promotion of regional seed sector. Upon establishment the SSF had a number of adhoc committee meetings in last four years to shape up its constitution and bylaws in final stage and set up of priorities for its activities. Lately it submitted a project proposal to International Finance Corporation (IFC), a sister organization of the World Bank, for financial support for its strengthening and implementation of activities. The IFC approved the proposal and prepared a Cooperation of Agreement between IFC and SAC as SAC is patronizing SSF. The Cooperation of Agreement is under review in the SAARC system followed by authorization. Once the SAC obtain authorization the Cooperation of Agreement will be signed and then SSF activities will be initiated.

1.1.5 Food grain scenario of SAARC countries

SAARC Food Security Reserve Board in its Seventh Meeting held in Colombo, Sri Lanka in 1998 decided that the Member States may provide data on the situation of major food grains to SAARC Agriculture Centre (SAC) for compilation and distribution to the member countries. Since then, the Centre has been collecting, collating and compiling relevant data on production, anticipated demand, likely shortfalls, surplus, minimum support price, procurement levels etc. of major food grains which is being distributed among the concerned organizations within the region. This bulletin includes basic information of major food grain situation in SAARC countries which is published annually. Bulletin number 16, Crop year 20011-12 was published in 2013.

Data on food grains is critical input for any policy planning and formulation for ensuring food and nutritional security. Recently, food grain production has decelerated in the world including South Asian countries. It is hoped that this bulletin would help understanding the current food grain scenario of the SAARC Countries, which is important as policy input to the policy planners in developing need based programs for food security in the region. The data indicates that among SAARC region, rice production in Bangladesh, India and Sri Lanka has increased in recent years and Nepal, Bhutan, and Pakistan are showing a decreasing trend. Afghanistan and Maldives is totally dependent on import. Expected demand of food grains has also increased in Bangladesh, and Sri Lanka. Minimum support price of food grains rose sharply in SAARC countries. At the same time, it indicates that wheat surplus countries are India, Nepal and Pakistan. Wheat production in Bangladesh is increasing recently and price of the wheat has increased in the region. Production of pulses, coarse grains, sugar, oilseeds crops remained either stagnant or showed a very little rise (Figure 2).

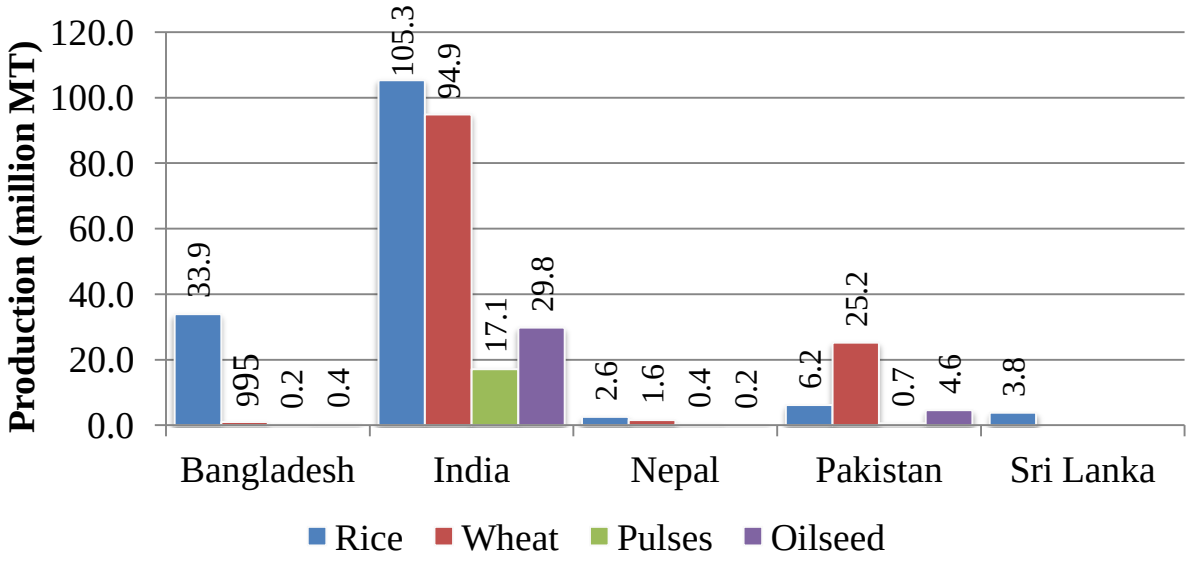


Figure 2. Crop production during 2011-12 crop seasons

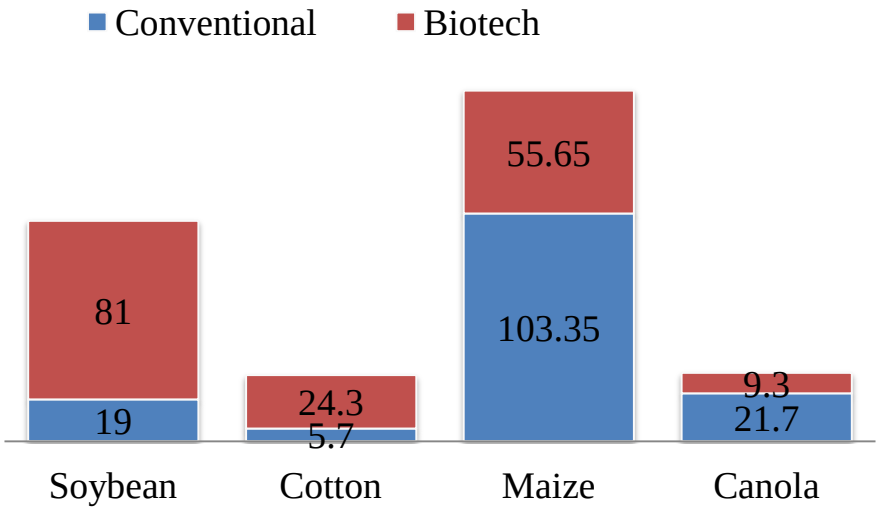
1.1.6 Prospects, needs, benefits and risk assessment of GM products

Food production in South Asia is dwindling. On the other side, population is increasing while crop production level is decreasing, which is resulting in increase of poverty (37%). Simultaneously, undernourishment has also been observed up to 33%. Consequently pressure of food is enhancing. Side by side, we have to face the challenge of climate change, which may lead to not only emergence of new pest-diseases but also aggressiveness and damage by these pest-diseases. Moreover, weather variability is also a big issue. To provide food for all and in sufficient amount, we would have to produce crop varieties which have multiple resistance and capable of producing higher yield. For this, we would have to move to Biotechnology. Under this advance technology, genetic engineering is a versatile tool for introducing new traits and to break yield barriers. Now, all countries are cautious to move forward to adopting this technology. GM foods are foods derived from organisms whose genetic material (DNA) has been modified in a way that does not occur naturally.

In Asian agriculture, the role of genetic modification (GM) technology remains unclear and individual countries have adopted different approaches to tackle the sensitive subject. UN-WFP reported no detrimental effects of GM foods currently available in the international market on human health. Almost, similar report has been issued by WHO. It is clear now that GM technology is the future of agriculture, without compromising the safety concerns.

The global value of biotech seed alone was US$13.2 billion in 2011, with the end product of commercial grain from biotech maize, soybean grain and cotton valued at approximately US$160 billion or more per year. The largest share of the GMO crops planted globally is from seed created by the United States firm Monsanto. In 2007, Monsanto's trait technologies were planted on 246 million acres (1,000,000 km^2) throughout the world, a growth of 13 percent from

2006. In addition, a 2007 report from the European Joint Research Commission predicts that by 2015, more than 40 per cent of new GM plants entering the global marketplace will have been developed in Asia. As of 2011, 11 different transgenic crops were grown commercially on 395 million acres (160 million hectares) in 29 countries such as the USA, Brazil, Argentina, India, Canada, China, Paraguay, Pakistan, South Africa, Uruguay, Bolivia, Australia, Philippines, Myanmar, Burkina Faso, Mexico and Spain. There was a sustained increase of 12 million hectares (30 million acres) in 2011 over 2010, which accounts for 8%. Out of total area sown, global adoption rate for biotech soybean, cotton, maize and canola was 81, 81, 35 and 30 %, respectively (Figure 3).



Source: Clive James, 2012

Figure 3. Global Adoption rates (%) for principal biotech crops during 2012.

SAC and Bangladesh Agricultural Research Institute (BARI), Gazipur jointly organized this meeting at Bangladesh Agricultural Research Council (BARC), Dhaka during 6-7th December 2013, where all the participating member countries and four local professionals presented their country status reports. The program was organized to take stock of the available resources in the genetic modification sector in SAARC region, to create the awareness for obtaining necessary scientific skills and to utilize the modern advancement of GM products in agriculture towards achieving food security in the SAARC region. Professionals from six of the SAARC member countries (Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka) participated in the program by developing a country status report. 40 professionals from

SAARC countries and 15 local organizations participated in the consultation meeting and collectively drafted regional perspectives on GM products and a way forward to R & D.

The prospects of GM crops in the region do exist and some of the areas are as follows:

Bangladesh	Adequate legislation and capacity development
Bhutan	Cold and drought tolerant varieties, multiple resistance to biotic and abiotic stresses,
India	Increase yield levels and multiple resistance in rice, wheat, oilseed, cotton, soybean, chickpea, much bean, pigeon pea, and groundnut
Nepal	Crop yield increase
Pakistan	Bio-safety evaluation of developed transgenic plants, gene pyramiding, tissue specific promoter
Sri Lanka	Gene pyramiding, resistance breeding, structural and functional genome analysis

To take forward the initiatives on GM research, the consultation meeting enlisted recommendation in three areas of (i) research and development, (ii) extension and marketing, and (iii) policy.

Research and Development

1. Identification and Isolation of trait specific genes, for biotic and abiotic stress tolerance using genomics and bioinformatics.
2. Establishment of Common biochemical and risks assesment Methodology.
3. Enhancement of research and collaboration in virus, fungus and bacterial resistance.
4. Abiotic stress **(**Salinity-Rice Jute**;** Heat-Wheat and Rice**;** Cold – Rice and Maize**;** Drought-Maize, wheat, Jute**;** Submergence- Rice**;** Waterlogging-Maize, Jute**)**
5. Development of Research facilities in each member country.
6. Exchange of expertise among the countreies in molecular breeding, MAS and Transformations.

Extension and Marketing

1. Capacity Building of institutions, extension and farmers
2. Creation of Awareness for Policy and decision makers, growers, consumers and media about the GMO and products
3. Marketing – monitoring, labelling; Strengthening/creation of Research-extension-farmers-consumers linkages

Policy

1. SAARC countries may encourage research and commercialization of GM crops including cereals, horticultural crops, legumes, fibre and oil seed crops.
2. Uniform GMO policy to facilitate GMO research and sharing of release GM crop varieties for testing and adoption. Networking among Biotech scientists in member countries through meetings and visits.
3. Existing bio-safety rules and regulation in member countries should be documented by SAC and it may be posted SAC website.

1.1.7 Development and implementation of the SAARC pesticide information network (SPINet)

The predominance of agriculture in the South Asian region is evident from 33% its contribution to GDP and 68% of population engaged in the sector. The pressure of ever increasing population on food demand has forced the use of high yielding crop varieties, high levels of fertilizer and chemical pesticides. Despite the increase in crop production, annually 30-52% of the yield is lost to pest and diseases. As a means to protect crop yield, pesticides are extensively used. Realizing the negative effects of excessive use of pesticides, integrated pest management strategies are promoted to minimize the use of chemical pesticides. Considering the open market, compelling advertisement of agro-chemicals, and well established supply chain, farmers are lured to use the pesticide to protect their crops.

In most situations, farmers make decision to use pesticide with a limited information and knowledge about the pesticides. They are generally provided with information on target pest it kills assuring complete protection of the crop. In all most situations, farmers have no knowledge about its negative effects to environment and human health. Therefore, the lack of information on pesticide use and its harmful effects prejudice the enforcement of existing regulations on control of pesticide contamination. In view of the fact that complete information easily accessible to general users both at national and regional level is not available, SAARC Agriculture Centre, initiated a program to develop regionally coordinated web-based information network on pesticides with the following objectives:

- Promote regional cooperation in harmonizing pesticide management issues and strategies and to have uniform and effective legislation, definition, regulation, and enforcement
- To compile details on pesticide used in the regional
- To minimize duplication of activities done by individual countries by sharing work on evaluation, residue analysis and registration of pesticides.
- To facilitate the implementation of FAO code of conduct on distribution and use of pesticides, and compliance to international conventions and instruments.
- To serve as single window for regional information resource link on pesticides.

The work to develop web-based network was contracted to Agriculture Education Unit, Faculty of Agriculture, University of Peradeniya, Kandy, Sri Lanka through a MoU signed between SAARC Agriculture Centre, Dhaka and University of Peradeniya, Kandy, Sri Lanka in March 2013.

The development of SAARC Pesticide Information Network (SPINet) has been successfully completed and can

be accessed via link http://spinetwork.org. Although the website has been developed, database entry is yet to be done. As the information is organized in two strata (national and regional), the network is administered at two levels by a regional site administrator from SAC and at national level by a country administrator who is the designated focal point for respective countries.

Before the network is fully operational, SAC plans to organize a orientation and data coding for all the national focal points in Sri Lanka in 2014, after which national datasets will be uploaded and the site launched subsequently.

1.1.8 Extent and potential use of bio-pesticides for crop protection in SAARC

The agriculture land in SAARC region extends to more than 345 million hectares which spreads across various agro-ecological zones. The diversity of crops grown in the region and pest and disease prevalent in the region poses enormous challenges to the farmer to save their crops from the pest damage. The challenge to produce more food to fulfil the need of rapidly growing population has forced growers to use pesticides to protect crops and secure higher production. The indiscriminate use of pesticides has raised the concern and lead to enactment of global declaration "International Code of Conduct on the Distribution and Use of Pesticides - Guidance on Pest and Pesticide Management Policy Development" in 2010. The inappropriate use of pesticides in public health, industries, and household sanitation can pose risk to public health and environment.

As an alternative, use of bio-pesticides (botanical and microbial) are widely promoted as safe and environmentally friendly means to counter the pest and diseases at the same time contain the harmful effects of the chemical pesticides. Many of these bio-pesticides are within the reach of farmers in terms of cost and many of these formulations can be prepared by farmers too.

The use of nicotine extract to control plum beetles as early as 17th century may have been triggered by the need to protect crop due to damage by insect pest. The earliest recorded work of Agostine Bassi during 1835 who demonstrated that *Beauveria bassiana* (white-muscadine fungus) could be used to cause an infectious disease in silkworm. The brake through research in identifying bacteria *Bacillus thuringiensis* (Bt) as the cause of disease in silkworm by Japanese biologist Shigetane Ishiwata in 1901 gave way to several other research on microbial solution to pest control. In 1911, Bt was classified and remains most widely used bio-pesticides to this day. Bio-pesticides are used to control pests, pathogens, and weeds by a variety of means.

The prospect for use of bio-pesticides in SAARC region is enormous. At the same time the technological innovation in developing bio-pesticides also exist in the region. Aligning to the food safety needs, application of environmentally safe bio-pesticide vis-à-vis the integrated pest management approach is fast becoming a popular approach in agriculture. With the range of bio-pesticides available in the market with varying efficacies it is important to have adequate knowledge about the bio-pesticides before applying it. As bio-pesticides are narrowly selective and pose few problems to non-target organisms including natural enemies it is safe. However, specific mode of action, slow acting, safer than chemicals, limited field persistence, high unit cost can make it more expensive. Considering that most countries are promoting organic

products and food safety measures, the common knowledge of bio-pesticides used in the region and their efficacy can enhance the potential use of bio-pesticides.

SAARC Region poses wealth of botanicals which can be effectively used in different formulations of bio-pesticides. According to Talukder (2006) there are 43 plant species as insect repellents, 21 plants as insect feeding deterrents, 47 plants as insect toxicants, 37 plants as grain protectants, 27 plants as insect reproduction inhibitors, and 7 plants as insect growth and development inhibitors. In view of the wealth on resources and knowledge in the region, SAARC Agriculture centre organized a program to (i) prepare an inventory of bio-pesticides and its extent of use in agriculture, (ii) document best practices in use of bio-pesticides, (iii) prepare directory of bio-pesticides producers in the region, and (iv) prepare a synopsis of bio-pesticide in crop protection in SAARC Region and the way forward. Six countries (Afghanistan, Bangladesh, Bhutan, Nepal, Pakistan, and Sri Lanka) participate in the program by contributing comprehensive country status report and partake in the regional consultation meeting.

All countries have enacted Pesticide Acts and Ordinance to regulate import and use of chemical pesticide in agriculture and other uses. The concern of environmental hazards by abuse of chemical pesticides and other chemicals are well covered under the purview of the environmental policies of each country. In every country there are also well established institutional set up to regulate the pesticide use.

The predominant bio-pesticide products in the region are neem-based formulations and trichoderma. In specific there are 45 different formulations in Nepal followed by Sri Lanka with 34 products and Pakistan 16. In Bangladesh, Bhutan and Afghanistan there are 13, 10 and 3 bio-pesticides currently in use by farmers respectively. Most of these formulations are produced in respective countries, except in Afghanistan and Bhutan who depend on imported products. There are 19 agencies in Bangladesh, 10 in Nepal, 7 in Sri Lanka and 1 in Pakistan engaged in bio-pesticide production. They also have very strong support from public institutions to produce bio-pesticides.

The country study and the regional consultation identified following issues in promoting and adoption of bio-pesticides:

Policy

- Inadequate policy /varying national policy of member states.
- No clear lead agency to promote development of bio-pesticide
- Registration system is time consuming and tedious for the chemical pesticides
- Inconsistent labelling of harmful inputs

Research

- Several Indigenous knowledge and practices are in the region but due to lack of documentation, decreased availability of botanicals is limiting their adoption.
- Lack of standardized technologies in extraction, formulation and mass production
- Collaborative research

Extension and Development

- Field level efficacy of bio-pesticides/up-scaling
- Lack of education/awareness on the advantages and disadvantages of use of bio-pesticides
- Farm level accessibility of effective bio-pesticides
- Quality control and monitoring
- Networking in the private-public institutes in the SAARC countries
- Capacity development
- Limited production facilities

Some of the actions proposed by the consultation meeting are as follows:

Policy

- Legal framework for commercialization of bio-pesticide should be done by respective government
- Promote and support private sector to manufacture/formulate bio-pesticides within the country.
- Facilitate trade among the member countries (conducive trading policies/regulations, tax exemption, tariffs, subsidies, etc)
- Identification/establishment of referral lab in the SAARC region which is accredited to carry out testing and revalidation of bio-pesticides.
- Adopt FAO guided fast track registration system for bio-pesticides.
- Labelling of hazardous materials to be made mandatory in member countries
- Harmonization of bio-pesticide promotion policies of SAARC member states

Research

- Initiate collaborative research on testing and promotion of most promising bio-pesticide
- Testing the bio-efficacy of botanicals and other bio-agents; development methods/mass production of bio-agents and extraction methods for botanicals; cultivation methods to be developed for important botanicals (domestication of wild plants e.g. sweet flag)
- Lead agency and laboratory identified for research and development on bio-pesticides in all the member countries
- Several Indigenous knowledge and practices are in the region but due to lack of documentation, decreased availability of botanicals is limiting their adoption.
- Conservation technologies (in situ and ex situ) to be developed for the effective biological agents and botanicals (e.g. establishment or incorporation within existing botanical gardens or gene bank or herbarium)
- SAC should develop a centre of excellence for product development, toxicity testing of botanical pesticides and taxonomic identification of bio-agents.

Extension and Development

- Organize training on bio-pesticide formulation and product development
- Awareness building- publicity and advocacy (News and awareness in print and electronic media, radio, poster programmes, curriculum at School and college level)
- Establish networking among the SAARC countries for knowledge and technology sharing

- Documentation, promotion and sharing of traditional knowledge on pest management at local level with proper acknowledgement and keeping in mind the international treaties
- Assist private sector in exclusive bio-pesticide business

1.1.9 Adaptation to climate change impact on crop production in SAARC countries

Climate stands out as a unique natural element that determines, to a large extent, the quantity and quality of agricultural produce in all parts of the world. Agriculture has been a human enterprise for over ten thousand years now, but despite great technological advances agricultural production still remains within limits imposed by the quality of natural resources like land, soil and water and climate-related natural processes and phenomena. The modern agricultural technologies have been instrumental in substantially increasing agricultural production, but these technologies are profitable only under favourable climatic conditions. The agriculture sector both contributes to climate change, as well as will be affected by the changing climate, as such it is one sector that is important to consider in terms of climate change.

Droughts, floods, tropical cyclones, heavy precipitation events, and heat waves are known to negatively impact agricultural production, and farmers' livelihood. The projected increase in these events will result in greater instability in food production and threaten livelihood security of farmers. Increased production variability could be perhaps the most significant impact of global change on Bangladesh. All agricultural commodities even today are sensitive to such variability. Several adaptation and mitigation options for a range of agro ecosystems strategies such as change in planting dates and varieties, development of adverse climate tolerant genotypes, providing value-added climatic risk-management services to farmers, and improved land-use policies and risk management though early warning system and crop-weather insurance can assist in reducing the negative impacts of climate change. Sustainable management of soil and water resources can make a difference in successful adaptation to vagaries of changing climate.

Climatic parameters like temperature, rainfall, relative humidity; solar radiation, etc. greatly influence critical biological events in the growth cycles of crops, fish and livestock on the one hand and their natural enemies like insects and diseases on the other. However, while climatic factors like rainfall, temperature, solar radiation, etc. cannot be changed, it is possible to minimize agricultural production loss from unfavourable climate through preventive, adjustment and rehabilitation measures. Advance information on impending weather can be utilized to advise farmers to take advantage of those aspects of weather conditions which are favourable to their activities as well as to take preventive measures to minimize the damage to agricultural production which may be caused directly or indirectly by adverse weather. Inclement weather like droughts, unusual temperature regimes and calamities like floods, storms, cyclones appear to be frequently occurring in Bangladesh. These threaten to offset the delicate balance existing in the agro-ecosystems and ultimately adversely affect agricultural production. Agricultural scientists, government policy makers and farmers must face this challenge together to avert the shortages of food and other agricultural commodities. Prediction and forecasting on the impacts of climatic parameters on agricultural production can be a powerful tool in climate-related food and agriculture disaster management.

A two days Regional Expert Consultation Meeting on "Adaptation to Climate Change Impact on Crop Production in SAARC member countries" was organized at Bangladesh Agricultural Research Council (BARC), Dhaka, Bangladesh in association with BARC during 23-24 November 2013 with the objectives to identify impact of climate change on crop production in member countries of SAARC and suggest adaptation measures to protect crops from damage due to climate change

Dr. SM Nazmul Islam, Secretary, Ministry of Agriculture, Government of Bangladesh was Chief Guest on the occasion and delivered inaugural address. Dr. Md. Rafiqul Islam Mondal, Director-General, Bangladesh Agricultural Research Institute (BARI) and Mr. Mukul Chandra Roy, Director-General, Department of Agricultural Extension, Bangladesh were also present as Special Guest and Guest of Honour, respectively. The meeting was blessed by the august presence of Diplomat from Embassy/High commissions, Director-General of BRRI, Director-General of BJRI, Joint Secretary, Ministry of Agriculture, Representative from IRRI, and BRAC. Around 35 experts from the National Agricultural Research and Extension Systems from member SAARC countries participated in the consultation including the regional resource focal point experts. The inaugural session of the consultation meeting was presided by Dr. Wais Kabir, Executive Chairman, BARC.

During two days consultation meeting, eleven (11) technical papers and one synopsis paper was presented. All the resource persons from SAARC member countries and others participants of the consultation meeting discussed in the four groups on the following thematic areas:

Recommendations

At the end of the Consultative Meeting, following recommendations were adopted in each thematic area

Researchable Issues

- Breeding for stress tolerant and short duration varieties to fit in the cropping systems
- Development and promotion of location specific efficient technologies to reduce GHG emission in each member countries of SAARC as per their demand and need
- Risk analysis of emerging pests, diseases and weeds, and technological measures to minimize risk

- Identification and promotion of the use of traditional knowledge and community based practices like on-farm water management, water shed management, rain water harvesting and improvement of soil management practices for adaptation
- Use of different climate modelling tools for evidence based policy advocacy to enhance resilience of agriculture through technologies and natural resource management.
- Application of GIS and Remote sensing technologies for enhanced capacity of adaptation to climate change

Development and Extension issues

- Need Regional Collaboration and Cooperation in agriculture for identification, documentation and sharing of successful climate smart technologies among the SAARC countries through involvement of different stakeholders and arrange exposure visits for successful cases coordinated by SAC
- Capacity building for the research and extension personnel on climate adaptable technologies in regional basis
- Use of ICT (Mobile, Mass Media-Community Radio, website, Television including satellite channels in extension, use Agromet Bulletins) for agro-advisory weather forecasting system
- Promote self help or framers' groups at local level for dissemination of climate related issues including adaptation measures and policies
- Emphasize on diversification of the production systems to reduce climate risk and link technologies across the Value Chain
- Module development for Human Resource development for Climate Change Adaptation at different level in agricultural value chain
- Promoting integrated farming system approach, farm mechanization for small holder agriculture, resource conservation agriculture (e.g. zero tillage, bed planting) and prototype exchange among the SAARC countries

Policy issues

- Activating Regional Seed Bank for the Exchange of quality Seeds during disasters
- Ensuring availability of quality inputs, credit and placement of appropriate crop insurance mechanisms in each member countries
- Strong representation of agriculture sector in international climate change negotiations and SAARC may be represented by SAC in CoP programs.
- Encourage South-South Cooperation in finding solutions for climate change impacts on agriculture
- Establish a Central Climate Change Secretariat at the focal point Ministry of the United Nations Frame for Climate Change (UNFCC) in each member country having a strong linkage with relevant ministry in respective member countries to coordinate climate change related activities in agriculture of each member country involving all the stake holders engaged in research, development and policy formulation to address climate change issues
- Review existing investments and subsidies in the context of adaptation measures and promote the concept of Climate Smart Agriculture at local, regional and national level

- Strengthen the Seasonal Climate Forecasting capacity with a considerable lead time with the help of SAARC member countries in information generation and dissemination through ICT
- Strengthening and institutionalization of agricultural research and development through increased investment for developing climate change adaptive and resilient agricultural technologies
- Network among SAARC member countries to form climate change alliance in the region
- Ensure Private Sector participation and investment in climate change adaptation and mitigation initiatives
- Encourage to maintain the Gender Concerns in climate change adaptation and mitigation interventions
- Take appropriate measures to transform the subsistence level agriculture of member countries to commercial level agriculture as much as possible
- Agro-advisory based on weather forecasting system

Future prospects

- Effective coordination among SAARC countries for sharing germplasm and innovative crop management technologies through SAC
- Awareness of using cropping systems models (APSIM, DSSAT, Info Crop, etc.) as a tools to devise appropriate crop management strategies
- Capacity building of researchers for developing short, medium and long term in depth scenarios and their impact on crop production using appropriate technologies / tools
- Capacity building of farmers for adapting the innovative technologies
- Prioritize the adaptation measures for different Farming Systems (Homestead production, cropping systems, livestock and fisheries, agro forestry to promote climate smart agriculture
- Preparedness plan to overcome the climate effect on Agriculture
- Create National cell on natural disaster management in all SAARC countries
- Agricultural Universities in SAARC countries may include a subject on climate change and crop simulation modelling

1.1.10 Best practices and procedures of saline soil reclamation systems in SAARC countries

Salinity is one of the major causes hindering agricultural productivity in the world. Globally nearly 7% of the world is afflicted by soil salinity. Salinity caused by anthropogenic factors (secondary salinisation) is often related to large-scale development of irrigated agriculture without adequate drainage and clearing of natural deep-rooted vegetation. Problems associated with the presence of excess salts in the soil have for long constrained agricultural productivity, largely due to inappropriate agricultural management practices. The human-induced salinity problems are rapidly expanding as reclamation is expensive and time consuming. Despite the availability of the agronomic, biological and hydrological solutions, rehabilitation of saline are time consuming. In SAARC region, 7% of the total agriculture land (218 million ha.) is affected by salinity in Bangladesh, India, Pakistan and Sri Lanka. Among the four countries, 23% of

agriculture land in Pakistan is saline and sodic soil. Sri Lanka accounts 21% saline soil followed by Bangladesh with 12% and India only 4%. There are several common features among the countries of our region which imply that there is much to share and learn from each other's situational experience, successes and learning. Increased production in countries of the region must come through increased productivity per unit of land and water resources. Importantly productivity increases must be achieved in ways which do not cause impairment of resource base i.e. productivity increases are achieved in a sustainable way.

The regional program focused on documentation of national initiatives on addressing the issue of soil salinity that has arrested the productivity of agriculture land and in many cases rendering it uncultivable. Considering the impact of saline soil on crop production, a regional program involving Bangladesh, India, Pakistan and Sri Lanka was initiated with the objectives to (i) document existing reclamation systems of saline soil in SAARC region, (ii) compare and identify saline soil problems and appropriate reclamation techniques, and (iii) disseminate reclamation methods to the researchers, extension agencies, and policy makers in the SAARC region. Based on the country report and a regional expert consultation meeting the study attempts to provide a regional perspective on the salinity problem and suggests some way forward to share best practices among the SAARC Member countries to enhance agricultural production and food security.

Salinity problems are primarily associated with coastal areas and irrigated lands in the dry zones. Salinity is a major environmental factor that drastically affects the crop productivity throughout the world. Yadav (2003) reported that salt affected soils are distributed in 120 countries covering 953 M ha and reduced productivity to 7-8% at the global scale. Salinity occurs through natural or human-induced processes that result in the accumulation of dissolved salts in the soil water to an extent that inhibits plant growth. A saline soil is defined as having a high concentration of soluble salts and electrical conductivity of ECE of 4 dS/m or more. There are mainly two types of salinity a) Inherent or salinity due to par cut materials underneath the soil profile; and b) Coastal salinity due to intrusion of saline water in land. There are number of factors responsible for the salinisation of an area, depending on its situation. The land relief and degree of flooding mainly affect the formation of coastal saline soils. The other factors are: i) the nature of the soil, ii) precipitation, iii) tidal action, iv) the effect of the river system and their discharges, v) depth of the ground water table and salt deposits, and vi) the slope of the ground and the proximity to drainage channels. Sodicity is a secondary result of salinity in clay soils, where leaching through either natural or human-induced processes has washed soluble salts into the subsoil, and left sodium bound to the negative charges of the clay.

Historical perspective of the salinity problem and research in South Asia

In South Asian region, the first recorded report of salinity dates back to 1855 when a farmer complaint about the deterioration of land in Western-Yamuna canal command area in Moonak village (Now in Haryana). In 1863, Mr TE Brown, Chemical Examiner for Punjab suggested the

presence of alkaline substances as the principal cause of the problem. It was validated by laboratory analysis of water in Royal School of Mines in England in 1865 which identified continual irrigation of land with water containing sulphates and chlorides as the cause of deteriorating agricultural land in Moonak. Similarly in 1889 appearance of barren salt encrusted spots were reported in Nira valley (Mann and Tamhane, 1910).

Corresponding to the concerns raised in India since 1855, scheme of experiments for profitable cultivation of saline soil were recommended by the *Reh* Committee in 1879 by (i) removal of salts, (ii) drainage, (iii) silting, (iv) deep cultivation, (v) manuring, and (vi) ploughing of green crops. A conference was held in 1879 at Aligarh, during which it was decided to set up a series of experiments for the reclamation of salt lands (Leather, 1897). A series of experiments were carried out at Saidapet in Madras Presidency during 1880s to address the problem of salinity due tank irrigation in South India.

Based on the recommendation of the Indo-American team on water management constituted by the Government of India in 1967, the Central Soil Salinity Research Institute, Karnal was established by the Indian Council of Agricultural Research (ICAR) in 1969.

Thereafter research on salinity in other countries in the region gradually picked up and presently there are institutions designated to research on saline soil in all countries.

Extent of salinity

Saline soils vary widely in their chemical and physical properties and hydrology. The variables include content and nature of salts, distribution of salts in the surface horizon, soil pH, nature and content of clay, organic matter content, nutrient content, water regime relief and temperature (Ikehashi and Ponnamperuma, 1978).

Globally there are 400 million hectares of land affected by either salinity or sodicity, which is over 6% of the world land area. Of the current 230 million ha of irrigated land, 45 million ha are salt-affected (19.5 %) and of the 1,500 million ha under dryland agriculture, 32 million are salt-affected to varying degrees (2.1 %). Sodic soils are dominant (>50%) with largest area in Australia while sizeable area (20%) is saline in dry-lands of Asia and Pacific and waterlogged and secondary salinized (39.9 M ha) in irrigated regions (Ghessami and Nix, 1995; World Watch Institute, 1990).

In SAARC Region, salinity prevails as a major issue, for instance, in Bangladesh, the coastal region covers almost 29,000 km^2 or about 20% of land area and more than 30% of the cultivable lands. About 53% of the coastal areas are affected by salinity in Bangladesh. In India nearly 6.72 million ha of total land are salt-affected out of which 2.95 million ha are saline (including coastal) and 3.77 million ha are alkaline (IAB, 2000). In Pakistan, about 6.70 million hectares of land are salt-affected and of which 1.89 is sodic in nature. The area of Sri Lanka affected by coastal salinity was estimated at around 0.540 million ha. (Country reports, 2013) (Figure 4).

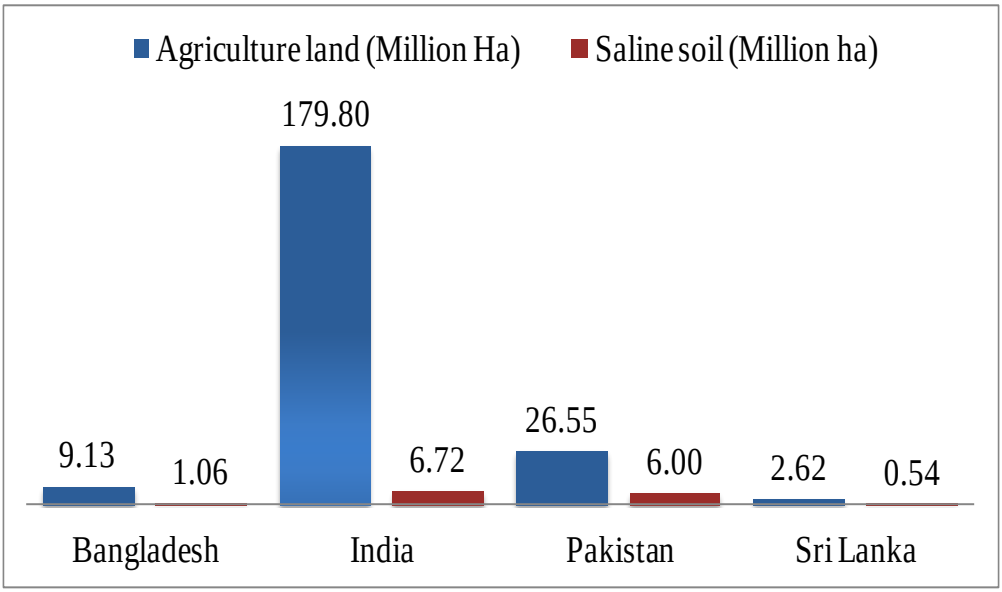


Figure 4. Salt affected agriculture land in SAARC Region

Across the four countries, 7% of the total agriculture land (218 million ha.) is affected by salinity. Among the four countries, 23% of agriculture land in Pakistan is saline and sodic soil. Sri Lank accounts 21% saline soil followed by Bangladesh with 12% and India only 4%.

The salt affected soils have an inherent association with geological formations of the area. The study in India show that maximum occurrence of salt affected soil (saline and sodic) is prevalent in Pleistocence and recent alluvial zone. It is also common in Deccan and Rajmahal geological formation.

A relationship of soil salinity to temperature and rainfall has also been studied. Prevalence of saline soil in India indicates that in areas where temperature ranges at 22 to 27°C and rainfall on 300-1500mm generally experience maximum salinity. This may be related to load of salinity in runoff water and evaporation that leave behind salt.

Practices and procedures to address the salinity problem

Ever since the salinity problem was reported, agriculture agencies have tested and adopted cropping systems and irrigation management strategies. For instance, during 1855 rice and barseem cultivation was promoted as a standard practice for reclamation of salt-affected soils in Sind and Punjab. The practices of reclamation of saline soils can be broadly classified into five groups (Figure 5) (i) crop and crop management, (ii) water management, (iii) nutrient management, (iv) land management, and (v) infrastructural intervention.

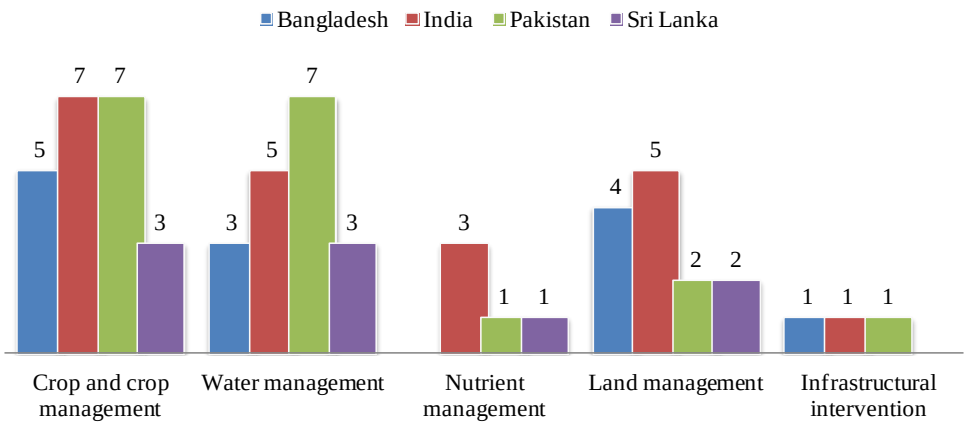


Figure 5. Broad strategies and technologies to address soil salinity problems

Among the five management practices, crop and crop management practices that involve use of crop varieties tolerant salinity and cropping systems are widely used. In the region there are 22 technologies and 112 crop varieties that are tolerant to salinity related to crop and crop management strategies (Figure 6).

As salinity is closely associated with water and irrigation systems, water management techniques have been widely used to reclaim saline soil both on short and long term basis. There are 18 water management technologies ranging from simple leaching to use of tree for bio-leaching.

Soil and land management techniques have been popular practices in managing soil salinity. In the region there are 13 technologies widely used by farmers in enhancing the productivity of land. Some of the common practices are bunding, deep furrows, mulching and land levelling.

It is common to see application of gypsum in the reclamation of sodic soils. Integrated nutrient management strategies are reported beneficial in longer term as it tends to sustain the productivity of the land.

For extensive and large scale reclamation of saline soil areas, major infrastructural interventions are tested and proven successful. Sub-surface drainage in India, tidal river management in Bangladesh and dykes in Pakistan are being in use.

An innovative 'Dorovu' technology has gained immense popularity in coastal regions of the country. It include *rabi* cropping in mono-cropped coastal saline soils, rainwater harvesting in dugout farm ponds, reduction of arsenic uptake by higher application (10-15 kg ha^{-1}) of Fe and Zn, salt tolerant rice varieties 'Sumati' and 'Bhootnath' released for coastal saline soils. One of the major areas of research in salt affected soils, which received attention of scientists, policy makers and Government, was the development of salt tolerant cultivars of potentially important crops.

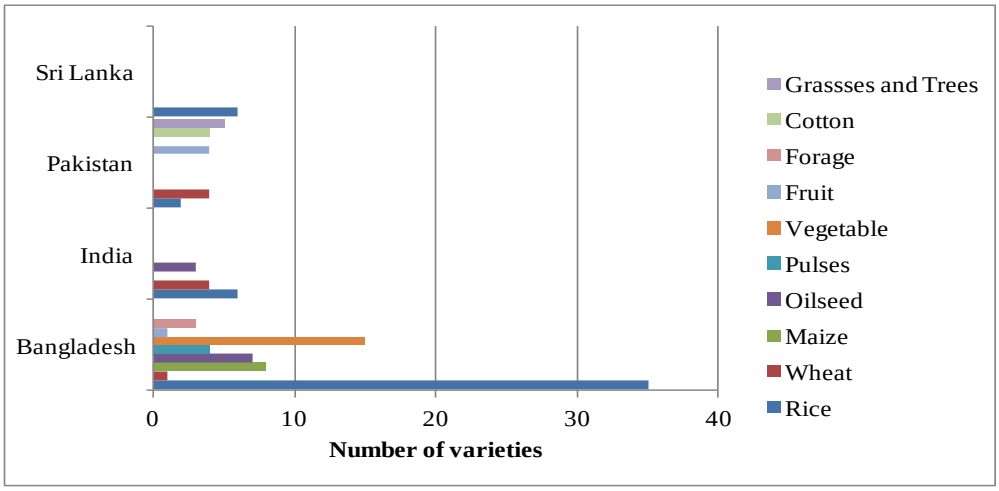


Figure 6. Crop varieties tolerant to saline soil

Impact of reclamation of salt affected soils

Considering that 14.32 million ha. of agricultural land is affected by salt, it significantly hampers the food production capacity of the region. Reclamation of salt affected land that represents 7% of the agricultural land (23% in Pakistan, 21% in Sri Lanka, 12% in Bangladesh and 4% in India) can help in enhancing food security. For instance, in India the reclaimed land every year adds about 15 million tonnes of food grains to the National food basket and provides additional income worth Rs 13.50 billion. The technology also provides on-farm and off-farm rural employment opportunities worth 8.5 million mandays every year. Based on 10 per cent discount rate, the economics of sodic land reclamation shows that the present net worth of reclaimed lands is Rs 56000/ha with B:C of 1.52, internal rate of return 21.4% and payback period is 3 years (Sharma *et al.,* 2011). Similarly in Bangladesh, in Coastal area 139 polders established since 1960s by Bangladesh Water Development Board has increased national irrigated area at a rate of 100-150 thousand hectares per year, further enhancing food production.

Issues

Despite the research on soil salinity, the adverse effect of salinity is both environmental and economic still prevails and poses greater challenges to manage it. The intrusion of salt from sea water and irrigation mismanagement not only reduces the productivity of land but it also renders the land uncultivable and results in mass land degradation and desertification. The reduction of crop yield has greater impact of individual food security and their incomes.

Some of the issues raised are:

- Alternative to gypsum as soil amendments
- Application of nano-technology, bio- and phyto-remediation in reclamation of soil and water
- Agroforestry as reclamation strategy

- Integrated plant nutrient management
- Integrated water management research

Way forward

The problem of soil salinity observed both in coastal zone and inland is a pervasive threat to agricultural production and the environment in view of its adverse effects on sustainable use of land and water resources. While the immediate source of salts in saline soils can be the parent material, irrigation water, shallow groundwater, fertilizer and amendments applied to the soils. The effect of salinity on crop yield is a function of the threshold salinity above which yield decline, and the percentage of yield decrease per unit of salinity increases above the threshold. The presence of salt could exert an adverse effect on plant growth. Salts make the nutrients less available because of osmotic pressure. Excess salt becomes toxic to plants. The long-term presence of excess salts can damage the soil irreversibly.

Taking advantage of the scientific advances in saline soil research and development in the region, there are ample opportunities to consolidate the efforts and design collective actions for taking forward the initiatives from each country.

- Establish a mechanism for closer interactions among scientists working on saline soil research on SAARC countries.
- Initiate[2] SAARC Saline soil Wheat Adaptive Trial (SASWAT) to exchange salt tolerant wheat varieties and test in all countries under the adaptive trial program.
- Share information and opportunity to participate in All India Coordinated Research Project for Management of Salt-affected Soils and Use of Saline Water in Agriculture

1.2 Use of geo-information technology for mapping of land degradation in SAARC countries

Land resource is one of the finite resources that are constantly under pressure of users and threat of natural forces. The pressure of ever increasing population and its indiscriminate exploitation of dwindling land resource have resulted in irreversible process of degradation. The acceleration of land degradation can also be considered as driven by market forces which are posing a major challenge to humans in terms of its adverse impact on biomass productivity and environment quality. It is generally perceived that land degradation is reversible and can be restored. However the restoration processes are costly. The cost of reclamation or restoration to productive use, of degraded soils is invariably less than the cost of preventing degradation before it occurs. Therefore if the degradation process is fully understood, measures to further expansion can be arrested and the land restored for its optimum utilization. The increasing degradation of land directly threatens livelihoods, food security, people's health and long-term sustainable development. This overwhelming condition is further intensified by growing populations,

[2] "Stress tolerant rice for poor farmers in Africa and South Asia (STRASA)", vegetable, pulses, oilseed adaptive trial already initiated under STRASA under IRRI program and other three under SAC program.

urbanization, widespread poverty, ineffective governance, ambiguous property rights, weak institutions and inappropriate policies. The information on land degradation is needed for a variety of purposes like planning reclamation programs, rational land use planning, for bringing additional areas into cultivation and also to improve productivity levels of degraded lands. The information on how the degradation is progressing also enhances our preparedness in tackling the impacts of land degradation.

Land degradation is temporary or permanent decline in the productive capacity of land user rain-fed arable, irrigated, rangeland and forests systems of land use or in farming systems. Land degradation globally affects 33% of earth land surface and an estimated population of 2.6 billion people (Adams and Eswaran, 2000). Land degradation is increasing in severity and extent in many parts of the world, with more than 20% of all cultivated areas, 30% of forests and 10% of grasslands undergoing degradation (Bai et al., 2008). Land degradation is complex and involves interaction of changes in physical, chemical and biological properties of soil and vegetation (NRC, 1994). According to FAO (2005), it encompasses factors concerning soils, water, forests, grassland, crops, and biodiversity. Correspondingly, the immediate causes of land degradation are inappropriate land use that leads to degradation of soil, water and vegetative cover and loss of both soil and vegetative biological diversity, affecting ecosystem structure and functions (Snel and Bot, 2003).

Land degradation is widely studied globally. One of the globally accepted studies Global Assessment of Human-induced Soil Degradation (GLASOD) reports that 15% of the land is degraded (Oldeman et al., 1991). The regional distribution of degraded land is reported to be 25% for Europe, 18% in Asia, 16% in Africa and 5% in North America. In South Asia 42% of the 4.13 million km^2 total area is estimated as affected by various kind of degradation (Sarkar et al., 2011). Especially in India and Pakistan, 63 million ha of rainfed land and 16 million ha of irrigated land have been lost to desertification. This lost land accounts to 7% of regional agricultural gross domestic product. The small holder farmers in the region operating a 0.20 ha[3] (World Development Indicators) under high rate of tenancy produces food just to subsists. Further, with mounting pressure on land from other uses (urban infrastructure/industrial expansion) and degradation of natural resources, agricultural land is shrinking rapidly, limiting

[3] http://data.worldbank.org/indicator/AG.LND.ARBL.HA.PC

the food production. Considering the complexity of land degradation and the need for reliable, comprehensible and comparable information for planning mitigation and adaptation strategies at all levels have become inevitable.

The information on land degradation is needed for a variety of purposes like planning reclamation programs, rational land use planning, for bringing additional areas into cultivation and also to improve productivity levels of degraded lands. The information on how the degradation is progressing also enhances our preparedness in tackling the impacts of land degradation. SAC jointly with ICIMOD organized a planning meeting during 12-13th December 2013 in ICIMOD, Kathmandu with the objectives to objectives (i) document the distribution and characteristics of land degradation in each country and the region as a whole, (ii) prepare maps of land degradation status, (iii) establish causes and impacts, for major land use systems in the area, and (iv) develop methodological tools for application in field for management decision making.

The meeting was attended by focal point experts from Nepal, Scientists from Nepal Agriculture Research Council, professionals from ICIMOD, SAARC Forestry Centre, and SAARC Agriculture Centre. Some of the recommendations grouped under three thematic areas are given below:

1. SAC-SFC-ICIMOD will prepare a full blown project proposal by March 2014 circulate among the partner institutions and once approved convene stakeholder meeting in mid of 2014.
2. The project will have the objective of "Development of a methodology for land degradation assessment at local and national scales, which can be scaled up and replicated by the national institutions/ programs".

SAARC-Australia Project

1.2.1 Developing capacity in cropping systems modelling to promote food security and the sustainable use of water resources in South Asia

The SAARC-Australia Project on "Developing capacity in cropping systems modelling to promote food security and the sustainable use of water resources in South Asia" commenced in 2011 and completed in 2013. The project had been undertaken by the Sustainable Agriculture Flagship of Commonwealth Scientific and Industrial Research Organization (CSIRO), in collaboration with the International Rice Research Institute (IRRI). The main interface with SAARC was through the SAARC Agriculture Centre (SAC).

The objective of the project was to improve water productivity in rainfed and irrigated smallholder rice-based farming systems in South Asia to enhance agricultural production and food security. The project contributed to achieving this objective through the three goals: (i)

establish a network of agricultural research scientists in SAARC Member States collaborating on cropping systems analysis and modelling, (ii) apply APSIM-Oryza to identify a suite of improved crop and water management practices that increase water productivity (WP) of representative rainfed and irrigated rice-based cropping systems & (iii) strengthen institutional support in SAC and in SAARC Member States for systems analysis and farming systems modelling as a means of enhancing research impact in addressing water scarcity and other future cross-sectoral issues.

Third Training Workshop

The project was designed with a series of activities including training workshops. The 3rd Training Workshop was held during 10-13 March 2013 at SAC, Dhaka. In this workshop the trainees learnt the yield gap analysis using the data collected from their own research stations and neighbouring farmers' fields. The focus of this workshop was for trainees to learn techniques for using the APSIM model to explore yield gaps in their home cropping systems. Yield Gap, for the purposes of this workshop, was defined as the difference between the grain yields which farmers achieve (under farmers practice), and/or which regional on-station research trials achieve (under recommended practice) and what is agronomically possible (i.e. potential or unlimited yields). This exploration consisted of two components: (i) using the model to understand the existing yield gaps. What were the driving mechanisms between discrepancies? Was it water stress, N stress, or some combination of both? Did it vary between seasons, or was it generally always the same story; (ii) using the model to explore ways of closing the revealed yield gaps through agronomic and management changes. Some of the analyses are described briefly as follows:

Picture 1: Participants at the 3rd Training Workshop of the SAARC-Australia Project

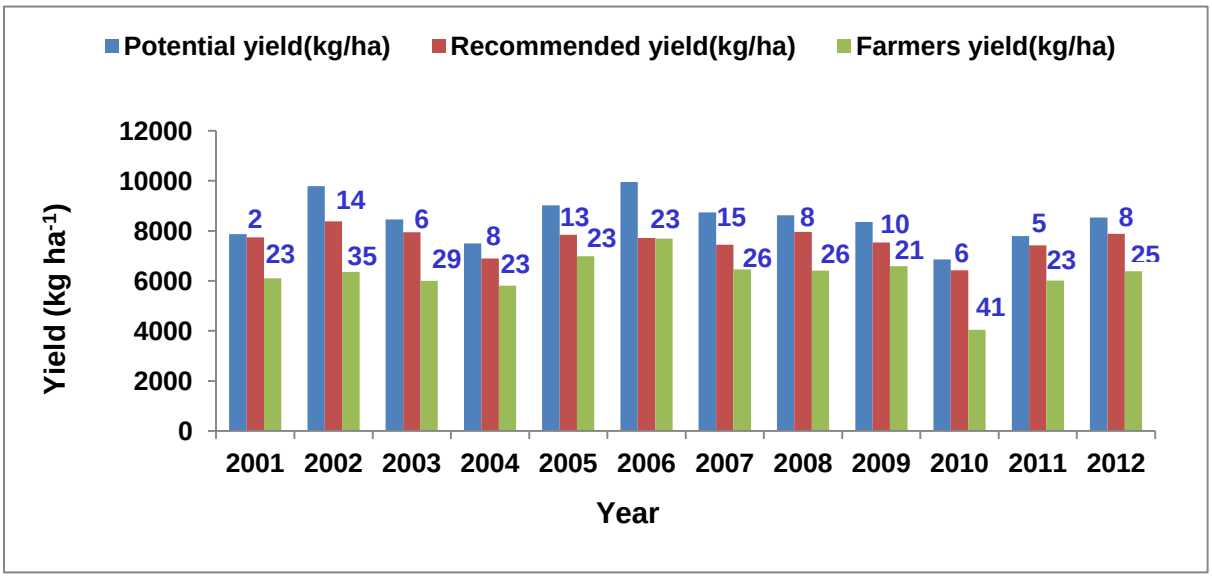


Figure 7. Yield gap of Rice under different Nitrogen application times in Gazipur, Bangladesh. Recommended practice: Irrigation based on AWD; N-140 Kgha^{-1} in 3 top dressings (15, 35 and 50 DAT). Farmers practice: Irrigation based on AWD; N-135 Kgha^{-1} in 3 top dressings (22, 42 and 57 DAT).

Yield gap analysis for Boro rice at Gazipur, Bangladesh under different nitrogen application times was carried out (Figure 7). It was observed that the average yield gap between potential and existing recommended practice was 13% while that was 23% between potential and farmer's practice. It was assumed that the yield gap was due to N stress during panicle initiation at both recommended and farmer's practices. The recommended practice may be improved by appropriate time of nitrogen application.

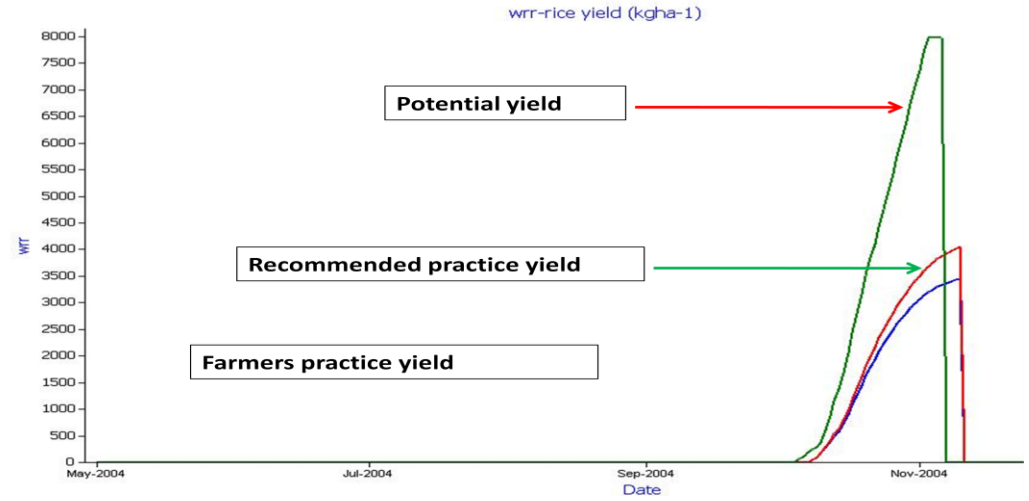


Figure 8. Yield gap of Rice under different Nitrogen limiting conditions in Bhur, Bhutan. Recommended practice: Nitrogen - 70 kgha^{-1} (35+25+15 at 0, 30 & 55 DAT). Farmers practice: Nitrogen - 40 kg ha^{-1} at transplanting only.

The yield gap analysis of rice for Bhur, Bhutan indicated that there was severe nitrogen stress throughout the growth stage both under recommended and farmers' practices (Figure 8). Focus should be given on adequate amount and time of nitrogen application as per crop requirement to increase the farmer rice yield.

The potential yield in Meghalaya region in India was around 8 t/ha providing there were no limiting factors (Figure 9). Under only water limiting (rainfed) condition the yield became 5.6 t/ha. Under recommended practice, consisting of rainfed condition and application of 80 Kg/ha Nitrogen, the rice yield was around 5 t/ha. However, the rice yield was around 4 t/ha under farmers' practice where the condition was rainfed and no nitrogen was applied. Yield gap analysis indicated that there was a yield reduction of rice under farmers' practice as well as recommended practice compared to the potential yield (Figure 10). The yield gap might be improved by better nitrogen and water management options.

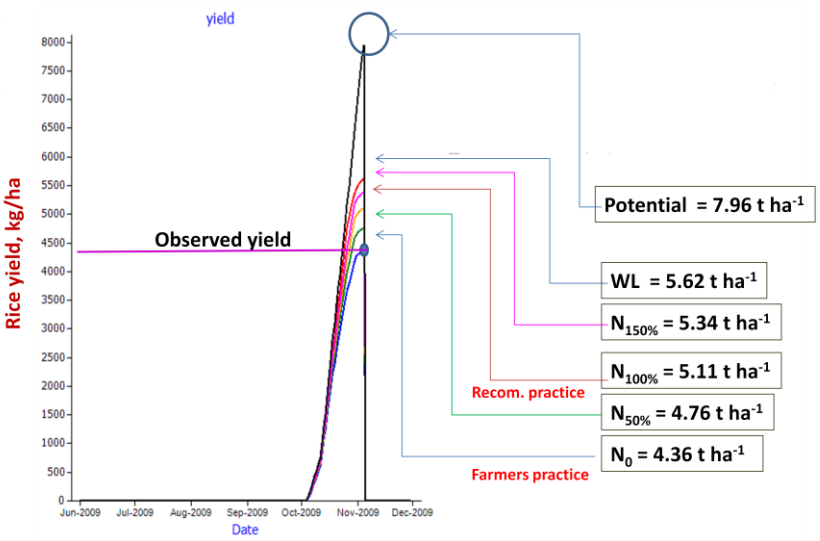
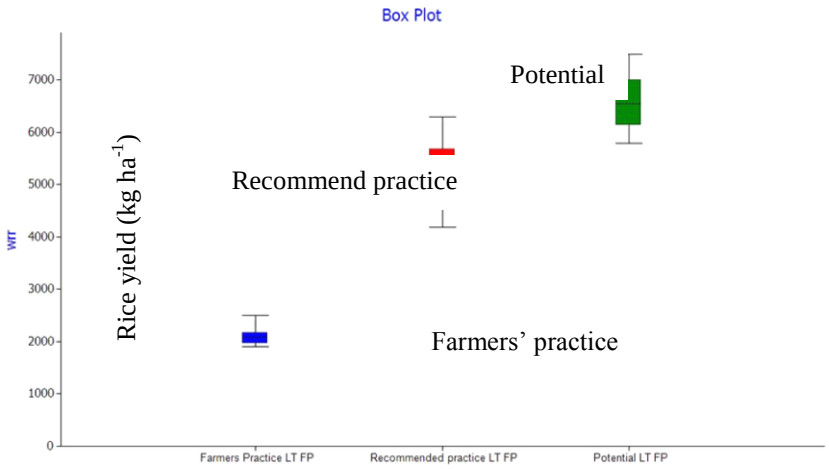


Figure 9. Yield gap of Rice under different Nitrogen and Water limiting conditions in Meghalaya, India. Recommended practice: rainfed + N 80 kg ha^{-1}; Irrigation applied between post panicle initiation to post anthesis. Farmers practice: rainfed + zero N.



The potential yield of rice at Nepalgunj, Nepal was around 6.5 t/ha providing that there were no limiting factors such as weather, nitrogen fertilizer and soil moisture. The recommended practice included application of N at the rate of 100 Kg/ha and full irrigation as per crop requirement. The farmers' practice included

Figure 10. Yield gap of Rice under different Nitrogen limiting conditions in Nepalgunj, Nepal. Recommended practice: Nitrogen - 100 kg/ha; Irrigation – 100% as per crop requirement. Farmers practice: Nitrogen - 25 kg/ha; Irrigation – 50% of the recommended.

application of N at the rate of 25 Kg/ha and 50% of the recommended irrigation. The rice yield under recommended practice was around 5.5 t/ha. Yield gap analysis showed that the lower rice yield (around 2 t/ha) under farmers' practice (Figure 10) was due to the application of very low nitrogen compared to the recommended dose. However, there was a little effect of water stress for lower rice yield under farmers practice (Data not shown). Rice yield in Nepalgunj, Nepal might be increased significantly by applying recommended nitrogen fertilizer.

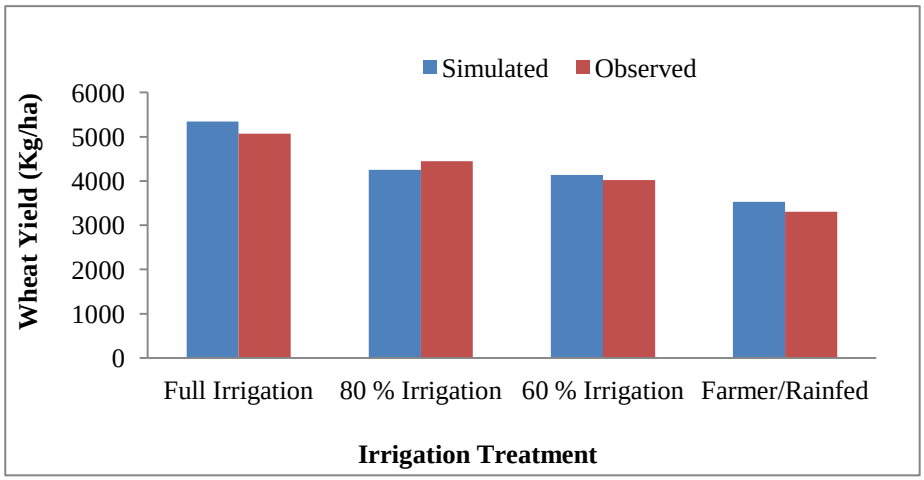


Figure 11. Yield gap of Wheat under different Water levels of crop requirement in Islamabad, Pakistan.

The wheat yields under different water regimes in Islamabad, Pakistan were compared (Figure 11). The wheat yield under full irrigation condition, i.e., as per crop requirement, was around 5.3 t/ha. When the irrigation reduced to 80% the wheat yield decreased to around 4.2 t/ha. A further decrease in yield was observed when the irrigation reduced to 60%. Under the farmers' practice, i.e., rainfed condition, the wheat yield was reduced significantly (around 3 t/ha) which indicated that there was high water stress during the crop growth. Wheat yield might be increased by minimizing water stress.

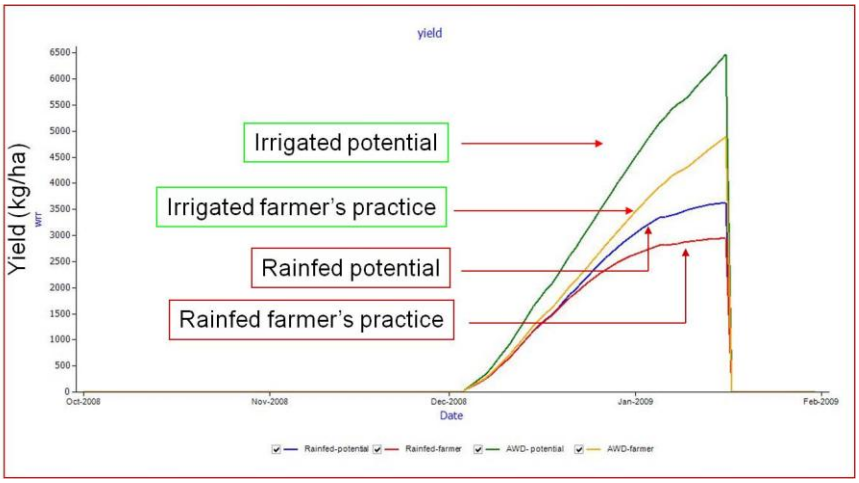


Figure 12. Yield gaps of rice between cropping environments and management practices in Kurunegala, Sri Lanka. Irrigated Potential: Irrigation interval is 7 days during 10 days after emergence (DAE) - 45 DAE, 5cm standing water from during 45 DAE - 60 DAE, Irrigation interval is 7 during 60 DAE – 85 DAE. Irrigated Farmers' Practice: Irrigation interval is 14 days throughout the growing season.

Rice yields in Sri Lanka under different cropping environments and managements were investigated (Figure 12). Simulated potential yield of rice under rainfed and N unlimiting conditions was much higher than the yield under rainfed farmers' N management practice of urea application at the rate of 87.5 Kg/ha at the time of rice transplanting. Under alternate wetting & drying (AWD) system the potential yield was much higher than that under the farmers'

practice (Figure 12). Overcoming N stress seemed to be important to narrow down the yield gap in rainfed environment. On the other hand, adopting irrigation system under irrigated potential the yield gap could be minimized significantly in the irrigated environment.

Modelling Awareness Session

An awareness session was organized on the second day (11 March 2013) of the workshop where the scientists and policy makers of the NARS institutes and Ministry of Agriculture of Bangladesh and other relevant people from different organizations in Bangladesh participated.

Picture 2: Modelling awareness session during 3rd Training Workshop of the SAARC-Australia Project

The key objective of the session was to develop awareness of the participants by explaining importance of cropping systems modelling with especial reference to APSIM-Oryza so that they can initiate as well as institutionalize the cropping systems modelling in their institutes/organizations.

Final Review Meeting

The final review meeting was held on 14 March 2013 at SAC, Dhaka conducted by the ACIAR appointed reviewers, Dr. Ian Willet (Australia) and Dr. Himanshu Pathak (India). The members of the Governing Board of SAC and advisory committee of the project, Director (ARD) from SAARC Secretariat, the project team and the project trainees were participated in the meeting. A day long presentation and discussion was held on the project activities. The reviewers review the project milestones and assessed the achievement of the project objectives. The project deemed to be very successful based on the reviewers' comments.

Picture 3: Final review followed by the 3rd Training Workshop of the SAARC-Australia Project

Project outputs

1. Twenty trainees including SAC Project Coordinator have been trained in cropping systems modelling using APSIM-Oryza to promote food security and sustainable use of water resources in South Asia.
2. Trainees' capacity was raised so that most can run APSIM-Oryza without external support, to "assistant trainer" level (able to train scientists in-country with support from CSIRO).
3. Trainees have initiated different activities in their own countries such as training other scientists and have undertaken projects using APSIM-Oryza model.
4. SAC database has been developed with the trainees' experimental data and linked with SAC website for the use as reference.
5. SAC Monograph of scientific papers are being published in which research findings on cropping systems modelling works of the trainees carried out during the project period have been included. Some papers can be published in the SAC Agriculture Journal, others in international journals.
6. APSIM-Oryza cropping systems modelling has been promoted to NARS leaders in the region so that they can take further initiative to use the APSIM-Oryza in their own institutes.
7. Dr. Ibrahim Saiyed, Project Coordinator, has been trained in APSIM-Oryza as Master Trainer and in data management.
8. SAC initiated to institutionalize the modelling position by appointing a Senior Programme Officer (NRM) after leaving the SAC Project Coordinator upon completion of the project. The Project Coordinator has been providing training on APSIM-Oryza modelling to the newly appointed Senior Programme Officer (NRM).

Project Extension

The completed project was very successful based on the outcome achieved. The reviewers were in agreement with an extension of the project. Accordingly, a follow on project was conceptualized by Commonwealth Scientific and Industrial Research Organization (CSIRO) and submitted a proposal to the AusAid for an extension of the project. Initially AusAid approved a budget under its "Sustainable Development Investment Strategy".

However, the new Australian government recently has decided to cease the activities of AusAID as an independent agency as of the 1st November 2013, and to merge AusAID with the Department of Foreign Affairs and Trade (DFAT). At the same time, the Australian government is also seeking major funding cuts to be implemented within the Australian Aid programme. As a result of these the funding allocated towards the extension of the SAARC-Australia project has also been revoked. Although the project extension has been revoked the SAC is hoping to resume the project and will try to intimate with Australian Government through SAARC Secretariat for the extension of the project.

1.3 Livestock

1.3.1 Regional study on farm animal genetic resources (FAnGR) evaluation, conservation and management in SAARC countries

SAARC Agriculture Centre (SAC) in collaboration with Department of Animal Production and Health (DAPH), Kandy, Sri Lanka convened a regional expert consultation meeting on Farm Animal Genetic Resources Evaluation, Conservation and Management in SAARC Countries during September 5-6, 2013 at Mahaweli Reach Hotel, Kandy, Sri Lanka. The expertise from Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka attended the meeting. The inaugural ceremony was graced by His Excellency Arumugan Thondaman, Hon'ble Minister of Livestock and Rural Community Development as Chief Guest, while His Excellency H. R. Mithrapala, Honble Deputy Minister of Livestock and Rural Community Development, Government of Sri Lanka was the special guest. International organizations like ILRI and WPSA (world society for the protection of animals) were also participated and presented.

South Asia is a home of good number of animal biodiversity. It is one of the world mega biodiversity Centre. As one of the world's mega biodiversity centres, SAARC Countries harbours a good number of well documented indigenous breeds of various species viz, cattle, buffalo, sheep, goat and poultry. World class high yielding trans-boundary animal breeds are (Murrah, Nili Ravi, Shahiwal, Red Sindhi) inhabitant in this region. This region belongs to promising breed like Red Chittagong Cow in Bangladesh, Nublang in Bhutan, Murrah & Gir cattle at India, Nili Ravi and Red Sindhi at Pakistan, lulu cattle at Nepal and Lankan Cattle at Sri Lanka. SAARC region has already documented approximately 80 breeds of cattle, 38 breeds of buffalo, 79 breeds of goat, 67 breeds of sheep and 56 chicken breeds respectively (Figure 13).

The first report on State of World's Animal Genetic Resources (SoW-AnGR) published by the FAO in 2007 indicated that 9% of breed were extinct and 20% are under risk. Further 36% of the breeds were classified under Unknown status. The report indicated that only 35% of world's breeds are enjoying not at risk status, which is an alarming situation for the entire world. SAARC countries harbour a good number of indigenous breeds of livestock and poultry. These valuable animal genetic resources have been developed over a period of thousands of years through natural selection and human intervention, therefore, well adapted to their respective habitat. Maintenance and management of this valuable vast diversity has become a major challenge as most of these breeds are low producers, facing genetic dilution or even complete erosion due to many factors like increasing pace of urbanization, mechanization of agriculture, over emphasis on some high producing breeds, market forces and many unforeseen factors in different parts of the country. Therefore, there is a need for every country to develop their plans for conservation and sustainable utilization of vastly distributed farms animal breeds by utilizing recently available technologies for their management.

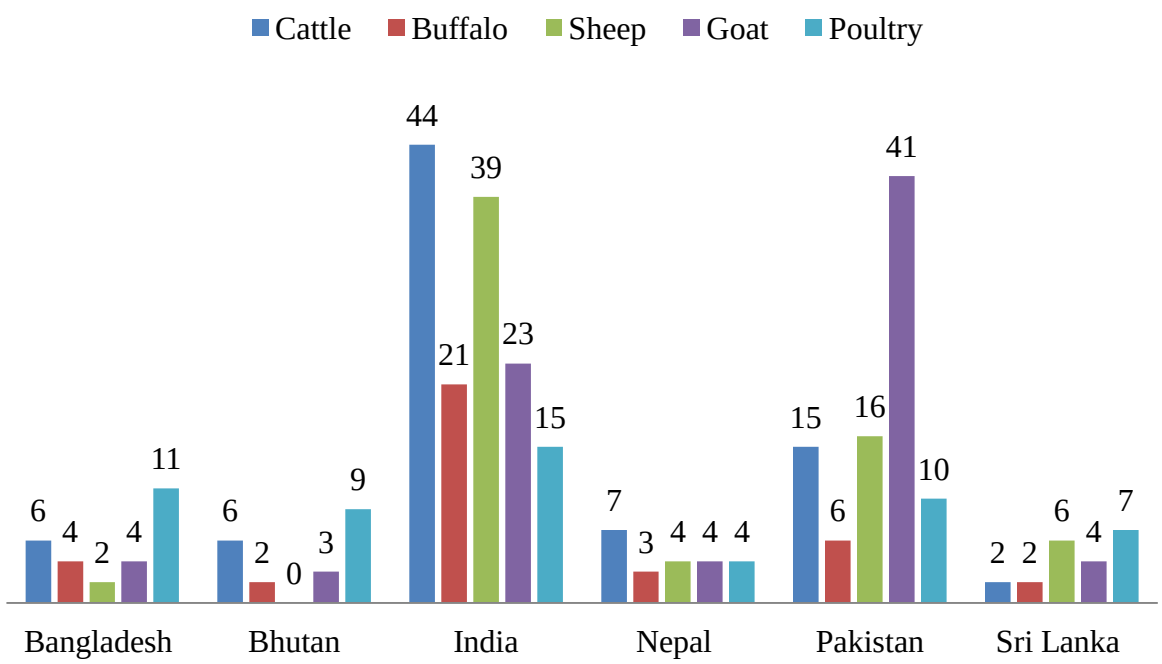


Figure 13. Farm Animal Genetic Resources in SAARC region (Population in number)

Recommendations

1. Characterization, documentation and monitoring of trends and associated risks

- In all SAARC countries a considerable proportion of FAnGR are non-descript,therefore it is required to explore such populations so as to get a complete understanding of FAnGR.
- All the identified populations/eco-types/strains deserving the status of the breed should be characterized, documented and registered so as to complete the inventories on FAnGR at national level.
- Following breed-wise information on basic population of each breed are to be collected through livestock census at a regular interval:
- Develop an early warning and response system for FAnGR.

2. Sustainable use and development of indigenous FAnGR

- Develop and implement strategic breeding programme to improve underutilized indigenous FAnGR, especially within low to medium external input production systems and pastoral systems, assess the developmental programmes periodically and revise, as appropriate, with aim of meeting envisaged economic and social need as well as market demand while keeping in mind scientific and technological parameters.
- Establish a nucleus farm for every defined indigenous breed in its native tract for performance testing and dissemination. Also develop basic animal identification and performance recording procedures under field conditions.

- Establish breed societies/associations and ensure their participation in breed development programmes and recording systems on FAnGR.
- Include more indigenous breeds under the umbrella of A.I. programme and use the semen in accordance with the current breeding schemes to ensure genetic variability.
- Integrate agro-ecosystem approaches in national agricultural and environmental policies and programmes relevant to FAnGR, where appropriate, particularly those directed towards pastoralists and rural smallholder communities as well as fragile environments. This should be aimed to make available adequate grazing land for the livestock kept under low input production systems.
- Support indigenous and local livestock production systems through removal of factors contributing to genetic erosions. Supports may include health management and extension services, financing/incentives to the farmers, marketing facilities, recognition of cultural practices and values as well as appreciation to additional value of their specialized products.
- Exploit a few unique FAnGR for their therapeutic uses and developing nich markets

3. Conservation of FAnGR

- Establishment of national and as well as state level conservation policies and programmes on FAnGR. Ensure adequate funding for in-situ as well as ex-situ conservation programmes for important and unique indigenous breeds at risk. The in-situ conservation programmes should be carried out in the native tracts with active participation of the stakeholders including breed societies/associations, communities, NGOs etc.
- Establishment of national as well as state level gene banks for in-situ and ex-situ conservation of FAnGR. The gene bank may have live animals, semen, ova and embryos.
- National priority breed(s) at risk should be identified for immediate conservation and management.
- Regular and valid population census for FAnGR should be undertaken at periodic interval.

4. Institutions and policies

- A national centre of excellence on evaluation and conservation of FAnGR should be established immediately.
- Economic and performance valuation of all existing FAnGR should be undertaken immediately at priority basis.
- National breeding plan and strategy should be developed and followed very stricktly.
- Legal instrument/ framework is needed for implementing comprehensive livestock policy, registration of animal breeds, protection of farmers' rights, control of genetic erosion of defined indigenous breeds and access to and benefit sharing of FAnGR.
- Establishment of fully functional national focal points for FAnGR. Development of strong national coordination between the national focal points and stakeholders involved in FAnGR,

such as the breeding industry, government agencies, civil society organizations, and networks and advisory committees.

- Review of national research and education capacities in relevant fields, and establish targets for training to build the national human capacity. Inclusion of special courses on management and sustainable utilization of FAnGR at graduate and post graduate levels pertaining to Animal/Veterinary Sciences. Identification of short-term, medium-term and long-term needs for research and education, and promotion of the formation of relevant cadres of national experts through international training.
- Establishment of open access new national database on FAnGR and strengthening existing databases to enable information sharing among countries.
- Development of a mechanism for export and import of farm animals/germplasm for a better management of FAnGR, especially of regional and international transboundary breeds.

5. Regional policies

- Development of regional detailed information database and network on FAnGR.
- Sharing of information about the national initiatives and policies on conservation and management of FAnGR among the SAARC member countries.
- Institutionalization of a regional reference genebank of FAnGR for conservation of transboundary animal genetic resources.
- National focal points should be identified from all SAARC member countries to maintan mutual collaboration, cooperation and networking.

6. Management of transboundary livestock and poultry breeds in SAARC countries

- Establish or strengthen international collaboration in the characterization, utilization, and conservation of transboundary breeds.
- Develop an agreement on a common set of minimum criteria and indicators for FAnGR, including means for assessing endangerment status, and methods to assess environmental, socio-economic and cultural factors related to the management of FAnGR,
- Develop technical standards and protocols for phenotypic and molecular characterization, including methods for the assessment of quantitative and qualitative production traits, nutrient utilization, functional traits and economic valuation. This makes possible the assessment of comparative breed performance in different production environments.
- Develop protocols for participatory monitoring of trends and associated risks, and characterization of indigenous breeds managed by indigenous and local communities and livestock keepers.
- Establish an integrated support arrangement to protect breeds and populations at risk from emergency or other disaster scenarios, and to enable restocking after emergencies, in line with the national policy.

- Establish regional and global networks of gene banks for FAnGR and harmonize approaches to cryopreservation via gene banks and to facilitating exchange.
- Strengthen technical cooperation and establishment of facilities for technology transfer and exchange of experience, and enhance educational and other training opportunities between SAARC countries.Support regional and international campaigns to raise awareness of the status of FAnGR for food and agriculture, and seek for strong support at the government and institutional levels, as well as among the general public.

1.3.2 High yielding dairy buffalo breed development in SAARC countries

An expert consultation meeting for the inception on High Yielding Dairy Buffalo Breed Development in SAARC Countries was held at SAARC Agriculture Centre (SAC), Dhaka, Bangladesh during 16-17 November 2013. The expertise from Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka attended this inception meeting. The inaugural ceremony graced by the Dr. Shelina Afroza, Secretary, Ministry of Fisheries and Livestock, Bangladesh. The meeting deliberated and recommended modalities of buffalo breed development in this region. The meeting also identified national focal authority for future networking approach among the stakeholders. Inception meeting appraised sharing of promising buffalo germplasm, expertise and experiences among the SAARC member countries for mutual benefits.

Buffalo is considered the dairy animal for 21st century due to its high adaptability in changing climatic conditions. South Asia is home of world class high yielding buffalo breed of Murrah, Nail Ravi, Jaffarabadi, Parkote and many other promising breeds. Most of the SAARC member countries possess a good number of identical and non descriptive buffalo biodiversity. According to FAO (2011) estimate, about 79.74 % of Asia and 77.50 % of world buffalo population are inhabitant in SAARC region (Figure 14). The total buffalo population is around 34.80 % of the total cattle and buffalo population in SAARC countries. Among SAARC countries, the buffalo population is highest in India followed by Pakistan, Nepal, Bangladesh, Sri Lanka, and Bhutan. According to FAO (2011) estimate, about 96.05 % of Asia and 93.19 % of world buffalo milk are produced in SAARC countries. Buffalo contributes around 54.95 % of the total milk production whatever is coming from cattle and buffalo sources from the SAARC countries. Buffalo contributes 51.4% in India, 67% in Pakistan and 73% in Nepal of total milk production.

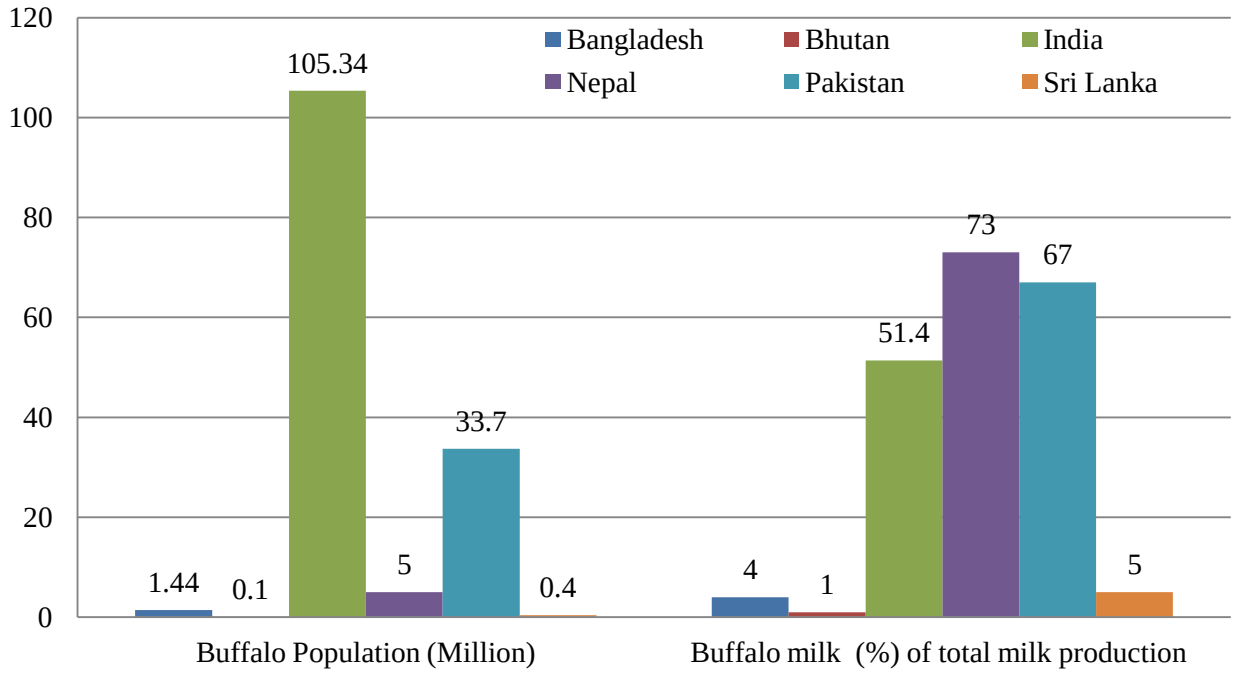


Figure 14. Buffalo population and its contribution in total milk production at SAARC countries

Recommendations: The expertise discussed and suggested recommendations on three different thematic are as follows:

Theme 1: Import policy guidelines of Buffalo germplasm for SAARC countries (Bangladesh, Bhutan, Nepal, Sri Lanka and other countries)

A. Policy Recommendations for Germplasm Import

1. Import of buffalo germplasm (semen, embryos and live animals) will be permitted for breeding, research and development purposes (in institutional /organized herds, peri-urban herds/ dairy un-organized in rural areas/any other buffalo herds recognized by competent authority/government agency).
2. The importing countries will not demand the germplasm/live animals of those indigenous buffalo breeds which has been declared threatened/endangered by the exporting country
3. The import of germplasm will be allowed subjected to the fulfilment of following conditions
    - For import of germplasm, order of preference shall be frozen semen, frozen embryos and live animals. However, based on the demand of the importing country, the exporting country shall fulfil their requirement.
    - Imported buffalo germplasm will conform true to the breed characteristics.
    - During import of germplasm average milk production and fat percent records of imported breeds will be above the breed averages of the exporting countries.
    - Health certificate of buffalo germplasm requested by the importing countries/authorities will be provided by the exporting country

- For import of semen/embryo/ova, the collection and processing techniques as mentioned by the OIE terrestrial animal health code (2005) as amended from time to time
- The exporting agencies will provide the requirement of import of the countries which are interested in importing buffalo germplasm (live animals, semen, ova, embryos and gonads) and also provide their import policy documents and health protocol to the concerned authority. The exporting agency from respective country will comply with the rules and regulations as intimated by concerned government authority.

B. Material Transfer Agreement (MTA)

1. The material transfer agreement has been approved by the six meeting of the TCARD (Technical Committee on Agriculture & Rural Development) held in Dhaka during 10-12 October 2010 and subsequently ratified by the SAARC member states.

Theme 2: Capacity building of the professionals

1. Training (Short Term) - Buffalo breed characterization, progeny testing, animal recording and analysis; Nutrition – Feed formulation and conservation; Reproductive herd health management – including USG; Frozen semen technology and AI; Disease surveillance and monitoring of buffalo herd

2. Participation in seminar and workshop: First / presenting author of a scientific paper may be supported partially / fully to participate in seminar on buffalo science organized in SAARC countries, or in Asian / World Buffalo Congress.

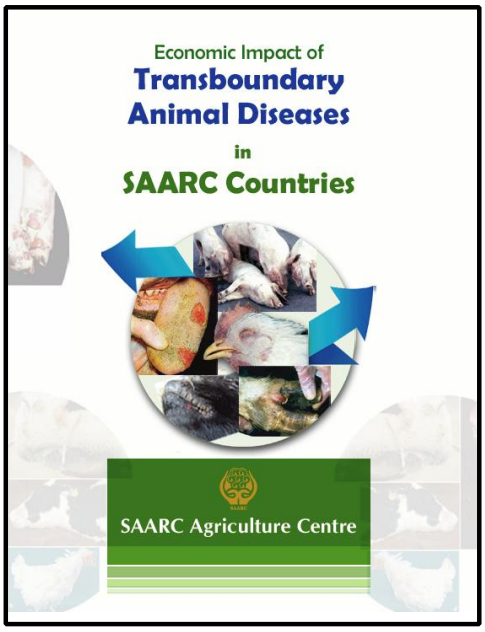
3. Collaborative Research: Progeny testing and adaptive breed development of Murrah and Nili-Ravi in SAARC countries; Methodological development of reproductive efficiency management in field buffalo; Assessment of location specific nutritional/mineral deficiencies for supporting appropriate feed formulation for buffalo; and Buffalo feed formulation as mitigation strategy for methane emission.

Theme 3: Knowledge Management and Information Sharing

- Develop a SAARC Harmonized Code of Rules for sharing the buffalo germplasm information among the SAARC member countries. The draft Code of Rules should be forwarded for approval by the appropriate authority through the SAARC Secretariat.
- Development and posting of data base on buffalo breeds in SAARC countries
- Characterization of a non-descript buffalo breeds /varieties of SAARC countries (Phenotypic, Molecular etc)
- Buffalo disease information sharing for effective prevention and control in SAARC countries
- Share success stories among the SAARC countries related to buffalo development
- Arranging E-conference on buffalo development in SAARC Countries

- Prepare farmers manual on buffalo rearing
- Prepare an effective manual on milk and milk products for small entrepreneurs/self help groups
- Exchange of extension materials for the improvement of buffalo productivity through improved management.
- Organize seminar/symposium/workshop in SAARC countries on rotation basis through SAC
- Publishing Buffalo bulletin highlighting the breed promotional activities
- Exposure visits of extension professionals/ scientists/ policy makers/farmers
- Awareness campaign to develop habit of "drinking milk " at national and regional level

1.3.3 Economic impact of trans-boundary animal diseases



Trans-boundary Animal Diseases (TAD) are those that are of significant economic, trade and/or food security importance for a considerable number of countries; which can spread to other countries and reach epidemic proportions; and where control/management, including exclusion, requires cooperation among several countries. South Asian Association for Regional Cooperation (SAARC) member states share common borders and trade agreements, which are prone to TADs. Some of the important animal diseases with the potential to spread across the borders and affect economic relations between these countries are Highly Pathogenic Avian Influenza (HPAI), Foot and Mouth Disease (FMD), Peste des Petits Ruminants (PPR), Haemorrhagic Septicemia (HS) and Classical Swine Fever (CSF).

FMD, PPR and HS are endemic in Bangladesh, while there is no report on CSF outbreak. A total of 59,181 cases of FMD, 84,087 cases of PPR and 3,437 cases of HS were reported at Upazila Veterinary Hospitals of the country in 2010. Exact incidence of these diseases would be several fold higher as only a fraction of cases are brought to hospitals for treatment. Since the first incursion of HPAI in Bangladesh in February 2007, a total of 519 events have been reported to the World Organization for Animal Health (OIE) as of 14 November 2011. Eradication through stamping out without vaccination has been the policy for HPAI control. Vaccination is practiced, though at a suboptimal level, for control of FMD, PPR and HS.

Analysis of economic impacts of TADs in Bangladesh is rather limited. In the absence of published information, hypothetical predictions of economic impact of FMD, PPR and HS were performed for the present report. The predicted annual direct loss stands at Tk. 819 million (US$ 10.92 million) for FMD, Tk. 1,842 million (US$ 24.56) for PPR and Tk. 1,105 million (US$ 14.74 million) for HS. Indirect loss from the diseases and overhead cost of the state veterinary

services were not considered for this analysis. A study on the economic impact of HPAI outbreaks in 2007 and 2008 was conducted at Bangladesh Livestock Research Institute (BLRI). The study estimated a total loss of Tk. 38,583 million (US$ 551 million) due to HPAI outbreaks in the first two years. The estimate included direct loss of Tk. 86 million, indirect loss of Tk. 2,497 million and the loss due to production downtime effect of Tk. 36,000 million. If the figure adjusted to the outbreak data of total five years, 2007-2011, the total loss would stand at Tk. 51,720 million (US$ 690 million).

In Bhutan, FMD is the priority disease with major economic impact followed by Avian Influenza, Hemorrhagic Septicaemia, Swine Fever and PPR based on the disease outbreak trend and economic losses to the communities.

In India economic impact of FMD incidences in four districts of Andhra Pradesh was studied. The results obtained from the study were extrapolated to approximately understand the economic dimensions of FMD outbreaks in the state and the country. The extrapolation was made based on an assumption that the proportion of different species of livestock and the disease prevalence would be similar in other areas too. From the projection, the estimated loss due to reduced milk output, the loss due to reduction in draught power, treatment of ailing animals, and the loss due to mortality and culling would be Rs. 388.58 crores, Rs.398.79 crores, Rs.351.41 crores and Rs.8.53 crores, respectively. Thus, the total economic loss estimated due to the setback that had occurred to livestock in study area in the form of FMD outbreak could have been to the tune of Rs.1147.31 crores in Andhra Pradesh.

In Nepal there are various infectious diseases of livestock and poultry prevalent in the country. The foot & mouth Disease (FMD), peste des petits ruminants (PPR), haemorrhagic septicemia (HS), classical swine fever (CSF), Newcastle disease (ND), highly pathogenic avian influenza and sheep & goat Pox are major TADs. The attempt has been made in this report to include the present status of the TADs and also the information available on the economic impact of some of the TADs in Nepal. However data on economic impact of TADs is scarce therefore it is necessary to carry out detail assessment of the economic impact of priority TADs in Nepal.

Pakistan has common borders with India, China, Iran and Afghanistan. Therefore, many of the trans-boundary animal diseases such as foot and mouth disease (FMD), peste des petites ruminants (PPR), hemorrhagic septicemia (HS) in livestock; and highly pathogenic avian influenza (HPAI) of poultry etc. are prevalent in Pakistan. The federal and provincial departments of livestock and poultry production are engaged to control these TADS in close coordination with the federal institutions. The major disease control activities are treatment of sick animals, vaccination of susceptible populations, launching of TADs awareness campaigns for public and livestock/poultry owners, setting up of disease reporting and surveillance work in high risk areas. All the TADS reported in Pakistan cause losses worth billions of dollars every year despite the efforts by the government authorities.

Sri Lanka has been endemic for two main trans-boundary diseases foot and mouth disease (FMD) and hemorrhagic septicemia (HS) for decades. There have been outbreaks of classical swine fever (CSF) too. The low country dry zone where the livestock farming is one of main income source was the enzootic area for FMD and HS. The diseases has originated there and transmitted to other areas through cattle and buffalo transportation. The socio economics of livestock farmers those who earn their living out of livestock farming had severe impact due to HS and FMD for year and years. The prophylactic vaccination program on HS has succeeded to control the disease completely for 7 consecutive years in the country. Even though the classical swine fever had severe economic losses in swine sector before 1999, the disease has not reported been since then. The diseases of peste des petits and avian influenza have not been reported in Sri Lanka.

Apart from economic impact TADs also may have price and market effects, trade impairment, impacts on food security and nutrition, livelihood and employment, health and environment. However, these impacts would be different for different diseases. Although all the important TADs could have impact on livelihood of the farmers and could affect food and/or nutritional security, HPAI also have impacts on employment, public health and environment.

Control of TADs usually demands a regional and global approach. Policy decision regarding control options for a TAD must be economically viable. This should be based on a cost benefit analysis, i.e., analysis of the benefit in terms of reducing economic impact of the disease against the investment in disease control. To begin with, a systematic structured survey on the incidence of selected TADs and their economic impact should be conducted in each country using a uniform economic analysis model.

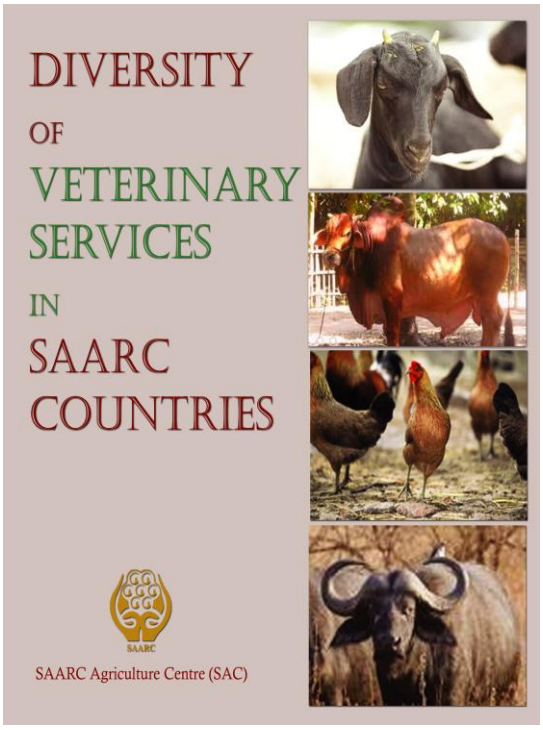
The public health concern and severe economic impact of HPAI would justify eradicating the disease by stamping out approach. For FMD a progressive control could be the rational option. Targeted vaccination of high value animals, ring vaccination in the face of an outbreak could be the viable option for the time being. However, improvement of facilities for quick detection and sero-typing of virus as well as sero-monitoring of vaccinated animals is necessary. A similar strategy might fit for HS. However, it might be possible to target eradicating PPR through mass blanket vaccination across the region. The cost-benefit analysis of such control strategy for PPR is very likely to be economically viable.

Stronger coordination and collaboration amongst various institutions involved in disease diagnosis, its prevention and treatment, as well as disease monitoring and response, within the country and across the region so as to make it easier to exchange information on TADS at the national, regional, and international levels.

1.3.3.1 Assessment of diversity of veterinary services

SAARC Agriculture Centre (SAC) has initiated a program on “Diversity of Veterinary Services in SAARC Countries” during 2012 and requested the respective member states to nominate focal point experts on the above subject to prepare the country status report. Centre received seven

country status reports prepared by focal point experts from Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka. Later on, these country reports were discussed in details on an expert consultation meeting organized by the centre in collaboration with Pakistan Agricultural Research Council (PARC), Islamabad, Pakistan during 17-18 July 2012. Finally, the centre has published the proceedings of country status report along with consultation recommendations.



Veterinary services in the SAARC countries can still be said to be in the public sector. Veterinary services in most of the SAARC countries have been traditionally funded, managed and delivered by the public sector with significant subsidies or on free basis. All of these facilities offered started with animal health facilities through stationary clinics manned by professional and sub professional staff that provided medicinal treatments, some surgeries and preventive vaccinations. Gradually animal production activities like animal breeding including artificial insemination, nutrition, vaccine production, semen production, public health aspects, animal quarantine etc were introduced with varying infrastructure initially in conjunction with agriculture and then independently. The services were also expanded to reach villages but by and large the approach remains clinic based. Moreover, except Afghanistan, no other countries has the status of cost of veterinary services paid by the farmers. Afghanistan veterinary extension system is unique in the region having the entire rural animal health extension system in the private sector (Veterinary Field Units) under what is known as Sanitary Mandate. These units provide services at cost to the livestock farmers. However, other aspects of veterinary extension system like public health, animal quarantine and animal breeding remain in the public sector. India has the largest veterinary extension system with four levels of systems mostly under state departments of animal husbandry.

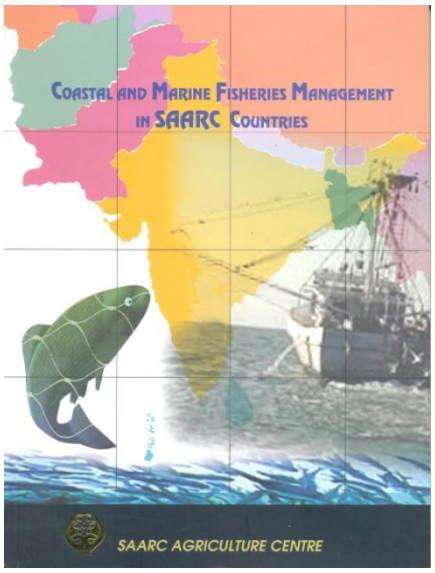
Veterinary research systems in all the countries started rather modestly at different dates with small institutes dealing mainly with disease diagnosis and vaccine production. Initially, all these were part of the veterinary extension system but they expanded/branched out into veterinary research systems. India blazed the trail of the concept of agriculture research councils with veterinary/animal science as its component. This system has been followed and established by four other countries with donor assistance. Bhutan has followed a different system of RNR research and development centre with more or less similar objectives as the agriculture research councils.

Except Bhutan all the remaining six countries have veterinary education system based on degree programs awarded by the universities. These universities also have degree programs leading to master's and doctorate degrees on various aspects of veterinary science. Bhutan has only diploma program awarded by the college of natural resources. India offered the degree programs on veterinary science, animal husbandry, dairy technology and fisheries at a large number of colleges/faculties of the universities. Most of the countries have non degree education systems that vary from one month courses to 2-3 years diplomas.

The veterinary planning process from the identification of problems to setting priorities and allocation of resources and finally the budgeting is informal and ad hoc without the involvement of the principal stakeholder namely the farmers. The system of informally gathering the farmers' problems by the field staff is fraught with inaccuracies. There is no involvement of farmers in setting the priorities and even the departments of veterinary research and extension are hardly consulted in resource allocation and budgeting. Thus the entire planning process takes place more or less in isolation and without any real involvement of the stakeholders at different stages of the planning process.

1.4 Fisheries

1.4.1 Coastal and marine fisheries management in SAARC countries



Coastal and Marine fisheries management in the SAARC region is an emerging issue for better governance of its marine fisheries resources. Scientists and managers of SAARC region are continuously working in this direction with different country specific problems. An attempt has been made to organize and bring out the best available practices in coastal and marine fisheries management in the region, a technical synthesis on Coastal and Marine Fisheries Management in SAARC Countries has been prepared based on the country papers presented at consultation meeting held in Male, Maldives during 20-21 November 2012 and relevant literature reviewed with the help of officials/experts in the region. Since, this is the first regional marine fisheries management initiative there should be vision statements, and as the long-term vision/s for the coastal and marine fisheries management/s and their crossing points in three Large Marine Ecosystems (LME); Bay of Bengal, Arabian Sea and Indian Ocean. This document will serve as source of information for researcher, students, academicians and policy maker for the management of coastal marine fisheries management in SAARC region.

The LMEs shall continue to provide subsistence resources to fishers, fish and other aquatic organisms at a level in which the sustainability of the resource is ensured, and improving current resources management practices.

Traditional fishers will acquire a greater awareness on responsible exploitation and shared responsibility and will act accordingly to help conserve the renewable resources.

The national governments and other relevant government agencies such as the Department of Fisheries will involve coastal people and fisher flocks to harvest resources based on Maximum Sustainable Yield (MSY). They will assist fisheries agencies to develop its capacity including infrastructure, logistics and technical capacities and seek technical assistance where appropriate in the marine and coastal fisheries management. Development of alternative livelihood options in the coastal areas will help adapt the local community to seasonal variations and climate change scenarios. The fish and other renewable aquatic resources will prosper throughout the SAARC where populations will continue to depend on aquatic protein. The Marine Protected Areas (MPA) and sanctuaries will be managed to provide secure habitat for aquatic lives and fish resources. Specific sites, especially coral reef dominated areas of the SAARC will be developed and/or maintained to provide for quality ecotourism experiences.

Several interdependent strategic management programs developed within national boundaries in the last few years in SAARC coastal countries will contribute to the achievement of the following planning goals and outcomes for the sustainable management of the coastal and marine fisheries in the regions:

	Goal	**Outcome**
1	Formulate/updates policies, ordinance, acts, regulations for coastal and marine resources managements	- National program/s for the development of coastal and marine fisheries will get due importance and will be incorporated within national development planning.
2	Exploration to quantify the stock in a habitat and/or ecosystem and determine the maximum sustainable yield (MSY)	- Carrying capacity of a given ecosystem will be known; judicious and orderly utilization of renewable and non-renewable coastal and marine resources would be outlined.
3	Provide low-cost but high quality animal protein, lipid and mineral rich fish and other aquatic organisms to one fourth of man-kind on globe	- Resource use is based on sustainability, cautious planning and management based on best available science and through information, knowledge and acquired skills.
4	Provide for resilience-based food security, food right and food sovereignty through provisions of subsistence uses of fisheries, values, benefits, products, and services and ensuring sustainable supply for future generations	- Renewable resource uses is done on the basis of availability, well management and - and consultations with all stakeholders
5	Protect, restore, sustain and enhance the biodiversity of the LMEs of SAARC countries	- Coastal seas, territorial waters and EEZ of each country and their biotic and abiotic resources with the representative capacity will be able to maintain their health, productivity, diversity and resilience.
6	Provide for implement climate change and trans-boundary issues through co-management initiatives among member countries of SAARC	- Will enhance the ecosystems resilience for improved adaptation of local communities to climate change impacts including cyclones and storms.
7	Provide for and enhance sea and mangrove based eco-tourism and visitor exchange for recreation opportunities among SAARC countries.	- Eco-tourism will create alternative employment opportunities among fishers who over-exploits in coastal areas and also destroy coral reefs, mangroves. The initiatives will enhance biodiversity conservation and trapping of blue and green carbons in coastal areas.

Information on marine fisheries and its management planning of all five coastal countries in SAARC is vital to prepare a comparable document. Coastlines in five SAARC countries are not uniform; south of Bangladesh and part of India is delta with alluvial pans and coastal tributaries of important rivers. With the depository pan of these rivers this zone keeps on expanding in land area outward onto the Bay of Bengal due to land accumulation. Whereas, the coastline in Pakistan and western part of India is characterizes by sandy beaches and salt lagoons. Coastline in Sri Lanka is in combination of stony and sandy beaches, mangroves and salt logons. Coast line in Maldives are characterizes by corals and the elevation of land compared to sea level is negligible.

The SAARC coastal countries are interconnect by a complex network of marine ecosystems in three large LMEs. In addition, these LMEs are source of some important marine fishing industry in the region whose stocks may have originated from the common sources. The ecological and socio-economic importance of fisheries in SAARC is associated with its rich biodiversity and the ecosystem's valuable ecological services and products. It is estimated that the Bay of Bengal, Arabian sea and the Indian Ocean is home to thousands of aquatic species, of which hundreds of species have economic importance including fish, shrimp, crab, cephalopods, gastropods, bivalves, corals and sea weeds etc.

The coastal and marine parts in the region serves a vital role in a variety of ecosystem functions including trapping of silt and sands for delta based land formation, allows speedy growth of corals for reef formation, protect human lives and habitation from regular storms, cyclone and tidal bore, traps blue and green carbons as part of climate change mitigation and adaptation through carbon sequestration, storage and cycling, and supplies numerous species of marine organism for human consumptions and industrial uses.

Management of both coastal and marine fisheries of the region separately by nations and regionally for yielding aquatic and marine products, and generating services while maintaining their environmental and ecological roles and functions is feasible but complicated. A vital succession responsible for the sustainability of the marine region as a productive zone is the responsible harvesting of renewable resources based on planning, well estimated stocks and MSY.

Appropriate coastal and marine fisheries management needs to be part of biodiversity and integrated coastal zone management strategy so that perennial earnings of fisher flocks can be maintained in perpetuity. Such a management system should be perceived as viable alternatives against currently practiced fishermen to totally dependent on fish catch. Attention should be given to the protection and conservation of resources for sustainable uses, and its recreational and other values.

Salinity levels in the coastal zones of SAARC countries are determined by physical forcing from freshwater flows in continental landmasses of Bangladesh, India and Pakistan especially at estuaries and river mouths. Three mighty river systems in the world, the Ganges, the Brahmaputra and Indus flows among SAARC countries, which are fed by snowmelts in the Himalayas and monsoon rains, is maximum during monsoon season (June-September), which coincides with the formation of a counter-clockwise gyre in the Bay of Bengal and Arabian seas.

The high amount of nutrients carried by river flows coupled with sunlight and temperature, results in highly productive coastal fisheries, which supply much needed food security including aquatic protein to local community and beyond.

Protection of ecologically critical marine areas with objectives of providing protection to the fragile ecosystem and habitat and conservation of its biodiversity is important and integrated coastal zone management may be designated as the interface between land and sea in the context of climate change adaptation through value chain and livelihood enterprises and support for environmental and biodiversity conservation.

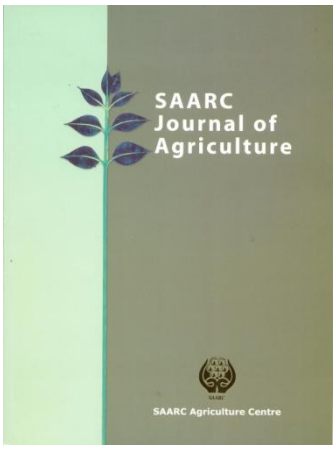
There has been a great deal of change in the sea resource use patterns of the SAARC countries with development of modern harvesting tools. The livelihoods of the traditional fishers in coastal areas are often threatened due to industrial fishing. Developed of fish and shrimp culture in coastal region has not adequately created alternative livelihoods for them. The coastal people dependent on fishing is characterized by poverty, natural calamities, poor education and health services, drinking water scarcity, and little income opportunities, all of which contribute to high biotic pressure on the natural resources of the coastal sea.

Based on the current resources management situations in coastal SAARC countries, some strategic and interlinked fisheries management programs are needs to be developed for their implementation in respective countries as well as to address trans-boundary issues among the SAARC countries for the future.

KNOWLEDGE MANAGEMENT

2 Knowledge management and networking

2.1 SAARC Journal of Agriculture



SAARC Agriculture Centre (SAC) has been publishing half yearly peer reviewed journal "SAARC Journal of Agriculture" since 2003. It is a half yearly publication from the centre and serves as a platform for exchange of latest knowledge on breakthrough topics that are of current concern. It publishes original research articles as well as review articles in all areas of agriculture, animal science and fisheries from SAARC member countries. It is indexed by Centre for Agriculture and Biosciences International (CABI). The volume 11, issue 1& 2 has been published with full length papers (26) and short communications (3).

2.2 SAC publications

In 2013 the Centre published the following documents

1. Best Practices and Procedures of Saline Soil Reclamation Systems in SAARC Countries
2. Developing Capacity in Cropping Systems Modelling for South Asia
3. Diversity of Veterinary Services in SAARC Countries
4. Economic Impact of Trans-boundary Animal Diseases in SAARC Countries
5. Extent and Potential use of Bio-pesticides for Crop Production in SAARC Countries
6. National Agricultural Education System in SAARC Countries
7. SAC Monograph- Developing Capacity in Cropping Systems Modelling for South Asia, SAARC Australia Project
8. Popularizing multiple cropping innovations as a means to raise crop productivity and farm income
9. Coastal and marine fisheries management in SAARC countries
10. Quality Seed in SAARC Countries: Production, Processing, Legal and Quality Control and Marketing System (Reprint)
11. SAC Annual report 2012
12. Food grain situation Bulletin
13. SAARC Journal of Agriculture

2.3 Technology dissemination

2.3.1 Videos on agro-technology collected in 2013

No	Title of the AT video	Collected from
01	Innovative Agricultural Research Assuring Socio-Economic Development in Sri Lanka	Sri Lanka Council for Agricultural Research Policy, Ministry of Agriculture Sri Lanka

2.3.2 Video on agro-technology distributed 2013

No	Title of the AT Video	Sent to
1	Little Fishes and Tiny Nets (India)	The Governing Board Members from Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, India, Pakistan and Sri Lanka
2	The Greedy Fish Farmer (India)	
3	Greening the Sea: The Story of Green Mussel Cultivation in India	
4	Yellow fin Tuna Fishing: Some Glimpses (India)	
5	Monsoon Season Post Harvest Losses Traditional Fish Processing in India	
6	New Horizons in Mariculture: Culture of Seabass in open Sea Cage (India)	
7	CMFRI: The Saga Continues (India)	
8	Farming Jewels from the Sea (India)	
9	CIFT-The Wave Riders (India)	

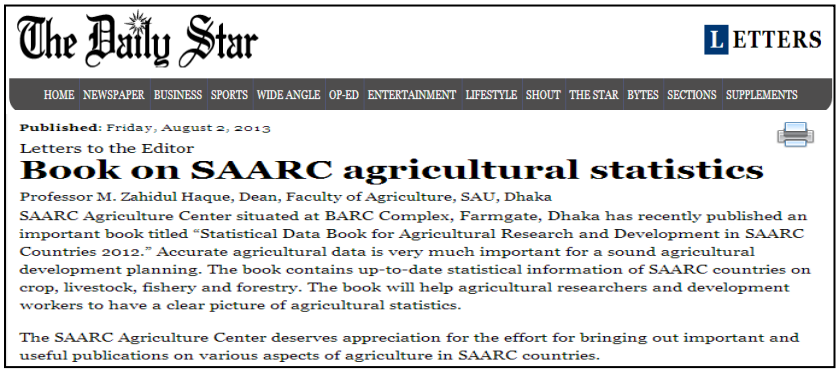
2.3.3 SAC in news media

जागरण सिटी
हरियाणा

www.jagran.com

सार्क देशों में भूमि सुधार पर मंथन शुरू

A local news paper in Haryana, India "Jagran City" reported on the regional consultation meeting on "Best practices on reclamation of saline soil in SAARC Countries" which was held in CSSRI, Karnal, Haryana, India during 27-30th November 2013.



The Daily Star

LETTERS

HOME | NEWSPAPER | BUSINESS | SPORTS | WIDE ANGLE | OP-ED | ENTERTAINMENT | LIFESTYLE | SHOUT | THE STAR | BYTES | SECTIONS | SUPPLEMENTS

Published: Friday, August 2, 2013

Letters to the Editor

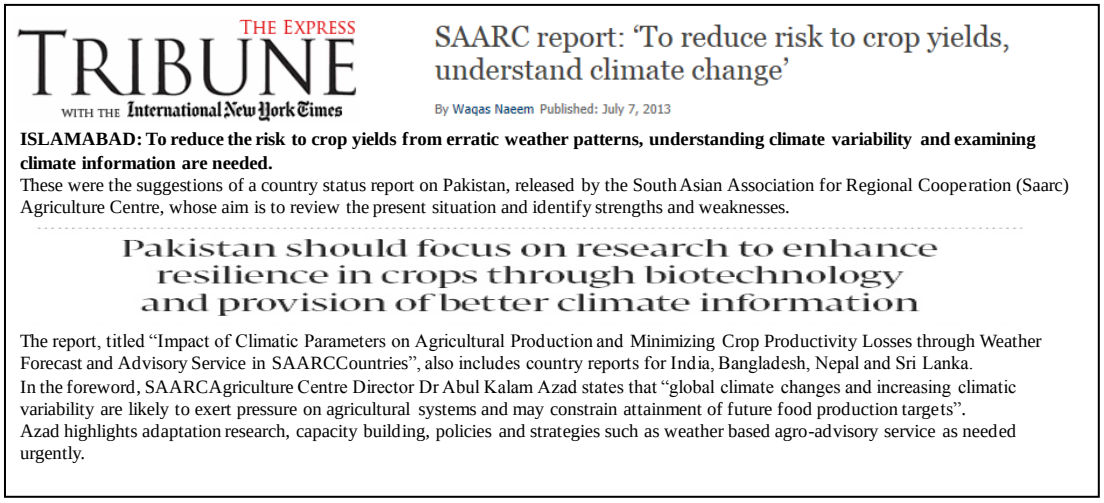
Book on SAARC agricultural statistics

Professor M. Zahidul Haque, Dean, Faculty of Agriculture, SAU, Dhaka

SAARC Agriculture Center situated at BARC Complex, Farmgate, Dhaka has recently published an important book titled "Statistical Data Book for Agricultural Research and Development in SAARC Countries 2012." Accurate agricultural data is very much important for a sound agricultural development planning. The book contains up-to-date statistical information of SAARC countries on crop, livestock, fishery and forestry. The book will help agricultural researchers and development workers to have a clear picture of agricultural statistics.

The SAARC Agriculture Center deserves appreciation for the effort for bringing out important and useful publications on various aspects of agriculture in SAARC countries.

http://archive.thedailystar.net/beta2/news/book-on-saarc-agricultural-statistics/



THE EXPRESS TRIBUNE
WITH THE International New York Times

SAARC report: 'To reduce risk to crop yields, understand climate change'

By Waqas Naeem Published: July 7, 2013

ISLAMABAD: To reduce the risk to crop yields from erratic weather patterns, understanding climate variability and examining climate information are needed.

These were the suggestions of a country status report on Pakistan, released by the South Asian Association for Regional Cooperation (Saarc) Agriculture Centre, whose aim is to review the present situation and identify strengths and weaknesses.

Pakistan should focus on research to enhance resilience in crops through biotechnology and provision of better climate information

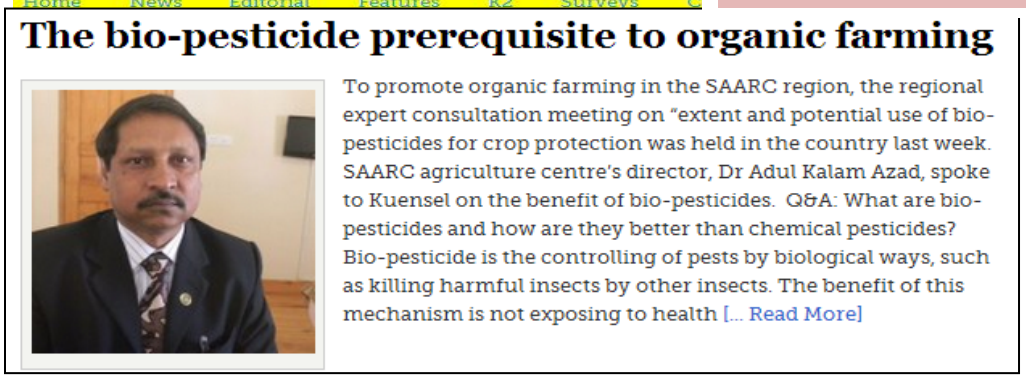
The report, titled "Impact of Climatic Parameters on Agricultural Production and Minimizing Crop Productivity Losses through Weather Forecast and Advisory Service in SAARCCountries", also includes country reports for India, Bangladesh, Nepal and Sri Lanka.

In the foreword, SAARCAgriculture Centre Director Dr Abul Kalam Azad states that "global climate changes and increasing climatic variability are likely to exert pressure on agricultural systems and may constrain attainment of future food production targets".

Azad highlights adaptation research, capacity building, policies and strategies such as weather based agro-advisory service as needed urgently.

http://tribune.com.pk/story/573436/saarc-report-to-reduce-risk-to-crop-yields-understand-climate-change/

Dr. Abul Kalam Azad, Director, SAC speaks to Bhutanese National Newspaper on Bio-pesticide during the consultative meeting in Bhutan during 23-25 December 2013.



The bio-pesticide prerequisite to organic farming

To promote organic farming in the SAARC region, the regional expert consultation meeting on "extent and potential use of bio-pesticides for crop protection was held in the country last week. SAARC agriculture centre's director, Dr Adul Kalam Azad, spoke to Kuensel on the benefit of bio-pesticides. Q&A: What are bio-pesticides and how are they better than chemical pesticides? Bio-pesticide is the controlling of pests by biological ways, such as killing harmful insects by other insects. The benefit of this mechanism is not exposing to health [... Read More]

http://www.kuenselonline.com/the-bio-pesticide-prerequisite-to-organic-farming/#.UwVzZ_mSxWU

Bhutanese national newspaper "Kuensel" reported on the review of the SAC initiated vegetable adaptive trials in the region.

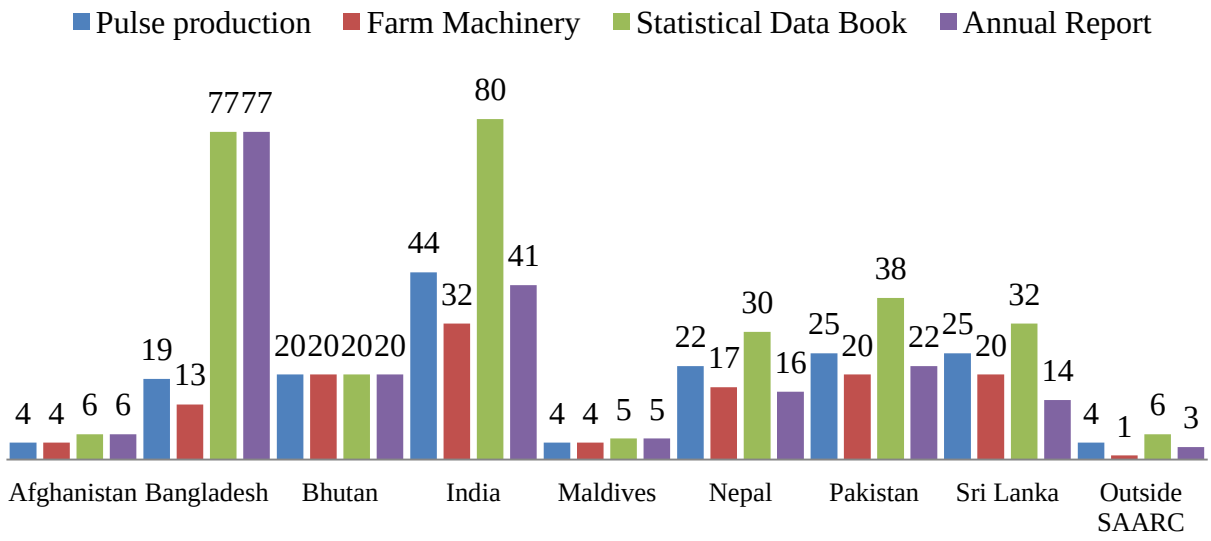
http://www.kuenselonline.com/six-nations-review-trial-growth-of-five-vegetables/#.UwVzHvmSxWU

2.3.4 SAC AgriNews

This is a quarterly publication contains information on successful technologies/success stories generated in the fields of crops, fisheries, forestry, livestock, etc. in different SAARC member countries. Its volume Vol, 6, issue 4 and Vol, 7, issue 1, 2 and 3 were published in 2013.

2.3.5 Distribution of SAC publication

167 Pulse productions, 131 Farm Machinery, 294 Statistical Data Book, and 204 Annual Report



During 2013 SAC publications were sent to 3,784 researchers/officials of NARS and NAES of SAARC countries, agricultural education institutions of SAARC countries VIPs, International organizations, Focal Points Scientist and donors.

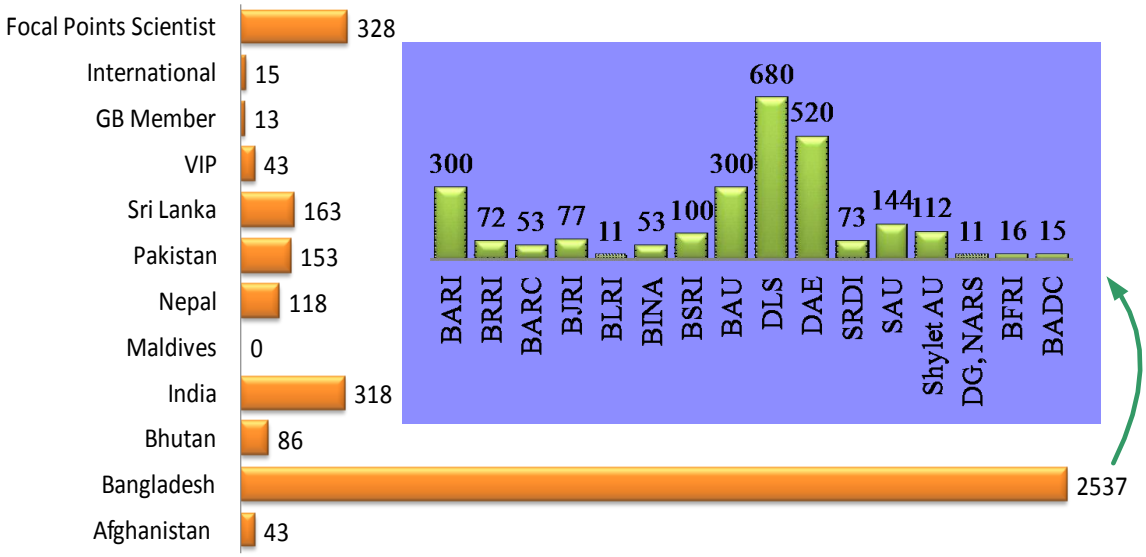


Figure 15. Number of recipients of SAC publication in 2013 (Sent as email attachments)

2.3.6 Archive for SAARC Agriculture Centre

In 2013, 24 SAC publications were uploaded in SAC website to facilitate easy access to the users. The pdf files are downloadable from the archive.
http://www.saarcagri.org/index.php?option=com_abook&view=category&id=1&Itemid=246

1. Directory of Successful Farm Machinery in SAARC Countries
2. SAARC Seed Outlook
3. Current Status and Future Prospect of Pulse Production in SAARC Countries
4. Impact of Climatic Parameters on Agricultural Production and Crop Productivity Losses through Weather Forecast and Advisory Service in SAARC Countries
5. SAARC Journal of Agriculture Vol.10 No.2
6. Statistical Data Book for Agricultural Research and Development in SAARC Countries 2012
7. Strategies for Arresting Land Degradation in South Asian Countries
8. Veterinary Public Health and Zoonotic Disease Control in SAARC Countries
9. Dairy Production, Quality Control and Marketing System in SAARC Countries
10. NARS - National Agricultural Research System in SAARC Countries – An Analysis of System Diversity
11. SAARC Journal of Agriculture Vol.10 No.1
12. Quality Seed in SAARC Countries: Production, Processing, Legal and Quality Control and Marketing System
13. SAARC Journal of Agriculture Vol.9 No.1
14. Medicinal and Aromatic Plants of SAARC Countries
15. Annual Report 2012
16. SAARC Journal of Agriculture Vol.11, Issue-I
17. Pesticide Information of SAARC Countries
18. Public Sector Support System and its collaboration with Private Sector for Livestock Development in SAARC countries
19. Proceeding of Regional Workshop on Hill Agriculture in SAARC Countries: Constraints & Opportunities
20. Fodder Germplasm in SAARC Countries
21. Status of Integrated Pest Management (IPM) in SAARC Countries
22. Regional Workshop on Farm Mechanization for Small holders Agriculture in SAARC Countries
23. SAARC Journal of Agriculture Vol.9 No.2
24. SAARC AgriNews, Vol. 6 No. 4, Vol.7 No. 1,2,3
25. Food grain situation in SAARC countries - Bulletin 16.

2.3.7 New document received by SAC in 2013

In 2013, Library subscribed and received gift items totally 240 publications from SAARC member countries and other international organizations. Among the publications, there were 102 books, 36 journals, 38 Annual Reports, 24 Newsletters and 40 Newspaper/Magazines as shown in the table below.

Country	Books	Journals	Annual Reports	Newsletters	Newspaper/ Magazines	Total
Bangladesh	60	18	22	11	15	126
Bhutan	-	-	-	-	10	10
India	17	6	10	6	10	49
Maldives	-	-	-	-	2	02
Nepal	4	2	2	2	2	12
Pakistan	1	3	1	-	2	07
Sri Lanka	-	2	1	1	1	05
Others	20	5	2	4	10	41
Total	102	36	38	24	40	240

In 2013, a total of 312 requests were received from users in Bangladesh, India and Pakistan in response, the centre sent out 1,025,000 abstracts and TEEAL Search 35 through e-mail as follows:

Sl. No.	Country	No. of Abstracts
1.	Bangladesh	1023371
2.	India	597
3.	Pakistan	1032
	Total	1025000

CAPACITY DEVELOPMENT

3 Capacity Development

3.1 Regional training on molecular techniques in diagnosis of diseases of farm animals and poultry

SAARC Agriculture Centre (SAC) in collaboration with High Security Animal Disease Laboratory (HSADL), India organized a regional training on "Molecular Techniques in Diagnosis of Diseases of Farm Animals and Poultry" at HSADL, Bhopal, India during 22nd April to 1st May 2013. The participants from SAARC member states namely Bangladesh, Bhutan, India, Nepal, and Sri Lanka attended this useful hands on training. Dr. J. M. Kataria, Director, Central Avian Research Institute (CARI), Izzatnagar -243122 Bareilly U.P. India was present as chief guest and Dr. Md. Nure Alam Siddiky, Senior Program Officer (Livestock) was present as guest of honour in the inaugural function. Dr. H. V. Murugkar, Joint Director (In charge) of HSADL presided over the inaugural function.

The aim of the training programme was to refresh the participants in newer concepts in animal disease diagnosis as well as in molecular and conventional diagnostic techniques. The training programme was consists of a good blend of lectures and laboratory demonstration sessions. It covered the recent and conventional disease diagnostic techniques with more concentration on advanced molecular biological techniques of livestock and poultry diseases. The molecular techniques have broadened the scope of animal diagnostics and are now powerful tools that assist in a comprehensive elucidation of animal pathogens, their molecular epidemiology and are very helpful for the diagnosis. Conventional diagnostic techniques such as agar gel immunodiffusion, hemagglutination inhibition and enzyme linked immune sorbent assay, fluorescent antibody test, neutralization test etc. along with cell culture techniques were included. The training also given exposure on DNA/ RNA extraction, polymerase chain reaction (PCR), nucleotide sequencing and many other newer and emerging technologies for disease diagnosis.

In this training programme, the practical knowledge provided excellent opportunities to the participants to gain first-hands on working knowledge of various techniques as mentioned above and broaden their research aptitude in the area of animal disease diagnosis with special reference to pathology and molecular tools. The training provided a common platform for all the participants to interact and exchange ideas among them.

INTERNATIONAL COLLABORATIONS

4 International collaborations

4.1 SAC-IFC

IFC, a member of the World Bank Group and SAC agreed to initiate a Project to assist in harmonization of regional seed regulations to enhance regional seed trade among SAARC member states as well as facilitate the strengthening of SSF. The specific objectives of the collaboration are as follows:

a. To Strengthen SSF through (i) development of a working network across member states via setup of Nodal Points (refer to a Country Representative for each member countries assigned to coordinate on regional seed harmonization among SAARC region via SSF) and an Executive Committee; and (ii) facilitation of the initial functioning of the operations of the SSF.
b. To Facilitate regional harmonization through: (i) development and recommendation of standard and harmonized seed rules and regulations for faster variety release among regional countries; (ii) development a framework for harmonized seed quality control legislation and seed testing; (iii) development of standard process and requirements for export and import of seed and sanitary and phyto-sanitary certification to facilitate regional trade; and (iv) development of framework for reciprocal variety release agreements.

The Cooperation Agreement has been circulated among the Member States for their concurrence on the content and principles of collaboration. Once consent from the Member States has been received through the SAARC Secretariat, the Cooperation Agreement will be signed and collaborative activities will be planned and implemented.

4.2 SAC-IJSG

Memorandum of Understanding (MoU) between the International Jute Study Group (IJSG) and the SAARC Agriculture Centre (SAC) for cooperation in research and development of Jute, Kenaf & Allied Fibres has been finalized. The MoU has been circulated among the Member States for their concurrence on the content and principles of collaboration. Once consent from the Member States has been received through the SAARC Secretariat, the MoU will be signed and collaborative activities will be planned and implemented.

4.3 SAC-ICRISAT

The International Crops Research Institute for the Semi-Arid Tropics **(**ICRISAT) and SAC inspired by their common goals and objectives agreed to envision a prosperous, food-secure and resilient dryland tropics as erratic rainfall, degraded soils and biodiversity, water scarcity, droughts, floods and very poor physical and social infrastructure in South Asia in order to

enhance food and nutritional insecurity as well as the livelihood of the poor farmers through the active participation of the following areas:

a) Undertaking joint study / research on topics of mutual interest through using /sharing the existing facilities and sharing of the results reciprocally;
b) Facilitating exchange of information, experiences, views, experts between the Parties;
c) Facilitating policy changes in NARS to speed up the process of varietal release and dissemination in the region, These include:
    - exchange of germplasm, breeding lines and released varieties for research purpose;
    - sharing of advanced breeding materials, released varieties and technologies;
    - joint evaluation and early release of varieties and seed multiplication in more than one country for similar agro-ecological conditions;
    - pre-release promotion (across countries) and seed multiplication;
d) Promotion and extension of improved technologies through SAARC resource mechanism and networking; new and improved production technologies developed and adopted by smallholder farmers in areas of limited water widespread adaptation and delivery of new and improved technologies to increase food production and raise income in areas of limited water
e) Capacity building of SAC officials, and national scientists, trainers, extension workers and farmers in improved technologies; specially enhanced capacity of agricultural service providers to support smallholder farmers in areas of limited water
f) Exchange of scientific literature, information, material and methodologies on research and development generated through SAC in member countries; enhanced regional knowledge base, information sharing and policy development mechanisms
g) Joint organization of trainings, meetings, consultation, workshops etc.;
h) Participation of officials/scientists in the training, meeting and workshop organize by ICRISAT and SAC;
i) Regular review of the progress and recommendations for the improvement;
j) Translation of scientific literature into local languages for better understanding of the information;
k) Any other issue mutually agreed upon by both the parties.

The MoU has been circulated among the Member States for their concurrence on the content and principles of collaboration. Once inputs from the Member States have been received through the SAARC Secretariat, the MoU will be signed and collaborative activities will be planned and implemented.

GENERAL UPDATES

5 General update for 2013

5.1 Important events

5.1.1 The Seventh governing board meeting

The Seventh Meeting of the Governing Board (GB) was held in Dhaka during 24-25 September, 2013. The Meeting was inaugurated by Dr. S M Nazmul Islam, Secretary, Ministry of Agriculture, Government of Bangladesh with Mr. Abdul Motaleb Sarker, Director General (SAARC & BIMSTEC), Ministry of Foreign Affairs (MOFA), Dhaka as Special Guest and Mr. Tareque Muhammad, Director (ARD), SAARC Secretariat representing the Secretary General of SAARC.

The meeting reviewed the progress of 2013, and approved proposal for 2014 and budget. Some of the most pertinent recommendations of the 7th GB Meetings are as follows (excerpt only):

i. SAARC outlook should be based on emerging themes of high relevance to the region.
ii. To strengthen and support the initiatives of SAC on SAARC Seed Forum and its activities, SAC has been authorized to sign the "Cooperation of Agreement" with International Financing Cooperation (IFC).
iii. The MoUs, SAC-IJSG and SAC-ICRISAT were recommended for submission to SAARC Secretariat for circulation to the member states.
iv. Upgrading of "SAARC Journal of Agriculture" from print journal to online journal was approved.
v. SAC has been advised to communicate with International Sericultural Commission (ISC), Bangalore for possible collaboration.
vi. SAC has been granted permission to communicate with potential donors for funding specific activities. However, the formalizing of such arrangements, approval of the GB would be needed.

5.1.2 The 28th SAARC Charter Day

The SAARC Charter was signed by the Heads of State or Government of the Member States on 8 December 1985 in Dhaka to promote the welfare of the peoples of South Asia and to improve the quality of their life through acceleration of economic growth. It is continually reminding the activities and commitment to assist the member countries for preparing the national plan of action to address issues of food security through agricultural development, poverty reduction, empowerment of women and human resources development.

SAARC Agriculture Centre and SAARC Meteorological Research Centre jointly commemorated the 28th SAARC Charter day on 8 December 2013. The celebration was started on 7th December, 2013 by illuminating the SAC premises. The auspicious day instigated with hoisting of national

flags of SAARC member countries in the morning in front of personnel of both organizations. Eight Pigeons flown in the sky as symbol of peace and colorful balloons as the sign of festival with a festoon inscribed***" Long live the spirit of SAARC".***

Next event was a art competition for the children on "Nature". In this year a lot of children attended as competitor and tried to fill up the white space with their inner dreams on Nature. It was arranged for two groups, junior and senior, three kids from junior and three from senior gained the prizes accordingly.

A seminar also arranged at BARC Conference room on two themes respectively "Increasing crop production through four crops based cropping system by Dr. Md. Rafiqul Islam Mondal, Director-General, Bangladesh Agricultural Research Institute, another one is on" Problem and prospects of GM crops in Pakistan" by Dr. Shahid Mansoor , Director, National Institute of Biology & Genetic Engineering, Pakistan. Dr. Wais Kabir, Executive Chairman was graced the function as Chief Guest while Mr. Md. Shah Alam, Director, SAARC Meteorological Research Centre presided over the seminar. A huge number of audiences were attended like scientists from NARS institutions; Extension service providers; SMRC and SAC personnel.

5.1.3 Financial report

In 2013 the Centre used a total fund of US$ 681,048.12. The budget is broadly divided into program cost which comprised of 49% of the expenditure and institutional cost covering 51% of the fund in 2014. The Institutional and the Program costs are shared by all the SAARC member countries according to the SAARC proportion formula (Table 1).

As the host, the Government of Bangladesh provides capital costs and other infrastructure facilities. The capital cost support such as accommodation, furniture, vehicles, equipment etc. is proposed on an occasional basis based on requirements.

Table 2. The shares of contribution for each SAARC country are as follows:

Sl. No.	Name of Countries	Institutional Cost share	Program cost share
1.	Afghanistan	3.09%	5.26%
2.	Bangladesh	47.87%	11.28%
3.	Bhutan	3.09%	5.26%
4.	India	18.76%	31.92%
5.	Maldives	US $ 500 (Fixed)	0.00%
6.	Nepal	6.63%	11.28%
7.	Pakistan	13.93%	23.72%
8.	Sri Lanka	6.63%	11.28%
	Total:	**100%**	**100%**

The program budget is used to finance regular programs and need based programs that emanates from higher SAARC forums and ongoing regional programs. The Figure 16 clearly shows different expenditure items under the program budget. Regional programs which comprise of consultative meeting, orientations and adaptive trials took 70% of the fund, while Information sharing and publication used 15% and 11% of the program budget respectively.

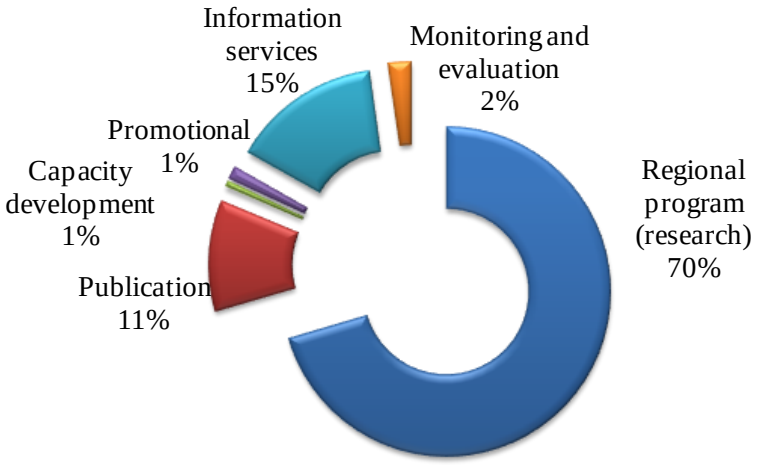


Figure 16. Utilization of program budget in 2013

Annexure 1: SAC Governing Board Members

The Governing Board (GB) is the apex body to supervise functions of the Centre. The GB composed of eminent personalities in the field of agriculture from each member countries. The GB analyses the policy matters, approves the projects, recommends the annual budget estimates, monitors and evaluates the administrative and overall operations of SAC. A Chairman designated for a two-year term from the member countries by alphabetical rotation heads the Board. The GB meets usually once in a year and may meet more frequently if necessary. A representative of the SAARC Secretariat also attends the GB meeting. The Proceedings of the GB meetings need to be approved by Programming Committee and subsequently by the Standing Committee and the Council of Ministers.

Mr. Gh. Rabani Haqiqatpal
Member, SAC GB and Director
Marketing, Economics & Statistics Division
Ministry of Agriculture, Irrigation and Livestock Ministry of Agriculture Compound
Jamal Mina, Kart-e-Sakhi
Kabul, Afghanistan

Dr. Md. Kabir Ikramul Haque
Member, SAC GB and Member-Director (Fisheries)
Bangladesh Agricultural Research Council, Farmgate, New Airport Road, Dhaka - 1215, Bangladesh

Ms. Singye Wangmo
Member, SAC GB and Program Director
Information & Communication Services (ICS)
Ministry of Agriculture, Tashichhodzong Complex
Thimphu, Bhutan

Professor Dr. Ramesh Chand
Member, SAC GB and Director
National Centre for Agricultural Economics and Policy Research (NCAP)
Dev. Prakash Shaastri Marg, Pusa
Post Box No. 11305, New Delhi-110012, India

Mr. Ibrahim Shabau
Member, SAC GB and Deputy Director General
Ministry of Fisheries and Agriculture
Male, Maldives

Mr. Ishwar Prasad Rijal
Member, SAC GB and Chief
Agriculture Information & Communication Centre
Ministry of Agriculture & Development
Govt. of Nepal, Harihar Bhawan, Lalitpur, Nepal
Dhaka-1212, Bangladesh

Dr. Ch. Muhammad Sharif
Member, SAC GB and
Member, Social Science Division
Pakistan Agricultural Research Council (PARC)
Islamabad, Pakistan

Dr. H.H.D. Fonseka
Chairman, SAC GB and
Additional Director (Research)
Horticultural Crop Research and Development Institute, Department of Agriculture
Gannoruwa, Peradeniya 20400, Sri Lanka

Mr. Iqbal Ahmed
Director (SAARC & BIMSTEC)
SAARC & BIMSTEC
Ministry of Foreign Affairs
Government of the People's Republic of Bangladesh
Shegun Bagicha, Dhaka-1000, Bangladesh
Phone: 9559538 (Office) Ext. 129, 9138817 (Res)

Mr. Tareque Muhammad
Member, SAC GB and
Director (ARD)
SAARC Secretariat
Kathmandu, Nepal

Dr. Abul Kalam Azad
Director, SAARC Agriculture Centre &
Member Secretary, SAC Governing Board
BARC Complex, Farmgate, Dhaka-1215, Bangladesh

Annexure 2: Staff

No.	Name	Designation
1	Dr. Abul Kalam Azad	Director
2	Dr. Muhammad Nurul Alam	Senior Program Specialist (PS & PD)
3	Ms. Nasrin Akter	Senior Program Specialist (Horticulture)
4	Dr. Muhammad Musa	Senior Program Specialist (Crops)
5	Dr. Tayan Raj Gurung	Senior Program Specialist (NRM)
6	Dr. Ibrahim Md. Saiyed	Project Coordinator, SAARC-Australia Project
7	Mr. Mohammad Abdullah	Senior Program Officer (Publication)
8	Dr. Niazuddin Pasha	Senior Technical Officer
9	Ms. Mafruha Begum	Senior Program Officer (Info. & Comm.)
10	Mr. Md. Nure Alam Siddiky	Senior Program Officer (Livestock)
11	Mr. M. Golam Mustafa	Senior Program Officer (Fisheries)
12	Ms. Fatima Nasrin Jahan	Senior Program Officer (NRM)
13	Mr. Shah Alam Mawla Chowdhury	Video Production Officer
14	Mr. Md. Saifur Rahman	Administrative Officer
17	Mr. Md. Mizanur Rahman	IT Manager (Database)
18	Mr. Mizanur Rahman	Personal Officer to Director
19	Mr. Md. Iqbal Karim	Store & Procurement Officer
20	Ms. Raihana Kabir	Graphic Designer
21	Mr. Md. Abdul Kadir	IT Manager (Software)
22	Mr. ATM Mostafizur Rahman Mojumder	Senior Finance Officer (In-Charge)
23	Mr. Ananda Chandra Kha	Program Assistant
24	Mr. Md. Nurul Wara	Program Assistant
25	Mrs. Nazmoon Nahar	Cataloguer
26	Mr. Jewel Rana	Office Assistant
27	Mr. Md. Nurul Amin	Driver
28	Mr. Md. Rafiqul Islam	Driver
29	Mr. Md. Shahidul Alam Khan	Lift-cum-Gen. Operator
30	Mr. Md. Ruhul Amin Sarder	Driver
31	Mr. Md. Harun-or-Rashid	Messenger
32	Mr. Md. Helal Uddin	Messenger
33	Mr. Md. Akhter Hossain	Watchman
34	Mr. Md. Altaf Hossain	MLSS
35	Mr. Md. Abu Taher	Janitor
36	Mr. Md. Ashraful Alam	MLSS

Annexure 3: Training/Seminars/Workshops/Conference attended by SAC officials during 2013

Date	Training/Seminars/Workshops/Conference (Title and Venue)	Participants from SAC
2-6 January	*Forty-Third Session of the Programming Committee* at Kathmandu, Nepal.	Dr. Abul Kalam Azad, Director
28 April to 5 May	Training workshop on "*Rice Technology Transfer Systems for Stress-prone Environments in South Asia*" at Tamil Nadu, India.	Muhammad Abdullah, SPO (Publication)
20 April to 1 May	Training program on "*Molecular Techniques in Diagnosis of Farm Animals and Poultry*" at Bhopal, India.	Md. Nure Alam Siddiky, SPO (Livestock)
25-28 May	Meeting of the SDF Board of Directors for "*Intervention to improve Livelihood of resource-poor farmers of SAARC member countries through farming systems approach*" at Thimphu, Bhutan.	Dr. Tayan Raj Gurung, SPS (NRM),
10-14 July	Expert Consultation Meeting on "*Regional Initiation on Improvement of Pulses and Adaptive Trial in SAARC Member Countries*" at New Delhi, India.	Ms. Nasrin Akter, SPS (Horticulture),
12-15 August	South Asia Policy Dialogue on "Regional Cooperation for Strengthening National Food Security Strategies" at New Delhi, India.	Dr. Tayan Raj Gurung, SPS (NRM),
25 to 31 August	FAO training workshop on "*Open Journal System for Regional NARS*" at Nonthaburi, Thailand.	Dr. Tayan Raj Gurung, SPS (NRM), Md. Nure Alam Siddiky, SPO (Livestock)
3-8 September	Consultation meeting on "*Farm animal genetic resource evaluation, conservation and management in SAARC Countries*" at Sri Lanka.	Md. Nure Alam Siddiky, SPO (Livestock)
5-9 September	Seminar on "*Enhancing the Role of Community Radio and Promoting Positive Social Change*" at Kathmandu, Nepal.	Mafruha Begum, SPO (Information & Communication)
21-26 October	Regional workshop on "*Youth and Agriculture: Challenges and Opportunities, the APAARI Executive Committee Meeting, and the NARS-CGIAR Interactive Session for Strengthening Partnership on AR4D in the Asia-Pacific Region*" at Islamabad, Pakistan.	Ms. Nasrin Akter, SPS (Horticulture),

Date	Training/Seminars/Workshops/Conference (Title and Venue)	Participants from SAC
28-30 October	Regional expert consultation on "*National Agricultural Education Systems in SAARC Countries"* at Dhaka, Bangladesh.	Dr. Tayan Raj Gurung, SPS (NRM), Dr. Muhammad Nurul Alam, SPS (PS & PD), Muhammad Abdullah, SPO (Publication), Dr. Muhammad Musa, SPS (Crops), Ms. Nasrin Akter, SPS (Horticulture), Md. Nure Alam Siddiky, SPO (Livestock), Dr. Ibrahim Md. Saiyed Coordinator, SAARC-Australia Project,
30 Oct. – 2 November	"Popularizing Multiple Cropping innovations as a means to raise productivity and farm income" at Colombo, Sri Lanka.	Dr. Muhammad Musa, SPS (Crops),
16-17 November	Inception Meeting on "*High Yielding Dairy Buffalo Breed Development in SAARC Countries*" at Dhaka, Bangladesh.	Md. Nure Alam Siddiky, SPO (Livestock), Dr. Muhammad Nurul Alam, SPS (PS & PD), Dr. Tayan Raj Gurung, SPS (NRM), Dr. Muhammad Musa, SPS (Crops), Muhammad Abdullah, SPO (Publication), Mrs. Fatema Nasrin Jahan, SPO (NRM), Dr. Ibrahim Md. Saiyed Coordinator, SAARC-Australia Project,
23-24 November	Regional Expert Consultation Meeting on "Adaptation to Climate Change Impact on Crop Production in SAARC member countries"	Ms. Nasrin Akter, SPS (Horticulture), Dr. Muhammad Nurul Alam, SPS (PS & PD), Dr. Tayan Raj Gurung, SPS (NRM), Muhammad Abdullah, SPO (Publication), Dr. Muhammad Musa, SPS (Crops), Md. Nure Alam Siddiky, SPO (Livestock), Mrs. Fatema Nasrin Jahan, SPO (NRM), Dr. Ibrahim Md. Saiyed Coordinator, SAARC-Australia Project,
23-27 November	*6th Meeting of SAARC Food Bank Board* at Thimphu, Bhutan.	Dr. Muhammad Nurul Alam, SPS (PS & PD), Mr. Mizanur Rahman, Personal Officer to Director

Date	Training/Seminars/Workshops/Conference (Title and Venue)	Participants from SAC
25 November to 01 December	Regional expert meeting on "*Best Practices and Procedures of Saline Soil Reclamation Systems in SAARC Region"* at Haryana, India.	Dr. Tayan Raj Gurung, SPS (NRM)
01-05 December	Meeting on "Institutions and Policies for Scaling out climate smart Agriculture" at Colombo, Sri Lanka.	Dr. Muhammad Nurul Alam, SPS (PS & PD),
6-7 December	SAARC Regional expert consultation meeting on "*Prospects, needs, benefits and risk assessment of agriculture related genetically modified products in South Asia*" at Dhaka, Bangladesh	Dr. Muhammad Musa, SPS (Crops), Dr. Muhammad Nurul Alam, SPS (PS & PD), Dr. Tayan Raj Gurung, SPS (NRM), Ms. Nasrin Akter, SPS (Horticulture), Dr. Ibrahim Md. Saiyed Coordinator, SAARC-Australia Project, Muhammad Abdullah, SPO (Publication), Mrs. Fatema Nasrin Jahan, SPO (NRM),
8-13 December	*Forty-Forth Session of the Programming Committee* at Kathmandu, Nepal.	Dr. Abul Kalam Azad, Director
10 - 14 December	Methodology development and planning meeting on "Use of geo-information on mapping of land degradation in SAARC Countries" at Kathmandu, Nepal.	Dr. Tayan Raj Gurung, SPS (NRM), Dr. Abul Kalam Azad, Director
15-18 December	SAARC *Monsoon Working Group Meeting* at Colombo, Sri Lanka.	Dr. Tayan Raj Gurung, SPS (NRM),
20-26 December	Meeting on "*Extent and potential use of Bio-pesticides for Crop Protection in SAARC Countries*" at Bhutan	Dr. Tayan Raj Gurung, SPS (NRM), Dr. Abul Kalam Azad, Director
27-30 December	2nd Annual Review Meeting on "*SAARC Vegetable Adaptive Trials Network*" at Thimphu, Bhutan.	Dr. Muhammad Nurul Alam, SPS (PS & PD),

Annexure 4: Incoming and outgoing staff

Incoming staff

A) Professional:

Ms. Nasrin Akter

Ms. Nasrin Akter from Bangladesh joined the Centre as Senior Program Specialist (Horticulture) in 14 January 2013. Before joining, she was working at SAARC Agriculture Centre as Senior Program Officer (Crop Management) from January 2008.

Dr. Muhammad Musa

Dr. Muhammad Musa, Assistant Agronomist, Barani Agricultural Research Institute, Chakwal, Pakistan joined the centre as Senior Program Specialist (Crops) in 17 February 2013. He obtained his PhD from University of Wales, United Kingdom.

Dr. Tayan Raj Gurung

Dr. Tayan Raj Gurung, Farming Systems Specialist of Ministry of Agriculture and Forest, Royal Government of Bhutan joined the centre as Senior Program Specialist (Natural Resource Management) in April 2013. Dr. Tayan obtained his PhD from Université Paris Ouest Nanterre La Défense, Paris, France in the field of NRM.

B) General Services Staff:

Md. Nure Alam Siddiky

Md. Nure Alam Siddiky joined the Centre on 1 April 2013 as Senior Program Officer (Livestock). Before joining this position, he was working at this Centre as Program Officer (Livestock) since 5 July 2009.

M. Golam Mustafa

M. Golam Mustafa joined the Centre as Senior Program Officer (Fisheries) on 1 April 2013. Before joining this position, he was working at this Centre as Program Officer (Fisheries) since 10 January 2011.

Ms. Fatema Nasrin Jahan

Ms. Fatema Nasrin Jahan Joined at SAARC Agriculture Centre (SAC) as Senior Program Officer (NRM) on 5th November, 3013. Prior to joining SAC, she worked as Research Associate under a project of the Bangladesh Agriculture Research Institute. She completed her M.Sc. Ag (Soil Science) from Sher-e-Bangla Agricultural University, Dhaka in 2010.

Promotions

Ms. Mafruha Begum

Ms. Mafruha Begum gets promotion as Senior Program Officer (Information & Communication) on 1 April 2013. Before this, she was working in the Centre as Communication and Media Officer (Design & Art) since 26 June 1993.

Md. Abdul Kadir

Mr. Abdul Kadir gets promotion as IT Manager (Software) on 1 April 2013. Before this, he was working as IT Assistant since 21 August 1991.

Outgoing Staff

M. Golam Mustafa

M. Golam Mustafa resigned the Centre as Senior Program Officer (Fisheries) in June 2013 as he got appointed as Lecturer in Noakhali Science and Technology University, Noakhali District, Bangladesh.

Annexure 5: Visitors to SAC

Date		Name and Address
15 January, 2013	-	Mr. Hossein Shahbaz, Director (Pilot Project)
	-	CIRDAP, Dhaka
15 January, 2013	-	Mr. Cecep Effendi, CIRDAP, Dhaka
30 April, 2013	-	Mr. Pradip Maharjan, Federation of Nepal Chamber of Commerce and Industry, Kathmandu, Nepal
19 June, 2013	-	Dr. Rasheed Sulaiman, Director, Centre for Research on Innovation & Science Policy (CRISP), Hyderabad, India
01 July, 2013	-	Mr. Birendra Bajracharya, Programme Coordinator, Regional Databases Initiative, ICIMOD, Kathmandu, Nepal
01 July, 2013	-	Mr. Sudip Pradhan, GIS/DSS Development Specialist, ICIMOD, Kathmandu, Nepal
01 July, 2013	-	Mr. Mostafa Ali, GIS Database Specialist, ICIMOD, Kathmandu, Nepal
02 July, 2013	-	Mr. Dhan Bahadur Oli, Director (Admn.), SAARC Secretariat, Kathmandu, Nepal
02 July, 2013	-	Mr. Binod KC, Department of Foreign Employment, Nepal
04 July, 2013	-	Mr. Jugesh Vig, 26 Roche Place, Nepean, ON K2HSP9
04 July, 2013	-	Ms. Julien Winter, 175 Trimaine St. Cobourg, Canada
18 July, 2013	-	Mr. Suresh Pradhan, Joint Secretary, Ministry of Cooperative and Poverty Alleviation, Kathmandu, Nepal
14 August, 2013	-	Mr. Kevin Vang, WSPA, Olympia thai Plaza, Bangkok, Thailand
14 August, 2013	-	Mr. Gajender K. Sharma, WSPA-India, New Delhi, India
04 September, 2014	-	Mr. Shaikh Abdullah Al Mamun Hossain with a group of students, Department of Agricultural Engineering, Patuakhali Science & Technology, Dumki, Patuakhali
26 September, 2014	-	Mr. David Gisselquist, 29, West Governor Road, USA

Annexure 6: Regional activities implemented in 2013, activity leader and national focal points

Country	National Focal point
Activity :	**Popularizing multiple cropping innovations as a means to raise crop productivity and farm income**
Activity Leader:	**Dr. Muhammad Musa**, Senior Program Specialist (Crops), SAARC Agriculture Centre, BARC Complex, Farmgate, Dhaka-1215, Bangladesh. Email: mum96@hotmail.com
Afghanistan	N.A.
Bangladesh	**Dr. Md. Nurul Islam,** Principal Scientific Officer**,** Agronomy Division, Agricultural Research Institute**,** Joydebpur, Gazipur-1701, Bangladesh. E-mail: drmdnurulislam@yahoo.com
Bhutan	**Tirtha Bdr.Katwal,** Specialist III- Maize, Renewable Natural Resources Research and Development Centre (RNR RDC), Yusipang, Bhutan**,** Email: tirthakatwal@gmail.com
India	**Dr. Harbir Singh**, Principal Scientist (Agricultural Economics), Project Directorate for Farming Systems Research, *(Indian Council of Agricultural Research)*, Modipuram, Meerut - 250 110 (Uttar Pradesh), INDIA, Email: hs.pdfsr@yahoo.com
Maldives	N.A.
Nepal	**Dr. Mina Nath Paudel,** Crop Scientist, Director (Admn), Nepal Agriculture Research Council, Kathmandu, Nepal. Email: mnpaudel@yahoo.com , mnpaudel@gmail.com
Pakistan	**Dr. Parvez Khaliq,** Director (PRMC), National Agricultural Research Centre, Park Road, Islamabad, **Pakistan**. E-mail , parvezkhaliq786@yahoo.com : prmcparc@yahoo.com
Sri Lanka	**Dr. Ms. Mangalika Nugaliyadda,** Deputy Director (Research), Agriculture Research and Development Centre, Sita Eliya, Nuwara Eliya, Sri Lanka**,** E-mail: nmangalika@gmail.com
IRRI	**Amrendra Narayan Singh,** GIS Consultant (STRASA Project), International Rice Research Institute- India Office, D. P. Shastri Marg, Pusa, New Delhi-110012, India**.** Email: ansingh2007@gmail.com , a.n.singh@irri.org **Dr. Manzoor Hussain Dar,** Senior Associate Scientist, Seed Up-scaling, Technology Dissemination & Coordination Stress Tolerant Rice for Africa and South Asia (STRASA), International Rice Research Institute- India Office, 9th Floor, Aggarwal Corporate Tower, Plot No. 23, Rajendra Place, New Delhi - 110 008, India**.** Email: m.dar@irri.org

Country	National Focal point
Activity :	**Prospects, needs, benefits and risk assessment of agriculture related genetically modified products in SAARC countries**
Activity Leader:	Dr. Muhammad Musa, Senior Program Specialist (Crops), SAARC Agriculture Centre, BARC Complex, Farmgate, Dhaka-1215, Bangladesh. Email: mum96@hotmail.com
Afghanistan	N.A.
Bangladesh	Dr. Md. Khalequzzaman A. Chowdhury, Member Director (Crops), Bangladesh Agricultural Research Council, Farmgate, Dhaka-1215, Bangladesh. Email: md-crops@barc.gov.bd , kzamancho55@yahoo.com
Bhutan	Ms. Tashi Yangzom, Regulatory and Quarantine Officer, Bhutan Agriculture and Food Regulatory Authority (BAFRA), Ministry of Agriculture and Forests, Royal Government of Bhutan. Email : tashiyanz@gmail.com
India	Dr. K. V. Prabhu, Head, Principal Scientist, Division of Genetics, Indian Agricultural Research Institute, Pusa, New Delhi 110012. Email: jd_research@iari.res.in, kvinodprabhu@reddiffmail.com
Maldives	N.A.
Nepal	Dr. Bindeshwar Prasad Sah, Principal Scientist and Chief Biotechnology Division, Nepal Agricultural Research Council (NARC), Khumaltar, Lalitpur, Nepal, Email: bprasadsah2@gmail.com, bprasadsah@rediffmail.com
Pakistan	Dr. Shahid Mansoor, Director (NIBGE), National Institute for Biology and Genetic Engineering, Jhang Road, P.O.Box 577, Faisalabad, Pakistan. Email: shahidmansoor7@gmail.com , directornibge@gmail.com
Sri Lanka	Dr. (Ms) A. Malima Perera, Deputy Director, Field Crop Research and Development Institute, Mahailuppallama, Sri Lanka, E mail: malima60@yahoo.com

Country	National Focal point
Activity :	**National Agricultural Education System in SAARC Countries**
Activity Leader:	**Dr. Tayan Raj Gurung,** Senior Program Specialist (NRM), SAARC Agriculture Centre, BARC Complex, Farmgate, Dhaka-1215, Bangladesh. Email: tayanurung@yahoo.com
Afghanistan	NA
Bangladesh	Dr. S.M. Khalilur Rahman, Member Director (AERS), BARC, Dhaka, Bangladesh
Bhutan	Dr. Tashi Samdup, Director, Council for RNR Research of Bhutan, Ministry of Agriculture, Thimphu, Bhutan
India	Dr. Arvind Kumar, Deputy Director General (Education), ICAR, New Delhi, India
Maldives	NA
Nepal	Dr. Shidhi Ganesh Shreshtra, Deputy Director (Planning and Human Resource Development), Department of agriculture, Harihar Bhawan, Lalitpur, Kathmandu Nepal
Pakistan	Dr. Tariq Hassan, Registrar/Director, PARC, Institute of Advance Studies in Agriculture (PAISA), NARC, Park Road, Islamabad, Pakistan
Sri Lanka	Dr. P.K.K.R Perera, Additional Director (Services), Extension and Training Centre, Department of Agriculture, Peradeniya, Sri Lanka

Country	National Focal point
Activity :	**Best Practices and Procedures of Saline Soil Reclamation Systems in SAARC Countries**
Activity Leader:	**Dr. Tayan Raj Gurung,** Senior Program Specialist (NRM), SAARC Agriculture Centre, BARC Complex, Farmgate, Dhaka-1215, Bangladesh. Email: tayanurung@yahoo.com
Afghanistan	NA
Bangladesh	Dr. Jalal Uddin Md. Shoaib, Mirpur, Dhaka, Bangladesh Email: jalal_shoiab@yahoo.com Phone: 01716048256
Bhutan	NA
India	Dr. S.K. Chaudhari, Head, Soil & Crop Management Division, Central Soil Salinity Research Institute, KARNAL – 132 001 (Haryana), India E-mail : skc@cssri.ernet.in, hscm@cssri.ernet.in Fax: +91 184 2290480, +91 184 2292489
Maldives	NA
Nepal	NA
Pakistan	Dr. Arshad Ali, Principal Scientific Officer, LRRI, NARC, Islamabad, Pakistan. E-Mail: a.arshad62@yahoo.com Cell: +92-333-5966626
Sri Lanka	Mr. D.N. Sirisena, Deputy Director, Rice Research and Development Institute, Bathalagoda, Ibbbagamuwa, Sri Lanka Tel: Office: +94372258561, Mobile:+94714489488 e-mail: dinaratnesirisena@gmail.com

Country	National Focal point
Activity :	Extent and potential use of bio-pesticides for crop protection in SAARC Countries
Activity Leader:	Dr. Tayan Raj Gurung, Senior Program Specialist (NRM), SAARC Agriculture Centre, BARC Complex, Farmgate, Dhaka-1215, Bangladesh. Email: tayanurung@yahoo.com
Afghanistan	Associate Prof. Dr.M.Z. Sharifi, Head of Department of Agronomy, Faculty of Agriculture Kabul University. E-mail : sharifimz@yahoo.com Phone No: (93) 077-1787-341 and (+93) 079-4468-300
Bangladesh	Dr. Sayed Md. Nurul Alam, Chief Scientific Officer/Head, Entomology Division, BARI, Gazipur. Email: alamsn09@gmail.com, Cell: 01711907886
Bhutan	Ms. Kesang Tshomo, Coordinator, National Organic Program, Department of Agriculture, Simtokha, Bhutan. Email: kesang.tshomo@gmail.com
India	NA
Maldives	NA
Nepal	Mr. Anisur Rahman Ansari, Chief of Entomology Division, NARC, Kathmandu, Nepal. Email: aransari1@gmail.com
Pakistan	Dr. Javed Iqbal, Director (Technical), Pakistan Agriculture Research Council (PARC), Postal Code 44000, Islamabad, Pakistan Email: linkjaved@gmail.com; Phone: +92-51-8442517 Cell # +92-333-5163247
Sri Lanka	Ms. Damayanthi Galaniha, Head, Division of Entomology, Horticultural Crop Research and Development Institute, Gannoruwa, Peradeniya Sri Lanka. Email: laldam@yahoo.com, Mobile:+094714484131

Country	National Focal point
Activity :	**Adaptation to Climate Change Impact on Crop Production in SAARC member countries**
Activity Leader:	**Ms. Nasrin Akter,** Senior Program Specialist (Horticulture), SAARC Agriculture Centre, BARC Complex, Farmgate, Dhaka-1215, Bangladesh.
Afghanistan	NA
Bangladesh	Dr. Abu Wali Ragib Hassan, Project Director, Disaster and climate Risk Management in Agriculture Project, Department of Agricultural Extension, Khamarbari, Dhaka, Bangladesh. Cell: 01711224573, Email: hassan58_dae@yahoo.com
Bhutan	Mr. N K Pradhan, Specialist (PP), Council for RNR Research of Bhutan, Ministry of Agiculture and Forests, Thimphu. Fax : 00975-2-322504, Mobile : 00975-17612787, Phone: 00975-2-321097. Email: narenkpradhan@gmail.com
India	Dr. PS Birthal , Principal Scientist, National Centre for Agricultural Economics and policy Research, Pusa, New Delhi 110012, India. Email: psbirthal@ncap.res.in, Phone: 25842665, Fax: 25842684
Maldives	NA
Nepal	Dr. Ananda Kumar Gautam, Chief, Agricultural Environment Research Division, Nepal Agricultural Research Council, Khumaltar, Lalitpur, PO Box 3605, Kathmandu , Nepal. Tel: +977-1-5535981. Email: env@narc.gov.np
Pakistan	Dr. Muhammad Asim, Deputy. Director (Crop Production), PARC, Plant Sciences Division, G-5/1, Islamabad, Pakistan. Email Address: asim.muhamed@gmail.com, Cell: +92-300-9859858, Office Ph: +92-51-8442417, Fax: +92-51-9202659
Sri Lanka	Dr. B.V.R. Punyawardena, Senior Research Officer, Natural Resources Management Center, Sarasavi Mawatha, Peradeniya, 20400, Sri Lanka. E-mail: batugedara_vrp@yahoo.com, Tel: +0094812388355, Mobile: +0094714159671

Country	National Focal point
Activity :	Initiation on Improvement of Pulses and Adaptive Trial in South Asia
Activity Leader:	Ms. Nasrin Akter, Senior Program Specialist (Horticulture), SAARC Agriculture Centre, BARC Complex, Farmgate, Dhaka-1215, Bangladesh.
Afghanistan	NA
Bangladesh	Dr. Tapan Kumar Dey, Director, Pulses Research Centre, Ishurdi, Bangladesh Agricultural Research Institute (BARI), Pabna, Bangladesh Cell: 0088-01716122331 Fax: 0088-2-9261415, Email: tapankumer73@yahoo.com Dr. Altaf Hossain, Principal Scientific Officer, Pulses Research Centre, Ishurdi, BARI, Pabna, Bangladesh. Fax: 0088-2-9261415; Cell:0088-01725034595; Email : hossain.draltaf@gmail.com
Bhutan	Mr. Tshering Wangchen, National Coordinator for pulses, RDC Bajo, Thimphu, Bhutan. Email: wangchey084@yahoo.com, Cell phone no +975-17556777, Fixed no +975(2)481209, Fax no: +975(2)481311 Mr. Sonam Jamtsho, Research Assistant II, RNR Research & Development Centre Bhur, Gelephu, Bhutan. Cell: 00975-17588328; Office: 00975-77191520/77191521; Fax: 00975-6-252275; Email: sonam57jamtsho@gmail.com
India	Dr. N. Nadarajan, Director, Indian Institute of Pulses Research, Kanpur-208024, Uttar Pradesh, India. Phone: 0091-512-2572464, 2572465, 2572012, Fax: 0091-512-2572582. Email: director@iipr.ernet.in; Cell: 0091-94530042910 Dr. BB Singh, Assistant Director General (Oilseed & Pulse) , ICAR, Krishi Bhawan New Delhi - 110001 , India, Telefax : 011 23385357. Email : adgop.icar@nic.in, cell: 0091-9999734852 Dr. K.C. Bansal, Director, National Bureau of Plant Genetic Resources, Pusa, New Delhi--110012, India. Email: director@nbpgr.ernet.in, ph: +91-1125843697, Fax: +91-11-25842495, Cell: 0091-9999105667
Maldives	NA
Nepal	Dr. Suroj Pokhrel, Program Director, Department of Agriculture, Crop Development Directorate, Hariharbhawan, Lalitpur, Nepal. e-mail: surojpokhrel@yahoo.com; cropdev@vianet.com.np, Phone: +977-9851045805; Cell: 009779851045805 Dr. Renuka Shrestha, Senior Scientist/Coordinator, Grain Legume Research Programme, Rampur, Nepal Agricultural Research Council (NARC), Kathmandu, Nepal Email:nglrp_rampur@hotmai.com, renuka_shrestha@hotmail.com
Pakistan	Dr. Asghar Ali, Coordinator (Pulses), National Agricultural Research Centre, Crop Sciences Institute, Park Road, Islamabad, Pakistan. Email : asgharapk@yahoo.com Cell: +92-300-5174209; Off: +92-51-8443519; Res: +92-51-5738316
Sri Lanka	Dr. W. M. W. Weerakoon, Director, Field Crop Research and Development Institute, Mahailuppallama, Sri Lanka. email: weerakoonwmw@gmail.com Dr. Hemal Fonseka, Additional Director (Research), Horticulture Crop Research and Development Institute, Gannoruwa, Peradeniya 20400, Sri Lanka. Fax: +0094-81388234, Mobile:+0094714484094, Email: hemalfonseka@yahoo.com

Country	National Focal point
Activity :	High Yielding Dairy Buffalo Breed Development in SAARC Countries
Activity Leader:	**Mr. Md. Nure Alam Siddiky,** Senior Program Officer (Livestock), SAARC Agriculture Centre, BARC Complex, Farmgate, Dhaka-1215, Bangladesh. Email:
Afghanistan	NA
Bangladesh	Dr. T. Nurun Nahar, Chief Scientific Officer, Bangladesh Livestock Research Institute, Dhaka, Bangladesh. Email: tnnahar@yahoo.com, Cell: +88-01715 992209 Dr. Gautam Kumar Deb Senior Scientific Officer, Bangladesh Livestock Research Institute, Dhaka, Bangladesh. Email: debgk2003@yahoo.com , Cell: 01716 523 423
Bhutan	Dr. Min Prasad Timsina, Specialist, National Dairy Development Centre Department of Livestock, Ministry of Agriculture and Forests, Thimphu, Bhutan Email: timsinampdr2003@gmail.com, Cell: + 975 17718099 Mr. Thinlay Rabten, Dzongkhag Livestock Officer, Samdrupjongkhar Dzongkhag Department of Livestock, Ministry of Agriculture and Forests, Thimphu, Bhutan Email: sjgonor@gmail.com, Cell: + 975-17618970
India	Dr. Inderjit Singh, Director, Central Institute for Research on Buffaloes, Sirsa Road, HISAR, Haryana, India. Email: inderjeet.dr@gmail.com, Cell: +91-9354-324-903 Dr. A. K. Chakravarty, Principal Scientist and In Charge, Artificial Breeding Research Centre, National Dairy Research Institute, Karnal, Haryana, India Email: ak_chakravarty@yahoo.co.in, Cell: +91-9896125955
Maldives	NA
Nepal	Mr. Bhola Shankar Shrestha, Chief (Senior Scientist, S4), Animal Breeding Division Khumaltar, Nepal. Email: bsshrestha1967@gmail.com, +977- 9841272335
Pakistan	Dr. Abdul Ghaffar, PSO (Animal Genetics & Breeding), Animal Sciences Research Institute, National Agricultural Research Centre, Islamabad, Pakistan Email: abdul.ghaffar58@gmail.com, Cell: +92-300-5621650 Dr. Muhammad Anwar, PSO (Animal Production), Animal Sciences Research Institute, National Agricultural Research Centre, Islamabad, Pakistan. Email: manwar_94@yahoo.com, Cell: + 92-333-5323206
Sri Lanka	Dr. D. R. T. G. Ratnayake, Additional Director General (Animal health and Vet. Research), Department of Animal Production and health, P. O. Box 13, Getambe Peradeniya, Sri Lanka. Email: gamini_ratnayake@yahoo.com, Cell: + 94-718199643 Prof. CMB Dematawewa, Department of Animal Science, Faculty of Agriculture University of Peradeniya, Peradeniya, Sri Lanka. Email: mdematawewa@gmail.com Cell: + 94-716845746

Country	National Focal point
Activity :	Molecular Technique in Diagnosis of Diseases of Farm Animals and Poultry
Activity Leader:	**Mr. Md. Nure Alam Siddiky,** Senior Program Officer (Livestock), SAARC Agriculture Centre, BARC Complex, Farmgate, Dhaka-1215, Bangladesh. Email:
Afghanistan	NA
Bangladesh	Dr. Shah. Md. Ziqrul Haq Chowdhury Chief Scientific Officer (Livestock) Bangladesh Agricultural Research Council (BARC), Dhaka, Bangladesh Email: ziqrul06@yahoo.com, Cell: +88-01712 064831 Dr. Kazi Md. Rokibul Islam, Upazilla Livestock Officer (L/R), Department of Livestock Services, Dhaka, Bangladesh. Email: drrokibulislam@yahoo.com Cell: +88-01711-945233
Bhutan	Mr. Rinzin Dorji, Assistant Laboratory Technician- II, Dzongkhag Veterinary Hospital, Department of Livestock, Tsirang, Bhutan. Email: rinzin_dorji85@yahoo.com, Cell: + 975 17614406
India	Dr. Dipak Deka, Assistant Scientist, School of Animal Biotechnology Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, India Cell: + 09417176124, Email: deepakdeka@gmail.com Dr. P. Krishanmoorthy, Scientist, Project Directorate on Animal Disease Monitoring and Surveillance, IVRI Campus, Bangalore, India. Email: krishnamoorthyp@pdadmas.ernet.in Dr. K. Thangavel, Department of Microbiology, Veterinary College and Research Institute, Namakkal, Tamil Nadu, India. Email: ktvmicro@gmail.com
Maldives	NA
Nepal	Dr. Manish Man Shrestha , Veterinary Officer, Rabies Vaccine Production Laboratory, Department of Livestock Services, Kathmandu, Nepal
Pakistan	NA
Sri Lanka	Dr. R. M. C. Deshapriya, Senior Lecturer, Department of Animal Science Faculty of Agriculture, University of Peradeniya, Sri Lanka Email: desha1018@yahoo.com; Cell: + 94 718501967 Dr (Mrs). N. Y. Hirimuthugoda, Senior Lecturer, Department of Animal Science Faculty of Agriculture, University of Ruhuna, Sri Lanka Email: nyhirimuthugoda@yahoo.com; Cell: + 94 718601903

Country	National Focal point
Activity :	Farm Animal Genetic Resources Evaluation, Conservation and Management in SAARC Countries
Activity Leader:	**Mr. Md. Nure Alam Siddiky,** Senior Program Officer (Livestock), SAARC Agriculture Centre, BARC Complex, Farmgate, Dhaka-1215, Bangladesh. Email:
Afghanistan	NA
Bangladesh	Prof. Dr. A. K. Fazlul Haque Bhuiyan, Department of Animal Breeding and Genetics , Bangladesh Agricultural University, Mymensingh, Bangladesh Email: bhuiyanbau@gmail.com , Cell : 01715 047767
Bhutan	Dr. Jigme Dorji, Senior Biodiversity Officer, National Biodiversity Centre Ministry of Agriculture and Forest, Serbithang, Thimphu, Bhutan Email: jixmedorji@yahoo.com , Cell : +975-1-7388440
India	Dr. A. K. Srivastava, Director and Vice Chancellor, National Dairy Research Institute (NDRI), Karnal, Haryana, India Email: dir.ndri@gmail.com, Phone: +91-184-2252800
Maldives	NA
Nepal	Mr. Krishna Prasad Rijal, Senior Livestock Development Officer Ministry of Agriculture Development, Kathmandhu, Nepal Email: kprijal2003@yahoo.com , Cell : +977 9851071959 Phone: +977-1-4436756 (off)
Pakistan	Dr. Abdul Ghaffar, Principal Scientific Officer, Animal Sciences Institute, National Agricultural Research Centre (NARC), Pakistan Email: abdul.ghaffar58@gmail.com, Cell : +92-301-562-1650 Phone: +92-51-8443960
Sri Lanka	Dr. S. H. Gamini Wickramarathna, Deputy Director (Dairy Development) Department of Animal Production and Health, Peradeniya, Sri Lanka Email: aralupola@gmail.com, Cell : 0094 71 4426212/ +94 71 4426212

Annexure 7: Statement of expenditure (2013)

A) Institutional Cost

Sl. No	Head of Accounts	Amount US$
1	Allowances to Director and other Professional Staffs	100,549.77
2	Salaries and allowances to GS Officers and Staff	183,778.70
3	Printing, Stationeries and Reproduction	4,223.57
4	Travel Cost and Perdiem	1,685.52
5	Utilities Services and Maintenance	20,277.88
6	Local Hospitality for Governing Board, Selection Committee meetings	8,279.14
7	Vehicles Generator Lift, AC etc. POL, Insurance, Repairs etc.	18,145.00
8	Contingencies	13,706.25
	A) Total of Institutional Cost:	**350,645.83**

B) Programme Cost

Sl. No	Head of Accounts	Amount US$
1.	SAARC AgriNews (4 issues)	5,488.15
2.	SAARC Journal of Agricultural (2 issues)	6,370.05
3.	SAC Annual Report – 2012	1,980.53
4.	In-house Res. and Pub. on Thrust Areas of Agriculture in SAARC Countries: Printing	15,738.79
5.	Food grain situation in SAARC Countries and data for SAARC food Bank	248.10
6.	Observance of SAAARC Charter Day	1,253.17
7.	Capacity building and professionals development	1,620.83
8.	Program Building, Monitoring and Backstopping	6,007.49
9.	Acquisition of information materials in agricultural and allied fields from SAARC countries & other countries/organizations	7,500.39
10.	CAB Abstracts	13,717.00
11.	ICT Mediated Communication	5,637.17

12.	Distribution of Information Materials	11,499.88
13.	Reproduction of information materials audio visual/prog./dubbing/sub-titling	1,155.89
14.	Promotional Activities on SAARC Agriculture Centre	1,436.32
15.	Regional Initiation on Improvement of Vegetables and Adaptive Trial in SAARC Countries	17,601.31
16.	SAARC agriculture archive	592.79
17.	Prospects, Needs, Benefits and Risk Assessment of GM Products	14,728.30
18.	Regional Study on coastal and marine fish management in SAARC countries	2,500.00
19.	Comparative Analysis/Study of NAES in SAARC countries	11,398.88
20.	Assessment of veterinary services (Pub. & Priv.) practitioners in SAARC Countries	2,200.00
21.	Development and implementation of the SAARC Pesticide Information Network (SPINet)	6,500.00
22.	Extent and Potential use of Bio-Pesticides for Crop Protection in SAARC	22,393.08
23.	Use of Geo-info. Tech. for Mapping of Land Degradation in SAARC Countries	2,680.65
24.	Reg. Initiation on Dev. of Pulses & Adaptive Trial in SAARC	15,883.93
25.	Adaptation to Climate Change Impact on Crop Prod. in SAARC	15,177.24
26.	Popularizing Multiple Cropping Innovations as a Means to Raise Production and Farm Income	17,826.63
27.	Reg. Study on Conservation of Farm Animal Genetic Resources	24,666.29
28.	Training on Molecular Techniques in Diagnosis of Diseases of Farm Animals and Poultry	11,357.29
29.	High Yielding Buffalo Breed Development in SAARC	11,257.89
30.	Best Practices and Procedures of Saline Soil reclamation system in SAARC	17,415.04
22.	Miscellaneous/Incidental Charges	930.92
	B) Total of Programme Cost:	**274,764.00**
	Total Institutional and Programme Cost (A+B)	**625,409.83**
C)	SAARC-Australia Project Fund – 2013	55,638.29
	Grand Total (A+B+C)	**681,048.12**

Annexure 8: Audit Certificate

AUDITORS' REPORT ON THE STATEMENT OF RECEIPTS AND PAYMENTS OF THE SAARC AGRICULTURE CENTRE (SAC), DHAKA FOR THE PERIOD 1ST JANUARY 2013 TO 31ST DECEMBER 2013.

Report on the Financial Statements

The SAARC Standing Committee at its Twenty-eighth Session held in Kathmandu on 19th -20th August 2002 decided that the audit of the accounts of the SAARC Secretariat, SAARC Japan Special Fund and the SAARC Regional Centres will be performed by one Auditor each from the current Chair and the next Chair. Accordingly, the Governments of Maldives and Nepal have appointed Auditors for the Joint Audit Team 2013 to carry out audit of the Accounts of the SAARC Organization. Accordingly, the Joint Audit Team (JAT13) comprised of Mr. Yazmeed Mohamed, Manager-Financial Audit, Auditor General's Office, Male', Maldives and Mr. Bamdev Sharma Adhikari, Director, Office of the Auditor General of Nepal.

We have audited the accompanying financial statements based on the financial regulations/rules of the SAARC Regional Centres, which comprise the statement of receipts and payments and schedules forming part of the financial statements for financial year ended 31st December 2013.

Management's Responsibility for the Financial Statements

Management is responsible for preparation and fair presentation of these financial statements in accordance with the provisions of the Financial Rules. This responsibility includes designing, implementing and maintaining internal control relevant to the preparation and fair presentation of financial statements that are free material misstatement, whether due to fraud or error, selecting and applying appropriate accounting policies, and making accounting estimates that are reasonable in the circumstances.

Auditor's Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted the audit in accordance with the Generally Accepted Auditing Standards and International best practices. Those standards require that we comply with the ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amount and disclosures in the financial statements. The procedures selected depend on auditor's judgment, including the risk of material misstatement in the financial statements whether due to fraud or error. In making those risk assessments, the auditor considers internal controls relevant to the entity's preparation and fair presentation of the financial statements in order to design audit

procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on effectiveness of the entity's internal control.

An audit also includes evaluating the appropriateness of the accounting policies used and the reasonableness of accounting estimates made by the management, as well as evaluating the overall financial statement presentation.

We believe that the audit evidence obtained by us is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the Financial Statements comprising of statement of Receipts and Payments give a true and fair view of the financial operations of the SAARC Agriculture Centre (SAC) for the year ended 31st December 2013 and its fund balance as on that date.

(Yazmeed Mohamed)
Manager-Financial Audit
Auditor General's Office,
Male', Maldives

(Bamdev Sharma Adhikari)
Director,
Office of the Auditor General of Nepal,
Babarmahal, Kathmandu, Nepal.

Joint Audit Team
Dhaka, Bangladesh
25th June 2014

Contributors

Dr. Muhammad Nurul Alam, Senior Program Specialist (PSPD)
Dr. Muhammad Musa, Senior Program Specialist (Crops)
Ms. Nasrin Akter, Senior Program Specialist (Horticulture)
Mr. Md. Nure Alam Siddiky, Senior Program Officer (Livestock)
Mr. Mohammad Abdullah , Senior Program Officer (Publication)
Ms. Mafruha Begum , Senior Program Officer (Info & Comm)
Dr. Ibrahim Md. Saiyed, Project Coordinator, SAARC-Australia Project
Mr. Shah Alam Mawla Chowdhury , Video Production Officer
Mr. Md. Mizanur Rahman, IT Manager (Database)
Mr. Md. Abdul Kadir, IT Manager (Software)
Mr. Md. Saifur Rahman, Administrative Officer
Mr. Md. Iqbal Karim, Store & Procurement Officer
Mr. ATM Mostafizur Rahman Mojumder, Senior Finance Officer (In-Charge)
Mr. Mizanur Rahman, Personal Officer to Director
Dr. Tayan Raj Gurung, Senior Program Specialist (NRM)

ABOUT THE CENTRE

SAARC Agriculture Centre (erstwhile SAARC Agriculture Information Centre) was established as the first Regional Centre of SAARC in 1988 in Dhaka, Bangladesh. As the centre developed, its mandate expanded from information management to promotion of agricultural research and development, technology dissemination for sustainable agriculture development and poverty alleviation in the region. The objectives of the centre are set as follows:

1. To strengthen agricultural research and accelerate technology transfer through establishing regional networks on agricultural and allied disciplines, particularly among agricultural research and extension institutes, professionals, policy planners and stakeholders.
2. To provide inputs for developing regional policies, strategies, projects, primarily through developing networks in crop, livestock and fisheries sectors; and for efficient management of soil, water and other natural resources.
3. To promote new and innovative techniques and systems in agriculture, including production, post-harvest and food processing.
4. To facilitate collaborative studies, *inter alia*, on agricultural marketing and distribution systems, harmonization of agricultural related standards, promotion of agricultural trade, food security, risks and disaster management in agriculture.
5. To facilitate and undertake collaborative capacity building programmes in agriculture and allied sectors with focus on skill development and research on frontier areas.
6. To collate and disseminate information for agricultural advancement in the region.

The centre under the guidance of Governing Board members follows "participatory need-based program development" through consultative process with the member countries. In addition to the stakeholder participation, the Inter Governmental Core Group and SAARC Technical Committee on Agriculture and Rural Development (TCARD) provide broad guiding principles for program development.

The centre is supported directly by the member states through their annual financial contributions. The annual contribution is used for institutional and program cost. The Government of Bangladesh provides capital cost and infrastructure as the host country.

A team of professionals and support staff (31 heads) manages the programme in the centre.

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