Expert Consultation on Promotion of Medicinal and Aromatic Plants in the Asia-Pacific Region

Bangkok, Thailand
2-3 December, 2013

PROCEEDINGS & RECOMMENDATIONS

Organizers

Food and Agriculture Organization of the United Nations (FAO RAP)
Asia-Pacific Association of Agricultural Research Institutions (APAARI)
The Organizers

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APAARI (Asia-Pacific Association of Agricultural Research Institutions) is a regional association that aims to promote the development of National Agricultural Research Systems (NARS) in the Asia-Pacific region through inter-regional and inter-institutional cooperation. The overall objectives of the Association are to foster the development of agricultural research in the Asia-Pacific region so as to promote the exchange of scientific and technical information, encourage collaborative research, promote human resource development, build up organizational and management capabilities of member institutions and strengthen cross-linkages and networking among diverse stakeholders. To meet these needs, the Association: i) convenes General Assembly once in two years, holds regular Executive Committee meetings yearly and organizes consultations, workshops, trainings, etc., ii) collects, collates and disseminates research findings, iii) maintains links with other fora in the region and outside through meetings, participation and information exchange, and iv) promotes need based collaboration in research projects among member institutions, analyzing priorities and focusing on regional agricultural development. For details, please visit: [www.apaari.org](http://www.apaari.org)
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FOREWORD

The Asian region is very rich in the diversity of medicinal and aromatic plants. Any threat to these valuable resources will not only jeopardize the health safety of millions of people but will also affect the livelihood of resource poor farmers and communities that depend on them. Therefore, medicinal and aromatic plants must receive priority attention by the countries in the Asia-Pacific for adequate research, development and marketing activities. It is well recognized that over 80 per cent of world’s population depend largely for their healthcare on traditional medicines derived from plants. In some developed countries, medicinal and aromatic plants have moved from essentially unknown, minor agricultural plants category to crops that many farmers consider economically remunerative, safe and beneficial to the society. Hence, medicinal and aromatic plants deserve urgent attention for their conservation, evaluation, genetic enhancement, and scientific cultivation by the farming communities in the Asia-Pacific region.

Today, many valuable medicinal and aromatic plants are available in Asia. Also, the people living in the region can benefit provide they take full advantage of increasing production scientifically and process through value chain to link with markets. It is also extremely important to conserve the genetic resources of medicinal and aromatic plants in order to save them from extinction, since they are otherwise exposed to overexploitation and negative consequences of climate change. The growing demand for medicinal and aromatic plants makes them remunerative alternative crops for smallholder farmers. However, they require greater research efforts on propagation methods, harvesting and processing techniques, germplasm collection, genetic improvement, quality control and marketing.

In view of above concerns, a Regional Expert Consultation on Promotion of Medicinal and Aromatic Plants in Asia and the Pacific Region was organized jointly by the Food and Agriculture Organization of the United Nations (FAO) and the Asia-Pacific Association of Agricultural Research Institutions (APAARI) at Bangkok on 2-3 December, 2013. The consultation was attended by 38 experts from 14 countries including representatives from FAO RAP, and APAARI. The expert consultation provided a neutral platform to share knowledge and experiences, to learn and to discuss the future Road Map to promote medicinal and aromatic plants. Organizing the expert consultation was indeed very timely to have in-depth discussions and assess the national and regional priorities. It also enabled to address the emerging issues and challenges for making this vital MAP sector yet more vibrant, demand driven and market oriented.

These proceedings do cover the main recommendations, beside extended summaries of lead papers and country reports. We believe that the recommendations emerged will draw attention of policy makers, administrators, researchers, industry, farmers and other stakeholders to enhance research, development and extension efforts for the promotion of medicinal and aromatic plants in the Asia-Pacific region.

Hiroyuki Konuma                                     Raj Paroda
FAO Assistant Director General and                           Executive Secretary
Regional Representative for Asia and the Pacific                         APAARI
# ACRONYMS AND ABBREVIATIONS

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<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tr>
<td>ADG</td>
<td>Assistant Director General</td>
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<td>AICRP on MAPs</td>
<td>All India Coordinated Project on Medicinal and Aromatic Plants</td>
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<td>APAARI</td>
<td>Asia-Pacific Association of Agricultural Research Institutions</td>
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<tr>
<td>AYUSH</td>
<td>Department of Ayurveda, Yoga &amp; Naturopathy, Unani, Siddha and Homoeopathy</td>
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<tr>
<td>BARC</td>
<td>Bangladesh Agricultural Research Council</td>
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<td>BCSIR</td>
<td>Bangladesh Council of Scientific and Industrial Research</td>
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<td>BFRI</td>
<td>Bangladesh Forest Research Institute</td>
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<td>CBD</td>
<td>Conservation of Biological Diversity</td>
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<td>CHIPI</td>
<td>Chamber of Herbal Industries of the Philippines Inc.</td>
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<td>CSIR</td>
<td>Council of Scientific and Industrial Research</td>
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<td>DAMC</td>
<td>Department of Agricultural Marketing and Cooperatives</td>
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<td>DDG, Hort.</td>
<td>Deputy Director General, Horticulture</td>
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<td>DMAPR</td>
<td>Directorate of Medicinal and Aromatic Plants</td>
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<tr>
<td>FAO RAP</td>
<td>Food and Agriculture Organization of the United Nations Regional Office for Asia and the Pacific Region</td>
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<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
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<tr>
<td>GACP</td>
<td>Good Agricultural and Field Collection Practices</td>
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<td>GAP</td>
<td>Good Agricultural Practices</td>
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<td>GCP</td>
<td>Good Collection Practices</td>
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<td>GMP</td>
<td>Good Manufacturing Practices</td>
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<td>ICAR</td>
<td>Indian Council of Agricultural Research</td>
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<td>IPRs</td>
<td>Intellectual Property Right</td>
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<td>ITK</td>
<td>Indigenous Traditional Knowledge</td>
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<td>JIRCAS</td>
<td>Japan International Research Center for Agricultural Sciences</td>
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<td>MAPs</td>
<td>Medicinal and Aromatic Plants</td>
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<td>MARDI</td>
<td>Malaysian Agriculture Research and Development Institute</td>
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<tr>
<td>mm</td>
<td>Millimeter mm</td>
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<tr>
<td>MPFI</td>
<td>Moringaling Philippines Foundation Inc.</td>
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<tr>
<td>mt</td>
<td>Metric tons</td>
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<td>NARC</td>
<td>National Agricultural Research Centre</td>
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<td>NARC</td>
<td>Nepal Agricultural Research Council</td>
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<td>NARS</td>
<td>National Agricultural Research System</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>NTFP</td>
<td>Non Timber Forest Products</td>
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<td>PGR</td>
<td>Plant Genetic Resources</td>
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<td>PGRI</td>
<td>Plant Genetic Resources Institute</td>
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<td>PITAHC</td>
<td>Philippines Institute of Traditional and Alternative Health Care</td>
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<tr>
<td>PNG</td>
<td>Papua New Guinea</td>
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<td>R&amp;D</td>
<td>Research &amp; Development</td>
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<td>R4AD</td>
<td>Research for Agricultural Development</td>
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<td>RET</td>
<td>Rare, Endangered and Threatened</td>
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<td>SHGs</td>
<td>Self Help Groups</td>
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<td>SITC</td>
<td>Standard International Trade Classification</td>
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<td>SWOT</td>
<td>Strength, Weakness, Opportunity and Threat</td>
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<tr>
<td>TCM</td>
<td>Traditional Chinese Medicine</td>
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<tr>
<td>TIM</td>
<td>Traditional Indian Medicine</td>
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<tr>
<td>TMS</td>
<td>Traditional Medicinal System</td>
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<td>WHO</td>
<td>World Health Organization</td>
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EXECUTIVE SUMMARY

The Asia region has a long tradition of use of herbal medicines and have very rich diversity of medicinal and aromatic plants (MAP). Out of about 8000 species having ethnobotanical properties, 2000 MAP species are primarily used in different traditional medicinal systems and only about 250 MAP species are traded in large volumes. The world trade in botanicals is US $ 32.702 billion of which Asia accounts for US $ 14.505 billion (44.35%). This vast resource is the mainstay of raw material supply to industries for drug formulations, nutritional applications, food flavoring, perfumery, cosmetics, toiletries, etc. The increasing demand for herbal products has, forced the overexploitation and unscientific collection of natural populations of medicinal and aromatic plants from the forest rendering several species to vulnerable state and most Asia-Pacific countries are experiencing the loss of diversity. Any threat to these valuable resources will not only jeopardize the health safety of millions of people but also the growing global market of medicinal and aromatic plants and also the livelihood of resource poor farmers and communities that depend on them. Therefore, this sector deserves a renewed thrust and priority attention by the countries in the Asia-Pacific for adequate research, development and marketing activities in order to ensure their better utilization and conservation. It is also extremely important to conserve the genetic resources of MAP species in order to save them from extinction, overexploitation and negative consequences of climate change. The significance of MAP species has risen in recent years due to substantial change in the life style and negative impacts of modern chemical based products and increasing requirements on quality, safety, and efficiency of medicinal and aromatic plant products.

In view of these facts, Food and Agriculture Organization of United Nations (FAO) and the Asia-Pacific Association of Agricultural Research Institutions (APAARI) jointly organized a “Regional Expert Consultation on Promotion of Medicinal and Aromatic Plants in Asia and the Pacific region” at Bangkok, Thailand on 2-3 December, 2013. In all, 38 delegates from 14 countries, namely, Bangladesh, Bhutan, India, Japan, Malaysia, Myanmar, Nepal, Papua New Guinea, Pakistan, Philippines, Republic of Korea, Sri Lanka, Thailand and Vietnam participated in the expert consultation. In addition, representatives and experts from medicinal plants industry, the Pacific region, FAO RAP, and APAARI, also participated.

The objectives of the consultation were to assess the current status of MAP species in Asia and the Pacific region and identify future needs, share knowledge and technologies, identify relevant policy options for strengthening conservation and sustainable development of these resources and strengthen regional collaboration through networking for promotion and sustainable use of medicinal and aromatic plants. Through this consultation, it was aimed to consolidate the available information on production, R & D efforts and policy issues on MAP in the Asia-Pacific region.

The two day consultation was structured into Inaugural Session, three Technical Sessions, three Working Group Discussions and a Plenary Session. In the Inaugural Session, two lead papers on MAP species covering the areas of promotion of MAP
and marketing aspects of MAP in the Asia-Pacific Region were presented. In two Technical Sessions, 14 country reports were presented and discussed. The key highlights of the country reports indicated that the MAP species are often called as non-timber forest products (NTFP). It was strongly felt that now these species must be designated as future crops for human needs. The MAP species are a large group, having diversified growing habits and habitats and require prioritization of species for cultivation, value addition and conservation efforts. The investment in R&D has to be enhanced substantially and more institutions need to be created. There is a need to develop effective and demand driven R&D progrm on plant genetic resource (PGR) management with special attention on rare, endangered and threatened (RET) species, crop improvement, crop production, post-harvest management and developing good agricultural practices (GAP) and well organized organic farming. The quality aspects are the most important and should be taken care from raw material stage to finished product. An effective and easy mechanism for certification of organically produced raw material with defined quality be developed in each country for producers and users of MAP species. The MAPs sector has several stakeholders and requires networking of all such players. The partnership between private sector and R&D organizations is essential. The needed information on collection of raw material from forest, production from cultivation, value addition and trade is lacking in all the countries. Therefore, a mechanism needs to be developed in each country to document all such information authentically. It will help in development of a regional database for the Asia and the Pacific region to promote the effective coordination and partnership related to R&D and trade in MAP sector.

The Technical Session III was on ‘Policy Perspective: AR4D Strategies’ in which the six panellists presented their views on overall development of MAP species. The panellists emphasized on PGR management, quality standard and safety measures and marketing and trade regulations and suitable policy to implement good agricultural practices (GAP), good collection practices (GCP), good manufacturing practices (GMP), and good laboratory practices (GLP). Each country is to develop guidelines/monographs for good practices and quality labelling. Linkage between research and industry is lacking and needs to be developed through appropriate linkage models. Regulatory mechanism for conservation and international trade including quality standard development of dominant/commercial MAP species needs to be developed by the member countries of the region.

Three Working Group Discussions were also organized. The Working Group 1 ‘Production: Conservation, Improvement, and Management’; emphasized on creation of field genebanks in different climatic zones of each country, in situ conservation areas may be marked and declared, cultivation to be organized using cluster approach which will solve the problems of small holdings and small volumes. Plus tree selection from the diversity and their vegetative propagation method be standardized for tree and shrub species and common facilities for drying, grading, packing and labelling be created at community level. The Working Group 2 ‘Utilization: Value Addition, Marketing, and Export’ highlighted the involvement of self-help groups/local entrepreneur/community groups for value addition (cleaning, grading, packaging, etc.) at farm level to enhance the income of farmers and collectors. Mechanism for buy-back arrangement should be developed between the producer and user industry. The better National HS Codes appropriately codified for accurate information be developed for trade in MAP species (import and export). Such efforts will facilitate better understanding of trade in each country. Knowledge exchange
related to trade along with the other regulatory procedures will facilitate the effective
and fair trade of MAP species in the Asia-Pacific region. The Working Group 3
‘Collaboration and Networking’ strongly advocated for the establishment of a
Network of Asia-Pacific countries with a facilitating role of APAARI with the support
of FAO and a host country to be identified to house the secretariat of the Network.
The proposed Network will develop cooperation among the member countries at
field, national and regional levels. The main responsibilities of Network will be to
facilitate sharing information on research and development in member countries
through dedicated website, enhance collaboration among member countries through
conducting workshops/seminars/dialogues on research and development among the
member countries. Where necessary, bilateral cooperation can be developed using the
support of this Network for research and collaborative activities.

Various action points and recommendations pertaining to the establishment of
Regional Network on MAP species through support of FAO and facilitation role of
APAARI and to develop the Road Map for future directions for research,
development and policy issues emerged. These proceedings cover the details of
various deliberations and recommendations relating to research, development, policy
and regional cooperation emanating from the regional expert consultation on
medicinal and aromatic plants.
Expert Consultation on Promotion of Medicinal and Aromatic Plants in the Asia-Pacific Region

INTRODUCTION

The Asian region has a glorious tradition on plant based health care system and detailed descriptions are available in the ancient literature. The herbal system of medicine provides low cost treatment for various common diseases and several chronic ailments with safety and efficacy. The rich diversity of medicinal and aromatic plants (MAP) remained a crucial source of livelihood for majority of the forest based communities and possess the wealth of as indigenous traditional knowledge (ITK). Out of 8000 species of ethno botanical importance available in Asia, 2500 species are primarily used in different traditional of medicine systems. The modern pharmacopoeia also has about 25 per cent component of plant based drugs. At present, 134 species are under cultivation, 160 species are partially cultivated and 250 species of MAP are traded in large volumes in the region. This vast resource has formed the mainstay of raw material supply to industries for drug formulations, nutritional applications, food flavouring, perfumery, cosmetics, toiletries, etc. The international market of herbal products is estimated to be US $ 62 billion and poised to grow at a rate of 7 per cent per annum to US $ 5-7 trillion by 2050.

The increased demand has forced the overexploitation and unscientific collection of natural populations from the wild and most of the Asia-Pacific countries are experiencing the loss of diversity of MAP. Therefore, an effective plant genetic resource management program needs to be developed by the respective National Agricultural Research System (NARS) in each country. The Asia-Pacific region is also rich in indigenous traditional knowledge (ITK) and efforts are needed to document and revalidate before it get eroded forever. The World Health Organization (WHO) has developed the guidelines for good agricultural and field collection practices (GACP). Accordingly, each country in the Asia-Pacific region should develop a set of guidelines for GACP and implement effectively at all levels to ensure the production of quality of raw material. The cultivation of medicinal and aromatic plant species provides an added advantage by producing the uniform and consistent quality raw material. Therefore, the R&D efforts need to be reoriented so as to keep this sector free form the ill effects of chemical fertilizers. The efforts are required to generate ecofriendly agro-technology to support commercial cultivation if NAO soecues under organic environment with buyback arrangements with user industry. An effective mechanism needs to be in place for certification of organically produced MAP species in individual country with its recognition for international trade.

Though, the MAP species requires full care at each stage of production but the quality of the produce depends primarily on the correct taxonomical identification of the species and its optimum stage of harvest (where the biological yield and chemical content are optimum). The post-harvest management, monitoring the shelf life and need based value addition are equally important and requires full attention of individual countries. Concerted efforts are needed for quality testing, developing quality standards, and pesticide residue analysis of the produce using faster and more accurate analytical procedures.

The MAP covers large number of species and, therefore, it requires prioritization of important MAP species for research and development after taking into consideration the medicinal use, market demand and other factors. Also, larger investments are
needed to create the R&D institutions and need based infrastructural facilities. The National Agricultural Research System (NARS) should develop a national strategy for research and development on MAP speceis in different countries. There is a need for complete shift in the approach from agricultural research and development (R&D) to agriculture research for development (AR4D) and have an appropriate mechanism in place for enabling policy environment enhanced funding support.

At present, no regulated market mechanism exists to control various marketing practices involved in the entire supply chain. Understanding of trade in medicinal and aromatic plants is far from satisfactory. The available data are not fully authenticated in the absence of required HS Code. This needs to be addressed individually at the country level and also at the regional level so that a correct picture is emerged. The farmers and collectors are not paid reasonable price of their produce and the middle man cheat these innocent people. Therefore, at producer’s level, self-help groups (SHGs) and marketing cooperatives need to be created. The participation of private sector at present is minimal and, hence, it is necessary to develop public-private partnership models where the private sector also contributes through funding, helping in priority setting and also guiding the farmers for better quality of the produce. The R&D institutions should take lead role in capacity building to enhance the output of scientists to keep them abreast with advances in MAP research. A database needs to be developed on MAP species and its management at the national level involving all stakeholders from the National Agricultural Research System (NARS). There is a strong need to create awareness and undertake literacy campaign on intellectual property rights related to MAP speceis and training of human resource at the national and international level to make them familiar with latest technological advancements in the MAP sector.

The countries in the region should share the knowledge, information and technology associated with MAP species. In the Asia-Pacific region, there are several MAP species which are common across the countries, and hence, there is also great need for the exchange of material of common interest for which a suitable mechanism needs to be in place. There is an urgent need to develop a regional network on MAP species in the Asia-Pacific region.

The rich diversity of medicinal and aromatic plants, its indispensable use in social, cultural and health traditions and also as a source of raw materials for plant based products in modern industries has more importance and relevance today than ever before. Any threats to these vital and natural resources will not only jeopardize the livelihoods of millions of people but also the growing global market of medicinal and aromatic plants. Therefore, this sector deserves a renewed thrust and the MAP species must be designated as future crops for humankind. The cultivation of medicinal and aromatic plants should be supported by adequate research, development and extension activities to ensure the uniform quality production for better utilization and conservation. The MAP species play a significant role in ensuring health security of millions of people globally. In the past, natural resources were the only source of livelihood for thousands of years. However, exploitation of MAP pecies as a source of livelihood does no longer seem a viable option due to population pressure, overexploitation, conflict of interests in land use and negative impact of climate change. In addition, the paradigm shift from common heritage of mankind to sovereignty of nations on their plant genetic resources (PGR), agreements related to intellectual property rights (IPRs) and other international treaties call for taking due care of their native medicinal and aromatic plant resources. The significance of MAP
species has risen in recent years due to substantial change in the life style and negative impacts of modern chemical based products and thus, the trend of increasing requirements on quality medicinal and aromatic plant products are now visible.

In view of these facts, the Food and Agriculture Organization of the United Nations (FAO) and the Asia-Pacific Association of Agricultural Research Institutions (APAARI) have jointly organized a Regional Expert Consultation on Promotion of Medicinal and Aromatic Plants in Asia and the Pacific region at FAO, Bangkok, Thailand on 2-3 December, 2013. In all, 40 delegates including policy makers from 14 countries, namely, Bangladesh, Bhutan, India, Japan, Malaysia, Myanmar, Nepal, Papua New Guinea, Pakistan, Philippines, Republic of Korea, Sri Lanka, Thailand and Viet Nam participated in the expert consultation. In addition, representatives from medicinal plants industry, FAO, and APAARI, also participated. The consultation provided a platform to the participants to share the knowledge and experiences and assess future requirements and prepare the road map to accelerate the overall development of MAP sector taking into consideration the conservation of bioresources for sustainable use and produce the quality products for healthcare of people in the region. The consultation was structured in to three technical sessions: In the first two Technical Sessions 14 country reports were presented and discussed. In Technical Session III on ‘Policy Perspective: AR4D Strategies’ seven panelists presented their views on overall development of MAP species. This was followed by the Working Group Discussions which was structured in three separate Working Groups, viz., Working Group 1: Production: Conservation, Improvement, Management; Working Group 2: Utilization: Value Addition, Marketing, Export, and Working Group 3: Collaboration and Networking. The participants were identified to join the groups based on their experiences. The in-depth discussions were held in different Technical Sessions and Working Groups and the outcomes of the discussions and recommendations were presented in the Plenary Session.

Objectives:

• To assess the current status of production, utilization and conservation of medicinal and aromatic plants in Asia and the Pacific region and identify future needs of conservation and opportunities for their development

• To exchange information and share knowledge and technologies available in different countries in the region and learn from each other’s experience

• To create awareness on the value of medicinal and aromatic plants among producers in order to promote cultivation with a special focus to small scale farmers

• To identify relevant policy options for strengthening the conservation and sustainable development of these resources

• To strengthen regional collaboration and networking and develop a regional strategy for, promotion and sustainable use of medicinal and aromatic plants

Opening Session

Dr. Raj Paroda, Executive Secretary, APAARI, welcomed the Chief Guest Mr. Hiroyuki Konuma, ADG, FAO RAP, the resource persons, Dr. S.P. Ghosh, Former DDG (Hort.), ICAR, India, Mr. Ranjit Puranik representing the medicinal plants industry from Shree Dhootpapeshwar Ltd. Mumbai (India), and Dr. Subash Dasgupta, Senior Plant Production Officer, FAO RAP and distinguished participants from 14
countries. He highlighted that the Asia-Pacific region has rich diversity of medicinal and aromatic plants (MAPs) with associated wealth of indigenous traditional knowledge (ITK). These valuable resources are the major source of primary health care for 80 per cent of rural population and livelihood for millions of people through self-employment. While highlighting the importance of MAP species Dr. Paroda emphasized that these are often called as non-timber forest products (NTFP), and now there is an urgent need for a paradigm shift and to designate MAP species as future crops for the well being of humankind. He further mentioned that the MAP sector remained neglected in the past but now it requires due attention of policy planners and researchers particularly in view of their conservation and enhanced use. The need for plant diversity in MAP is continuously increasing due to increase in population with greater risk to health due to changing environment and life style, adverse side effects of chemical based modern medicines and other household products. People are becoming increasingly aware of the importance of returning to nature for better healthcare. In this context, the herbal products which are less expensive and safe with high efficacy attracted the consumers and are now getting increased attention.

Dr. Paroda mentioned that the MAP based product has an expanding national and international market due to increasing demands of these products. The increased demand of raw material forced the overexploitation and unscientific collection of natural population of MAP from the forest rendering several species to vulnerable state and many of the important species are already extinct and several species are at the verge of extinction. Therefore, an effective plant genetic resource management program needs to be developed by each National Agricultural Research System (NARS) to address the issues related to conservation and sustainable use of the genetic wealth of MAP. While recognizing the contribution of communities, Dr. Paroda further emphasized that we must express our gratitude to the communities who have conserved these valuable resources and also showed us the way to use them in various ways though ITK. Therefore, conscious efforts are needed to document and revalidate the ITK properly before this wealth of knowledge disappears forever.

Some of the MAP species are also cultivated in some countries but the R&D support for scientific cultivation to make them economical and profitable is lacking. After the Convention on Biological Diversity (CBD), more awareness has been created on safe conservation and use of bioresources but at the same time the exchange of these resources became more difficult. We must also consider the issues related to biosafety for human health, and may go for organic farming of MAP species. This is high time to bridge the knowledge gap and create appropriate R&D facilities. Only a few institutions with limited human resource can not undertake the required R&D activities on all aspects of MAP species. Therefore, new institutions need to be created. All stakeholders including farmers should come together and strong partnership needs to be developed involving particularly private organizations and R&D institutes and share the knowledge and know-how for betterment of humankind. Another important area in MAP is the value addition. It has been seen that if some value is added to the product than its efficacy increases many fold and this value addition activity should start from farmers field or collection site. This component requires high priority for R&D. A favorable environment needs to be created and all need based policy related issues should be addressed properly at individual country level and also jointly at the regional level.

Dr. Paroda further mentioned that this expert consultation on MAP was organized on the initiative of Dr. Hiroyuki Konuma, ADG FAO RAP. Through this consultation,
we aim to consolidate the available information on production, R & D efforts and policy issues on MAP in the Asia-Pacific region. This was the reason that two persons, one senior level official dealing with policy issues and one scientist working on MAP were invited from each country to participate in the expert consultation on MAP. He stated that full attention should be given to conserve, collect, evaluate and exchange these resources for the wellbeing of humankind because these are not only the source for healthcare but also the main stay of livelihood security of tribal communities who have been living around these resources from centuries and conserved these for posterity and use. Dr. Paroda expressed his gratitude to the Chief Guest, Dr. Konuma for his timely initiative to organize this consultation at Bangkok and wished that under his leadership a road map be developed. He stressed that APAARI has already identified the MAP as future crops for humanity and will support this activity in future also. On this occasion, three publications of APAARI and also APAARI on CD were released by the Chief Guest.

Dr. Hiroyuki Konuma, Assistant Director General & FAO Representative for Asia-Pacific (ADG, FAO RAP), the Chief Guest of the Opening Session, welcomed all the participants and resource persons from 14 countries attending the Expert Consultation. He mentioned that this meeting was pending for the last 3-4 years and now it has been organized with full support of Dr. Raj Paroda, Executive Secretary, APAARI. The importance of this Expert Consultation was very well highlighted by Dr. Paroda and I join him in saying that the MAP species are used in healthcare of larger population and provide raw material to wide range of industries in the region. These are the valuable source for livelihood security of tribal communities who live around these resources from centuries and conserve it for humankind. The herbal system of medicine has high efficacy and is safe in use. The demand of herbal products in domestic and international markets is increasing at a faster rate. Due to unscientific collection from the forests, several species have already disappeared and many others are at the verge of extinction. This is causing greater threat to the valuable diversity and needs a clear policy at the national and regional level for their safe conservation and sustainable use. The rich indigenous traditional knowledge (ITK) available on MAP species needs to be documented and understood properly for use for the well being of humankind.

In order to meet the growing demand of quality raw material for industry, the organized cultivation provide an answer and, therefore, the production and processing technologies must be worked out and effect of climate change on the quality of these resources may also be studied by the National Agricultural Research System (NARS) in different countries. This expert consultation will prove to be very useful in knowing the present status of MAP species and their future R&D needs at the country level. It will also facilitate the development of a road map for future collaboration and networking between the countries in the region for generation and sharing of knowledge, process of utilization of the MAP, awareness on use and livelihood security along with policy for production and utilization. While realizing the importance of MAP in healthcare, use in diversified industries, livelihood security of communities and preservation of eco-system, Mr. Konuma felt the necessity of establishing a Regional Network on MAP. This Network will address all related issues concerning MAP species with priority on conservation, sustainable production, utilization, and value addition. The Network will facilitate the sharing of experiences/technology and work in partnership mode towards livelihood security. He stressed that public-private partnership needs to be initiated in each country for technology development for conservation, sustainable utilization and value chain
development. He expressed the hope that these issues will be deliberated in greater length during this consultation and a road map will be developed for future.

**Dr. S.P. Ghosh**, former Deputy Director General (Horticulture), ICAR, India presented the keynote paper on ‘Promotion of Medicinal and Aromatic Plants in the Asia-Pacific Region’. He defined the medicinal plants as those plants which provide medicines to prevent the diseases, maintain health and cure ailments and possess some major chemicals like alkaloids, glycosides, tannins, essential oils, gum resins and mucilage, etc. He stated that different plant parts are being used for making herbal products, source of drug for western medicines and also serve as model for synthesis of novel new drugs. The World Health Organization (WHO) estimated that 80 per cent of population of developing countries depends on traditional medicines, mostly from plant origin and modern Pharmacopoeia also contains 25 per cent drugs from plant sources. He mentioned that China and India are the two major producers of medicinal plants in the world. He also highlighted some breakthroughs in botanical drug discovery like anti-malarial drug (*Artemisia annua*), anti-bird flu drug (fruits of *Illicium* spp.), gugalsterones as anti-hyperlipidemia drug (*Comomiphora wightii*), and liver protecting drug from kalmegh (*Andrographis paniculata*) and memory restorer from brahmi (*Bacopamonnieri*).

Dr. Ghosh emphasized that some restrictions are required on collection of wild plant population of MAP from the forests and advocated for a complete ban/restriction on collection of critically endangered species. There is an urgent need to prepare national inventory, focused program on plant genetic resource management and organized cultivation by each National Agricultural Research System (NARS). The good agricultural practices (GAP), good collection practices (GCP) and good manufacturing practices (GMP) also need to be followed to produce the quality raw materials and it should be free from pesticides residue, microbial contaminations and heavy metals. The Asia region has long tradition of use of herbal medicines which covers the traditional chinese medicine (TCM), traditional Indian medicine (TIM) including *Ayurvedia*, *Siddha*, *Unani*, *Tibetian* medicine and others. The R&D support in certain countries has helped in stabilizing the commercial production of medicinal plants. China has 80 per cent of its medicines from plant origin, about 7,137 species recorded as medicinal plants of which 492 species are cultivated with good number of improved varieties. Ginseng coded under Standard International Trade Classification (SITC). To conserve the genetic resources, more than 100 botanical gardens have been established. About 26 major species are under commercial production on 0.83 m ha. In India, 8,000 species have been reported to be of medicinal value of which 2,500 species provide raw material to herbal industry. The *Ayurveda* (900 species), *Siddha* (800 species) and *Unani* (700 species) systems are the main users and about 1000 species are reported to have trade potential. The 54 top most traded medicinal plants are still being collected from the wild. India has a research support through Indian Council of Agricultural Research(ICAR), Council of Scientific and Industrial Research (CISR),Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH) and private sector and there are some large manufacturing units like Dabur, Zhandu, Himalayan Drug, Hamdard, etc. While concluding his presentation, Dr. Ghosh emphasized that the all the Asia-Pacific countries should consolidate the species-wise data on all aspects, develop marketing network, enhance conservation and resource augmentation efforts and adopt the quality standards. He further mentioned that the present research efforts are insufficient and thinly spread and investment is also very low. The post-harvest technology also remained neglected. Therefore, there is an urgent need for dedicated efforts to conserve, produce and use this vital resource for the wellbeing of humankind in the Asia-Pacific region.

**Mr. Ranjit Puranik**, Executive Director, Shree Dhootpapeshwar Ltd. Mumbai, India made an interesting and critically analyzed presentation on the status of utilization and
marketing of medicinal plants in Asia and provided detailed information on the production/consumption/export of medicinal plants. He stated that it is very difficult to get sole data on medicinal plants while some high volume botanicals have 4 digit HS codes and can be identified for trade purposes. The presentation was based on marketing News Service Report of December, 2011 which reflects trade data for 2010-11. The world trade in botanicals is US $ 32.702 billion and Asian botanical trade is for US $ 14.505 billion with 6.634 million tones and accounts for 44.35 per cent and 53.13 per cent of world trade in terms of value and volume, respectively. Among the top 15 countries which accounts for 72 per cent of the world trade in botanicals in Asia, China (11.48%) and the India (8.75%) are at first and second position in world ranking in terms of value while in terms of volume, their ranking is second (9.92%) and third (8.75%), respectively. The Chinese trade covers 107 botanical counts, 51 medicinal plants commodity counts and the value of trade is US $ 3651.79. The Indian trade accounts for US $ 3050.04 with 304 botanical commodity count and 174 medicinal plant commodity count. Indonesia exports over 40 kinds of essential oils and 12 of them have reached industrial scale. The MAP species are generally high price and low volume crops by nature and the major species are lemongrass, pepper and nutmeg. It is reported that Indonesia is the largest seaweed packer and total export was set to exceed US $ 177 million. It occupies the 4th place (volume-wise) and 5th place (value-wise). Malaysia is another important country in the region which occupies 6th rank in world trade as per the volume and 11th rank as per value. Though Sri Lanka is 7th rank and the Philippines at 5th rank in world trade as per the value but there is no substantial HS Code-wise data available. Tea, spices, coconut are the conventional cash crops in the region. Similarly, cinnamon is also a big traded spice-cum-medicinal plant from Vietnam and Sri Lanka.

The high altitude medicinal plants from the Himalayas (Nepal, India, China, and Bhutan) play the major role but not reflected in these data. The countries of Southeast Asia have a very rich diversity and dependence on traditional medicinal system (TMS), the data may not be compiled but consumption is surely of significance these countries itself. Regarding the trade of rare, endangered and threatened (RET) species, he opined that it requires the efficient conservation production and use mechanisms.

**Dr. Subas Dasgupta**, Senior Plant Production Officer, FAO Regional Office for Asia and the Pacific extended vote of thanks to the Chief Guest, distinguished invitees and resource persons as well as the participants. He highlighted the importance of MAP species and the need for developing suitable strategies for promoting the use of these species in the region.

**TECHNICAL SESSION I: COUNTRY STATUS REPORTS – SOUTH ASIA**

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In this session, six presentations covering the country reports of Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka were made by the respective country representatives. Brief summary of the presentations and major highlights of the session are given below:
Mohd. Shahjahan, Chief Scientific Officer (Forest), Bangladesh Agricultural Research Council (BARC), Dhaka (Bangladesh) made a presentation on the present status of medicinal and aromatic plants in Bangladesh. He highlighted that Bangladesh is a tropical country, has rich traditional medicinal system and about 5,000 MAP species are grown. Bangladesh has rich diversity of MAP species but no efforts have been made to identify these species taxonomically. Bangladesh Council of Scientific and Industrial Research (BCSIR) has identified 747 species of medicinal plants of which eight species are endangered, viz., Andrographis peniculata, Rouvolafia serpentina, Terminalia acirrina, Cycas circinalis, Dioscorea praeripera, Cymbidium aloifolium, Amomum costatum and Zingiber roseum. 191 species are harvested from nature and 29 species are imported. There is no report of comprehensive survey on area and production of MAP in Bangladesh. In 2002, plantation fortnights were started and Bangladesh Forest Research Institute (BFRI) initiated cultivation of five species, viz., Withania somnifera (ashwagandha), Ocimum tenuiflorum (tulsi), Asparagus resimus (satamuli), Adhatoda vasica (basak), and Andrographis paniculata (kalomegh) in the hill tract. The supply chain involved 270 seedling suppliers, 320 local service providers, 62 collection centers and 39 collectors.

Dr. Shahjahan highlighted the importance of conservation and stated that BFRI made germplasm collection of 85 rare species of MAP. Bangladesh has initiated the work on development of cultural practices for five species of medicinal plants in hilly areas and another six species were identified by the Task Force for commercial cultivation. Efforts were also made to develop the nursery raising techniques and also the extension material. Only a few incidences of diseases and pests were noted and farmers are encouraged to use bio-pesticides. Some efforts are now being made to develop quality seed and planting material by BFRI. The primary processing like cleaning, sorting, grading and drying are done by cultivators and value addition work is done by the industry but the activity requires lot of inputs and efforts. About 12,000 tons of raw material worth US $ 4.5 million is sold through rural collection worth and 5000 tons of material US $ 8 million are imported by Bangladesh. The domestic market of herbal medicines in Bangladesh is valued at US $ 60 million. The major concerns in the Bangladesh are the extinction of MAP species from natural habitat, undocumented traditional knowledge (Biodayas (traditional Heller) don’t disclose it), lack of awareness on conservation and use, lack of R&D support, poor marketing based infrastructure support. He also listed the approaches to address the emerging challenges which include survey and inventorization of MAP resources, development and implementation of GAP, GACP, and GMP for commercial cultivation through public-private partnership and networking of institutions working on MAP in Bangladesh.

Dr. Dhanapati Dhungyel, Deputy Chief Research Officer, Medicinal and Aromatic Plants, Department of Agriculture, Thimpu (Bhutan) presented the country report on medicinal and aromatic plants of Bhutan. While mentioning about the historic use of medicinal plants, he stated that Bhutan is referred to as “Lho Jong Men Jong”, the south land of medicinal herbs and Bhutanese have been practicing the age old medical institution called as gso-ba-rig-pa from 8th century. About 7000 plant species are known to occur in Bhutan of which 600 species have been identified with medicinal properties. Most of the MAP species are collected from wild but the cultivation started from 1990s. In the 11th Five Year Plan, spices, medicinal and aromatic plants (SMAP) were given the status of a commodity program. He further mentioned that the most widely domesticated MAP species are large cardamom, ginger and turmeric. There are two distinct production sites for different MAP species in Bhutan, viz., high
altitude MAP and low attitude MAP. Bhutan produces 2284.3 mt of major MAPs valued at 479 Nu. million during 2012. The package of practices for cultivation of artimesia, lemongrass and turmeric have been developed. The Department of Agricultural Marketing and Cooperatives (DAMC) facilitates the improvement of the marketing channels of MAPs. Dr. Dhungyel stated several constraints and opportunities which included limited technical capacity, lack of good processing facilities, inadequate production of seed and planting material, lack of awareness on sustainable harvest and value addition. He stressed the need to strengthen institutional set-up, improve coordination between different stakeholders, human resource and capacity building, establishment of storage and processing infrastructure.

**Dr. Satyabrat Maiti**, Director, Directorate of Medicinal and Aromatic Plants (DMAPR), Anand, Gujarat, (India) made a presentation on the current status, ongoing R&D programs and overall achievements with respect to medicinal and aromatic plants in India. The ancient Indians had good knowledge on use and preparation of MAP products for medicine, cosmetics, health and hygiene, toiletries, fragrance and food supplements through its *Ayurvedic* system even 5,000 years ago. India is rich in diversity of MAPs and about 7,000 species are recorded in various folklore medicines of which 1,700 species are referred in *Ayurveda* text. At present, 134 species are cultivated widely and 160 species are cultivated partially. It is estimated that about half a million ton of raw material is collected from the wild. The Indian household industrial use and export amounts to about 319,500 million tons of raw material and 960 species of medicinal plants are traded the most.

Dr. Maiti mentioned that the export of raw material and finished herbal products is valued at about US $ 100-114 million per year. The germplasm holdings at the Directorate of Medicinal and Aromatic Plants, (DMAPR) and All India Coordinated Research Project on MAPs (AICRP MAPs) are 2,612 accessions of 39 species. Although India has *in situ* and *ex situ* conservation programs, but there is an urgent need for focused program to strengthen the conservation efforts through inventorization and distribution mapping, threat categorization, conservation biology, re-introduction of extinct/threatened species in their natural habitat and development of good agricultural practices (GAP) for more species. In addition, cultivation, improved quality control as well as species improvement are needed to maintain the supply chain of raw material. The quality seed production has been initiated in some major medicinal plants like isabgol, senna, ashwagandha, guggal, aloe, safed musali, lemon grass and palmarosa but need to be expanded along with the development of minimum seed standards. The primary processing and value addition is not adequate and requires focused attention.

He highlighted that though several marketing channels are prevalent but still the marketing remained a grey area and requires an overhaul. Another important aspect is quality assurance and for this purpose good agricultural and collection practices (GACP) and good manufacturing practices (GMP) need to be followed in the right earnest. There are several constraints in the MAP sector. It includes the high risk of commercial cultivation due to unorganized marketing. There is no policy in place to regulate the cultivation in the desired soil and climatic conditions. The candidate species are large in number which require R&D support through enhanced funding and institutional mechanism, post-harvest and value addition at farmers’ fields and other need based logistic support for storage and transport. There is a great need to develop partnership mechanism with research institutes/farmers/private industrial organizations. The networking of all stakeholders by strengthening of medicinal plant
chain both vertically (producer–industry) as well as horizontally (strengthening producer organization) to increase people’s trust and ability to corporate. The safety and quality of raw drugs is of paramount importance which calls for strengthening of certification (GACP and organic) and labeling. There is a great need to have a defined policy and priority setting for this vital resource.

Dr. T.P. Barakoti, Senior Scientist, Nepal Agricultural Research Council (NARC), Kathmandu, Nepal presented a detailed overview on medicinal and aromatic plants in Nepal. He stated that Nepal is gifted with the wide range of soil and climatic conditions and therefore, produce large number of species of MAP in the country. It possesses eight ecological zones, 35 forest types, 75 vegetation units and 118 ecosystems. The plant wealth of Nepal covers 5,856 species of flowering plants of which 1,624 are MAP species. The country cultivates aromatic plants (mentha, chamomite, citronella, lemongrass, palmarosa and French basil) on about 968 ha area and produce 2,752 MT of essential oil. The total production of medicinal plants during 2011-12 was 2550 MT. The wild populations of medicinal plants are the major source of raw material and local Garau in Tarai Tharu, Dhami-Jhankri in hills and Amchi in high hills uses the medicinal plants for preparation of various formulations for local healthcare practicing traditional systems including Ayurvedic, Homeopathic and Tibetan. The seed production of aromatic plants and raising the plantation are done in an organized manner. The Dabur Nepal produces quality planting material of selected medicinal plant species and distributes to farmers for organized cultivation. The value addition to raw material is limited due to lack of appropriate technologies and policy support. There are over 400 various preparations made from MAPs and are traded locally and also exported. Realizing the importance of conservation and to prevent overexploitation of natural populations of MAPs, Nepal has banned collection, transportation and trade of about 20 species of MAP.

He further mentioned that due to overexploitation, several species are under rare, endangered and threatened (RET) category which require attention for appropriate conservation efforts. By and large, no work has been undertaken for crop improvement and varietal development on MAPs in Nepal. There is a great potential to cultivate and produce quality raw material in Nepal, but required facilities, technological support and favourable policy environment need to be created. Nepal markets its MAP products through Indian trade hub and India gets major high altitude MAP species from Nepal. There are several constraints in production of MAPs which require immediate attention because due to suitable climate, it has ample scope of development of MAP sector in Nepal. Therefore, the future thrust should be on scientific conservation, organized cultivation and value addition. For this, enhanced funding and technological support, favourable policy environment, and market linkages are extremely important and need to be addressed on priority. The sharing of knowledge and experiences as well as the partnership mode of operation are also required on priority.

Dr. M. Naemullah, Principal Scientific Officer, Plant Genetic Resources Institute (PGRI), National Agricultural Research Centre (NARC), Islamabad, Pakistan presented the country report on MAPs of Pakistan. He presented the overall scenario of agriculture in Pakistan and stated that several MAPs are grown in Pakistan including vegetables, spices and seed species and listed about 20 species of MAPs which are largely used in primary healthcare. There are several institutes which are working on agriculture and also cover the MAPs. In particular, National Agricultural Research Centre, Islamabad primarily undertakes the work on the collection,
conservation, and cultivation of MAPs and the Botany and Chemistry Departments take care of taxonomy and phyto-chemistry aspects. There are about 26 species of high altitude MAPs which are endangered and vulnerable and need to be conserved on priority. Efforts were made to collect the germplasm of about MAPs and collected about 900 accessions of about 32 species. Efforts were also made to augment the germplasm through import from different countries. The germplasm characterization was undertaken in 20 species and about 350-600 accessions were characterized annually. Seed production work has also been initiated in selected MAPs.

He further highlighted that only the private sector is involved in processing, value addition and marketing and 125 firms are registered with Pakistan Tibbia Pharmaceutical Manufacturing Association (PTPMA). While highlighting the constraints, opportunities and approaches for meeting the challenges, he categorically stated that there is a great need for awareness generation on all aspects of MAPs among all the stakeholders. He emphasized that suitable strategies should be in place for conservation and sustainable use of MAPs. There is a greater need to collect and evaluate the germplasm for desired traits and expand organized cultivation with backup support of technology. There should be a national policy in place for MAPs and public-private partnership approach is required to be adopted and promoted. Efforts are needed to update the inventory of MAPs regarding their availability in the wild. Some communities totally depend on the wild populations of MAPs for their livelihood and the income of these communities can be enhanced substantially by providing technological and policy support for on-farm value addition and product development activities. To achieve the goal, coordination and linkages among various stakeholders of MAP sector is essential.

**Dr. J.T.R. Yauakody**, Senior Lecturer, Department of Dravyagunavignana, Gampha Wickramarachhi Ayurveda Institute, University of Kelaniya, Colombo, Sri Lanka stated the importance of MAPs in overall health management and economy of Sri Lanka. The country is located in the tropical belt close to the equator with mean annual temperature (20°C-28°C) and high rainfall (1,000 mm – 3,000 mm). There are four major vegetation zones, viz., arid zone, dry zone, intermediate zone, and wet zone which are rich in diversity of tropical plants and possess 4,143 species of flowering plants including 1,500 species of MAPs and 180 endemic species. In Sri Lanka, most of the MAPs are available in forest areas which have rich diversity of aromatic plants like cinnamon, pepper, cloves, ginger, citronella, nutmeg and turmeric. The country produces 2,174 MT of cinnamon leaf oil and bark oil followed by nutmeg, cardamom oil, clove oil and citronella oil. He also mentioned about the export of the produce of MAPs along with the other agricultural produce and highlighted that Sri Lankan produce is getting popularity abroad. The future thrust of the country is on improving the productivity through research and extension efforts and giving a focused attention to value addition and product development.

While concluding the session, Dr. Subash Dasgupta emphasized that the source of data provided in each country report needs to be mentioned. He stressed that priority setting is essential for cultivation, conservation and value addition. There is also a great need to develop a Regional Network on MAPs for sharing the experiences, knowledge and information. The quality management of production and use of MAPs is also very important.
TECHNICAL SESSION II: COUNTRY STATUS REPORTS – SOUTHEAST ASIA AND PACIFIC

Chair : Dr. T. Dhendup, DoA, Bhutan
Co-Chair : Dr. T. Sugino, JIRCAS, Japan
Rapporteur : Dr. L. Jung-Hoon, RDA, Korea

In this session, eight country status reports on MAPs were presented by the respective country representatives of Japan, Malaysia, Papua New Guinea, the Philippines, Republic of Korea, Thailand, Vietnam and Myanmar. Brief summary of each presentation and major highlights of the session are given below:

Dr. K. Nakahara, Project Leader, Biological Resources and Post-harvest Division, Japan International Research Center for Agricultural Sciences (JIRCAS), Tsukuba, Japan presented the country report on MAPs of Japan. He stated that the Japanese Pharmacopoeia has listed 248 items of eastern-style herbal (Kampo) medicine and produces different products worth US $ 1,000 million (2007) and expected to increase it to US $ 2,000 million by 2015. Japan is a big importer of aromatic products and its domestic production of material for natural flavour and fragrance is very low. He narrated the major uses of five selected species of MAPs in Japan. The National Institute of Biomedical Innovation (NIBI) is managing a collection of 4,000 species / lines of medicinal plants. The National Institute of Agrobiological Sciences (NIAS) genebank holds more than 2,50,000 accessions including MAPs. Regarding the varietal development, he stated that 20 patents were registered during 1971-1998 by private companies producing Kampo medicines. In Japan, medicinal plants are mainly cultivated in a contract farming system as per an agreement between private companies and farmers groups where private companies take care for supply of quality seed and other know-how for cultivation. The cultivation practices have been developed for MAPs of major importance. The primary processing, value addition and marketing aspects are taken care by the private companies only. He elaborated the steps from processing of raw material to finished product. The demand for Kampo medicine in Japan is increasing at a faster rate due to increase in the population of old people who are the main consumers. The production of Kampo medicines depends on import of raw drugs and therefore, government led academia, research groups and industry have now started research projects on efficient domestic production of crude drugs. Application of hydroponic culture technique in plant factory for medicinal plant production has started only recently. In his concluding remark, Dr. Nakahara said that crude drugs and flavour and fragrance materials (FFM) are important industrial materials, and there is a high demand for these in Japan. The domestic production of MAPs has decreased considerably during the last 20 years, since most of the domestic products are much more expensive than imported material from China and other Asian countries.

Dr. W.Z.W. Mamat, Deputy Director, Malaysian Agriculture Research and Development Institute (MARDI), Kuala Lumpur presented the MAPs scenario in Malaysia and stated that the herbal industry has significant demand in global and domestic markets. The major markets are looking for new, safe and effective products. Malaysia is known for Jamu traditional medicines. While presenting the strengths, weaknesses, opportunities and threats (SWOT) analysis, he pointed out that Malaysia is rich in diversity of MAPs and associated rich traditional knowledge but the herbal industry is still in its infancy and the wellness multi-sectorial segments have not been fully exploited. At present, the country is concentrating in the primary...
processing, cultivation and extraction but not on value addition. The MAP sector requires coordination among all stakeholders. He stated that five major herbs have been identified as the priority species for cultivation. Sincere efforts are being made by Malaysian Agriculture Research and Development Institute to establish four herbal centres of excellence clusters, develop herbal cultivation and expand extraction facilities. The Malaysia produces 35,294 mt of MAP raw material from 4,206 million ha area. Malaysia’s future thrusts are to ensure the production of quality seed and planting material, cultivation of selected local MAPs using modern farming practices with high emphasis on post-harvest management. The need was felt to develop value added products with desired quality and enforcement of regulations/acts which are essential to ensure sustainable production of raw material. While concluding his presentation, Dr. Mamat emphasized that herbal industry in Malaysia is new and intensive efforts are required to develop technology with full policy support to this important sector.

Dr. P.P. Rai, Professor, Division of Pharmacy, School of Medicine and Health Sciences, University of Papua New Guinea presented country report of Papua New Guinea (PNG) on MAPs. The Papua New Guinea has unique geographical position and climate and is one of the largest countries in the Pacific and comprises hundreds of islands. The largest and longest mountain range in PNG is the Owen Stanley Range that runs through the middle and dividing the country in New Guinea in the North and Papua in the South. The country is divided into islands, the low land (0-1200 m) and the highlands (1200-2800 m). There are 800 ethnic groups originally settled approximately 40,000 BC with repeated rounds of colonization. About 800-850 distinct languages are spoken in the PNG. About 95 per cent of the land is privately owned. PNG is the fourth mega-biodiverse country in the world and 70 per cent of its area is covered by tropical forest. The native flora contains an estimated 20,000 species of vascular plants. Scientists have estimated that more than half of the plant species are yet to be named. The nature remains a mainstay of medicines today and natural products are potential source of new drugs. PNG has several constraints and opportunities due to its geographical and geological positions and the health indicators are the lowest performing in the Pacific.

Dr. Rai further mentioned that there is no commercial or large scale planting of medicinal and aromatic plants in PNG and hence no marketing network exists. There is only small scale production of essential oils that too limited to domestic market. About 1,000 plants species are used in indigenous traditional medicine. The bark and hardwood of *Cryptocaria massoy* contains C-10 lactone, a golden colour oil and an experimental plot has been established set-up in central province of PNG. The *wariwari* (*Asteromyrtus symphyocarpa*), a tree grown abundantly in western province of PNG and produces an essential oil similar to eucalyptus oil in odour and properties. A small scale sustainable essential oil industry has been set-up with Govt. support to generate income for local communities. He stated that there are about 20 high value MAP species which have high potential and can be grown successfully in PNG. So far, no work has been done on any aspect of plant genetic resource (PGR) management and cultivation of MAPs and also no government policy is in place to promote MAPs in PNG. But, PNG is interested in developing the herbal industry because it is the part of culture and tradition, accessible and affordable with a high potential source of drug discovery. The future thrusts include the systematic survey of MAP resources, establishment of database, traditional medicine practitioners register and network, awareness and R&D support. He has listed 100 most commonly used medicinal plants in PNG.
Dr. C.C. de Guzman, Professor, University of the Philippines, Los Banos, presented the status of MAPs in the Philippines. He stated that in the Philippines, general awareness about health is increasing due to increase in the percentage of aging population. The change of life style and high price and low availability of drugs have renewed the interest of people in herbal medicines. During 2012, MAPs were cultivated in about 900 ha area and 2,630 mt of raw material was produced in the Philippines. Ten medicinal plants and four aromatic plants have been identified as priority species but it also includes some fruit and vegetables species. In addition, MAP species like Coleus, Moringa, and Lagerstroemia are also considered important medicinal plants in the country. The University of Philippines, Los Banos has a collection of 73 species of MAP and a field genebank containing 180 species of MAP. The country has developed cultivation practices of 14 MAP species which also includes some fruit plants. He also presented information on diseases and pests of some major MAP species and stated that by and large no efforts have been made to develop the improved varieties and production of quality seed and planting material. However, efforts have been made to identify the optimum stage of harvest in 10 MAP species which include some important species like citronella, lemon grass and patchouli. He highlighted that the marketing, commercialization and trade are important and the Philippines Institute of Traditional and Alternative Health Care (PITAHC) has established four processing units with a capacity of 10-15 million tablets/year. In addition, a processing unit of ilang – ilang (Cananga odorata) has also been established by the local Government. There are some private groups like Chamber of Herbal Industries of the Philippines Inc. (CHIPI), an umbrella group of companies (about 50) engaged in the manufacturing and trading of herbal products. Moringaling Philippines Foundation Inc. (MPFI), a network organization serving the moringa supply chain and the two major pharmaceutical companies in the Philippines, namely, Pascual Laboratories to commercialize lagundi (Vitex negundu) and sambong (Blumea balsamifera) and Rite Med, a leading unbranded unit of medicines marketing its first herbal product (Stop Cough Lagundi) from 2011. He stated that like other countries, the data published on herbal trade in the Philippines are also not adequate and the country is still a net importer of spices and essential oils. The magnitude of export was 814 mt valued at US $ 305,000 and import was 15,020 mt valued at US $ 3384,000. He also highlighted the constraints, which included lack of scientific support, no standardization of natural ingredients, minimal implementation of GAP, lack of R&D support with required funding to the natural product industry and no suitable policy environment for overall development of the MAP sector. Therefore, to address all the above emerging issues, the approach could be to establish linkages between government institutions and private organization, promote GAMP, develop required R&D facilities with enhanced funding and create favourable environment for marketing with a policy support.

Dr. P. Chung-Bern, Senior Researcher, Department of Herbal Crop Research, National Institute of Horticulture and Herbal Sciences (NIHHS), RDA, Korea made a presentation on present status of MAP species in Korea. The Rural Development Administration (RDA) which is the central government organization responsible for agricultural research and extension services in Korea, has developed and disseminated the green technologies. The huge agro R&D area has been divided into three categories, viz., future high technology, on-farm technology and agro-food technology which have 15 identified priority programs. The National Institute of Horticulture and Herbal Sciences (NIHHS) is responsible for collection of new
germplasm to develop new cultivars and cultivation practices for sustainable production of horticultural and herbal crops.

The medicinal crops, so called herbs, are not the minor crops anymore and have indefinite applicability as functional medicinal food material to the entire natural health industry. The R&D status of medicinal crops is expanding explicitly and the traditional processed medicinal crops have turned into new products which can be used with ease. The current research efforts include determining the origin of MAP species and their native habitats, disseminating GAP, quality standardization of products and testing their efficacy, identifying new plant based compounds to develop new drugs and establishing of medicinal herb gardens. Korea has rich tradition on use of herbal products and out of 544 species available, 450 species are listed in the Korean Pharmacopeia as herbaceous herbs. The aging people’s increasing concerns on healthcare is getting due attention because by 2025, Korea will the 6th oldest society in the world.

He highlighted that the domestic market is of 7.4 trillion Won (2009) which is 3.1 percent of world market. Korea, depends largely on imports (75% for food and 25% for medicine). The area under production of MAP species was 62,208 hectares and the produce was valued at 100 million Won during 2011. Now the efforts are more towards the development of herb-derived new drugs and replacing the chemically synthesized drugs. Though, Korea has 8,200 indigenous plant species but only 50 species have been domesticated so far. The integrative medicine plays a great role in promising industrialization of herbal health products. To meet the needs of consumers, functional beverage, trendy herb tea and liquor products are developed by using flavour and volatile property of various herbs. Emphasis has been laid in developing beauty products, personal hygiene items and aroma therapy materials. In an innovative effort, Korea is developing new four resources to bring nature and its potential value to public.

Dr. S. Chingduang, Senior Plant Pathology Specialist, Horticulture Research Institute, Thailand presented the country status report on MAP species in Thailand and highlighted that many MAP species are used for traditional healthcare in the country and also export material worth about 300,000 million Baht of cosmetics, supplementary foods, and herbs and spices etc. The Department of Agriculture undertakes research work on plant genetic resources (PGR) management and production technology aspects and collected herb and spice plants of about 1,500 species from 5 areas in different parts of Thailand. While describing on achievements, he highlighted that in turmeric (Curcuma longa), 2 varieties, namely, Trang 84-2 and Trang 1 were developed. The research work on production technology includes standardization of plant spacing, shading, mulching, irrigation and fertilizer requirements along with the control of pests and diseases. The post-harvest and processing technology is equally important and have received focused attention of the Department of Agriculture. The quality control of products and good agricultural practices (GAP) are followed for cultivation of MAP species. The GAP registered production area is about 480 ha.He stated that 20 promising herbs have been identified for R&D efforts and presented a road map developed for the promotion of MAP species in Thailand (2014-19) which includes the promotion of MAP products for use in national drug industry and export, standardization of Thai products using Thai GAP and conservation of MAP genetic resources.

Dr. T. N. Hung, Senior Researcher, Fruit and Vegetable Research Institute, Trauqui-Gialam-Hanoi, Vietnam presented the country status report of Vietnam. He mentioned
that the geographical position of Vietnam is unique with 1600 km length and 75 per cent of the land area under hills and mountains of which the forest occupies about 40 per cent. In Vietnam, about 4,470 MAP species are available in wild state and are being used by different groups of people. About 12,000 tons/year of herbal material is collected primarily from 206 MAP species growing in the wild. About 136 MAP species are cultivated commercially. The total production of MAP species based raw material is 60,000 tons/year of which 20,000 tons are being used in pharmaceutical industry, equal amount for production of popular medicines and about 30 per cent is exported. He also highlighted that MAP species have played a significant role in traditional medicines and also in the socio-cultural systems. Several hospitals, institutions and companies are involved in processing, compound extraction and developing remedies based on MAP species. He has presented significant work on important essential oils. The Vietnam has undertaken ex situ conservation efforts for 730 species, including 86 species from the red list. The threatened species have been conserved under in situ conditions. The red list of MAP species covers 144 species of 58 families. Vietnam has introduced 70 new species which are well adapted to the Vietnam conditions. Efforts are being made to provide certified planting material to the growers. He also highlighted the constraints and opportunities which include poor management, overexploitation, and sharply reduced natural forest areas. He further mentioned that the future thrust areas include development of master plan to develop MAP species associated with forestry development strategy, assessment of natural resources in key areas, building of some intensive cultivation areas, organize trainings and strengthening of interdisciplinary collaboration with different stakeholders.

Dr. Zin Zin Nwe, Deputy Director (Food Control), Department of Food and Drug Administration, Ministry of Health, Myanmar, presented the country status report on MAP species of Myanmar. The Myanmar’s climate is greatly influenced by the monsoon with 500-5000 mm rainfall and three distinct seasons, namely hot, rainy and cool. Myanmar has a great tradition of use of herbal medicine and it is now becoming popular among the urban populations. He presented information on 20 important medicinal plants used in the country. In order to promote the awareness about the MAP species, Myanmar has developed eight herbal gardens and six nurseries of MAP species used for the treatment of major diseases. There is one University of Traditional Medicine and largest herbal garden which is situated in Nay Pyi Taw covering 196.4 acres of land where a large collection of medicinal plants of about 500 species are grown and nurtured. Thankha (Limoniacrenulata) is the famous traditional cosmetic of Myanmar since over 2400 years. It does not produce timber but it is one of the non wood forest product (NWFP) and also requires silvicultural practices. The bark of this tree is used for production of local cosmetics to protect skin. He further stated the success story on utilization of Micheliachampaca for developing perfume, Shoreasiamensis for medicinal uses like prevention of cancer cell division, malaria and also as traditional medicines and Mesua ferrea for medicinal purposes. The Department of Traditional Medicine is responsible for manufacturing of medicines in public sector but the private sector also plays a significant role in production of medicines and follow GMP.

In his concluding remark, Dr. T. Dhendup, Chairman of the Session emphasized that the Asian region is rich in diversity of MAP species with wealth of indigenous traditional knowledge (ITK) which must be documented, authenticated and used for future R&D. There is an urgent need to create a favorable policy environment
including marketing infrastructure, awareness generation at all levels. The MAP species should be designated as future crops for the humankind.

Key Highlights

Technical Sessions I & II

- The MAP species are often called as non-timber forest products (NTFP) and remained neglected so far. Now this paradigm need to be shifted and the MAP species should be designated as future crops for the well being of humankind. Due to the changing life style and emerging uncommon health problems, there is a need for focused attention of policy planners and R&D organizations for overall development of MAP sector.

- There is an urgent need for higher investment in research and development (R&D) of medicinal and aromatic plants at national and regional level to undertake the focused activities to address the emerging issues for overall development of MAP sector.

- The institutional support to undertake R&D work and trained man power in the area of medicinal and aromatic plants are very meagre in all the Asia-Pacific countries. Therefore, more institutions need to be created (at least one institute for each climatic zone as the MAP species have distinct climatic requirements) to undertake the research work on MAP species for generation of economically viable and environmental friendly technologies for sustainable quality production and creation of trained and skilled man power.

- The MAP species are a large group, having diversified growing habits and habitats and are grown under wide range of soil and climatic conditions. Further, their different plant parts and distinct chemical compounds are used for medicinal and aromatic purposes. Therefore, it calls for the prioritization of species for cultivation, value addition and conservation efforts leading to sustainable use.

- The R&D work on MAP species is the minimal in most of the Asia-Pacific countries. Therefore, the R&D activity in MAP species should be reoriented involving the NARS and it should be demand driven, vibrant and capable of addressing the emerging concerns. The dedicated efforts are needed for inventorization and distribution, threat categorization, conservation biology, reproduction of rare, endangered and threatened (RET) species of MAP. There is a great need to develop effective R&D program on PGR management, crop improvement, crop production and post-harvest management, developing good agricultural practices (GAP) and adopting organic farming.

- The quality aspects are most important and should be taken care right from raw material stage to the production of finished product. There is a need for development of monographs for quality standards of all important MAP species by the respective NARS.

- There is an urgent need to have an appropriate mechanism in place for certification of organically produced raw material with defined quality in each country for the benefit of producers and users of MAP species. All herbal products need to be labeled suitably with required information on content and quality to fetch premium price in the market.
• There is a need to develop innovative system of partnership between private sector and R&D organization for reorientation of R&D efforts and also funding support from private sector organizations for major species having large turnover. Effective linkages also need to be established through a Network involving R&D organizations, private sector and collectors/farmers in participatory mode to effectively address the operational management issues related to the MAP species.

• There is lack of awareness at all steps of collection and production of MAP species in the Asia-Pacific countries and therefore, there is a great need to undertake well organized awareness programs on collection, production and sustainable use of MAP species.

• The MAP sector comprises several stakeholders like collectors, cultivators, local commission agents, primary processors, industry, NGOs, R&D organizations and policy makers. There is a need to have an effective mechanism in place for networking of all stakeholders and a nodal organization should also be identified to coordinate the activities of MAP species in each country.

• The data on collection of raw material from forests, cultivation and production, value addition and trade is lacking in the countries in Asia-Pacific region. Therefore, a mechanism need to be developed in each country to document all such information authentically. It will help in development of a regional database for the Asia-Pacific region to promote the effective coordination and partnership related to R&D and trade in MAP sector.

• A Regional Network on MAP species needs to be created for the Asia-Pacific region which will promote the regional activities on information and knowledge sharing, exchange of human resource and material, organize trainings, workshops and seminars.

• Several species which are predominantly used as fruits, vegetables, seed spice and for other uses have also been mentioned as MAP species in various country reports and presentations. This gives an incorrect impression on overall strength of MAP species in the country/region. Therefore, only those species which have medicinal and aromatic value and are traded for this purpose should be listed as MAP species.

TECHNICAL SESSION III: POLICY PERSPECTIVE: AR4D STRATEGIES

Chair : Dr. S.P. Ghosh, Former DDG, ICAR
Co-Chair : Mr. Khalid Mahmud, MNFS&R
Rapporteur : S.R. Merry, DFRI

Seven presentations addressing the major challenges related to policy perspective for agricultural research for development strategies on MAP species were made by the experts from different countries dealing with policy issues and identified as panelists. The brief summary of each presentation and the key highlights of the discussions during the session are summarized below:
Mr. R. Puranik, Managing Director, Sree Dhootpapeshwar Ltd., Mumbai, India stated that the business in MAP sector should be driven by R&D support and the R&D efforts should be demand driven. Realizing the importance of correct data on collection from the wild and production from cultivation, he advocated that the MAP species should be given a commodity status. APAARI with the support of FAO should play a facilitating role in generating the required data on marketing in each country. While highlighting the market scenario, he stated that the Ayurvedic medicine is given a HS code – 30049011. This HS Code is understood by creation of new HS heading (4 digit) for a product that requires a minimum of 100 million US$ international trade in that commodity and creation of a new HS sub-heading (6 digit) for a commodity that requires an international trade of 50 million US$ as per the guidelines of World Commerce Organization (WCO). The tree species remain neglected due to their long gestation period and it can be taken care by developing suitable model of intercropping of other MAP species in tree plantation to make it remunerative. There is an urgent need to understand the traditional knowledge base for ‘whole plant’ profile and not just the marker compound concentration. The phytochemistry of the plant is to be well understood in relation to seasonal variation and develop robust agro-technology for MAP species enabling handshake farmer-user. While mentioning about ‘Market Mantra’ he highlighted that raw material should qualify for sustainability source, organic certification, traceability, procurement, fair trade and quality guidelines.

Dr. T. Sugino, Regional Representative, Southeast Asia liaison Office, Japan International Research Center for Agricultural Sciences (JIRCAS), Japan mentioned that Japan has established a Research Centre for Medicinal Plant Resources, National Institute of Biomedical Innovation with three R&D centres in 1874. It undertakes R&D work on all aspects of MAP species covering conservation, reproduction, cultivation, breeding and evaluation of medicinal properties etc. Regarding aromatic plants and their essential oils, he stated that the essential oil sector has well defined policy and using functional component of aromatic plants as feed, food and developed their production and pest control technology. He also emphasized the need for developing international collaboration integrating Japan’s experiences.

Dr. H.K. Manandhar, Director, Nepal Agricultural Research Council, Kathmandu, Nepal highlighted that production of MAP species contribute about 3 per cent of gross domestic product (GDP) in Nepal and have great potential for improving socioeconomic status of people in the mountain region. The existing policies have not clearly emphasized on MAP species as an important crop and still it is being dealt as non-timber forest product (NTFP) which gets the least attention. Therefore, there is a great need to have a well-defined policy for MAP species. A separate MAP Development Board needs to be created which should include training and R&D components. Thus, there should be a well-defined public-private-partnership. A mechanism should be in place to address all the issues related to intellectual property rights (IPRs). The country also needs to develop facilities in advanced technology and quality management.

Dr. M. Naeemullah, Principal Scientific Officer, Plant Genetic Resources Institute, National Agricultural Research Centre, Islamabad, Pakistan presented the overview of MAP policy perspective in Pakistan and raised some of the important issues related to MAP sector. There is an urgent need for developing suitable strategy for development of MAP species and focused attention is required for implementation of GACP at the level of farmers, collectors and traders and develop research based production.
technology to comply with World Health Organization (WHO) guidelines on GACP. The registration of medicinal plant material, development of quality seed and planting material and its distribution to farmers for raising commercial plantations are to be taken up on priority in future. There is a great need to develop better market linkages, public-private partnership and training of all stakeholders in Pakistan.

**Dr. N.M. Lita,** Senior Ecosystem Management Specialist, Protected Areas and Wildlife Bureau, Wildlife Resources, Division, Los Banos, Philippines mentioned that the Philippines specifically articulated a policy on traditional and alternative medicine in 1997 and the Philippine Institute of Traditional and Alternative Health Care (PITAHC) was established. Its main functions are to encourage R&D efforts, promote traditional medicines for healthcare, skill development, develop standards, guidelines and codes and formulate policies related to MAP species. He further mentioned the herbal industry in the Philippines is in the early developmental stage and full potential of MAP species is yet to be exploited. It requires collaboration between R&D institutes, private sector and other stakeholders. Enhanced investment in this sector is extremely essential to address all emerging issues related to MAP species. The quality management and marketing also need to be developed in the Philippines.

**Dr. Lin Chi Vu,** Head of Division, Plant Resource Center, An Khanh Commune, Hanoi, Vietnam raised various issues related to overall development of MAP sector and stated that MAP species are high quality unique industrial plants. There should be appropriate policies for conservation and sustainable use of genetic resources of MAP species, human resource development and enhanced funding support to this sector. There should be proper coordination among all players of MAPs sector including public-private-partnership documentation and understanding of traditional knowledge and also develop international cooperation.

**Dr. R. Ramani,** Director, Indian Institute of Natural Resins and Gums Ranchi, India presented important AR4D strategies. He mentioned that there are large number of species of MAP and it requires priority setting under each category. He stressed on the need to develop and implement the GAP and GACP and understanding the phytochemistry in relation to plant and its environment. The input from industry should come forward to develop R&D programs of institutions. The organized cultivation is a variable option for sustainability. The tree species which require long waiting periods need a totally different strategy. The investment in R&D of MAP species need to be enhanced substantially. There is need to develop web portal of MAP species and also to develop quality monographs on each important species.

Dr. S.P. Ghosh in his concluding remarks, emphasized that four important issues are emerging out from the seven presentations made and discussed thereof. These included research and development, quality assurance, marketing and trade related aspects and capacity building. The organic certification is a difficult job but if we go for area certification or group certification than it will not only reduce the expenditure but also will be easy in adoption. The quality parameters should also take care for heavy metals, pesticides residue, etc. and follow GAP, GCP and GMP. The Asian region in general and individual countries in particular should address these issues in addition to creation of favourable environment and enhance the investment for overall development of MAP species in the region.

**Key highlights**

- At present, MAP species are under the non-timber forest produce (NTFP) group and are being dealt with as per the code of NTFP. Realizing their vast potential,
the MAP species should have a designated title and separate code of operation so that due attention is paid to this important sector.

- Since the medicinal plants and their plant parts are used in raw form in the traditional medical system, the important aspects which govern the quality of the drug at initial level are the correct identification of species, optimum stage of harvest and primary processing. All these important aspects need to be taken care in the right earnest.

- A mechanism needs to be in place for growing the MAP species with buyback arrangements with the user industry. It will ensure fair price of the produce to farmers and enhance their income to livelihood security. Efforts should be made to grow the MAP species organically and an appropriate certification system should also be in place.

- There is a need to identify the priority species for cultivation and value addition in each country and develop a database on collection from wild, production from the cultivation and have effective PGR management including conservation and use of MAP species listed in the red list.

- The tree MAP species are remained neglected due to their long growing period and low income during the gestation period. Therefore, suitable intercropping system needs to be developed in order to use inter-row space effectively and make the system more profitable.

- There is a need to understand and document the indigenous traditional knowledge (ITK) and based on this knowledge, the R&D efforts need to be initiated.

- There is a need to have separate MAP Board to regulate all activities related to MAP species. MAP species should also be included in the teaching curricula of State Agricultural Universities as well as traditional Universities.

- In general, there is a lack of financial support to this sector. The funding support needs to be enhanced at least by three times. R&D efforts should be demand-driven and private sector should also participate with funding support to the R&D efforts. Efforts are also needed to train the staff engaged in different sectors of MAP for their skill development.

- In the present global scenario, the countries are dependent on each other and to share the experiences of each other and exchange the knowledge, information, material and manpower which require adequate funding support. In view of this, FAO should provide the funding support for activities related to the regional cooperation for overall development of MAP sector in the Asia-Pacific region and to develop effective international cooperation.

- There is an argent need to prioritize 5-10 species in each country having comparative advantage of high market demand and medicinal value for cultivation and value addition. The rare, endangered and threatened MAP species need to be brought under National Agricultural Research System (NARS) for their research and development.

- The impact of herbal products depends on quality. Therefore, quality management should be done at all stages starting from the raw material through value chain to finished product. Hence, suitable policy needs to be developed to implement good agricultural practices (GAP), good collection practices (GCP), good manufacturing practices (GMP) and good laboratory practices (GLP). Each
country has to develop appropriate guidelines for good practices and quality labeling on priority.

- There is a need to strengthen the research on to MAP species through enhanced funding so that the requirement of both domestic consumption and export are taken care. Ethnobotanical studies (including molecular taxonomy, geographical distribution and economic significance) are the prerequisites of commercial cultivation. Leading research efforts on medicinal plants could unveil the curative measures of dreadful diseases that can be therapeutically significant in drug discovery.

- There is an urgent need to have strong linkage between research institutions and pharmaceutical industry which needs to be established through appropriate linkage model. The public-private partnership (PPP) model needs to be adopted for implementing R&D programs for overall development of MAP species. Regulatory measures for conservation, cultivation and marketing as well as development of quality standards of commercial MAP species need to be developed by all MAP growing countries in the region.

TECHNICAL SESSION IV : Working Group Discussions

Focused discussions to identify research priorities and need assessment on research and development initiatives for overall development of medicinal and aromatic plants in the Asia-Pacific region were organized involving key resource persons in the related fields and were facilitated by eminent experts. The three Working Groups were organized on various aspects: i) Production, Conservation, Improvement, Management; ii) Utilization, Value Addition, Marketing, and iii) Collaborations and Networking.

Working Group1– Production: Conservation, Improvement, Management

Facilitator: Dr. S. Maiti

The first group involving 13 participants from the Asia-Pacific countries, APAARI and FAO had in-depth discussion on prioritization of MAP species for organized commercial cultivation, crop improvement and conservation efforts and need assessment for future R&D activity on MAP species in the Asia-Pacific region. The key issues/recommendations emerged were presented and discussed by all participants of the expert consultation collectively in a separate plenary discussion.

Working Group2 – Utilization: Value Addition, Marketing, Export

Facilitator: Dr. R. Ramani

The second group comprising 10 participants discussed and finalized issues and recommendations related to the utilization component of the raw material and value added products and also covered the marketing and export of MAP species. The group identified important aspects of value addition at farmers fields through investment for supporting the common facilities, developing the organized marketing and labeling of the herbal products. The group also felt the need of a separate HS Code for MAPs. The key issues/recommendations emerged were presented and discussed by all participants of the expert consultation collectively in a separate plenary discussion.

Working Group 3 – Collaboration and Networking

Facilitator: Dr. Subash Dasgupta.
The third group involving 9 participants dealing with policy issues in different Asia-Pacific countries, key resource persons from APAARI and FAO had in-depth discussion to develop the regional cooperation and create a network on MAP species for the Asia-Pacific region with the support of FAO and facilitation role of APPARI. The key issues/recommendations emerged were presented and discussed collectively by all participants of the expert consultation in a separate session.

PLENARY DISCUSSION ON RECOMMENDATIONS OF WORKING GROUPS

Moderator: Dr. Raj Paroda

In this special session, the recommendations of three Working Groups were presented by the respective Group Conveners, viz., Working Group 1 – Production: Conservation, Improvement, Management by Dr. S. Maiti, Working Group 2 – Utilization: Value Addition, Marketing, Export by Dr. R. Ramani and Working Group 3 – Collaboration and Networking by Dr. Subash Dasgupta. The group recommendations were further discussed collectively by all the participants and were refined based on valuable inputs from the experts across the groups. The key recommendations emerged are given below group-wise:

Recommendations

Working Group 1: Production: Conservation, Improvement, Management

- Medicinal and aromatic plants (MAPs) are large in number and hence 5-10 species need to be prioritized based on the medicinal value and market demand for efficient R&D management. The RET species should be given top priority for conservation efforts. At least one field genebank needs to be established in each climatic zone in each country for conservation and utilization of MAP species.

- *In situ* conservation is the cost effective method for conservation. A few *in situ* conservation areas may be earmarked and declared protected areas in each country following the model of Medicinal Plants Conservation Area (MPCA) and Medicinal Plants Development Areas (MPDA) as adopted in India.

- Development of varieties with improved quality should be given greater thrust for enhancing their conservation. Exchange of improved varieties of MAP species between the countries on bilateral basis needs to be encouraged.

- To ensure the sustainable harvesting of MAPs species from forest and systematic cultivation, each country should develop the GACP as per the guidelines of WHO and implement faithfully at all steps from collection to production in order to produce quality raw material. The species collected most from the forests may also be brought under cultivation and which needs to be organized following the cluster approach to solve the problems of smallholder and small volumes.

- The tree MAP species are more vulnerable to extinction as their bark and root are used. Therefore, a sustainable harvesting method by staggered harvesting and replanting in accordance with the harvesting cycle need to be adopted. Plus tree selection from the available diversity and their vegetative propagation method should be standardized for tree and shrub species improvement.

- There is lack of post-harvest facilities at the level of communities’ due to their low income. Therefore, there is a need to develop common facilities for drying, grading, packing and labeling at the community level for common access to all the
small farm holders and small gatherers. It will greatly facilitate the post-harvest processing at the ground level.

- The MAP species are being handled by various Departments/Ministries in most of the countries which lack coordination. A suitable mechanism should be developed in each country by identifying a nodal organization to coordinate the activities on research and development being undertaken by various organizations working on MAP species. Awareness programs among the stakeholders and may be organized periodically.

- Several innovations have been made in the past using the indigenous traditional knowledge (ITK). Therefore, efforts are required to document and revalidate the valuable MAP wealth before it gets extinct forever. The documentation of ITK will empower the communities to raise their voice for benefit sharing.

- Establishment of Regional Network on MAP species for cooperation among countries is required to facilitate sharing of knowledge, information, material and human resource for future growth of MAP sector in the Asia-Pacific region.

**Working Group 2: Utilization: Value addition, Marketing, Export**

- Guidelines on good agricultural and collection practices (GACP) need to be developed and implemented at all stages from collection to cultivation in each country for production of quality raw materials.

- Encourage involvement of Self-Help Groups/local entrepreneurs/ community groups for value addition (cleaning, grading, packaging, etc.) at farm level to enhance the income of farmers and collectors. The cluster-based approach needs to be followed to facilitate higher investment for betterment of community based value chain programs.

- Efforts are needed to develop the database on production, processing, trade of raw material and the finished products of MAP species in each country to facilitate the development of regional database for the Asia-Pacific region.

- At present, the researcher-farmer-industry linkage does not exist in most of the countries to know the demand and supply of the MAP species. This type of linkage needs to be developed with involvement of SHGs and contract farming groups. Mechanism for buy-back arrangement should be developed between the producer and user industry.

- Globally acceptable certification (organic produce with defined quality) needs to be linked with the local certifying agency through credibility building for end user along with good labelling code with complete disclosure of details to facilitate transparent export and trade.

- The better national HS Codes appropriately codified for accurate information should be developed by approaching the national and international authorities dealing with the allotment of HS Code for trade in MAP sector (import and export). Such efforts will facilitate better understanding of trade in each country.

- Knowledge exchange related to trade along with the other regulatory procedures needs to be promoted to facilitate the effective and fair trade of MAP species in the Asia Pacific region.
Working Group: 3 Collaboration and Networking

- A Network of Asia-Pacific countries needs to be established with a facilitation role of APAARI and funding support of FAO. A host country also needs to identify to house the secretariat of the Network. The proposed Network will develop cooperation among the member countries at the national and regional levels.

- The main responsibilities of Network will be to facilitate sharing information, enhance collaboration among member countries through conducting workshops/seminars/dialogues on research and development among the member countries through dedicated website. Where necessary, bilateral agreements should be adopted to further the research and collaborative activities through the exchange of experts and material transfer.

PLENARY SESSION

Chair: Dr. Hiroyuki Konuma, FAO RAP
Co-chair: Dr. Raj Paroda, APAARI
Rapporteur: Dr. Bhag Mal, APAARI

The key highlights and recommendations emerged from different Technical Sessions, Working Groups were presented by Rapporteur and Convenors. The overall synthesized general recommendations of the expert consultation were presented by Dr. Bhag Mal, Consultant, APAARI. The reflections and remarks by the Chair and Co–Chair and the key recommendations relating to research, development and policy are given below:

Dr. Raj Paroda, Executive Secretary, APAARI in his concluding remark emphatically mentioned about the need for conservation of MAP resources and health security of the people of the Asian region. He stressed that MAP sector now requires full attention of all stakeholders in view of the adverse effect of chemicals on health and environment and the fact that the world is looking towards these resources for their healthcare. In order to achieve health for all, more systematic and scientific work is required to be done on all aspects particularly on safe conservation and sustainable utilization of wild populations in the forest areas. He emphasized on the need of documentation of valuable wealth of information available as ITK before it is lost forever. The data on MAP species must be validated and authenticated. While stressing on the development of database for MAP species, he suggested that an authentic documentation and information management system should be in place on all aspects of MAP sector in each country to facilitate the development of database for the Asia-Pacific region and for this purpose, each country should identify a nodal person and the organization to take up the responsibility for database development. He also stressed on the need for recognition of the role of communities that had been conserving these resources from centuries and draw their livelihood thereby protecting the ecosystem. Their contributions must be recognized and they must be suitably compensated and rewarded for their valuable contributions. Greater emphasis is now required to be given on conservation, utilization, exchange of PGR and help communities in restoring the lost germplasm. There is an urgent need to develop a road map which calls for collective work and catalyzing the efforts of each sector. He further highlighted that greater coordination is required among all stakeholders and sectors of MAP particularly the forestry sector which still cater to the needs of raw
material. The organized cultivation of priority species should be taken up with technological support with tie up arrangement with user industry. It calls for strengthening the national system and developing an effective national program on MAP species. Based on the needs of the national programs, the regional requirements can be worked out and the proposed Regional Network may take up activities to address all such issues. Also, an effective mechanism of public-private partnership needs to be developed. The private sector should come forward and play an important role by investing in R&D, help in prioritizing the species and link farmers at the national and international level. Through this mechanism, the farmers/forest dwellers will come on the forefront and will be effective players in implementing programs related to MAP species. Several issues related to intellectual property rights (IPRs) also need to be addressed. Dr. Paroda highly appreciated Dr. Hiroyuki Konuma, ADG, FAO RAP for taking this initiative and stated that FAO and APAARI should jointly undertake this responsibility. He also thanked profusely all the participants for attending the expert consultation.

**Mr. Hiroyuki Konuma**, Assistant Director General and FAO Regional representative for Asia and the Pacific, in his concluding remarks emphasized on three major areas of MAP species, viz. conservation, sustainable utilization and value chain development. He stressed on the need for developing a website on medicinal and aromatic plants for the Asia-Pacific region and FAO will support this activity. He emphasized that there should be a favourable policy environment to address emerging issues on medicinal and aromatic plants and each country should develop a national policy for conservation and use of MAP species. All R&D programs should be need based and be reoriented and FAO will provide support for activities having wider impact. He also mentioned that the public-private partnership should be strengthened and more and more interaction should be held among all stakeholders. Now the growing demand for quality products of MAP species is increasing. In order to meet the demand, there is a need to pay more attention on quality, value addition and at the same time on safe conservation and sustainable utilization of these resources. He highlighted said that it is for first time that a regional level consultation on MAP species has been organized in partnership with APAARI and we through the Regional Network, we would like to continue these efforts after every 2-3 years with the involvement of all related stakeholders. He emphasized on the need for all stakeholders to come together to save, conserve and use these valuable resources for the humankind. He thanked APAARI for collaboration and all the experts and participants for sharing their views, knowledge and experiences and felt great satisfaction on the outcomes of the expert consultation and the recommendations that emerged.

Dr. Bhag Mal, Consultant, APAARI extended vote of thanks to the organizers, Co-Sponsors, Chairs/Co-Chairs/Convenors/Rapporteurs/Speakers and the participants attending the regional consultation. He highlighted that the expert consultation was highly successful, expected outputs were achieved and a future road map for research and development on MAP species was developed.
Major Recommendations

The medicinal and aromatic plants do play a significant role in ensuring health security of almost 80 per cent of the world’s rural population. These are the main source of livelihood for forest based communities and also the basic raw material for the industries. According to the World Health Organization (WHO), the goal of ‘Health for All’ cannot be achieved without the use of herbal medicines. The demand for herbal medicines/products is also increasing as people are becoming more health conscious and looking for safe alternatives such as traditional medicines. In this context, APAARI and FAO Regional Office in Bangkok organized an expert consultation on medicinal and aromatic plants to deliberate on status and role of MAP for human health in the region.

The major recommendations related to research, development, policies and regional cooperation, as emerged in the regional expert consultation, are given below:

Research

- There is an urgent need to prioritize the species (atleast 5-10) in each country that have high demand and comparative advantage. These species need to be accorded high priority for intensification of research, general cultivation and value addition. Also, the rare, endangered and threatened (RET) species need to be given due importance for their evaluation and conservation.

- There is need to identify a few in situ conservation sites in each country following the model of Medicinal Plants Conservation Area (MPCA) and Medicinal Plants Development Area (MPDA) adopted in India since it is the most cost-effective method of conservation.

- The countries in the Asia-Pacific region have a wealth of information on indigenous traditional knowledge (ITK) on MAP species which needs to be documented scientifically and revalidated to benefit future R&D programs.

- There is need to strengthen research work on MAP species in important areas like ethnobotany (including molecular taxonomy), inventorization and distribution, economic significance and threat categorization, genetic resource management, crop improvement, crop production, organic farming, post-harvest management and processing/value addition in order to develop economically viable and ecofriendly technologies for the production of MAP species.

- The impact of herbal products invariably depends on their quality. Therefore, product quality management must be given due attention right from production of raw material to the finished product stage. To achieve this, there is an urgent need to adopt good agricultural practices (GAP), good collection practices (GCP), good manufacturing practices (GMP), and good laboratory practices (GLP) as per the guidelines of WHO.

- Research efforts towards the discovery of medicinal plant based new drugs, especially for therapeutic use against various pharmacological targets, would require strong institutional as well as funding support. State-of-the art bioactivity and biosecurity screening technologies would be needed to harness full benefits from MAP species in the region.

- The medicinal plants and their plant parts are often used as raw in the traditional medical system. Therefore, it is necessary to have correct taxonomical identification of species and these be harvested at optimum stage for appropriate...
primary processing. Also, the quality of such raw materials should also qualify the pharmacopoeia and essential oil standards. To achieve these objectives, the countries in the Asia-Pacific region should develop proper guidelines/monographs for good practices, including the labeling for quality requirements.

- The tree MAP species have invariably remained neglected due to their long growing period and low income potential during the gestation period. Therefore, suitable intercropping system need to be developed in order to use inter-row space effectively for increased profitability.

**Development**

- The occurrence of uncommon health problems is increasing in all age groups due to the change in lifestyle, environmental pollution and adverse effects of chemical based products. The MAP sector has potential to address all these challenges. Therefore, MAP species be accorded proper commodity, status and designated as future crops to meet human needs.

- Linkage between research and industry is invariably lacking in most of the counties and hence needs to be strengthened using innovative models. For this, partnership between public and private sector through enabling environment and suitable policies, is needed both at national and regional levels. Also, there is need to undertake need based developmental activities to promote some major species having potential for large turnover.

- There is a need to have an effective mechanism in place for coordination of all stakeholders (including collectors, cultivators, local commission agents, primary processors, industry, NGOs, R&D organizations and policy makers). Hence, a nodal organization must be identified to coordinate the activities on MAP species in each country of the region. Alternatively, a MAP Promotion Board be created, if not existing already.

- An urgent need was felt to encourage the involvement of self-help groups/local entrepreneurs/community groups for value addition (cleaning, grading, packaging, etc.) at farm level to enhance the income of farmers and collectors. For this, a cluster-based approach be followed to facilitate higher investment for value chain programs.

**Policy**

- The number of MAP species grown is quite large in many countries and only a few institutions can not undertake the required R&D activities. Hence, there is an urgent need to build strong institutional base so as to undertake systematic research on MAP species. For this, more institutions need to be created to undertake research and development on priority MAP species.

- In order to serve the communities better for their healthcare, conserve genetic diversity and harness economic gains, the level of investment in R&D needs to be tripled by each country. To achieve this goal, concerted efforts to secure additional funding from potential donor community needs to be made. Also, the required emphasis needs to be given to build much needed competent human resource, which is currently lacking in many countries of the region.

- The Better National HS Codes, appropriately codified for accurate information, be developed by building linkages with the national and international authorities dealing with the allotment of HS Code for trade in MAP species (import and
export). Such efforts will facilitate better understanding and accelerate trade in each country.

- Regulatory mechanism for biosafety and international trade, including adherence to quality standards, will be important to link producers with consumers while ensuring inclusive market oriented development (IMOD). Hence, required mechanisms need to be established on priority.

**Regional Cooperation**

- In the Asia-Pacific region, there are several MAP species which are common and for which there exists considerable traditional knowledge. Hence, the countries in the region could benefit immensely by sharing the knowledge, material and the production and processing technologies.

- There is definite need to develop a mechanism for knowledge exchange related to trade along with the other regulatory procedures to facilitate an effective and fair trade of MAP species in the Asia-Pacific region.

- There is a need for validation of data at each country level in order to develop a regional database on MAP species covering (a) list of medicinal plants being cultivated on commercial scale (b) list of medicinal plants collected from wild, and (c) list of species on which valuable information on GAP and GMP are already in place/pipeline but not well documented.

- There is an urgent need to develop a Regional Network on MAP species for the Asia-Pacific region. Participants unanimously resolved that FAO Regional Office in Bangkok, with needed facilitation role of APAARI, may help initially to start this Network and eventually pass on this responsibility to one of the willing NARS in the region. Also, the countries willing to join the Network need to express interest in joining the Network formally. Such Network can provide support initially for the focused activities (knowledge and technology sharing, germplasm exchange, and human resource development) for an overall development of medicinal and aromatic plants in the region.
EXPERT CONSULTATION ON PROMOTION OF MEDICINAL AND AROMATIC PLANTS IN THE ASIA-PACIFIC REGION

Hotel Rama Gardens, Bangkok, Thailand
2-3 December, 2013

TECHNICAL PROGRAM

2 December, 2013

Time   Program

08.00 – 09.00  Registration

Opening Session (09.00 – 11.00)

09.00 – 09.10  Welcome Address  Raj Paroda, APAARI
09.10 – 09.30  Inaugural Address  Hiroyuki Konuma, FAO RAP

9.30 – 09.55  Promotion of Medicinal and Aromatic Plants in the Asia-Pacific Region  S.P. Ghosh, Former DDG (Hort.), ICAR

09.55 – 10:20  Status of Utilization and Marketing of Medicinal Plants in Asia  Ranjit Puranik, MD, SDL

10.20 – 10.30  Vot of Thanks  Subash Dasgupta, FAO RAP

10.30 – 11.00  Tea/Coffee Break & Group Photograph

TECHNICAL SESSION I : Country Status Reports – South Asia

Chair  :  Subash Dasgupta, FAO RAP, Thailand
Co-Chair  :  N.M. Lita, Philippines
Rapporteur  :  M.R.B. Awang, Malaysia

11.00 – 11.20  Country report of Bangladesh  M. Shahjahan, BARC
11.20 – 11.40  Country report of Bhutan  D. Dhungyel, DOA
11.40 – 12.00  Country report of India  S. Maiti, ICAR
12.00 – 12.20  Country report of Nepal  T.P. Barakoti, NARC
12.20 – 12.40  Country report of Pakistan  M. Naeemullah, PARC
13.00 – 13.30  Discussion

13.30 – 14.30  Lunch
TECHNICAL SESSION II : Country Status Reports – SE Asia and Pacific

Chair : T. Dhendup, DOA, Bhutan
Co-Chair : T. Sugino, JIRCAS, Japan
Rapporteur : L. Jung-Hoon, RDA, Korea

15.40 – 16.00 : Country report of Philippines  C.C.de Guzman, Univ. of Philippines

16.00 – 16.20 : Tea/Coffee Break

16.40 – 17.00 : Country report of Thailand  Charan Ditchaiwong, DOA
17.00 – 17.20 : Country report of Vietnam  T.N. Hung, FVRI
17.20 – 17.40 : Country report of Myanmar  Zin Zin Nwe, DFDA
17.40 – 18.20 : Discussion

19.00 Reception Dinner hosted by FAO RAP and APAARI

3 December, 2013

TECHNICAL SESSION III: Policy Perspective : AR4D Strategies

Chair : S.P. Ghosh, Former DDG, ICAR
Co-Chair : Khalid Mahmud, MNFS&R
Rapporteur : S.R. Merry, DFRI

9.00 – 10.00 : Perceptions of Panelists (10 minutes each)

R. Puranik, India
T. Sugino, Japan
H.K. Manandhar, Nepal
M. Naeemullah, Pakistan
N.M. Lita, Philippines
Lin Chi Vu, Vietnam

10.00 – 10.30 : Discussion

10.30 – 11.00 : Tea/Coffee Break
11.00 – 13.00 : **Working Group Discussion**

**WG 1** : Production : Conservation, Improvement, Management  
Convenor : S. Maiti

**WG 2** : Utilization : Value Addition, Marketing, Export  
Convenor : R. Ramani

**WG 3** : Collaboration and Networking  
Convenor : Subash Dasgupta

13.00 – 14.00 : **Lunch**

14.00 – 15.00 : **Plenary Discussion on Recommendations of Working Groups**
Facilitator : Raj Paroda, APAARI

15.00 – 15.30 : **Tea/Coffee Break**

15.30 – 17.00 : **Plenary Session**

Chair : Hiroyuki Konuma, FAO RAP  
Co-Chair : Raj Paroda, APAARI  
Rapporteur : Bhag Mal, APAARI

15.30 – 16.30 : Presentation of Recommendations : Rapporteurs / Convenors

16.30 – 16.40 : Remarks: Chair

16.40 – 16.50 : Remarks: Co-Chair

16.50 – 17.00 : Vote of Thanks : Subash Dasgupta
EXPERT CONSULTATION ON PROMOTION OF MEDICINAL AND AROMATIC PLANTS IN ASIA-PACIFIC REGION

Hotel Rama Gardens, Bangkok, Thailand
2-3 December, 2013

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EXPERT CONSULTATION ON PROMOTION OF MEDICINAL AND AROMATIC PLANTS IN ASIA-PACIFIC REGION

Hotel Rama Gardens, Bangkok, Thailand
2-3 December, 2013

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## Expert Consultation on Promotion of Medicinal and Aromatic Plants in Asia-Pacific Region

Hotel Rama Gardens, Bangkok, Thailand  
2-3 December, 2013

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EXPERT CONSULTATION ON PROMOTION OF MEDICINAL AND AROMATIC PLANTS IN ASIA-PACIFIC REGION

Hotel Rama Gardens, Bangkok, Thailand
2-3 December, 2013

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