Asia-Pacific Association of Agricultural Research Institutions (APAARI), Thailand

and

Council of Agriculture (COA), Taiwan

Collaborative Program

Progress Report

(January 1, 2019 to December 31, 2019)

Asia-Pacific Consortium on Agricultural Biotechnology and Bioresources (APCoAB)

2nd & 4th Floor, FAO Annex Building, 202/1, Larn Luang Road, Pomprab Sattrupai

Bangkok 10100, Thailand

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Asia-Pacific Association of Agricultural Research Institutions and Council of Agriculture (APAARI-COA) collaborative program on biotechnology has been in operation since 2008 as the Asia-Pacific Consortium on Agricultural Biotechnology (APCoAB). Initially approved for three years (2008-2010) with a funding support of USD 35,000 per annum, the program was extended twice (2011-2013, 2014-2016) and funding raised to USD 50,000 per annum. In view of the excellent performance of the APAARI-COA collaboration in terms of the number and range of activities conducted and benefits brought to APAARI members and other participants by way of knowledge enhancement, development of practical experience, networking and opportunities for partnership development, it was decided by both APAARI and COA to continue the APCoAB program for another term. Therefore, the program was extended for 4 years i.e. from 2017 to 2020 with a total budget of USD 560,000 is to be shared equally (USD 280,000) by COA and APAARI and other partners. The commitment of COA to continue supporting this program was conveyed during the XVIII APCoAB Steering Committee Meeting, held on October 31, 2016 at Taichung City, Taiwan. As per recommendations of Executive Committee (EC; 2/2017) of APAARI, XIX Steering Committee of APCoAB and EC 1/2018 of APAARI, activities on conservation and sustainable use of bioresources were included. The program Asia-Pacific Consortium on Agricultural Biotechnology was renamed as 'Asia-Pacific Consortium on Agricultural Biotechnology and Bioresources' retaining the old acronym as 'APCoAB' and also the objectives of APCoAB were modified, which were approved in the meetings of XIX Steering Committee of APCoAB and EC (1/2018) of APAARI.

During XIX Steering Committee of APCoAB held on May 28, 2018 at Bangkok, COA committed to enhance the funding with effect from 2019 in view of inclusion of bioresources activities under APCoAB and suggested that a revised APAARI-COA collaborative proposal (APCoAB) should be submitted to COA. Consequently, a revised APAARI-COA proposal (2019-2022) was submitted to COA, which has been approved by COA with enhanced funding from USD 70,000 to USD 170,000 per annum for 2019-2022 with the provision of salary of a Technical Associate in APCoAB, which was to be recruited.

Work Plan of APCoAB for 2019

Following is the Work Plan of APCoAB as approved by the Steering Committee of APCoAB and endorsed by Executive Committee (EC) of APAARI:

Area	**Activities**
Expert Consultation/ High Level Policy Dialogue	• Regional Expert Consultation: New genome manipulation technologies and their implications on biosafety regulation (October 2019)
Symposia/trainings/workshops	• Underutilized animal resources of Asia-Pacific and their amelioration (Workshop) (March 4-6, 2019)

	• Underutilized fish and marine resources of Asia-Pacific and their amelioration (Workshop) (July 10-12, 2019) • Gene editing technologies for crop and animal improvement (Training) (Sep-Oct 2019) • In vitro conservation and cryopreservation of crop germplasm (Training) (Nov 5-19, 2019) • The First International Symposium on Botanical Gardens and Landscapes (BGL 2019) (December 2019)
Steering Committee of APCoAB	• Steering Committee Meeting of APCoAB (June 12, 2019)
Publication of proceedings/status reports/success stories	• Publications on training manual (2), Proceedings of Expert Consultation and Workshops (4-5) (March-December 2019) • Three Status report/success stories are targeted - (GM Maize in Philippines, Rice Biotechnology in Asia-Pacific, Banana Tissue Culture in India) (March-December 2019)
APCoAB website	• Regular updates on agricultural biotechnology and bioresources developments, news and events of specific relevance to Asia-Pacific • Update of existing databases. Regular updates of other content and additional databases
One activity as suggested by COA	Workshop on Innovations in Agribusiness for Young Entrepreneurs, Taipei, Taiwan (July 1-5, 2019) Co-organizer: COA, APO

Accomplishments

During the period of January 1, 2019 to December 31, 2019, following activities were carried out as mentioned in chronological order:

A. Expert Consultation/Conference/Workshop (8)

The brief reports about activities accomplished under the period of report are discussed below in chronological order.

1. 13th International Conference on Development of Drylands was organized by ICAR-Central Arid Zone Research Institute, Jodhpur, India and Arid Zone Research Association of India (AZRAI), Jodhpur, India, at Jodhpur, from February 11-14, 2019. APAARI and APCoAB were also the co-organizers of 13th ICDD. The Conference was inaugurated by Shri Gajendra Singh Shekhawat, Minister of State for Agriculture and Farmers Welfare (Govt of India) on February 11, 2019.The conference was attended by 379 participants, researchers and policy makers including 91 foreign delegates from 37 countries covering five continents. In this conference, 5 plenary sessions having 17 lectures from global experts were organized, in addition to two evening lectures from highly reputed international experts. A total 55

Satellite Symposium on Dryland Agrobiodiversity for Adaptation to Climate Change

theme-wise oral lectures and 242 e-posters presentations were organized concurrently in 11 technical sessions. Likewise, five half-day satellite symposia (as concurrent sessions) were also organized on topics of contemporary importance in drylands.

Of the above, a satellite symposium on 'Dryland Agrobiodiversity for Adaptation to Climate Change', was also co-hosted by the Indian Society of Plant Genetic Resources (ISPGR), New Delhi, India, Bioversity International (BI), New Delhi, India and APAARI, Bangkok, Thailand with support from United Nations Environment Programme (UNEP) and APCoAB. The symposium was organized during the 13th ICDD. Dr Rishi Tyagi, APCoAB Coordinator, participated and Co-Chaired a technical session the main 13th ICDD Conference on agrobiodiversity.

The **Major Recommendations** emerged out of the Satellite Symposium are mentioned as below:

(i) It is imperative that a clear Road Map is developed and implemented for the efficient conservation and sustainable use of dryland agrobiodiversity, to ensure food and livelihood security in the drylands specially in the changing climate scenario.
(ii) Agrobiodiversity conservation and use should be comprehensive, not limited to crops on farm land, but include other components of dryland ecosystem, especially trees, shrubs, grasses and animal biodiversity.
(iii) For mitigation of climate change in dryland ecosystems, research on the distribution, collecting, documentation, conservation and legal protection of agrobiodiversity requires to be intensified. Development of a Red Data Book for dryland diversity would be an important requirement to determine conservation priorities and minimize genetic erosion.
(iv) Collection, characterization and evaluation animal and crop diversity of arid region that already withstand abiotic and biotic stresses must be undertaken on priority. Use of new tools and techniques like phenomics, genomics, space and robotic technologies should facilitate identification of valuable traits and genotypes better adapted in the drylands despite climate change scenario.
(v) There is need to promote and strengthen mixed cropping and agroforestry as well as silvi-pastoral systems (horticultural trees, multipurpose perennials, bushes, grasses and

livestock) to reduce the risk and stabilize income support to resource poor farmers, despite adverse conditions on account of climate change.

(vi) Precision water management technologies (such as conservation agriculture, precision land levelling, micro-irrigation including sub-surface drip and field bunding) should be popularized and promoted through appropriate policy and programs. The list of crops suitable for growing in drylands need to be reviewed especially with respect to water requirement.

(vii) Primary agro-processing units need to be established in rural and peri-urban areas to minimize the losses of farm produce and fetching better prices to farmers. Entrepreneurship involving youth and women at local level need to be created and supported.

(viii) Models to incentivize farmers need to be developed for facing ecological burden, in order to promote agroecology based cropping/farming and other agriculture systems. Also, environmental services for in situ and on-farm conservation of biodiversity and agrobiodiversity in the dryland ecosystems should be indexed and both incentives and reward systems be developed to support farmers promoting these sustainable practices. Crops and varieties adapted to local environments need to be mainstreamed to harness the benefits of their resilience to climate change and nutritional significance.

(ix) Circular bio-economy needs to be promoted, which is based on reduced use of inputs, recycling and reutilization for sustainable mode of renewal form of economy. Modification of the traditional integrated farming system and introduction of modern technologies need to be reassessed for small and marginal farmers in developing countries, by increasing subsides or other means of compensation.

(x) A more balanced approach in terms of policy is required for increased public funding/support to dryland farming and farmers, laying greater focus on research and development, production and marketing, on par with crops in the irrigated region.

(xi) The need to develop effective cooperation and partnership through either a consortium or a network was also recognized for knowledge and germplasm sharing as well as for capacity building and sustainable use. For this, the role of international centers like Bioversity International and APAARI was recognized.

3. Regional Workshop on Underutilized Animal Genetic Resources and their Amelioration

The Regional Workshop on Underutilized Animal Genetic Resources and their Amelioration was held on March 4-6, 2019 at MARDI Headquarters in Serdang, Malaysia. The workshop was organized by the APAARI, Malaysian Agricultural Research and Development Institute (MARDI), APCoAB, COA, and Australian Centre for International Agricultural Research (ACIAR) in collaboration with Department of Veterinary Services (DVS), Malaysia; Department of Wildlife and National Parks (WILDLIFE), Malaysia and Ministry of Agriculture and Agro-based Industry (MOA), Malaysia. Dr Zunika Bt Mohamed, Deputy Secretary General (Policy), Ministry of Agriculture and Agro-based Industry, Malaysia, inaugurated the Workshop. Opening remarks were presented by Dr Mohamad Roff Mohd Noor, Director

General, MARDI; Dr Chung-Hsiu Hung, Director General, COA and Dr Ravi Khetarpal, Executive Secretary, APAARI.

The objectives of the workshop were to assess the current status of underutilized animal genetic resources (AnGR) at sub-regional level and R&D status of priority native breeds that are needed to promote the use of underutilized AnGR in the Asia-Pacific region, to identify the knowledge gaps and way forward in defining regional priorities concerning underutilized AnGR, to create awareness on the role and value of underutilized AnGR that have potential for diversification of the food basket and to formulate strategies to strengthen the institutional, legal and policy framework for sustainable utilization of underutilized AnGR.

Invited guests, organizing committee members and participants of Workshop

A total of 63 participants from 14 countries in the Asia-Pacific region (Bangladesh, Bhutan, China, India, Iran, Kenya, Laos, Malaysia, Nepal, Philippines, Pakistan, Sri Lanka, Taiwan and Thailand) attended the workshop. The participants were from a number of national organizations such as research institutes, universities and research councils dealing with the management and conservation of underutilized AnGR.

The workshop comprised of presentations from 15 invited speakers who provided the background and status of underutilized AnGR in the region as well as presently available technologies in enhancing the management and breeding of underutilized AnGR. The presentations were delivered in three sessions: Technical Session I on The Status of Underutilized AnGR for Food and Agriculture at Sub-regional Level; Technical Session II on Thematic Presentations of Underutilized AnGR and Technical Session III on Strategies for Conservation and Utilization of Underutilized AnGR followed by the Technical Session IV on World Café Discussion – Regional Priorities for Underutilized AnGR in five key areas: (1) conservation, improvement and utilization; 2) value addition, marketing and export; (3) partnership and capacity development, biotechnology for enhancing utilization; (4) biotechnology for enhancing utilization and (5) regional information sharing system and focal points for the conservation and utilization of AnGR and Technical Session V on Panel Discussion on Legal and Policy Framework Support to Promote Utilization on Underutilized Animal Genetic Resources.

Launching of Proceedings and Country Status Reports

During the Plenary Session, a publication on Regional Expert Consultation on Agricultural Biotechnology - Scoping Partnership to Improve Livelihoods of Farmers in Asia-Pacific – Strategic Papers and Country Status Reports, was also launched by Dr Mohamad Roff Mohd Noor, Director General, MARDI, Malaysia

The **Major Recommendations** arising from the workshop are:

(i) On **conservation, improvement and use** of underutilized AnGR, each country within the Asia-Pacific region is recommended to have in place an enabling policy to protect and conserve AnGR. The assessment of underutilized AnGR has to be carried out at national level to gather information on geographical distribution, population dynamics, risk status, and indigenous knowledge and experience in the management of underutilized AnGR. The rights of smallholder farmers owning these underutilized AnGR are to be safeguarded through filing of their intellectual property rights and agreement on sharing of benefits.

(ii) On **value addition, marketing and export**, that improvement of technology, facility, training and education on value-added products of indigenous AnGR are highly recommended. Farmers engaged in keeping underutilized species should be provided with enhanced skill and knowledge to enable them to develop and commercialize these value- added products. Steps should be taken to initiate and develop–branding and national certification to promote products derived from indigenous species. The public should be exposed to these products through awareness campaign to promote these products. The governments of APAARI member countries are recommended to provide the legal provisions to protect the originality and exclusivity of indigenous animal products. The marketing of products from indigenous animals should be enhanced and their production be made more consistent and their high quality maintained through R&D and training modules.

(iii) On **partnership and capacity development**, it is recognized that many stakeholders of special groups, NGOs, entrepreneurs, farmers and research institutions are to be included in the management of underutilized AnGR. To ensure sustainable partnership, the stakeholders need to be identified and engaged at national and regional levels based on priorities identified on underutilized AnGR. To build partnership, a networking of interest groups and institutions could be initiated to collaborate on selected key issues such as expertise development, methods/technologies, deliverables and budget, and identify areas of common interest or current challenges of underutilized AnGR. Sharing of data and knowledge in specific areas of AnGR management including food security, is recommended to be strengthened through involvement of country personnel in workshops, seminars and training courses. A centralized data bank, also acting as repository of contributed information on AnGR, could provide easy access to member countries. Exchange of genetic materials of indigenous breeds is very crucial and should be given priority. For capacity building, awareness on the importance of status, risk issues and conservation methods of AnGR should be shared through seminars and workshops and hands-on trainings on modern biotechnologies. Selected advanced technologies

in the preservation of genetic materials and multiplication of breeding animals may assist in the sustainable management of underutilized AnGR in member countries.

(iv) On **biotechnology for enhancing utilization**, the issues constraining the use of biotechnological methods in livestock production are lack of expertise, data, financial support and facilities. It is highly recommended that an Asia-Pacific Regional Genebank for gametes and embryos to facilitate regional sharing of genetic materials and enhance the mechanism for intra-regional exchange of AnGR be formed. A consortium for Asia-Pacific for underutilized AnGR is recommended as a common platform for regional collaboration and networking in underutilized AnGR. Collaborative projects among countries in the Asia-Pacific region are proposed on specific areas such as breed characterization, genomic profiling, sexing and cryo-preservation of gametes and value-added products of underutilized AnGR. Hands-on training for researchers, extension agents and farmers should be organized to upgrade their skills and knowledge in the multiplication and management of AnGR. Knowledge in management of AnGR could also be imparted through conferences, seminars and newsletters. Awareness programs could be conducted to expose farmers to easy-to-do biotechnological methods in the identification and breeding of underutilized AnGR. APAARI may facilitate the scoping for partners and fund providers from public and private sectors for financial support through regional-wide proposals in the conservation and utilization of underutilized AnGR.

(v) On **regional information sharing system and focal points,** there is a need to tailor the AnGR information system to meet each country's specific attributes. A regional information system should have defined objectives (kinds of data to share, end users and involvement of local communities), be user friendly in its usage and promote public awareness to educate the local community on AnGR. It is recommended that an Asia Pacific AnGR information system which meets the regional requirements be set up. The information system is suggested to be linked to DAD-IS and DAGRIS to facilitate the systematic gathering of AnGR information in the region.

4. Regional Workshop on Underutilized Fish and Marine Genetic Resources and their Amelioration

The Regional Workshop on Underutilized Fish and Marine Genetic Resources (FMGR) and their Amelioration was held on July 10-12, 2019 at National Aquatic Research Agency (NARA), Sri Lanka. The workshop was organized by the APAARI under its programme on APCoAB, Sri Lanka Council of Agricultural Research and Policy (SLCARP), COA, in collaboration with National Aquatic Resource Research and Development Agency (NARA). Mr P Harison, Hon'ble Minister of Agriculture, Rural Economic Affairs, Livestock Development, Irrigation and Fisheries and Aquatic Resources Development, Government of Sri Lanka, participated as Chief Guest who inaugurated the workshop and delivered inaugural address. Mr Dilip Wedaarachchi, Hon'ble State Minister of Ministry of Agriculture, Rural Economic Affairs, Irrigation and Fisheries & Aquatic Resources Development, Government of Sri Lanka was also participated as Guest of Honour and delivered his speech. Opening remarks were presented by Dr Kingsley Bernard, Chairman, SLCARP, Sri Lanka; Er. EASK Edirisinghe, Chairman, NARA, Sri Lanka; Dr Hsin-ming Yeh, COA, Taiwan; and Dr Rishi Tyagi, Coordinator, APCOAB, APAARI, Bangkok.

The objectives of the workshop were to: (i) assess the current status of underutilized FMGR

Participants of Regional Workshop on Underutilized Fish and Marine Genetic Resources and their Amelioration

at regional level and to assess R&D status of priority species those are needed to be promoted for the use in food and agriculture, (ii) discuss the knowledge gaps and way forward in defining regional priorities concerning underutilized FMGR and create awareness on the role and value of underutilized FMGR that have potential for diversification of food basket and improve the livelihoods of rural and coastal population, and (iii) formulate strategies for strengthening the institutional framework for FMGR management, and legal and policy framework to promote conservation and sustainable use of underutilized FMGR at regional level.

Expected outcomes of the workshop were: (1) The Regional Workshop will provide a platform for sharing experiences/knowledge relating to underutilized FMGR those are important for food and agriculture in Asia-Pacific, (2) Assessing the importance of most potential FMGR, status of their R&D for exploring the possibilities of their commercial use and eventual benefit to rural and coastal population of Asia-Pacific, (3) Developing a Road Map to ensure efficient management including conservation and sustainable use of underutilized FMGR, and (4) Exploring the possibilities of project formulation and establishing a regional network for knowledge sharing and other related issues at regional level.

A total of 94 participants from 12 countries in the Asia-Pacific region (Bhutan, Fiji, India, Iran, Laos, Malaysia, Nepal, Philippines, Pakistan, Sri Lanka, Taiwan and Thailand) attended the workshop. The participants were from a number of national organizations such as research institutes, universities and research councils dealing with the management and conservation of underutilized FMGR. Out of 94, some 30% participants were women scientists/researchers.

The workshop comprised of presentations by 10 invited speakers/experts from different countries who provided the background and status of underutilized FMGR in the region as well as presently available technologies for conservation and utilization underutilized FMGR including access and benefit sharing, information system, sponges and their potential uses and non-food uses of FMGR. The presentations were delivered in three sessions: Technical Session I on Thematic Presentations, Technical Session II on Strategies for Conservation and Technical Session III on Country Status Reports followed by Technical Session IV on World Café Discussion – Regional Priorities for Underutilized FMGR in five key areas: (1)

conservation, improvement and use; (2) Value Addition, Marketing and Export; (3) Biotechnology for Enhancing Utilization, (4) Partnership and Capacity Development, and (5) Regional Information Sharing System and Focal Points for the Conservation and Utilization of FMGR and Technical Session V on Panel Discussion on Legal and Policy Framework Support to Promote Utilization on Underutilized Fish and Marine Genetic Resources.

Major recommendations arising from the workshop could be summarized as follows:

Thematic Presentations on Underutilized Fish and Marine Genetic Resources : Application of genetic tools for identification and stock assessment of marine species that subjected to over utilized; implement regulations and policies to establish species specific MSY; dissemination of knowledge on sustainable utilization FMGR among different stake holders; identify degraded fishing grounds and restoration of them; establish genome resource banks; application of biotechnological methods to promote aquaculture practices; establish partnerships among countries within the regions to share knowledge and technical support.

Value Addition, Marketing, and Export : Introduce simple and cost effective methods/technology at household levels and improve infrastructure facilities to produce alternative value added food sources; improve and promote culture based methods association with genetic tools to reduce the pressure on natural fishery resources and introduce alternative livelihoods; establish methods to gather data and data sharing within the country and among regional countries; maintain regionally accepted common standards for branding the products and initiate trade negotiations among regional countries to expand international markets.

Biotechnology for Enhancing Utilization: Establish central germplasm banks to develop better breeding programs via exchanging resources; develop captive breeding techniques in cooperating genetic tools to establish selective breeding programs; identify and establish suitable micro-propagation methods of selected seaweed types to enhance the seaweed farming; establish policies and regulations for exchange the knowledge on biotechnology, techniques and resources among countries to enhance the utilization and development of marine resources in the region.

Partnership and Capacity Building (PCB): Establish an inter-governmental/ regional cooperation body to assess the capacity building needs and gaps of the regional nations; establishment of a body to support to develop national and international work plans for PCB; create regional economic partnerships to identify potential value of resources for utilization; create regionally managed funded programs between countries to identify research capacities of regional partners; set up material transferring protocols (genetic or live samples) and repositories to facilitate safe custody of germplasm accessions and exchange for research; initiate PCB activities between countries for sharing water and genetic resources for harmonize policies on introduction of aliens/exchange of germplasm within the region and outside the region; and implementation of access benefit sharing of programs.

Regional Information Sharing System and Focal Point: Existing commodity wise national database to be enriched with other relevant metadata of the species including the conservation status in a standard format; mechanism to be developed for sharing the information in accordance to IPR and other national laws; a duplicate set of database should be maintained preferably in more than one country; addition of any information subjected to approval of an administrator and expert committee of the Focal Point which should be established in each country and the region; stimulate and coordinate the maintenance and further development of databases (commodity wise) at country and regional level in a standard format.

The detailed Proceedings and Recommendations and Country Status Reports are under compilation and publication.

5. Workshop on Innovations in Agribusiness for Young Entrepreneurs

The Asian Productivity Organization (APO) in cooperation with the China Productivity Center (CPC) and COA and APAARI under its programme on APCoAB, organized a workshop on 'Innovations in Agribusiness for Young Entrepreneurs' on July 1-5, 2019 in Taipei, Taiwan. The main objective of workshop was to promote discussion on innovations in agribusiness which create an attractive environment for the young, digital-savvy generation. A total 29 participants (from 13 countries) - 12 from APO members; seven from the APAARI member countries attended the workshop. Participation of seven participants from APAARI-member countries *i.e.* Fiji, India, Iran, Malaysia, Philippines, Sri Lanka, Thailand), were financially supported under COA and APAARI collaborative programme on APCoAB.

The workshop was steered by three international and three local resource persons, namely, Dr Wynand Bodewes, Associate Professor of Entrepreneurship, Maastricht School of Management, the Netherlands; Senior Consultant Jun Chanoki, 5 Plus 2 Corporation, Ltd., Japan; Dr Karl Behrendt, Professor, Elizabeth Creak Chair in Agri-Tech, Harper Adams University, UK; CEO Alice Hsieh, Niyu Life International Co., Ltd., ROC; Cheng-Ray Yang, Department of Farmers' Service, COA, ROC; and Manager Ya-Yin Yang, Julia Floratech Co., Ltd., ROC. After welcome addresses by Director General Dr Chung-Hsiu Hung of the Department of International Affairs, COA, and Executive Secretary Dr Ravi Khetarpal of the APAARI, the resource persons spoke on various aspects of agribusiness to attract young entrepreneurs in various interactive sessions.

Participants of Workshop on Innovations in Agribusiness for Young Entrepreneurs

Technical agenda included 6 Sessions on (1) Introduction to innovations, entrepreneurship, and the youth generation; (2) Agribusiness development through youth entrepreneurship; (3) Accelerating youth entrepreneurship through systemic facilitation; (4) Field visits; (5) Country paper presentations; (6) Group discussion and presentations. These included, new business models, procuring financing for agri-entreprenerial startups, overview of policies on youth in agribusiness, alternative food resources, and examples of support offered to young entrepreneurs by the COA were also discussed

The experts involved in the workshop appreciated for extremely high level of engagement of participants in professional manner; teamwork among the speakers, organizers, and APO Secretariat staff; and enthusiasm during the interaction of participants with experts. The workshop is expected to have positive entrepreneurial outcomes once participants implement the learning experience in their respective countries.

The participants also visited the two sites - FuHsiang Cactus Garden, the manager made a presentation on its brand and business model introduction and applications of its innovative agritech management system and New Farmers' Market, operated by the Xinpu Town Farmers' Association, to demonstrate and provide an opportunity to realize and experience the community-based agribusinesses operations. All resources material is uploaded for the benefit of the participants on: http://apo-net.sakura.ne.jp

6. Regional Expert Consultation on Gene Editing and its Regulation was held on October 10-11, 2019 at International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, India. The Expert Consultation was organized by Asia-Pacific Association of Agricultural Research Institutions (APAARI), under a program on Asia-Pacific Consortium on Agricultural Biotechnology and Bioresources (APCoAB), in collaboration with ICRISAT, Council of Agriculture (COA), Federation of Seed Industry of India (FSII), Research Program on Grain Legumes and Dryland Cereals (RP-GLDC). Dr Renu Swarup, Secretary, Department of Biotechnology, Government of India was the Chief Guest and delivered the inaugural address on Gene Editing in India during the of the Opening Session. Remarks were also given by Drs Peter S Carberry, Director General, ICRISAT; Kiran K Sharma, Deputy Director General (Research), ICRISAT; Ram Kaundinya, Director General, FSII; Rajeev K Varshney, RP Director, Genetic Gains. Dr Rishi K Tyagi, Coordinator, APCoAB, spoke about the rationale and expectations from the Expert consultation.

Dr Rishi Tyagi Felicitate Secretary DBT, Government of India during Inauguration of the Expert Consultation on Gene Editing

The objectives of the Expert Consultation are: (1) Review the status of regulatory policies around gene editing across the globe particularly in countries of Asia-Pacific region; (2) Provide a platform to promote adoption of science-based predictable policies for regulating gene edited crops and breeds; (3) Provide a platform to discuss the impact of regulatory hurdles, delays and associated high cost on technology adoption; and (4) Discuss on communication strategies, enabling policies for plant and animal breeding innovations.

The Expert Consultation is expected to bring about:

1. Record opinions and inputs from public and private sector regarding the regulatory framework in relation to gene edited products.
2. A white paper on recommendations for science-based, consistent, predictable regulatory policies.
3. Recommend the best regulatory path forward for India, considering its unique status and influence in the region, and other countries of Asia-Pacific region.

A total of 110 participants attended the Opening Session belonging from 9 countries (Australia, India, Japan, Philippines, Papua New Guinea, Switzerland, Taiwan, Thailand, Vietnam). Total 70 participants were present throughout 2-day meeting. Out of 70 participants, 26% were women researchers. Participants included researchers,

Participants of Regional Expert Consultation on Gene Editing and its Regulation

representatives of various public institutions and private sector; policy makers and scientists from member countries of APAARI; FAO; CGIAR centres; government departments and bodies including Department of Biotechnology, Ministry of Agriculture & Farmers' Welfare. Recognized diverse set of experts also attended and made presentations and participated in panel discussion.

The agenda of the Expert Consultation comprised of 7 invited lectures by the experts. The presentations were delivered in three sessions: Technical Session I on Status and Advances in Gene Editing, Technical Session II on Regulatory Status of Gene Editing in Asia-Pacific Region and Technical Session III on Status of Gene Editing in CG Centres and Perception of Gene Editing by Different stakeholders followed by special Session on Thematic Presentations on Gene Editing and Technical Session IV on Panel Discussion to Prioritize Research Areas, Capacity and Infrastructure Development, Regulatory Policy Development & Public Awareness, and Possible Partnerships to Achieve SDGs. Draft recommendations were presented in Plenary Session. Recommendations are being refined for circulation among all the participants for their inputs.

7. International Hands-on Training on Genome Editing Technologies was organized on October 19-25, 2019 at ICRISAT. The training was organized by Asia-Pacific Association of Agricultural Research Institutions (APAARI), under a program on Asia-Pacific Consortium on Agricultural Biotechnology and Bioresources (APCoAB), in collaboration with ICRISAT, BioNcube (DBT), and Research Program on Grain Legumes and Dryland Cereals (RP-GLDC).The training was inaugurated by Dr Peter Carberry, Director General, ICRISAT who delivered the inaugural address. Remarks were presented by Drs Rajeev Varshney, RP Director, Genetic Gains, ICRISAT; Rajeev Gupta, ICRISAT, and Jan Debenae, ICRISAT. Dr Rishi Tyagi made a presentation about the expectation from the training programme. A total 22 participants, belonging to public (NARS) and private sectors of 11 countries (Egypt, India, Kenya, Malaysia, Namibia, Philippines, Senegal, Taiwan, Thailand, Uganda, Vietnam) attended the training. Out of 22 participants, 36% were women scientists/researchers involved in gene editing research programmes. Five trainees (from Malaysia, Philippines, Taiwan, Thailand, Vietnam) were sponsored by APAARI under APCoAB programme.

Director General ICRISAT (center) inaugurated the International Hands-on Training on Gene Editing

Participants of the International Hands-on Training on Gene Editing with Chief Guest

A comprehensive 2-week schedule of training comprising theory and practical sessions was designed. Five theory lectures were given by the experts on various aspects of gene editing. The trainees were exposed to laboratory practical on various aspects of gene editing - Bioinformatics tools for guide RNA designing; cloning of the guide RNA and Cas9 in to the plant transformation vector; genetic transformation; Confirmation of the recombinant clones by colony PCR; plasmid DNA isolation for the colony PCR positive colonies; Agrobacterium transformation- electroporation; bacterial transformation for the Gateway LR ligated reactions; Demo Arabidopsis/Tobacco transformation; functional characterization of gene-edited plants; surveyor assay/Nano pore sequencing for identifying the Indels in gene edited plants; surveyor assay/Nano pore sequencing data analysis. Visits to Centre for Cellular and Molecular Biology (CCMB) and ICRISAT facilities – Phenotyping Platform, and Centre of Excellence in Genomics and System Biology (CEGSB) were also arranged for the trainees. In addition to developing the capacities in gene editing research, it is also expected

that interaction among the trainees and between trainees and scientists of ICRISAT will pave the path to develop the new partnerships and collaborative research programmes on gene editing at regional level.

8. International Training Course on '*In Vitro* and Cryopreservation Approaches for Conservation of Plant Genetic Resources' was jointly organized by ICAR-National Bureau of Plant Genetic Resources (NBPGR) and Bioversity International, India Office, New Delhi in collaboration with the APAARI, Bangkok, Thailand under its program on APCoAB.

The 2-week duration course was held from November 5-19, 2019 at the Tissue Culture and Cryopreservation Unit (TCCU) of ICAR-NBPGR, New Delhi. The TCCU was established to carry out research on *in vitro* conservation and cryopreservation of difficult-to-conserve crops and species, leading to the development of techniques for their short-, medium-, and long-term germplasm conservation in the *In Vitro* Genebank (IVGB) and Cryogenebank. The TCCU has been designated as a Centre of Excellence (CoE) in 2006 under the NBPGR-Bioversity International workplan, for undertaking international training programmes on *in vitro* conservation and cryopreservation of PGR, to enhance the capacity of national programs especially in the developing countries.

The present training was held this year was attended by 22 trainees from 13 countries including Africa (Algeria, Madagascar, Senegal), Central Asia (Uzbekistan, Kazakhstan, Ukraine, South and East Asia (Bangladesh, India, Philippines, Taiwan) and Pacific Region (Fiji, PNG, Samoa).

The training was inaugurated on November 5, 2019 by Dr R.C. Agrawal, Deputy Director General (Education), ICAR; National Director, National Agricultural Higher Education Project

Participants of the International In Vitro and Cryopreservation Training with Dr RC Agrawal, Chief Guest (center) of Inaugural Function and Faculty

(NAHEP) & Registrar General, Protection of Plant Varieties and Framers' Rights Authority (PPV&FRA) in the presence of Dr D.K. Yadava, Additional Director General (Seed), ICAR, Dr R.K. Tyagi, Coordinator, APCoAB, APAARI, Thailand and Dr J.C. Rana, National Coordinator, UN-GEF Project, Bioversity International-India.

The training was structured to cover all the aspects of in vitro and cryopreservation of germplasm, through 21 lectures and 14 practical sessions. Lectures were delivered by resource persons from within NBPGR along with four International faculty, namely, Dr Hugh Pritchard (Royal Botanic Gardens, Kew, UK), Dr Bart Panis (Bioversity International, Leuven, Belgium), Dr Takao Niino (Japan) and Dr Kanchit Thammasari (Mahidol University, Bangkok, Thailand). Trainees got a hands-on experience of handling vegetatively propagated crops and difficult to conserve recalcitrant plant species. In addition, lectures were also delivered by the co-organizers namely Dr R.K. Tyagi (APCoAB, APAARI, Thailand), Dr N.K. Krishna Kumar and Dr J.C. Rana (Bioversity International-India).

Participants of the International In vitro and Cryopreservation Training attending Lab Practical's

Apart from the lectures and practicals, trainees also visited the National Genebank and the National Herbarium of Cultivated Plants (NHCP), both housed within the ICAR-NBPGR Campus.

Participants and Faculty of the International In Vitro and Cryopreservation Training with Dr Raj S Paroda (center), Chief Guest of Valedictory Function

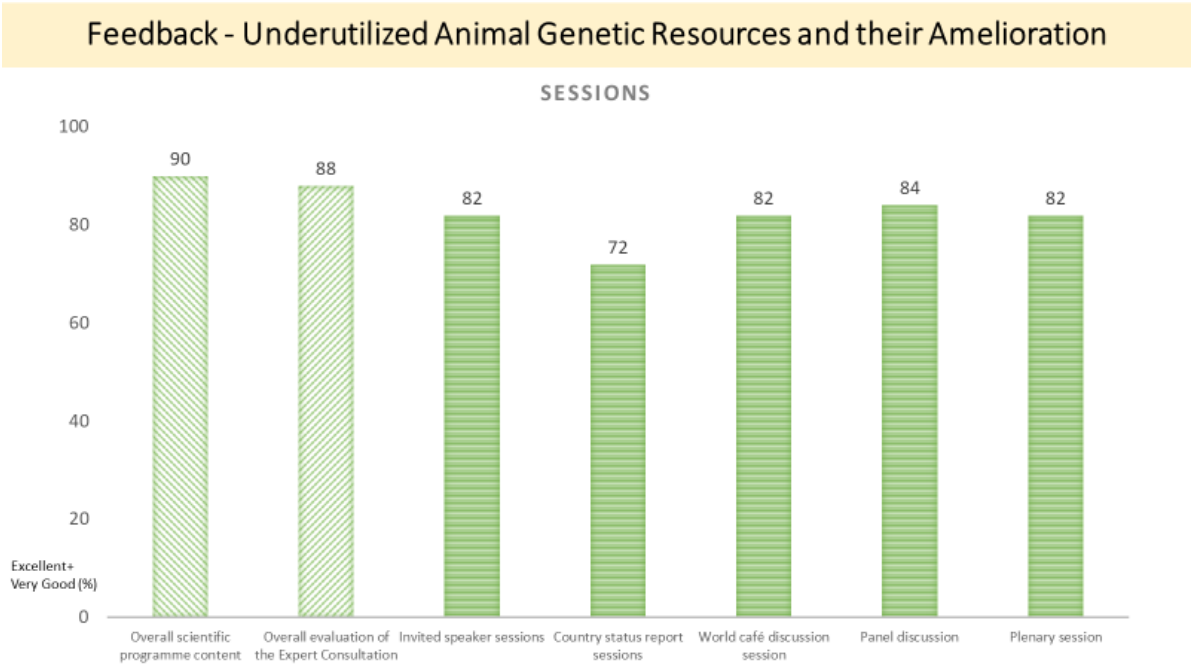
The training was concluded by distributing the Certificates of Successful Completion to the participants by Dr Raj S Paroda, Former Director General ICAR & Secretary DARE, Government of India and Executive Secretary, APAARI during valedictory function. Trainees gave their feedback which is presented in one of the following sections. The training ended on a high note, with appreciation by the participants and opened up newer avenues for collaboration with institutes in various other countries working on similar lines or setting up their research facilities in the area of *in vitro* and cryopreservation. The training provided the opportunities for South-South Cooperation as well as North-South collaboration in capacity development in the area of biotechnology for conservation of PGR, as faculty are also drawn from other nations like Belgium, Japan, Thailand and UK.

3. **Feedback from the Participants** of Regional Workshops on Underutilized (i) Animal and (ii) Fish and Marine Genetic Resources and their Amelioration, (iii) Regional Expert Consultation on Gene Editing and its Regulation, (iv) International Hands-on Training on Genome Editing Technologies and (v) International Training Course on *In Vitro* and Cryopreservation Approaches for Conservation of Plant Genetic Resources.

   A simple Evaluation Form was developed to obtain the feedback from the participants of the workshops for evaluation of the workshop regarding organization, logistics, scientific

programme content, technical sessions, speakers and suggestions from participants for further improvement. Feedback is analyzed and summarized below:

(i) Regional Workshops on Underutilized Animal Genetic Resources and their Amelioration held in Malaysia on March 4-6, 2019



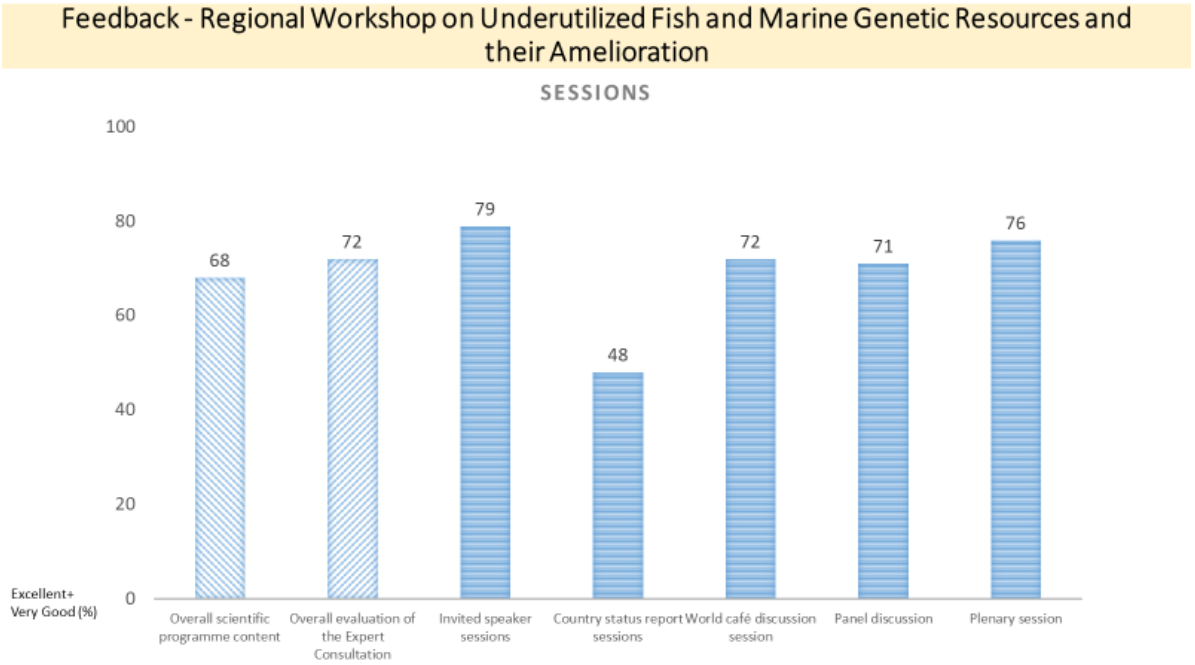
Some 80-98% participants gave the high commendation (Excellent or Very Good) for logistics, meeting venue and facilities, all technical sessions and overall scientific programme.

a) Quality of invited speakers, World café Discussion, Panel discussion, Plenary Session was rated as Excellent or Very Good by 82-84% participants.
b) Country Status Report session was rated as Excellent or Very Good by 72% participants.
c) Overall evaluation of the workshop was recorded as Excellent or Very Good by 88% of participants.
d) In general, it was inferred by the participants that the workshop was a very good platform for networking and collaboration
e) Some suggestions were also received from the participants:
    - Technical visits to farm where underutilized animals are maintained.
    - APAARI should organize the workshops/events in collaboration with member countries.
    - More time should be given for general discussion.

(ii) Regional Workshops on Underutilized Fish and Marine Genetic Resources and their Amelioration held in Sri Lanka on July 10-12, 2019

a) Some 60-79% participants gave the high commendation (Excellent or Very Good) for logistics, all technical sessions and overall scientific programme.
b) Quality of invited speakers, World café Discussion, Panel discussion, Plenary Session was rated as Excellent or Very Good by 71-79% participants.

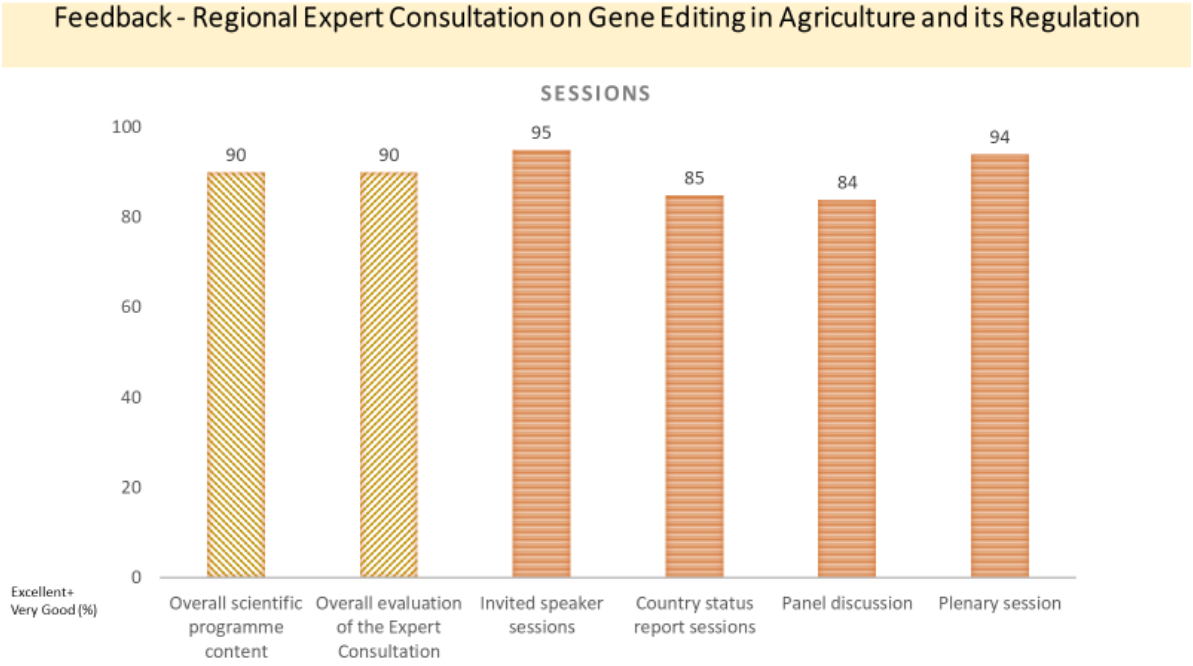
c) Country Status Report session was rated as Excellent or Very Good by only 48% participants.



d) Meeting venue and facilities were rated as Excellent or Very Good by 60% participants.
e) Overall evaluation of the workshop was recorded as Excellent or Very Good by 72% of participants.
f) In general, World café Discussion and Policy Framework session were much appreciated by all the participants.
g) Some suggestions were also received from the participants:
    - Country Status Reports were not consistent by all presenters.
    - Biotechnology of marine resources should have been elaborated for discussion.
    - Scope of improvement in meeting venue facilities.

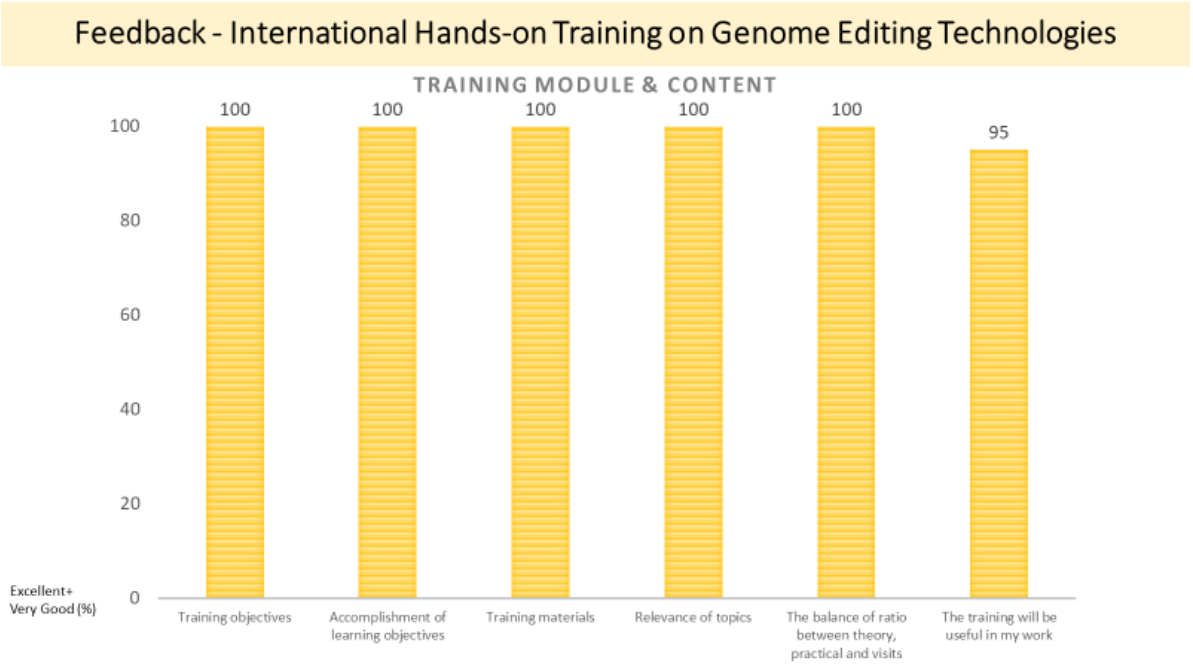
(iii) Regional Expert Consultation on Gene Editing and its Regulation

a) Some 80%-100% participants gave the high commendation (Excellent or Very Good) for logistics, meeting venue and facilities, all technical sessions and overall scientific programme.
b) Quality of Invited speaker sessions, Panel discussion, Plenary session was rated as Excellent or Very Good by 84%-94% of participants.
c) Country Status Report session was rated as Excellent or Very Good by 85% of participants.
d) Overall evaluation of the workshop was recorded as Excellent or Very Good by 90% of participants.
e) In general, invited speaker sessions and Regulatory framework were much appreciated by all participants.



f) Some suggestions were also received from the participants:
   - More time for critical topics.
   - More case studies, especially people from the U.S.A. who has done commercialization of products.

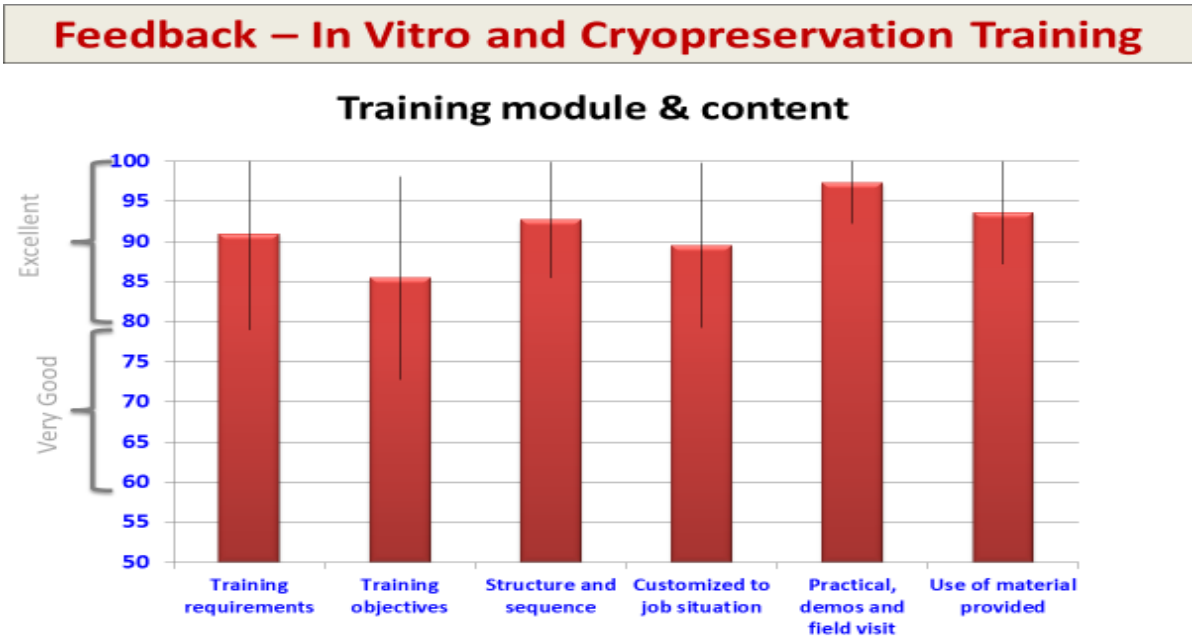
(iv) International Hands-on Training on Genome Editing Technologies



a) Above 90% of participants gave the high commendation (Excellent or Very Good) for logistics, meeting room, laboratories and overall training programme.
b) The accomplishment of learning objectives was rated as Excellent or Very Good by 100% of participants.
c) The relevance of topics was rated as Excellent or Very Good by 100% of participants.

d) Overall, the balance of ratio between theory, practical and visits was recorded as Excellent or Very Good by 100% of participants.
e) Some 95% of participants said this training will be useful in their work.
f) In general, visits to core faculties and lab session were much appreciated by all participants.
g) Some suggestions were also received from the participants:
    - Wi-fi access in the conference room was limited.
    - More trainings in the future such as Usage of bioinformatic tools and data analysis, Phenotyping, Speed breeding and Genome sequencing.

(v) International Training Course on *In Vitro* and Cryopreservation Approaches for Conservation of Plant Genetic Resources

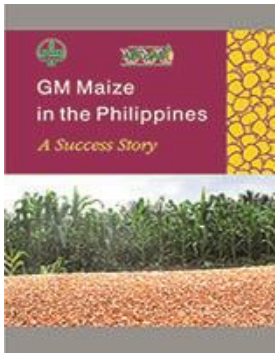


a) Some 98% trainees rated overall training as Excellent or Very Good.
b) The accomplishment of learning objectives was rated as Excellent or Very Good by 86% of participants.
c) Course content was scored as excellent or very good by 93% participants.
d) Hands-on practical and demonstration and expertise of faculty were rated as training facilities by 98% trainees rated as excellent or very good.
e) In addition to the newly-acquired knowledge, the participants appreciated the training as a platform for opening up new ways for collaboration with other institutes in other countries.

Additionally, it was also an opportunity for South-South Cooperation, as well as North-South collaboration in capacity development on biotechnology for conservation of plant genetic resource.

B. Publications (12)

(i) **GM Maize in Philippines – A Success Story** was documented and published. it comprised 11 chapters – Introduction, Laying the Foundations for Modern Agricultural Biotechnology, An Evolving Regulatory System for Modern Biotechnology, The First GM Crop: MON810 Maize, GM Maize: On the Farm and in the Market, Public Perception and Media Monitoring, Trend of GM Maize Cultivation, Economic Impacts of GM Maize, Science-based Policy Support for Prolonging benefits of GM technology through Insect Resistance Management, Lessons Learned and Looking Forward and References. The soft copy of the document was distributed to all concerned stakeholders and can be accessed on: http://www.apaari.org/web/wp-content/uploads/downloads/2019/GM%20Maize%20in%20Phillippines-Success%20Story_28-3-2019.pdf



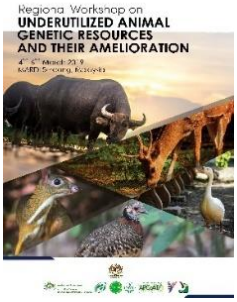
APAARI (2019) GM Maize in Philippines – A Success Story. Asia-Pacific Association of Agricultural Research Institutions, Bangkok, Thailand. xx+79 p. (ISBN : 978-616-7101-15-6)

(ii) **International Seminar on Conservation and Prospecting of Bioresources in the Asia-pacific Region – Biography and Abstracts, pp 59**. This publication was made by Academia Sinica containing biography of the speakers and the abstracts of the papers presented during the Seminar, Technical Program, and other logistic details.

(iii) **Proceedings of the III International Symposium on Plant Cryopreservation**. APAARI and APCoAB were the co-organizers of the above symposium. Selected contributed paper presented during symposium were reviewed by the Editorial Board and published as above proceedings (ISBN: 0567-7572). Dr Rishi Tyagi was member of the Scientific Committee, International Advisory Committee of symposium and Editorial board of this volume of Acta Hortuculturae (1234). https://www.actahort.org/books/1234/

Proceedings and Recommendations

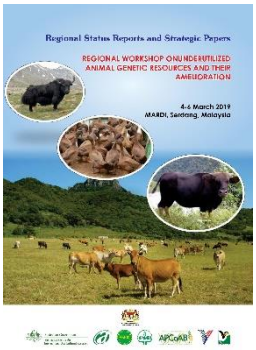
(iv) **Proceedings and Recommendations - Regional Workshop on Underutilized Animal Genetic Resources and their Amelioration**, held at Kuala Lumpur, Malaysia, Thailand, held on March 4-6, 2019, has been published (ISBN 978-616-7101-17-0). The publication can be accessed on http://www.apaari.org/web/wp-content/uploads/downloads/2019/Underutilized%20Animal%20Genetic-Proceedings%20&%20Recommendations_19-6-2019.pdf



M Ariff Omar, Ainu Husna MS Suhaimi, Rishi Kumar Tyagi, Amie Marini Abu Bakar, Habsah Bidin, Siti Masidayu Mat Saad, Noraini Samat and Ravinder Kumar Khetarpal (2019). Regional Workshop on Underutilized Animal Genetic Resources and Their

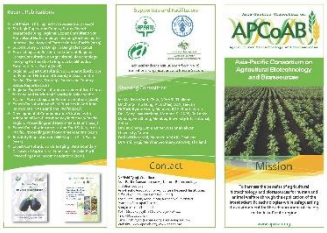
Amelioration - Proceedings and Recommendations. Asia-Pacific Association for Agricultural Research Institutions (APAARI), Bangkok, Thailand; March 4-6, 2019, xviii+64 p.

(v) Regional Workshop on Underutilized Animal Genetic Resources and their Amelioration – Regional Status Reports and Strategic Papers, has been published (ISBN 978-616-7101-20-0). The compilation has a total of 14 chapters including strategic papers and status reports of underutilized AnGR for Food and Agriculture in South and West Asia, Southeast Asia, East Asia, the Pacific. The different chapters for each sub region bring out the status of AnGR utilization in different countries of each of the sub region, highlights the unique AnGR in the sub region and provides information on their economic and socio cultural importance, production and consumption, import and export statistics, inventorization and future thrust areas for their optimal utilization and research. The publication can be accessed on: http://www.apaari.org/web/wp-content/uploads/downloads/2019/Underutilized%20Animal%20Genetic-Regional%20Status%20Report_24-10-2019.pdf

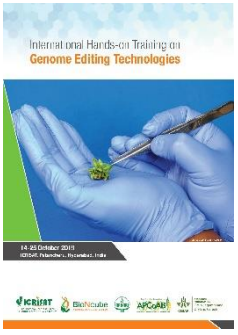


M. Ariff Omar, Rishi K. Tyagi, Amie Marini Abu Bakar, Habsah Bidin, Noraini Samat, Ainu Husna M.S. Suhaimi and Ravi K. Khetarpal (2019). Regional Workshop on Underutilized Animal Genetic Resources and their Amelioration – Regional Status Reports and Strategic Papers. Asia-Pacific Association for Agricultural Research Institutions (APAARI), Bangkok, Thailand; March 4-6, 2019, xviii+150 p.

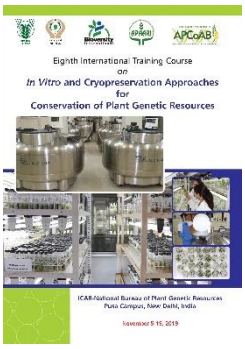
(vi) Revised Brochure of Asia-Pacific Consortium of Agricultural Biotechnology and Bioresources (APCoAB) with updated information was published. Brochure contains the concise information on mission, genesis, revised objectives, organization structure and steering committee, recent activities and publications and supporters and facilitators of APCoAB. The brochure was distributed to all concerned stakeholders and can be accessed on: http://www.apaari.org/web/wp-content/uploads/2018/08/2018-APCoAB-Brochure.pdf



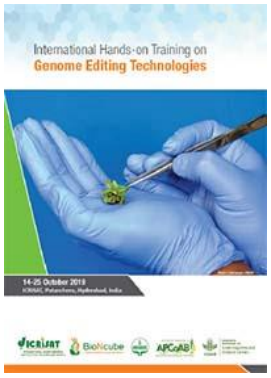
(vii) Brochure of International Hands-on Training on Genome Editing Technology was designed, developed and published. It contains the concise information on about the course and organizers (ICRISAT, APAARI, APCoAB), objectives of training, lectures and practical sessions, eligibility criteria of applicants, and application form. The brochure was posted on APAARI/APCoAB website for the benefit of the applicants and distributed to all concerned stakeholders which can be accessed on: http://www.apaari.org/web/wp-content/uploads/2019/08/Genome_editing_tech_training_Brochure.pdf



(viii) Brochure of International Training Course on In Vitro and Cryopreservation Approaches for Conservation of Plant Genetic Resources was **developed** and published. In addition to the brief description about the organizers (ICAR-NBPGR, Bioversity International, APAARI and APCoAB), the brochure contains the details of objectives and course contents (theory and practical sessions), resource persons, eligibility criteria of applicants, course fee details and application form. The brochure was posted on APAARI/APCoAB website for the benefit of the applicants and distributed to all concerned stakeholders which can be accessed on: http://www.apaari.org/web/wp-content/uploads/downloads/2019/CoE%20Training%20Brochure%20300519.pdf

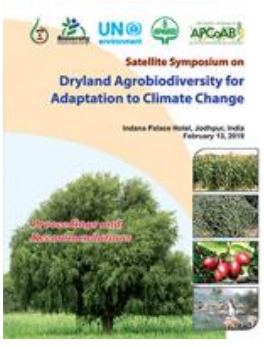


(ix) Training Manual on International Hands-on Training on Genome Editing Technology was published and printed. The Manual contains a combination of lectures, discussions with hands-on laboratory instructions and technology demonstrations for helping the participants stay ahead imparting both theory and practical aspects of CRISPR based genome-editing technologies. The course covered a basic gene editing workflows, from design and cloning of target specific guide RNAs (gRNAs), delivery of gRNAs in plant cells, detection through to analysis of gene editing efficiencies. design the genome editing experiments. It is envisaged that this will help the trainees, after completion, to design their own experimental workflows in their respective laboratories. The soft copy of manual was shared by all APAARI member countries and other stakeholders which can be accessed on



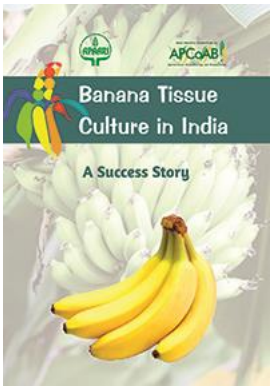
(x) Training Manual on International Training Course on In Vitro and Cryopreservation Approaches for Conservation of Plant Genetic Resources was published and printed. The Manual contains the protocols involved in the development and use of in vitro and/or cryopreservation techniques for the medium- to long-term conservation of germplasm of vegetatively propagated and non-orthodox seed species. The protocols are freely available to all APAARI members and other stakeholders which can be accessed on: http://www.apaari.org/web/wp-content/uploads/downloads/2019/Laboratory_Manual_for_In_Vitro_and_Cryopreservation_of_PGR-2019.pdf

(xi) Proceedings and Recommendations of the Satellite Symposium on 'Dryland Agrobiodiversity for Adaptation to Climate Change' was published and printed. The Proceedings and Recommendations contain the summary of keynote lectures presented by speakers/experts on agrobiodiversity management in the Indian, Central and West Asian and North African dryland regions and the required policy interventions to overcome the threats and challenges. and the key recommendations emerged out from the deliberations and discussions. The soft copy of



manual was shared by all APAARI member countries and other stakeholders which can be accessed on:

(xii) Banana Tissue Culture in India - A Success Story was published and printed. This document provides detailed information on banana, its different varieties grown across India, cultivation practices, various constraints faced in the conventional propagation of banana and how these can be overcome by the use of banana TC plants. Production of TC plants viz., mother plant selection, initiation, multiplication and hardening are briefly described. Protocols used for virus indexing and genetic fidelity testing for successful implementation of certification system has been provided in detail. The molecular and serological based methods standardized under NCS-TCP for virus indexing of the four major viruses infecting banana have been described. The various challenges encountered during certification procedure of banana TC plants have been discussed with reference to emergence of new diseases, particularly the occurrence of Fusarium wilt caused by the soilborne fungus *Fusarium oxysporum* in G9 cultivar, the production and distribution of plantlets, technology transfer for TC production and adoption of the technology by the farmers. This document is available to all APAARI members and other stakeholders which can be can be accessed on: http://www.apaari.org/web/wp-content/uploads/downloads/2019/Banana_Tissue_Culture-Success_Story_29-11-2019_For_Circulation.pdf



Publications in under preparation (4)

1. Proceedings and Recommendations - Regional Workshop on Underutilized Fish and Marine Genetic Resources and their Amelioration, held in Colombo, Sri Lanka, July 10-12, 2019.
2. Strategic Papers and Country Status Reports presented during Regional Workshop on Underutilized Fish and Marine Genetic Resources and their Amelioration, held in Colombo, Sri Lanka, July 10-12, 2019.
3. Proceedings and Recommendations – Regional Expert Consultation on Gene Editing and its Regulation, held in Hyderabad, India, October 10-12, 2019.
4. Induced Systemic Resistance Technology: A New Hope for Malaysian Papaya Industry (Success Story)

C. APCoAB Website

(i) Content update of databases

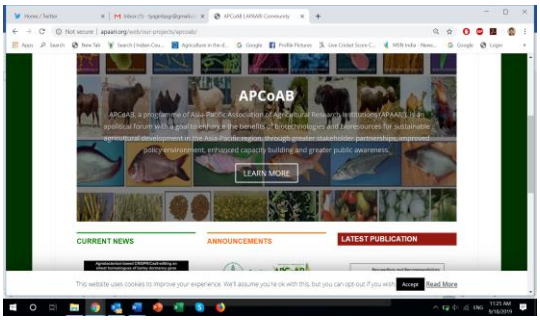
(a) Institutional database: 57 new institutions from 12 countries (total: 376 institutions)

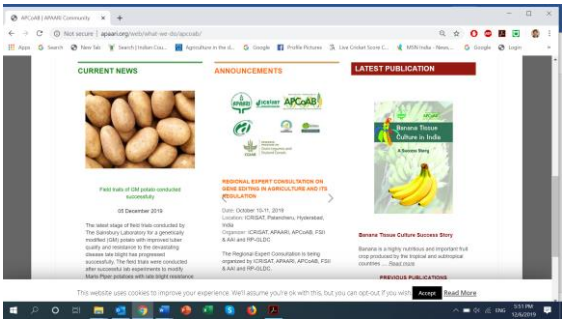
(b) Educational Institutions: 142 new institutions from 12 countries (total 142 institutions)

(c) Experts database: 103 new contacts from 13 different countries (total 138 experts)

(ii) Regular update

News, events, announcements, uploading of publications, event proceedings updates, etc. Distribution of resource material (proceedings, country status reports, PowerPoint presentations etc. of workshops to the participants and different stakeholders.





(iii) @Tweets: About 350 Tweets were posted relating to the application and benefits of new innovations in agricultural biotechnology and conservation and use of bioresources.

D. Participation/Visits/Meetings Organized by Other Organizations (11)

(i) Visited ILRI, Hanoi, Vietnam, to discuss about future collaboration between APAARI and ILRI with regard to animal science activities of common mandate, January 21, 2019.

(ii) Visited CIAT-Asia, Hanoi, Vietnam, to participate in Steering Committee meeting of Common Platform of Microbial Biotechnology (CPMB); made presentation to be partner of CPMB, January 22-23, 2019.

(iii) Co-organized, Co-chaired a session and participated in 13th International Conference on Development of Drylands (13th ICDD) at Jodhpur, India, from February 11-15, 2019.

(iv) Co-organized and delivered a talk on Dryland Agrobiodiversity for Adaptation to Climate Change: Role of Regional Organizations, in Satellite Symposium on Dryland Agrobiodiversity for Adaptation to Climate Change, to be held during the 13th ICDD in Jodhpur, India, February 13, 2019.

(v) Visited MARDI, for organization of Regional Workshop on Underutilized AnGR at MARDI, Malaysia, March 3-7, 2019.

(vi) Invited by MARDI for delivering a talk during MARDI Colloquium on Genome Editing for Crop Improvement: Recent Advances in Agriculture and 16th Meeting of the ASEAN Genetically Modified Food Testing Network, MARDI, Malaysia, April 23-25, 2019.

(vii) Participated in 25th Session of the ICGEB Board of Governors (Special Invitee), held at Trieste, May 21-22, 2019

Board of Governors Meeting at ICGEB, Trieste, Italy, May 21-22, 2019

(viii) Co-organized with COA/APO and participated in Workshop on Innovations in Agribusiness for Young Entrepreneurs, held at Taipei, July 1-5, 2019.

(ix) Co-Organized and participated in the Regional Workshop on Underutilized Fish and Marine Genetic Resources (FMGR) and their Amelioration was held at National Aquatic Research Agency (NARA), Sri Lanka, July 10-12, 2019.

(x) Participated in Workshop on "Genome Editing Applications and Beyond" organized by ICGEB and European Commission and made a presentation on "Gene Editing in Agriculture – Scope, Perspectives and Policy Challenges in Asia-Pacific Region", Trieste, Italy, 19-21 November 19-21, 2019.

(xi) participated in Science Meeting and discussed with ICRISAT partners for active collaboration and scoping new project on empowering women and youth for scaling up the technology in dryland areas under CRP GLDC program, Nairobi, Kenya, November 25-30, 2019 in

E. Networking and Partnerships

(i) Visited ILRI, Hanoi, Vietnam, to discuss about future collaboration between APAARI and ILRI with regard to animal science activities of common mandate, January 21, 2019.

(ii) Visited CIAT-Asia, Hanoi, Vietnam, to participate in Steering Committee meeting of Common Platform of Microbial Biotechnology (CPMB); made presentation to be partner of CPMB, January 22-23, 2019.

Visit to ILRI-Hanoi and CIAT-Asia, Hanoi to participate in CPMB

(iii) Co-organized, Co-chaired a session and participated in 13th International Conference on Development of Drylands (13th ICDD) at Jodhpur, India, from February 11-15, 2019.

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(vii) Discussion with official of Asian Productivity Organization for possible future collaboration in areas of agricultural biotechnology and innovations in agriculture, June 30-July 5, 2019.

(viii) Interaction for partnership with the officials of ICAR, NARA, SLCARP for future collaboration for capacity development in areas of conservation and use of fish genetic resources, July 10-12, 2019.

(ix) Partnership discussion with Director General, Deputy Director General (Research) and Director (Genetic Gains) of International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad, India, regarding organization of Expert Consultation on Gene Editing and its Regulation and

Visit to MARDI, Malaysia to deliver a talk in 16th ASEAN GMFNet Meet

International Hands-on Training on Genome Editing and future collaboration for the activities under APCoAB, July 29-30, 2019. Possibility of future collaboration were also discussed.

(x) Partnership discussion with Director, ICAR-National Bureau of Plant Genetic Resources (NBPGR), New Delhi, India, regarding organization, logistic arrangements, developing course content, finalizing the participants of training and publishing training manual, cost sharing with other collaborators (ICAR and Bioversity International) of *In Vitro* and Cryopreservation Approaches for Conservation of Plant Genetic Resources, August 01, 2019

(xi) Discussion with Secretary, Department of Biotechnology (DBT), India, for future collaboration in areas of agricultural biotechnology particularly in a capacity development and pursuing the BIRAC (DBT) membership of APAARI, August 02, 2019.

(xii) Discussion with Director General, ICAR, India, to identify the areas of future collaboration between ICAR and APAARI and develop an MoU for collaboration, August 02, 2019.

(xiii) Participated in a meeting at ICRISAT for sponsorship and finalizing the cost sharing amongst collaborators (ICRISAT, GLDC, FSII, PTCC) and logistic arrangements, finalizing the technical agenda and the participants for Expert Consultation on Gene Editing and its Regulation and International Hands-on Training on Genome Editing, September 19-20, 2019.

Memorandum of Understanding (MoU)

Draft MoU for collaboration between APAARI and ICAR was developed and submitted to ICAR, to collaborate for capacity building and knowledge management in areas of agricultural biotechnology and other agriculture sectors.

APAARI Membership Secured

(i) Biotechnology Industry Research Assistance Council (BIRAC) through Department of Biotechnology, Government of India, India (Associate Member).

F. Governance

(i) Steering Committee of APCoAB

XXth Steering Committee Meeting was organized on June 12, 2019. The Action Taken Report, Progress Report (for period of May 1, 2018 to May 31, 2019), Work Plan and statement of Account (January-December 2019) was

Participants of the XXth Steering Committee Meeting of APCoAB

presented which was approved by the Committee. Suggestions made by the experts were incorporated into the Work Plan.

(ii) Executive Committee Meeting (1/2019)

Executive Committee Meeting (1/2019) was held on June 12-13, 2019. The Progress Report (May 1, 2018 to May 31, 2019) and Work Plan (June 1, 2019 to December 31, 2019) was presented and approved by the Committee.

(iii) Executive Committee Meeting (2/2019)

Executive Committee Meeting (2/19) was held on November 7, 2019. The Progress Report (June 1, 2019 to September 30, 2019) and Work Plan (January-December 2020) was presented which was approved by the Committee. Suggestions made by the experts were incorporated into the Work Plan.

G. Project Proposal Developed

Approved

(i) Revised APAARI-COA collaborative program (APCoAB) was approved by COA, Taiwan (USD 960,000) for 2019-2022.

Under Submission

(ii) Capacity enhancement in agricultural biotechnologies and their applications for conservation and use of bioresources for sustainable agri-food system in the Pacific and submitted to ICDF (USD 2,468,260)

(iii) Capacity Building in Commercial Plant Tissue Culture Sector for Addressing the Need of Quality Planting Materials of Horticultural Crops in Least Developed Countries (LDCs) of South Asia and submitted to ICDF (USD 1,737,363)

H. Work Plan of APCoAB for 2020

Area	Activities
Expert Consultation/ High Level Policy Dialogue	• Regional Expert Consultation: Conservation and utilization of agriculturally important microorganisms. Co-organizer: PCAARRD/ICAR/ACIAR (March-April 2020)
Symposia/trainings/workshops	• Investment in agricultural biotechnology and its impact on livelihoods of farmers in Asia-Pacific region (June-July 2020) Co-organizers: PCAARRD/ICAR • Biotechnological tools for conservation and sustainable utilization of fish genetic resources (training) (October-November 2020) Co-organizer: ICAR • International Conference/training on Gene Editing (August 2020) Co-organizer: MARDI/ICRISAT
Steering Committee of APCoAB	• Steering Committee Meeting of APCoAB (May-June, 2020)
Publication of proceedings/status reports/success stories	• Proceedings (3-4) of Expert Consultation and Workshops (January-December 2019) • One Policy Brief on GM Maize and two success stories are targeted - (Banana Tissue Culture in India, Goat and Sheep in PNG and Fiji) (January-December 2019)
APCoAB website	• Regular updates on agricultural biotechnology and bioresources developments, news and events of specific relevance to Asia-Pacific • Update of existing databases. Regular updates of other content and additional databases
One activity as suggested by COA	To be decided by COA (October-December 2020) Co-organizer: COA

I. Summary of Account Statement of APCoAB (January 1, 2019-December 31, 2019)

	Amount (USD)	**Amount (In Kind equivalent to USD)**	
Receipts		Name of Partners*	Amount in USD
COA, Taiwan	170,000.00	ICRISAT	19,000.00
APAARI and Partner Contribution	70,000.00	MARDI	15000.00,
Sponsorship	10,000.00	SLCARP	11,235.00
Total	**250,000**		
Payments			
Salary costs	84,033.31		
Other Direct Costs			
Meetings/Trainings/Workshop	114,895.90		
Consultancy	9,000.00		
Telephone	1,035.61		
General communication	267.05		
Computer Hardware and Software	160.02		
Sponsorship	3,000.00		
Courier	2,761.43		
Hospitality	157.92		
Publications	19,902.46		
Miscellaneous Charges	164.5		
Facilities from Secretariat	22,694.04		
Total	**258,072.20**		
Balance	**-8072.00**		

* ICRISAT – International Crop Research Institute for Semi-Arid Tropics; MARDI – Malaysian Agricultural Research and Development Institute; SLCARP – Sri Lanka Council of Agricultural Research and Policy

Table 2. Summary of Expected Income and Expected Expenditure for the APCoAB activities during January 1, 2020-December 31, 2020

	Amount (USD)
Receipts	
COA, Taiwan	170,000.00
APAARI and Partner Contribution	70,000,00
Expected Sponsorship	30,000.00
Total	270,000.00
Payments	
Coordinator Salary costs	74,904.00
Technical Associate Salary	30,000.00
Other direct costs	
Meetings/Trainings/Workshop	89,500.00
Publications/printing etc.	15,000.00
Consultancy	10,000.00
Telephone and other communication	2,000.00
Travel	20,000.00
Computer hardware and software - Laptop	2,000.00
Facilities from Secretariat	25,500.00
Miscellaneous	1,000.00
Total	**269904.00**