Comprehensive Report of Webinar series for popularizing Plant Tissue Culture in Asia-Pacific Region and African Countries towards realizing its potential





Submitted
by
Biotech Consortium India Limited (BCIL)
New Delhi, India

Organizers

Asia-Pacific Association of Agricultural research Institutions (APAARI)
Biotech Consortium India Limited (BCIL)
Asia-Pacific Consortium on Agricultural Biotechnology and Bioresources (APCoAB)

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ABOUT ORGANIZERS

The Asia-Pacific Association of Agricultural Research Institutions (APAARI) based in Bangkok was established in 1990 by the Food and Agriculture Organization of the United Nations (FAO) for promoting sustainable development in Asia-Pacific region. It is a membership based apolitical, and multi-stakeholders' organization. **Asia Pacific Consortium on Agricultural Biotechnology and Bioresources** (**APCoAB**), a programme of APAARI, ensures greater stakeholder partnerships, improved policy environment, capacity building and greater public awareness through various activities related to agricultural biotechnology and bioresources in Asia-Pacific region.

APAARI continuously work for strengthening research and innovations for sustainable agricultural development in Asia and the Pacific. You may learn more about APAARI and APCoAB through official website (www.apaari.org)

Biotech Consortium India Limited (BCIL) is a company created as an initiative of the Department of Biotechnology (DBT), Ministry of Science and Technology, Government of India and financed by the all-India financial institutions for facilitating commercialization of biotechnology by promoting value added business support services. BCIL has vast experience and extensive expertise in the area of plant tissue culture by virtue of playing key role in conceptualizing, operationalizing and implementing the National Certification System for Tissue Culture Plants (NCS TCP) in India, organizing Entrepreneurship Development Programmes (EDPs), mentoring young entrepreneurs, extending consultancy services, imparting training and skill to national and international candidates in the area of commercial plant tissue culture. BCIL has played key role in accelerating commercialization of biotechnology in India over last three decades. For more details, please visit official website of BCIL (www.biotech.co.in)

GENESIS

BCIL and APAARI are Reciprocal Members and share complementary expertise for strengthening the mutual cooperation in field of agriculture. On the basis of survey and feedback of APAARI member countries, a need was felt by APAARI to sensitize stakeholders on various aspects of plant tissue culture particularly quality management and best practices in collaboration with BCIL. Asia-Pacific and African countries have great potential for application of plant tissue culture technology for sustainable development and benefit the smallholder farmers.

In view of this, **APAARI** had entrusted **BCIL** with the responsibility of organizing a series of four webinars covering a wide range of crops aimed at popularization of tissue culture raised certified quality plants in the region, their significance, best practices and way forward.

Each webinar focused on a specific crop such as Banana, Sugarcane, Date Palm, Bamboo, Ornamental plants, *etc.* and the significance of tissue culture in enhancing the quality and yield of the production and the economic upliftment of the farming community in the regions. A wide participation from the stakeholders as well as the donor agencies from more than 45 countries from the Asia-Pacific region and Africa was mobilized for the event to generate the initial interest and awareness regarding the benefits of plant tissue culture techniques.

The subjects of the four webinars are listed as below:

Webinar 1: Banana, Root and Tuber Crops (Banana & Potato)

Webinar 2: Perennial fruits/cash crops (Date palm, Pomegranate & Sugarcane)

Webinar 3: Tree/Woody Plants (Bamboo & Teak)

Webinar 4: Ornamentals Plants

The webinars were chaired by highly reputed dignitaries/policy makers from Ministries of Agriculture, Horticulture, Rural Development, Government of India. The speakers and the panelists comprised of experts from industry, academia and leading research institutions in India and from other countries in the Asia and Africa.

The webinar series has been a grand success with active participation of all stakeholders (researchers from public and private sectors, industries, policy makers, teachers and students including women and youth) which was very well received by one and all. The webinar series generated great interest at a global level among all concerned and resulted in some very thoughtful deliberations among the industry leaders and senior experts. It provided an effective platform to the tissue culture industry globally to voice their opinions as well as concerns. We hope that this webinar series has provided an ideal platform to build further on the ideas generated and developing the relevant support systems with the active collaboration of the all the interested stakeholders mutually.

PROGRAMME DETAILS

- The Programme details of the four webinars are listed as below:

  - **Webinar 1: Banana, Root and Tuber Crops (Banana & Potato)**
  - **Webinar2: Perennial fruits/cash crops (Date palm, Pomegranate etc.)**
  - **Webinar 3: Tree/Woody Plants (Bamboo & Teak)**
  - **Webinar 4: Ornamentals Plants**

WEBINAR 1

Webinar on "Banana, Root and Tuber Crops: Significance, Best Quality Management Practices and Way Forward"

Date: May 31 2022

Time: 11:30 AM ICT; Bangkok time (10:00 AM IST)

- **About Webinar:**

Banana, root and tuber crops. receive much attention due to their significant contribution to food security and income generation. Tissue culture of banana, potato and cassava are being done commercially in many countries. However, quality practices need to be adopted for production of virus free quality tissue culture plants of these species. The webinar was chaired by Dr. T. Mohapatra, Director General, ICAR and Vice Chair, APAARI. Academia Experts from India and Nigeria spoke about the journey of banana plant tissue culture from research to commercialization in their respective countries. Leading industries from India M/S Rise N Shine, Pune and Merino Industries, Hapur, India presented their success stories in the field of banana tissue culture. During Panel Discussion with experts from Uganda, Taiwan, Bangladesh and India deliberated on best practices and the way forward.


APAARI
BCIL
APCoAB
Webinar series being organized by APAARI, BCIL & APCoAB for popularizing Plant Tissue Culture in Asia-Pacific Region and African Countries towards realizing its potential
WEBINAR
1
Banana, Root and Tuber Crops: Significance, Best Quality Practices, and Way Forward
CHAIRPERSON
Dr. Ravi Khetarpal
Executive Secretary, APAARI, Bangkok
Dr. Trilochan Mohapatra
Secretary, DARE and Director General, ICAR, New Delhi
Dr. Purnima Sharma
Managing Director, BCIL, New Delhi
PRESENTERS
Dr. R. Selvarajan
Principal Scientist, NRC Banana, India
Dr. Afuape Solomon Olufemi
NRCRI, Nigeria
Dr. Bhagyashree Patil
MD, Rise N Shine Biotech, India
Dr. Tejpal Singh Tomar
GM, Merino Biotech, India
PANELLISITS
Dr. Rishi Kumar Tyagi
Coordinator, APCoAB- APAARI
Dr. T.H. Wu
Agriculture Specialist, TBRI, Taiwan
Dr. Rakha Hari Sarker
Professor, Dhaka University, Bangladesh
Dr. Henry Wagaba
NaCRRI, NARO, Uganda
Shri Sanjay Chandak
MD, Sheel Biotech Ltd, India
Dr. Shiv Kant Shukla
DGM, BCIL, New Delhi
Date: May 31, 2022
Time: 11.30 AM ICT; Bangkok Time (10.00 AM IST)
Registration Link:
https://zoom.us/webinar/register/WN_P0j9WgzyTKqNgVUCslpxtA

AGENDA

WEBINAR 1

Banana, Root and Tuber Crops: Significance, Best Quality Practices, andWay Forward

11:30 AM – 11:35 AM: Welcome Note
Dr. Purnima Sharma, Managing Director, Biotech Consortium India Limited (BCIL), New Delhi
11:35 AM – 11:40 AM: Opening Remarks
Dr. Ravi Khetarpal, Executive Secretary, Asia Pacific Association of Agricultural Research Institutions (APAARI), Bangkok
11:40 AM – 11:45 AM: Remarks by Chairperson
Dr. T. Mohapatra, Director General, ICAR/Vice Chair APAARI
11:45AM–12:05 PM: Journey from Research to Commercialization by Academia
11:45 AM-11:55 AM: Dr. R. Selvarajan, Principal Scientist, NRC Banana, Trichy 11:55 AM-12:05 PM: Dr. Afuape Solomon Olufemi, National Root Crops Research Institute, Nigeria
12:05 AM – 12:25 PM: Success Story by Industry
12:05 PM-12:15 PM: Banana Tissue Culture Success Story– Dr. Bhagyashree Patil, Chairperson and MD, Rise N Shine Biotech, Pune India) 12:15 PM-12:25 PM: Root and Tuber Tissue Culture Success Story – Dr. Tejpal Singh Tomar, GM, Merino Biotech, Hapur, India
12:25 PM – 12:50: PM: Panel Discussions
Moderator: Dr. Shiv Kant Shukla, Dy General Manager, BCIL **Panelist:** 1. Dr. Henry Wagba, NaCRRI, NARO, Uganda 2. Dr Sanjay Chandak, MD, Sheel Biotech Ltd, New Delhi, India 3. Dr. Rakha Hari Sarker, Professor, Dhaka University, Bangladesh 4. Dr. T.H. Wu, Agriculture Specialist, TBRI, Taiwan
12:50 PM-01:00: Open Q & A Session
01:00 PM-01:05 PM: Closing Remarks – Dr. Rishi Kumar Tyagi, Coordinator,APCoAB,APAARI

SPEAKER PROFILES

WEBINAR 1

Banana, Root and Tuber Crops: Significance, Best Quality Practices, and Way Forward

Chairperson

Dr. Trilochan Mohapatra

Dr. Trilochan Mohapatra, is an Indian biotechnologist, geneticist, a government **Secretary of the Department of Agricultural Research and Education (DARE) and the Director General of the Indian Council of Agricultural Research**. Known for his studies in the fields of molecular genetics and genomics, Mohapatra is an elected fellow of the National Academy of Sciences, India, the National Academy of Agricultural Sciences, the Indian National Science Academy and the Indian Society of Genetics and Plant Breeding. The Department of Biotechnology of the Government ofIndia awarded him the National Bioscience Award for Career Development, one of the highest Indian science awards, for his contributions to biosciences in 2003. As the Director General of the Indian Council of Agricultural Research, Dr Mohapatra is in charge of 101 ICAR institutes and 71 agricultural universities, spread across India. He has the distinction of receiving several honors and awards in recognition of his excellent academic and research contributions including the INSA Young Scientist Award, Prof. LSS Kumar Memorial Award, NAAS-Tata Award, IARI-BP Pal Award, DBT Bio-science Award, NASI-Reliance Industries Platinum Jubilee Award, Shri Om Prakash Bhasin Award 2016, IMS Diamond Jubilee Memorial Award 2016 and Dr. D. Sundaresan Memorial Oration Award 2017. He also received the Recognition Award of the National Academy of Agricultural Sciences for the biennium 2013-14 for significant contributions in Plant Improvement and the Lifetime Achievement Award of the Indian Genetics Congress in recognition of outstanding contribution in the field of Plant Genetics and also by the Indian Society of Agricultural Biochemists.

Dr. Ravi Khetarpal

Dr Ravi Khetarpal is the **Executive Secretary, APAARI** since 2017 and is based in Bangkok. He promotes and facilitates APAARI's vision of strengthening agricultural research and innovation for sustainable agricultural development in the region through networking amongst more than 80 members. He coordinates APAARI's projects sponsored by international and bilateral organizations on knowledge management, agriculture innovation systems, agriculture science technology indicators, strengthening phytosanitary compliance for international seed movement and pesticide risk mitigation in various countries of the Asia–Pacific region. He is the current Chair of the Global Forum of Agricultural Research and Innovation (GFAR), and the Tropical Agricultural Platform of FAO – a G20 initiative for developing and promoting the agricultural innovation system. He has served CABI – South Asia (India) as Regional Director and also as its Regional Advisor on strategic science partnerships for a span of more than seven years. Prior to that, he worked for the National Agricultural System in India in the field of plant protection for 30 years. He holds a PhD in life sciences (plant pathology) from the University of Paris and was a Visiting Scientist in an EU Collaborative Project at Institut National de la Recherche Agronomique (INRA), Versailles, France for three years.

Dr. Purnima Sharma

Dr. Purnima Sharma is the **Managing Director of Biotech Consortium India Limited (BCIL), New Delhi**. BCIL is a public limited company promoted by the Department of Biotechnology, Ministry of Science and Technology, Government of India and the all-India financial institutions for facilitating biotechnology commercialization.

Dr. Purnima Sharma is a doctorate in Experimental Medicine from Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh, the prestigious autonomous institution and deemed Medical University of national importance of the Ministry of Health, Government of India with Post-Doctoral experience from IIT, Mumbai, and has to her credit many awards for excellence in academics. She has more than 30 years of experience in the area of technology evaluation and transfer, management of IPR, project consultancy including DPRs for setting up Incubators and Science Parks, managing start-up ecosystem, public-private partnership funding schemes, entrepreneurship development etc. Dr. Sharma is a member of a number of national and state level committees responsible for biotech development and commercialization and also a member of The National Academy of Sciences, India (NASI), the first science academy of the country dedicated towards cultivation and promotion of science & technology in the country.

Presenters

Dr. R. Selvarajan

Dr. R. Selvarajan graduated from TNAU, Coimbatore in Agriculture, M. Sc. (Agriculture) in the discipline of Plant Pathology from 1988-1990 and he completed his Ph.D. degree in Plant pathology (Plant Virology) from the ICAR-Indian Agriculture Research Institute, Pusa New Delhi during 1990-1994. He started his carrier as scientist in ICAR-IIHR, Bangalore in 1994, and joined in **ICAR- National Research Centre for Banana, Tiruchirapalli**, TN in 1996 and he is serving as **Principal Scientist (Plant Virology)** since 2009.

He has several awards and recognitions to his credit - Hari Om Ashram Trust award, 2011; DST-Lockheed Martin-India Innovation growth program award, 2015; Best Research–cum-Extension Award 2001; Agrani award; and fellowship of Indian Phytopathological Society; Indian Virological Society; Confederation of Horticulture Associations of India; Association for Improvement in Production and Utilization of Banana.

Dr. Afuape Solomon Olufemi

Dr. Afuape Solomon Olufemi is the **Head, Sweet potato Breeding Program, National Root Crops Research Institute, Umudike, Nigeria**. When he was employed in 2002. he was deployed to the sweet potato Commodity Crop Programme. He knew nothing about sweet potato. Afuape started with the basics, learning the basic biology of sweet potato and how to handle it, and finally, starting to breed in 2003. He did his first crossing in 2004. It was an open pollinated crossing on a small scale. Since then, he has developed into an experienced sweet potato breeder. Dr. Afuape credits a lot of his professional growth to the community of sweet potato breeders in sub-Saharan Africa. He attended the first annual sweet potato breeders' meeting in 2006. At the time, it was hosted by International Potato Center's Vitaa Initiative.

As a budding breeder, Afuape was breeding a few hundred seeds at a time. A meeting focusing on how to handle a large number of clones changed all that. He has scaled up his operations and now handles

thousands of seeds. It's almost a decade since Afuape attended his first annual breeders' meeting. Since then, the community has grown and evolved. More recently, the sweet potato Action for Security and Health in Africa (SASHA) project has been supporting the activities of the sweet potato support platform. Through the project, efforts were made to breed and develop new sweet potato varieties, improve existing populations and develop new breeding methods such as the accelerated breeding scheme and promote exchange of information, skills and technologies across sub-regions.
The challenge of applying genomic tools to breeding, according to Afuape, is access to sufficient funds. However, he is optimistic that as with the past development in his career as a sweet potato breeder, he will find a solution through support and exchange of ideas with members of the Community of Practice.

Dr. Bhagyashree Patil

Dr. Bhagyashree Patil, the **Founder Chairperson of Rise and Shine Biotech Pvt. Ltd. and Pro-Chancellor of Dr. D. Y. Patil Vidyapeeth Society, Pune**. She has donned many hats in her expansive career. She is an educationist, entrepreneur, and philanthropist known for her indomitable spirit and her penchant to work for the betterment of society. An advocate of women empowerment, she has contributed immensely for the betterment of the lives of several women by giving them a happier and healthier life. Dr. Mrs. Patil has been instrumental in introducing several programs in the rural village areas of Theur and Yavat, and encourages social upliftment, especially of women. The quick success of Rise 'n Shine Biotech Pvt. Ltd has given employment opportunities to many women from about 10-12 villages in Maharashtra. Dr. Patil aims to assist these women and through that help their family financially. She also holds regular medical camps to ensure their well-being. She always motivates rural women saying that a woman walking with her legs will surely reach her destination but a woman walking with her brains will take herself & her family to achieve her destiny. Hailing from a humble farming background, Dr. Patil has always been passionate about the upliftment of the farming community. Rise 'n Shine is the dream project of her hard work, dedication & determination. This biotechnology company is a result of her entrepreneurial skills fused with her passion for Women Empowerment, which aims at serving the farmers and growers of our country and internationally.
Dr. Bhagyashree Patil has received many accolades and awards for her contributions in various fields and has donned many hats in her sprawling career.

Dr. Tejpal Singh Tomar

Dr. Tejpal Singh Tomar is **General Manager- Agro Operations with M/s Merino Industries Ltd. Hapur (UP), India** After completing Doctorate in Agronomy, Dr. Tejpal worked in research & development and Agri. extension for ten years. He then switched to potato processing industry in 2000 and worked with Frito Lays for five years as an Agronomy manager, ITC Ltd., as Specialist-Potato for Nine years. He Joined Merino Industries Ltd. in 2014 as General Manager-Agro Operations of total 32 years' work experience, he has been associating for more than 22 yrs. with potato processing industries in India. His major KRAs have been new geographies & variety matrix development, Potato seed tuber multiplication, new variety import, their registration and technical evaluation in India, Designer agronomy, Commercialization of new varieties through different contract farming models, Agronomy linked mechanization, Potato cold store management etc. and coordination with potato related Govt. & Non-Govt. Institutes in India.

Dr. Tsung-Hsien Wu

Dr. Tsung-Hsien Wu is an **Agriculture Specialist** for **Taiwan Banana Research Institute**. Tsung-Hsien graduated from National Taiwan University in 2014 with a Master's Degree in Horticulture. He has 7 years of agricultural working experience. Tsung-Hsien was the Technical Consultant for Banana Productivity Improvement Project in St. Lucia for the International Cooperation and Development Fund.

He was later invited by the Global Cooperation and Training Framework to share his experience at the Conference on 'Climate-Smart Agriculture: Building Sustainability and Resilience of Agriculture' for Latin America and the Caribbean. Additionally, Tsung-Hsien was the Plant Cultivation Engineer for Industrial Technology Research Institute in Taiwan.

Professor Rakha Hari Sarker

Dr. Rakha Hari Sarker obtained his Ph.D. from the University of Reading, UK through Commonwealth Scholarship. He was the **former Chairman of the Department of Botany, University of Dhaka**. He is a plant Biotechnologist by training and has published more than 125 research articles and book chapters. Presently he is the Director of Dhaka University Centre for Advanced Studies and Research in Biological Sciences. He is a member of the National Executive Committee on Biotechnology and a member of the Core Committee of the National Technical Committee of Crop Biotechnology (NTCCB) of the Govt. of Bangladesh. He has been involved in improving various crop plants using modern techniques of breeding and biotechnology.

Dr. Henry Wagaba

Dr. Henry Wagaba works at the **National Agricultural Research Organization (NARO)** as a **Plant Molecular and Plant Tissue Culture Biologist**, where he leadsa team in the plant tissue culture and molecular facilities. In his current position, he focuses on plant tissue culture and transformation, as well as plant pathology, including aspects of virology and diagnostics. In 2009, Dr. Wagaba started his PhD studies at the Donald Danforth Plant Science Center (DDPSC) in St. Louis Mo, USA. While at the center, he divided, his time between the Plant Transformation, Plant Growth Facilities, and Dr. Nigel Taylor's Laboratory. Using tobacco and cassava model systems, he contributed to the discovery of traits for resistance to the viruses that cause cassava brown streak disease (CBSD). Since his return to Uganda, Henry has continued to work with DDPSC, where he has been a key role in CBSD research. Part of this research work has led to the current approvals of the CBSD-resistant cassava for national performance trials in Kenya.

Dr. Sanjay Chandak

Dr Sanjay Chandak is **Managing Director of M/S Sheel Biotech Ltd., New Delhi, India.** Dr. Sanjay Chandak holds a Master's degree in Business Administration from USA with specialization in Management and is a Bachelor in Commerce from the University of Delhi- India. In his school years he gained the experience of hostel life in Dehradun due to which he learnt the value of discipline, hard work and integrity. Recently during corona period, he did not waste his time but rather studied further at the age of 50 and was awarded a Ph.D. degree from California Public University, USA.

He started working from his college days by engaging himself and helping in setting up a marble factory. He has over 27 years of experience in Agri-business in seeds/ planting material/saplings, protected cultivation and organic adoption and certification. During these years he has brought many joint ventures and international tie-ups for his company M/s Sheel Biotech Ltd. The Research and Development lab set up by him is duly recognized by the Department of Biotechnology (DBT), Department of Science and Technology (DST), Government of India.

Dr. Rishi Kumar Tyagi

Dr Rishi Kumar Tyagi is presently working as **Coordinator in Asia-Pacific Consortium on Agricultural Biotechnology and Bioresources (APCoAB), APAARI, Bangkok, Thailand**. Dr Tyagi holds a Ph.D. degree in Botany from University of Delhi, Delhi, India and Post-Graduate Diploma in Intellectual Property Rights laws from Indian Law Institute (Deemed University), New Delhi, India. He worked as Post-Doctoral Research Associate in University of Illinois,USA, worked on wide hybridization of soybean employing biotechnological methods. He has more than 34 years of experience in managing plant genetic resources (PGR). Since 2009 to 2017, he was holding the position of Head, Division of Germplasm Conservation at the ICAR-National Bureau of Plant Genetic Resources, New Delhi, India, managing its National Genebank.

Dr. Tyagi has to his credit 111 research papers in high impact factor peer reviewed journals, 156 book chapters/policy papers/proceedings, 27 edited books/monographs and 68 invited lectures in international seminar/symposia/conferences. His current areas of interest are promoting agricultural biotechnology and conservation and use of bioresources for sustainable agricultural development in the Asia- Pacific region for the benefits of smallholder farmers, through greater stakeholder partnership, enabling policy development and advocacy, enhanced capacity building and grater public awareness.

Dr. Shiv Kant Shukla

Dr. Shiv Kant Shukla has made significant contribution in the area of commercial biotechnology and plant tissue culture. He is Doctorate in Biotechnology from Pt. Ravishankar Shukla University Raipur. Dr. Shukla is currently working as the **Dy. General Manager, BCIL, New Delhi**, an organization promoted by Department of Biotechnology, Govt. of India. Prior to BCIL, he was heading a leading commercial plant tissue culture unit in central India. He has approx. 22 years of diversified experience covering research, production of tissue culture plants, field extension, quality management, biotech parks, technology transfer, administration and management of biotech projects. Dr. Shukla has more than 50 publications, and chaired/delivered more than 30 invited/key note speech at national and international forum. He has successfully organized more than 30 Entrepreneurship development programme (EDP) and conferences. Dr. Shukla has managed prestigious international and national long-term projects of Government of India. His contributions have been acknowledged by various recognitions and awards including Certification of Appreciation from Govt. of Chhattisgarh, West Bengal, Hony. Professorship from Amity University Uttar Pradesh, Rastriya Gaurav Award & "Certificate of Excellence" from India International Friendship Society, New Delhi etc.

Highlights/Outcome Report of Webinar 1

WEBINAR 1: Banana, Root and Tuber Crops: Significance, Best Quality Practices, and Way Forward

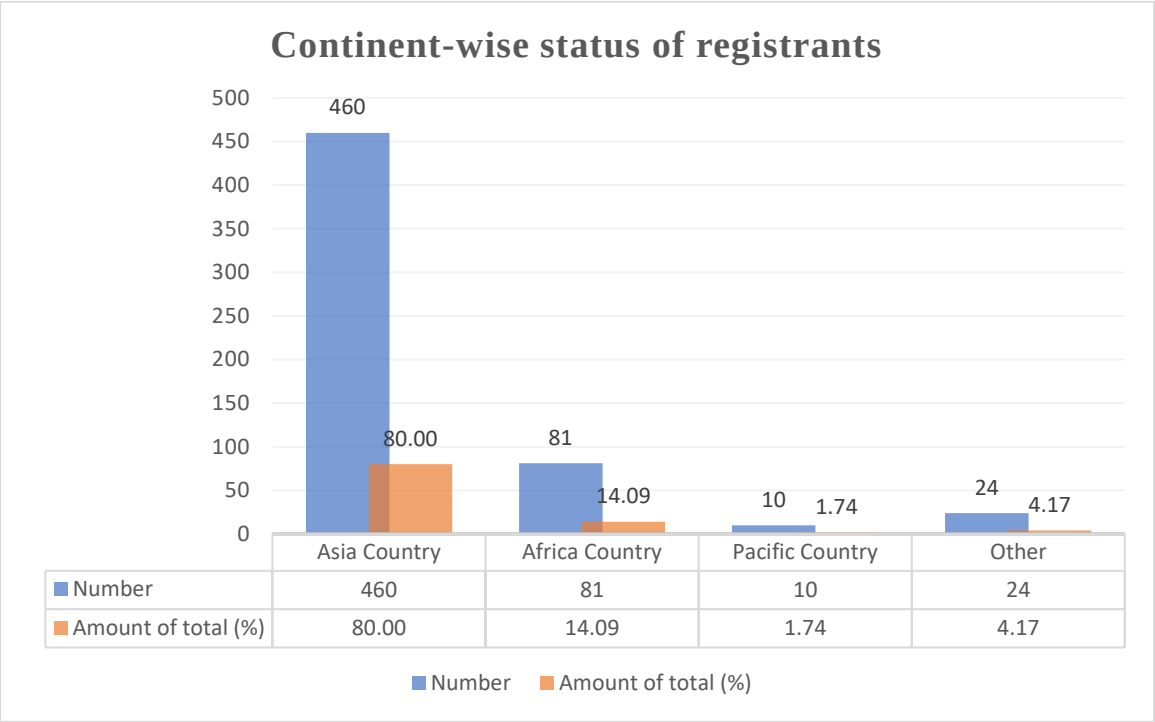
1. Registration Status

- **Number of Registrants**: 575
- **Number of Countries**: 44

1.1.1. Country-wise and region-wise status of registrants:

Country-wise and region-wise status of registrants	Number	Percentage (%)
Total	575	100.00
India	351	61.04
Nigeria	43	7.48
Thailand	16	2.78
Bhutan	13	2.26
Philippines	11	1.91
Vietnam	11	1.91
Iran	9	1.57
Nepal	9	1.57
Myanmar	6	1.04
Bangladesh	5	0.87
Pakistan	5	0.87
Taiwan	3	0.52
Samoa, Fiji and Papua New Guinea (Pacific Countries)	10	1.74
Other Asian Countries	21	3.65
African Countries	38	6.61
Others	24	4.17

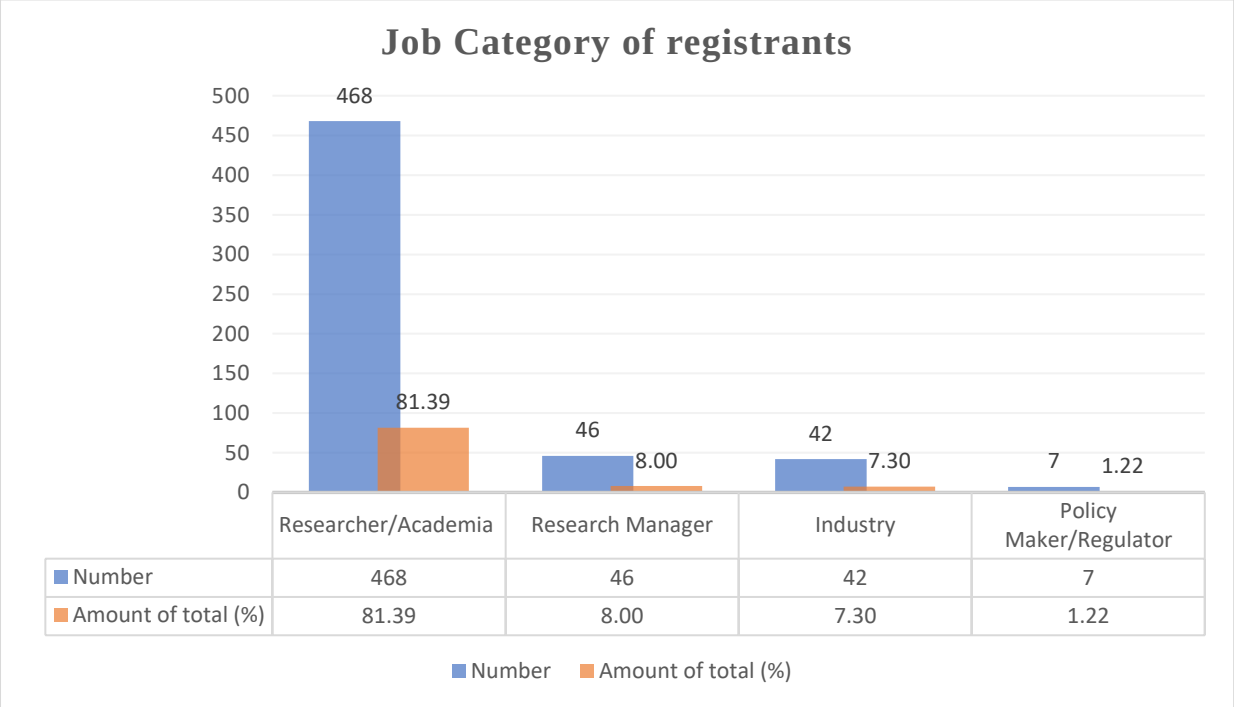
1.1.2.



1.1.2. Continent-wise status of registrants

Continent-wise status of registrants	Number	Percentage (%)
Total	575	100.00
Asian Countries	460	80.00
African Countries	81	14.09
Pacific Countries	10	1.74
Other	24	4.17

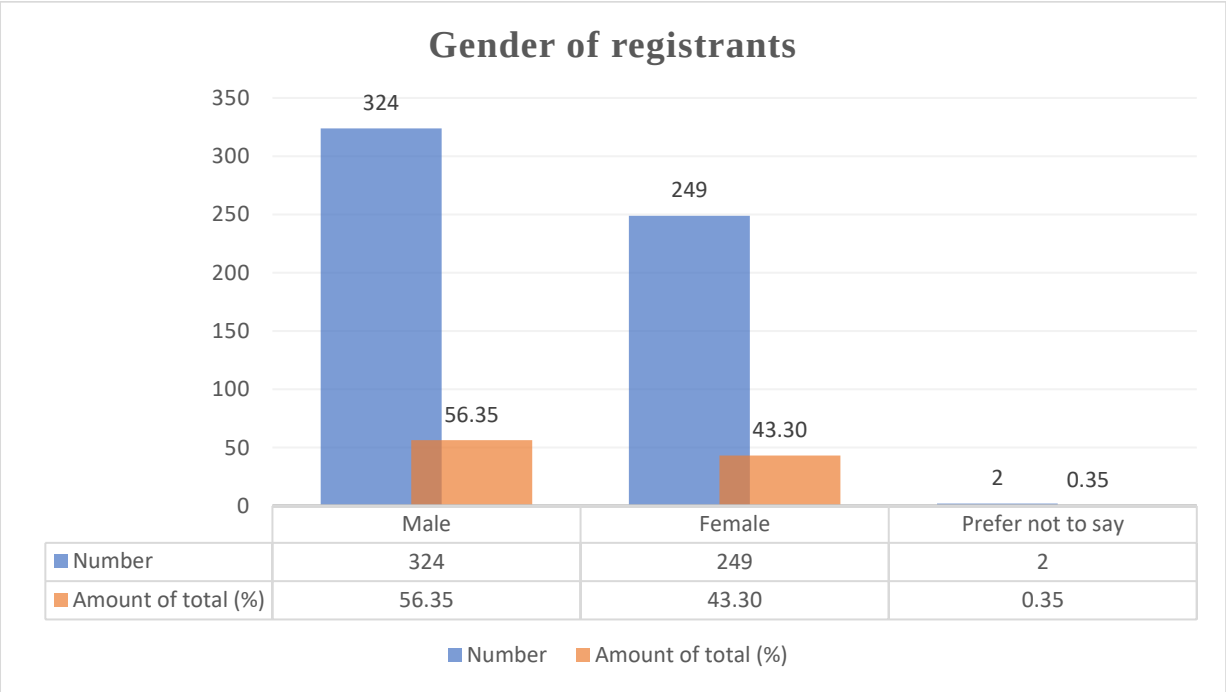
1.2.



1.2. Job Category of registrants

Job Category of registrants	Number	Percentage (%)
Total	575	100.00
Researcher/Academia/NARS	468	81.39
Research Manager of Academia/NARS	46	8.00
Industry	42	7.30
Policy Maker/Regulator of Academia/Industry	7	1.22
Other	12	2.09

1.3.



1.3. Gender of registrants

Gender of registrants	Number	Percentage (%)
Total	575	100.00
Male	324	56.35
Female	249	43.30
Prefer not to say	2	0.35

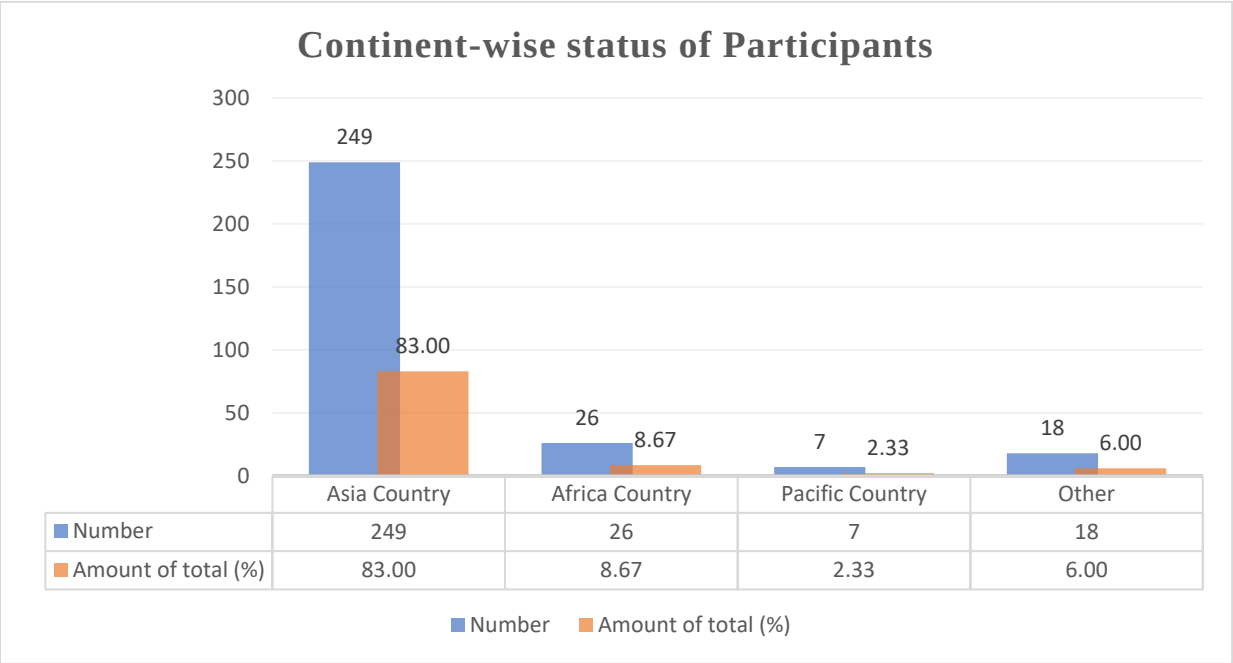
2. Participation status of Webinar 1

- Number of Registrant: 575
- Number of Participant: 300
- Participation rate (%): 52.17
- Number of respondents: 100-114
- Respondence of Participants rate (%): 33.33-38.00

2.1.1. Country-wise and region-wise status of participants

Country-wise and region-wise status of Participants	Number	Percentage (%)
Total	300	100.00
India	172	57.33
Thailand	15	5.00
Nigeria	10	3.33
Philippines	9	3.00
Bhutan	8	2.67
Vietnam	8	2.67
Malaysia	6	2.00
Nepal	6	2.00
Myanmar	4	1.33
Bangladesh	3	1.00
Iran	3	1.00
Taiwan	3	1.00
Samoa, Fiji and Papua New Guinea (Pacific Countries)	7	2.33
Other Asian Countries	12	4.00
Other African Countries	16	5.33
Others	18	6.00

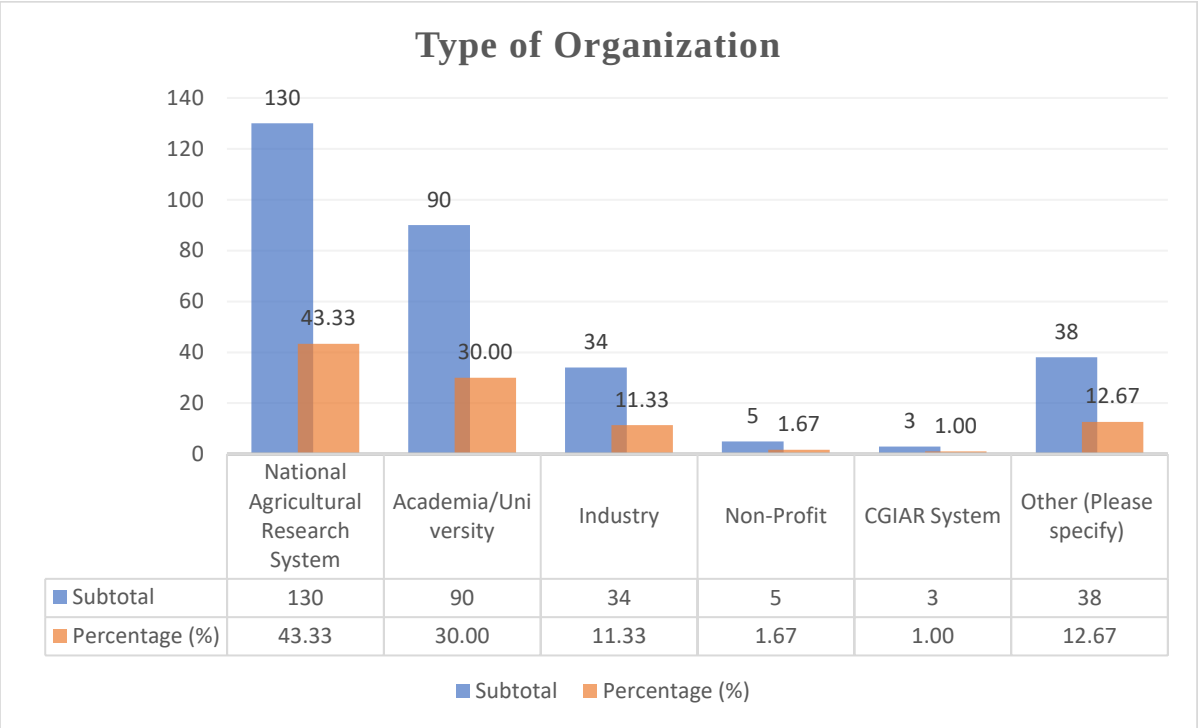
2.1.2.



2.1.2. Continent-wise status of Participants

Continent-wise status of Participants	Number	Percentage (%)
Total	300	100.00
Asia	249	83.00
Africa	26	8.67
Australia	7	2.33
Other	18	6.00

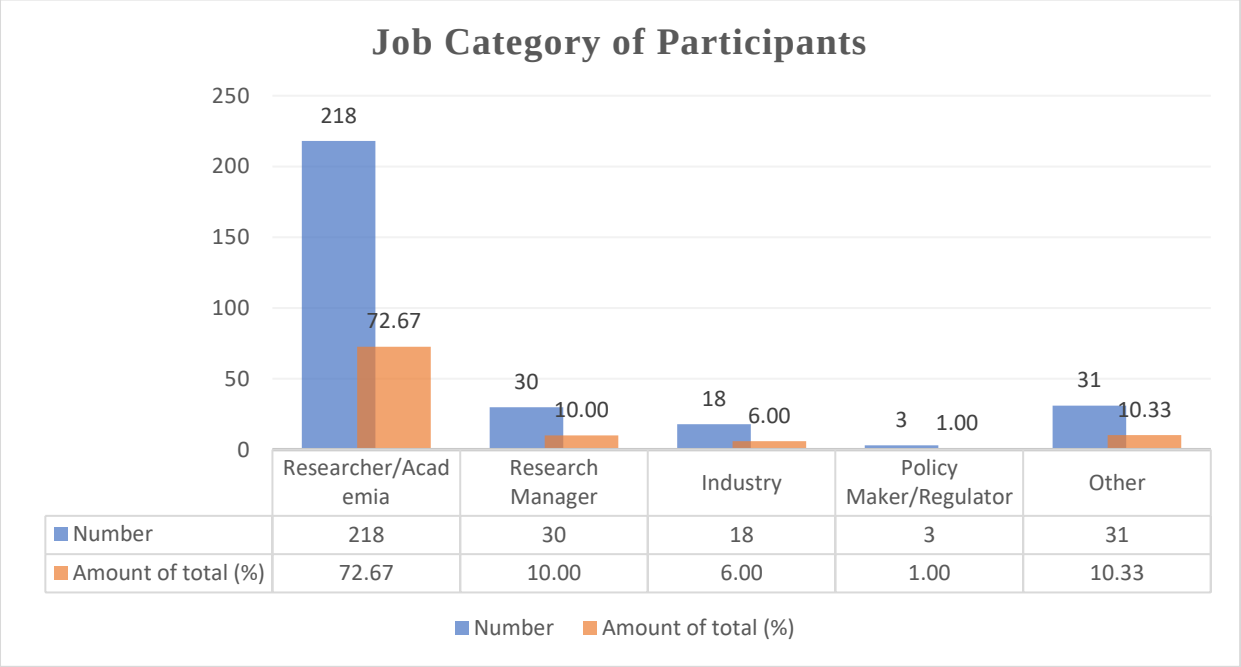
2.2.



2.2. Type of Organization (Government, CG Centre, Non-Profit, Academia, Industry, Other of Participants

Type of Organization	National Agricultural Research System	Academia/ University	Industry	Non-Profit	CGIAR System	Other
Subtotal	130	90	34	5	3	38
Percentage (%)	43.33	30.00	11.33	1.67	1.00	12.67

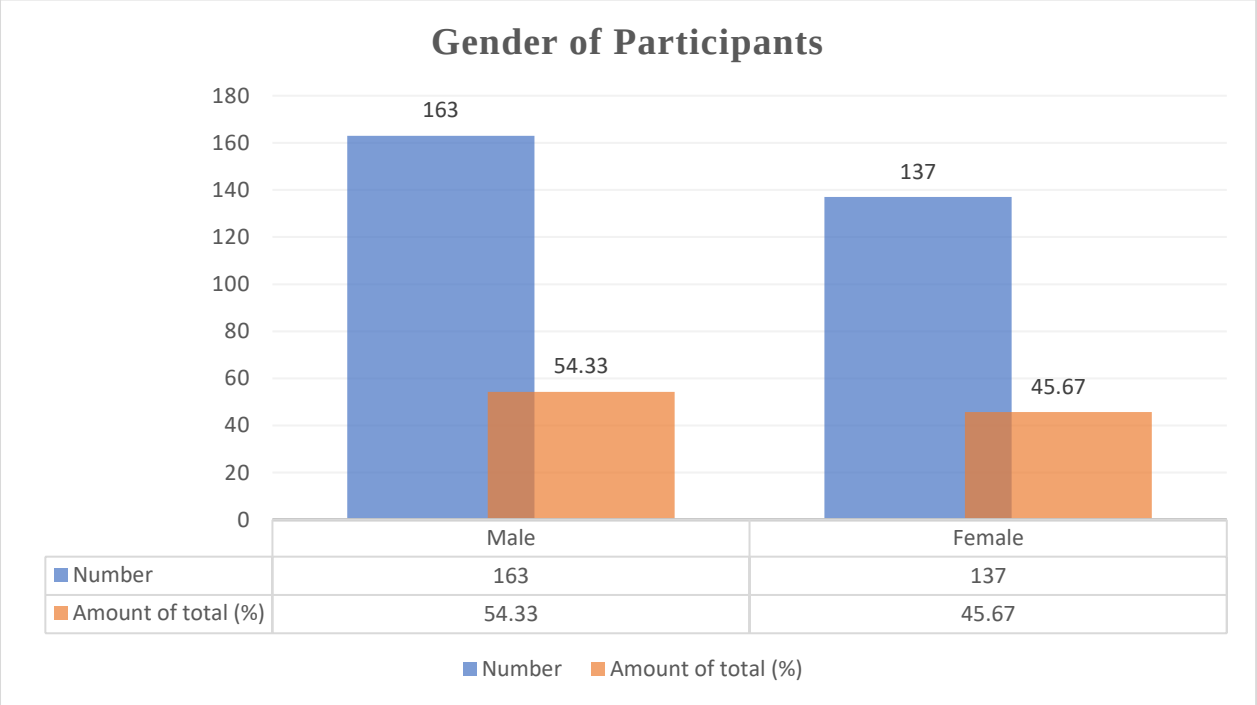
2.3.



2.3. Job Category (Research Manager, Policy Maker/Regulator, Researcher, Academia, Industry, Student, other

Job Category of Participants	**Number**	**Percentage (%)**
Total	300	100.00
Researcher/Academia/NARS	218	72.67
Research Manager of Academia/NARS	30	10.00
Industry	18	6.00
Policy Maker/Regulator of Academia/Industry	3	1.00
Other	31	10.33

2.4.

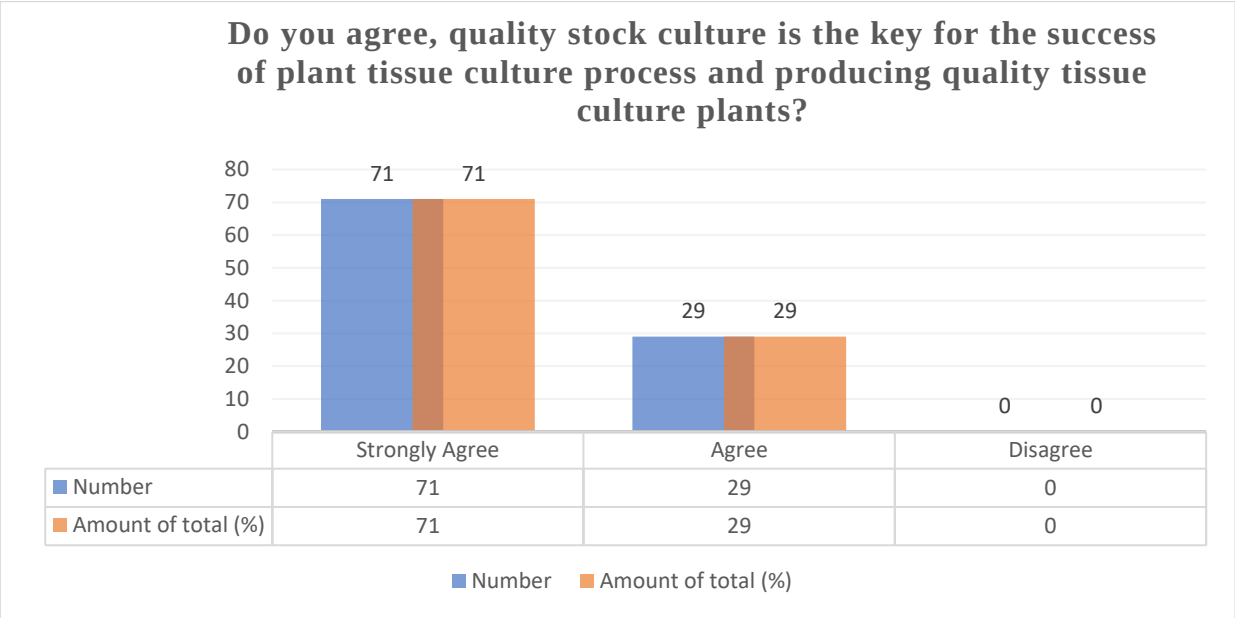


2.4. Gender of Participants

	Number	Percentage (%)
Total	300	100.00
Male	163	54.33
Female	137	45.67

Poll Question Result

2.5.

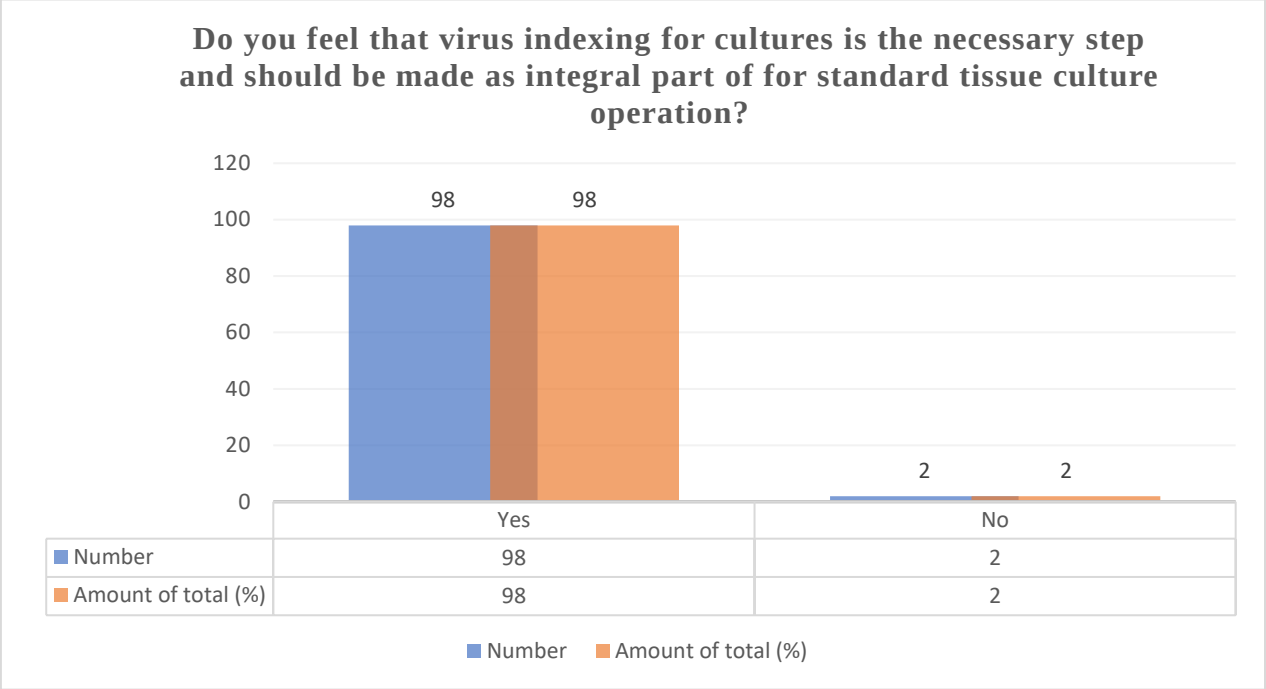


2.5. Do you agree, quality stock culture is the key for the success of plant tissue culture process and producing quality tissue culture plants?

	Number*	Percentage (%)
Total	100	100
Strongly Agree	71	71
Agree	29	29
Disagree	0	0

* Respondence rate (%): 33.33

2.6.

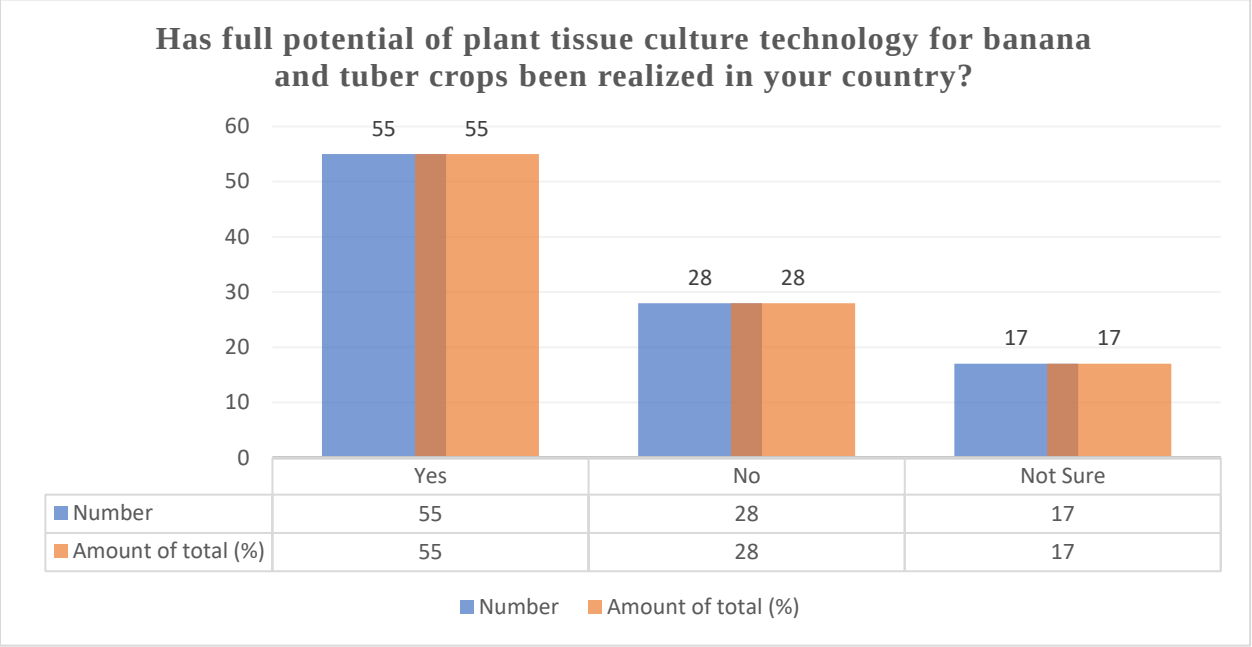


2.6 Do you feel that virus indexing for cultures is the necessary step and should be made as integral part of for standard tissue culture operation?

	Number*	Percentage (%)
Total	100	100
Yes	98	98
No	2	2

* Respondence rate (%): 33.33

2.7.

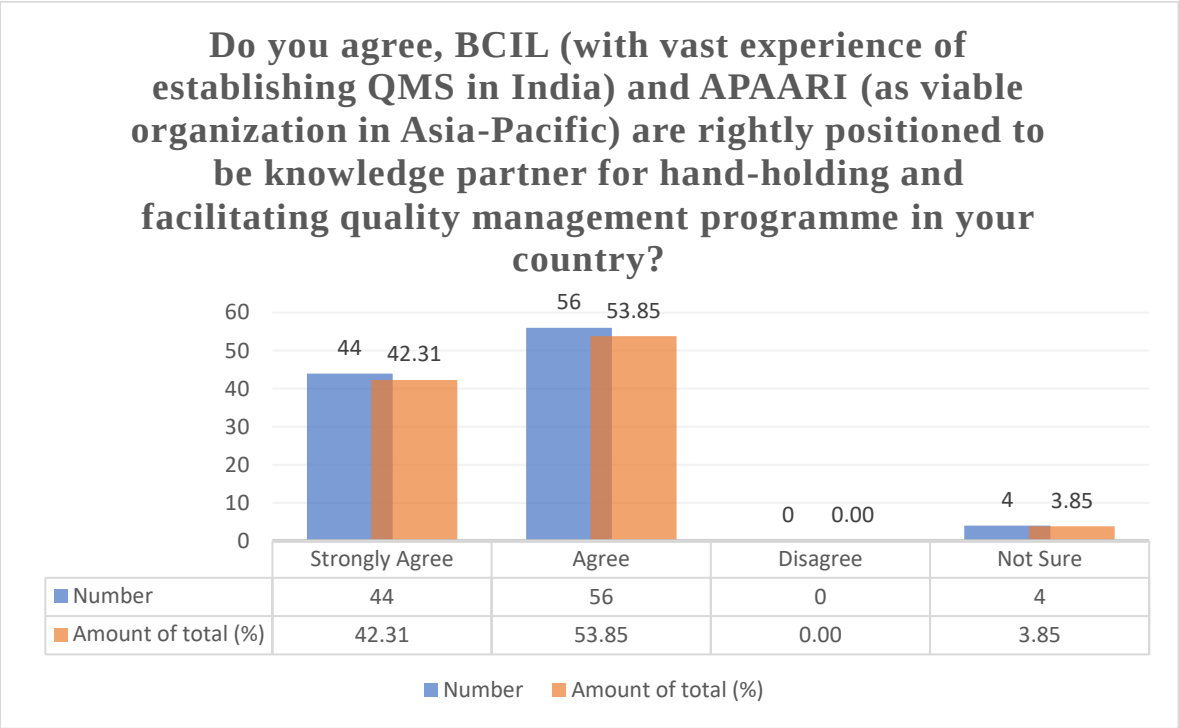


2.7 Has full potential of plant tissue culture technology for banana and tuber crops been realized in your country?

	Number*	Percentage (%)
Total	100	100
Yes	55	55
No	28	28
Not Sure	17	17

* Respondence rate (%): 33.33

2.8.

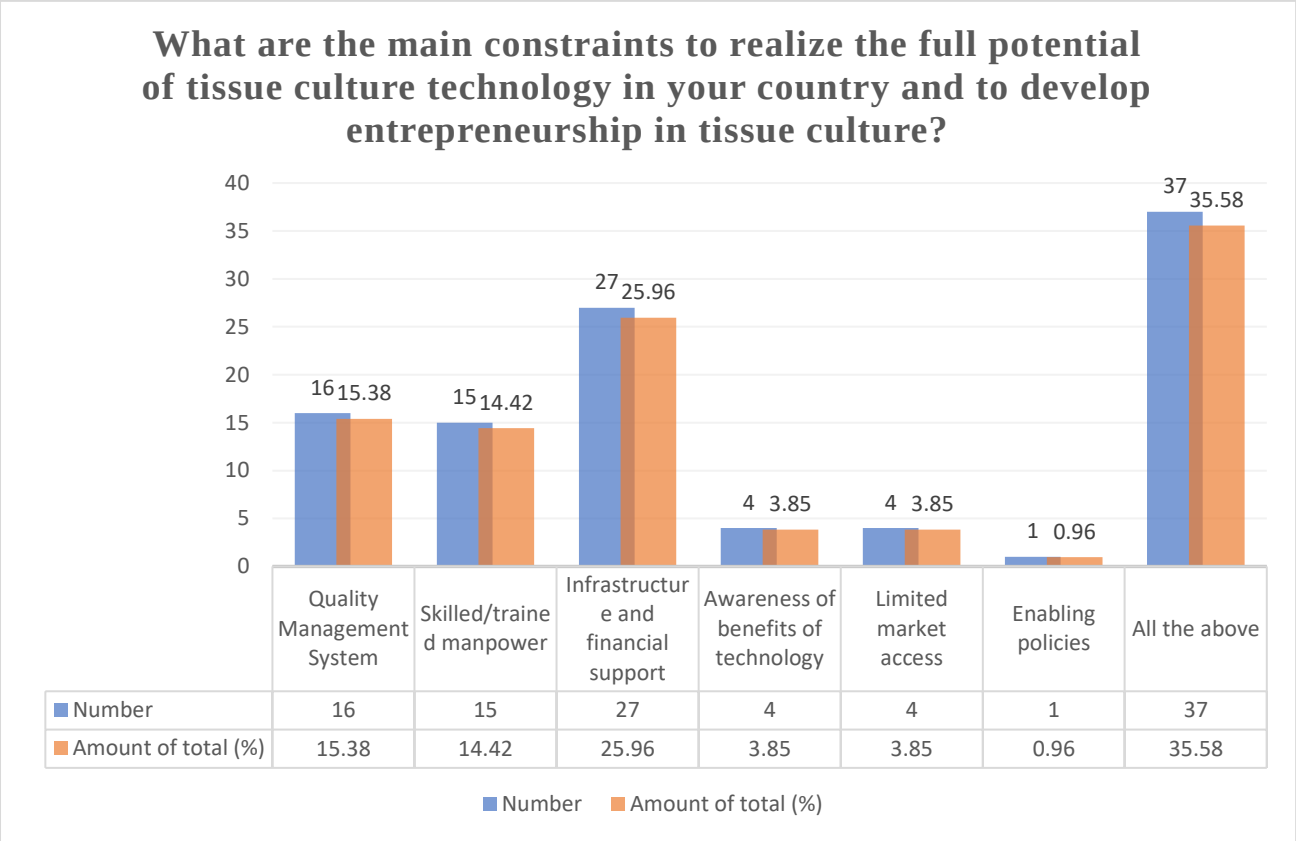


2.8. Do you agree, BCIL (with vast experience of establishing QMS in India) and APAARI (as viable organization in Asia-Pacific) are rightly positioned to be knowledge partner for hand-holding and facilitating quality management programme in your country?

	Number*	Percentage (%)
Total	104	100.00
Strongly Agree	44	42.31
Agree	56	53.85
Disagree	0	0.00
Not Sure	4	3.85

* Respondence rate (%): 34.67

2.9.

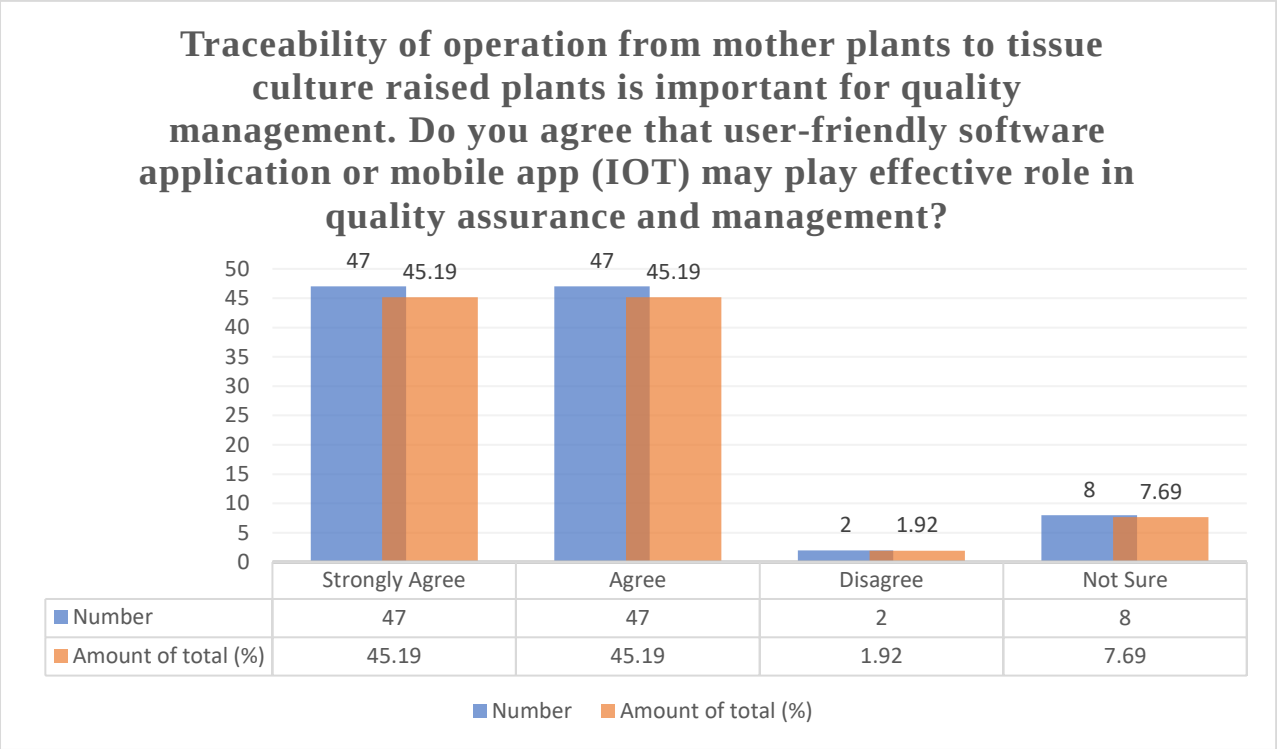


2.9. What are the main constraints to realize the full potential of tissue culture technology in your country and to develop entrepreneurship in tissue culture?

	Number*	**Percentage (%)**
Total	104	100.00
Quality Management System	16	15.38
Skilled/trained manpower	15	14.42
Infrastructure and financial support	27	25.96
Awareness of benefits of technology	4	3.85
Limited market access	4	3.85
Enabling policies	1	0.96
All the above	37	35.58

* Respondence rate (%): 34.67

2.10.

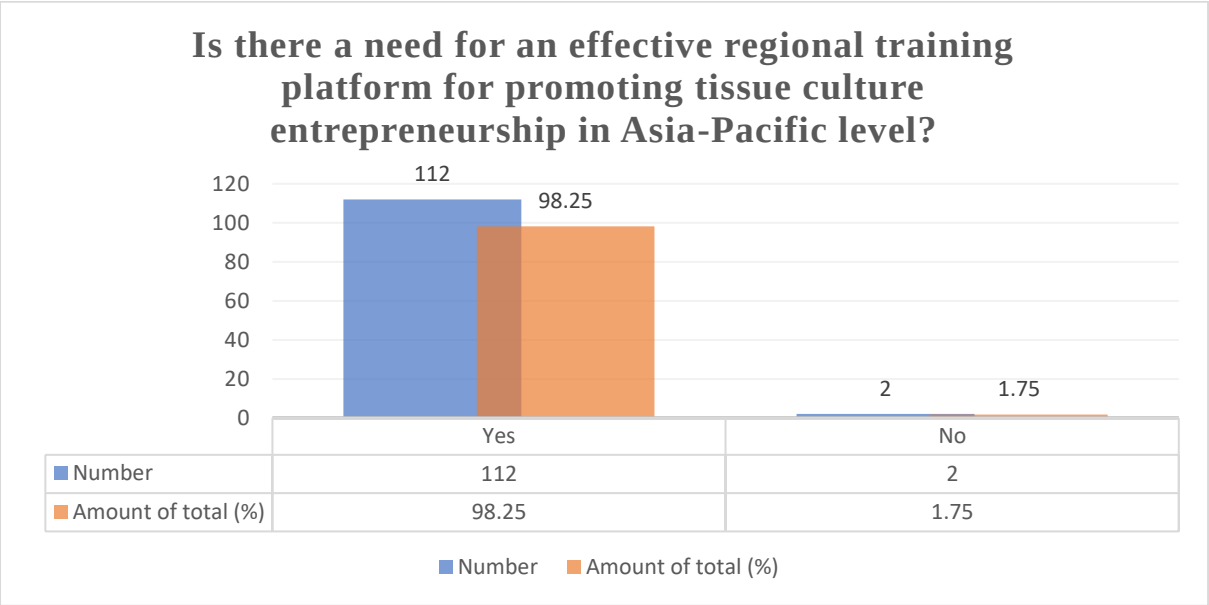


2.10. Traceability of operation from mother plants to tissue culture raised plants is important for quality management. Do you agree that user-friendly software application or mobile app (IOT) may play effective role in quality assurance and management?

	Number*	**Percentage (%)**
Total	104	100.00
Strongly Agree	47	45.19
Agree	47	45.19
Disagree	2	1.92
Not Sure	8	7.69

* Respondence rate (%): 34.67

2.11.

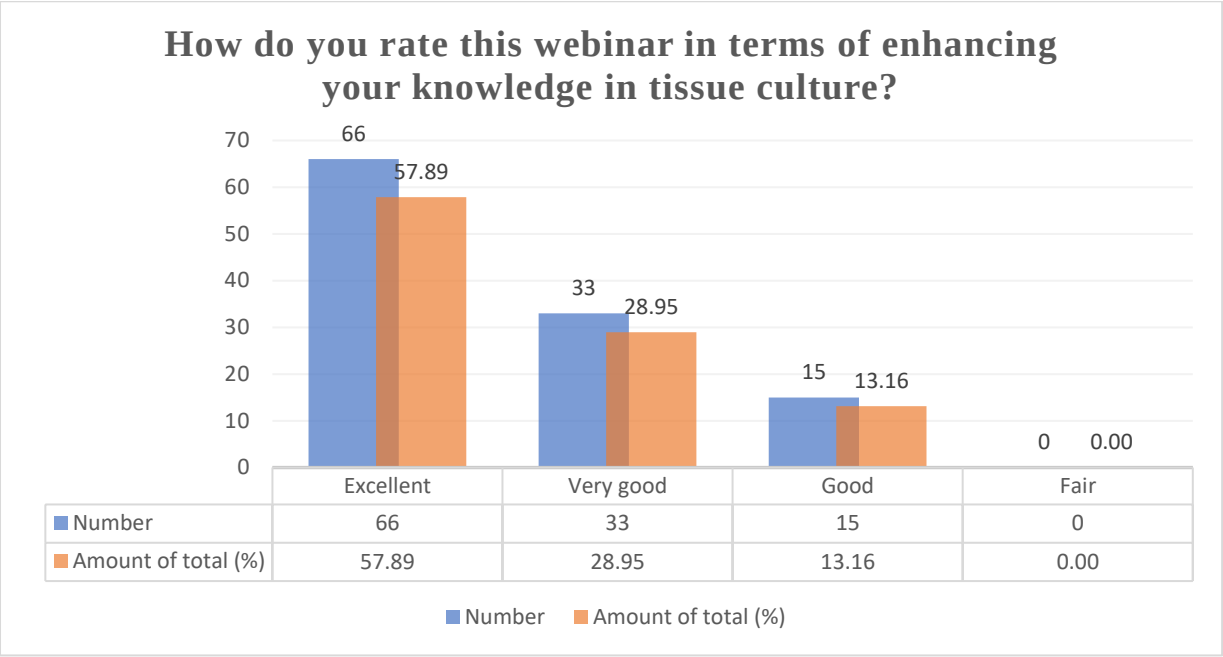


2.11. Is there a need for an effective regional training platform for promoting tissue culture entrepreneurship in Asia-Pacific level?

	Number*	**Percentage (%)**
Total	114	100.00
Yes	112	98.25
No	2	1.75

* Respondence rate (%): 38.00

2.12.

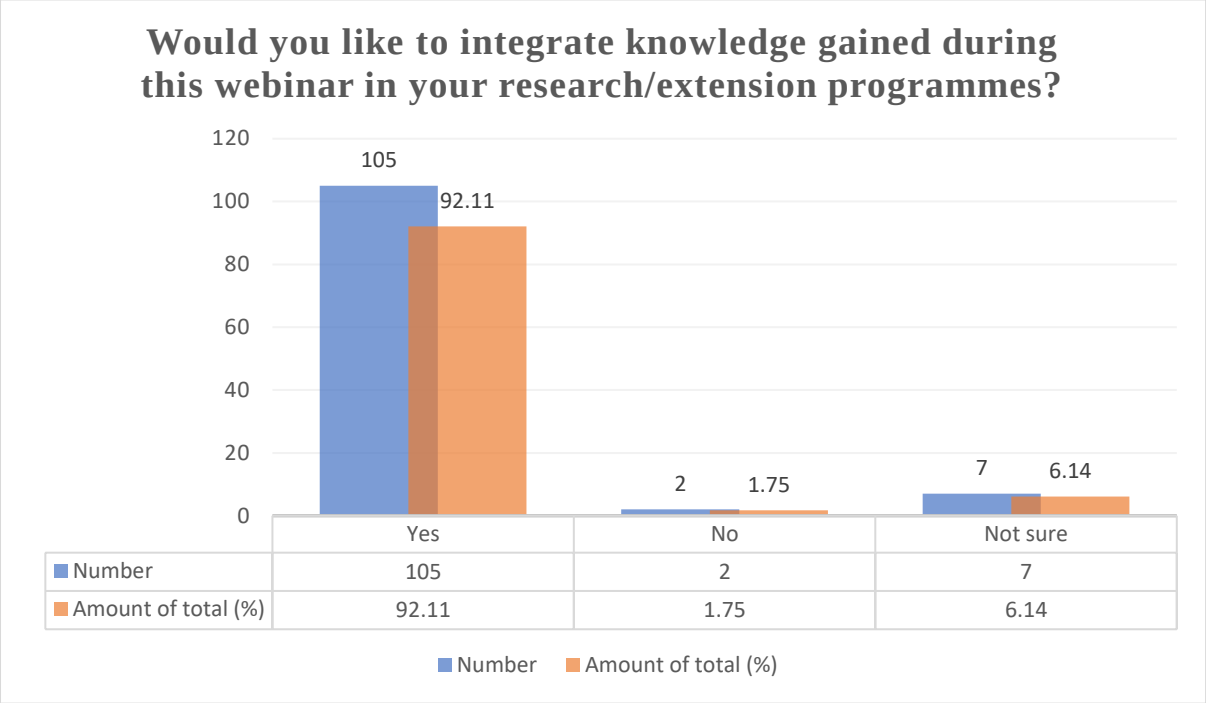


2.12. How do you rate this webinar in terms of enhancing your knowledge in tissue culture?

	Number*	**Percentage (%)**
Total	114	100.00
Excellent	66	57.89
Very good	33	28.95
Good	15	13.16
Fair	0	0.00

* Respondence rate (%): 38.00

2.13.

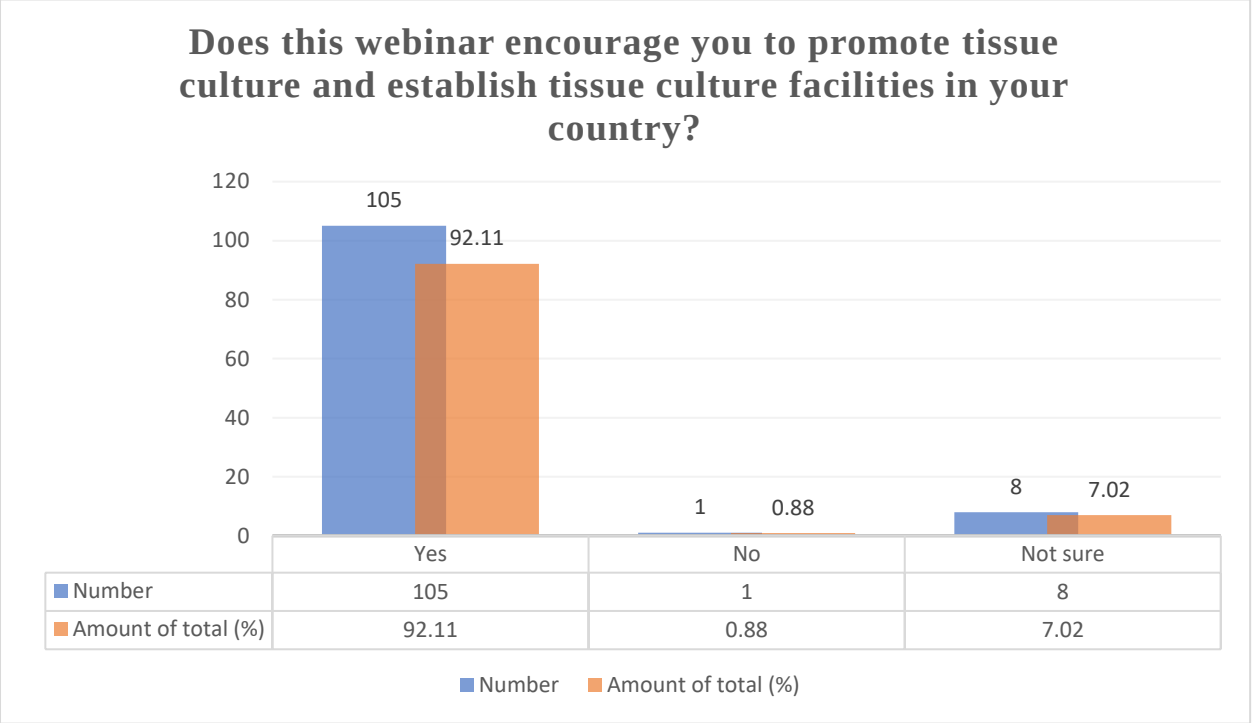


2.13. Would you like to integrate knowledge gained during this webinar in your research/extension programmes?

	Number*	**Percentage (%)**
Total	114	100.00
Yes	105	92.11
No	2	1.75
Not sure	7	6.14

* Respondence rate (%): 38.00

2.14.



2.14. Does this webinar encourage you to promote tissue culture and establish tissue culture facilities in your country?

	Number*	Percentage (%)
Total	114	100.00
Yes	105	92.11
No	1	0.88
Not sure	8	7.02

* Respondence rate (%): 38.00

Brief Proceedings

Dr. Purnima Sharma, Managing Director, BCIL, welcomed the participants to the webinar series and thanked APAARI for taking up this initiative and giving the opportunity to BCIL for jointly organizing this webinar series at a global level. She highlighted the benefits and importance of the tissue culture techniques and the need for for popularizing Plant Tissue Culture in Asia-Pacific Region and African Countries for realizing its full potential for the benefit of the agriculture and the economy of these regions.

Dr. Ravi Khetarpal, Executive Secretary, APAARI delivered his opening remarks and appreciated BCIL for its expertise in this sector and taking up this cause. Dr. Khetarpal also welcomed distinguished speakers, panelist & participants from across the globe. He highlighted the importance of Root and Tuber Crops in Asia-Pacific Region and African Countries.

The webinar was chaired by Dr. T. Mohapatra, Director General, ICAR and Vice Chair APAARI. He congratulated APAARI & BCIL for initiating this international series of webinars on the theme of popularizing Plant Tissue Culture techniques in Asia-Pacific Region and African Countries. Dr. Mohapatra stressed upon need of tissue culture techniques for enhancing the production of crops & importance of quality planting material. He also highlighted the role of BCIL and APAARI in the domain of tissue culture in Asia-Pacific Region and African Countries.

Academia Experts from India and Nigeria spoke about the journey of banana plant tissue culture from research to commercialization in their respective countries. Dr. R. Selvarajan, Principal Scientist from NRC on Banana, Trichy, India spoke about commercialization of Banana in India & increased productivity in past few years due to tissue Culture techniques & good quality of planting material. Dr. Selvarajan highlighted the importance of virus indexing for root & tuber crops. Dr. Afuape Solomon Olufemi from National Root Crops Research Institute, Nigeria, presented the challenges of tissue culture techniques in Nigeria and potential of tissue culture for root and tuber crops in Nigeria.

Leading Industries from India namely M/s Rise N Shine, Pune, India and Merino Industries, Hapur, India presented their success stories in the field of Banana and Tuber Tissue culture, respectively. Dr. Bhagyashree Patil, Chairperson and MD, Rise N Shine Biotech, Pune, India shared success story of their industry & highlighted the production, virus indexing process & market capacity of industry across the world. She also shared feedback of farmers associated with the industry. Dr. Tejpal Singh Tomar, General Manager, Merino Biotech, Hapur, India, explained the scope of tissue culture in quality potato seed tubers production in India, challenges and the way froward. Dr. Tejpal also shared success story of their industry & overview of agro production. Dr. Tejpal highlighted the current production scenario of potato in India & gap between market demand & supply chain for minitubers. He further summarized advantages of potato tissue culture & field performance of conventional seed tubers v/s tissue culture driven seed tubers

Panel discussion with experts from Uganda, Taiwan, Bangladesh and India deliberated on best practices and the way forward was followed up with a question answer session with the participants to address their specific queries on important issues of common interest. The esteemed panel consisted of Dr. Henry Wagba, NARO from Uganda, Dr. Sanjay Chandak MD, Sheel Biotech Ltd, India, Dr. Rakha Hari Sarker, Professor, Dhaka University, Bangladesh, Dr. T.H. Wu, Agriculture Specialist,

TBRI, Taiwan. In response to the questions raised by moderator Dr. Shiv Kant Shukla, DGM, BCIL, experts expressed opinion as specified below:

- Dr. Henry Wagba spoke about the technical challenges of tissue culture of cassava & provided insights on how to produce good quality planting material for cassava.

- Dr. Sanjay Chandak highlighted the role of quality mother culture in commercial tissue culture of banana plant production. Dr. Chandak also spoke about current scenario of tissue culture of banana plant in India. He further highlighted need for capacity building Programme for Africa and Asia pacific.

- Dr. Rakha Hari Sarker talked about growth potential of banana and tuber crop particularly in Bangladesh & current mechanism of quality control system and role of government/public institutions in Bangladesh.

- Dr. T.H. Wu form Taiwan spoke about importance of conducting test for true-to-typeness of tissue culture plants . Dr. Wu also highlighted prospect of banana, root & tuber crop for Asia Pacific region.

The session concluded with the closing remarks by Dr. Rishi Kumar Tyagi, Coordinator, APCoAB,APAARI, who thanked BCIL for taking up this initiative and associating with APAARI for jointly organizing this webinar series at a global level. Dr. Tyagi thanked to eminent speakers, panelist and participants for being a part of the webinar series. In between the above sessions online polls were also conducted to keep the audience involved and have a fair idea of the status, progress and requirements of the tissue culture industry in the different regions across Asia-Pacific and African regions. The results of this exercise are tabulated in the data compiled as above. The programme was moderated by Dr. Shiv Kant Shukla, DGM, BCIL, New Delhi, India.

The detailed presentations by the learned Academicians and esteemed Industry experts are attached as at **Annexure 1** for the record and ready reference.

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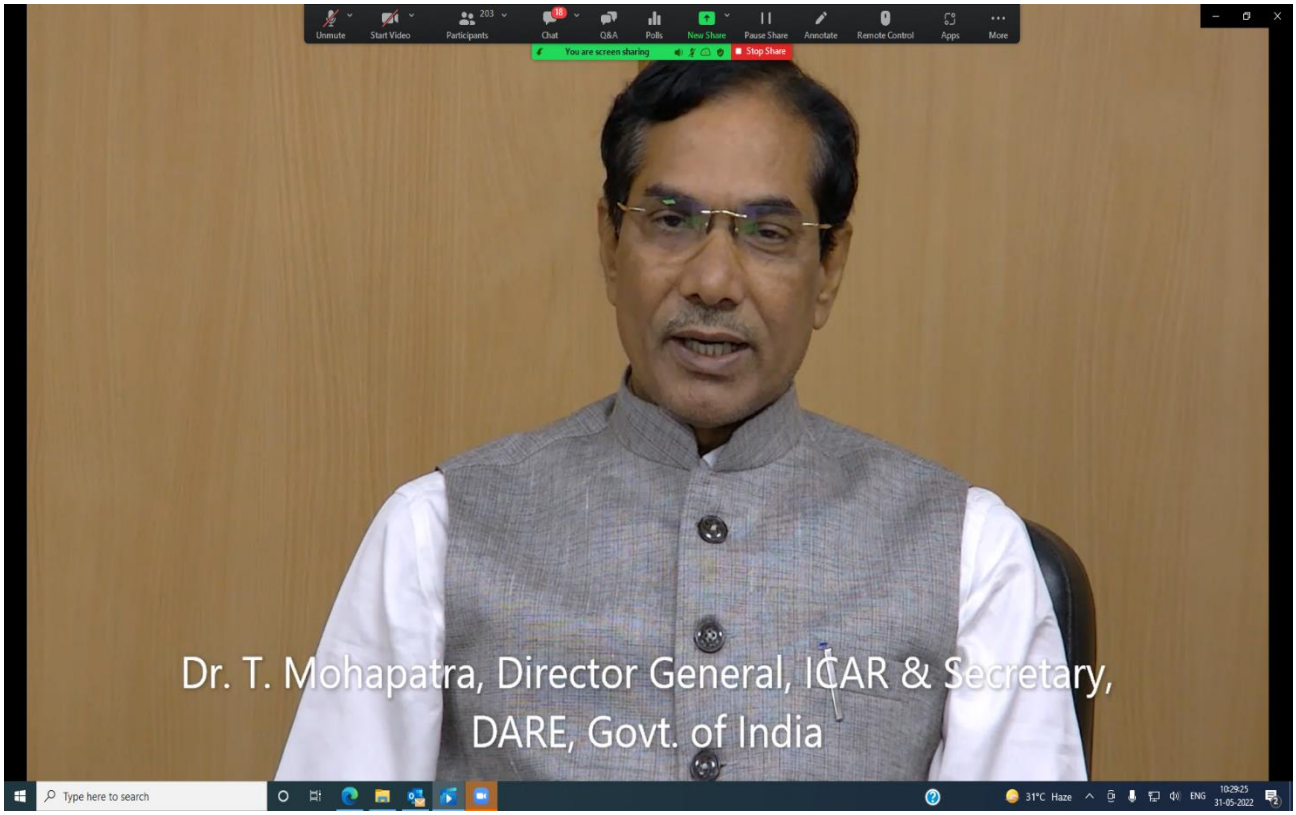
Unmute
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Chat
Q&A
Polls
New Share
Pause Share
Annotate
Remote Control
Apps
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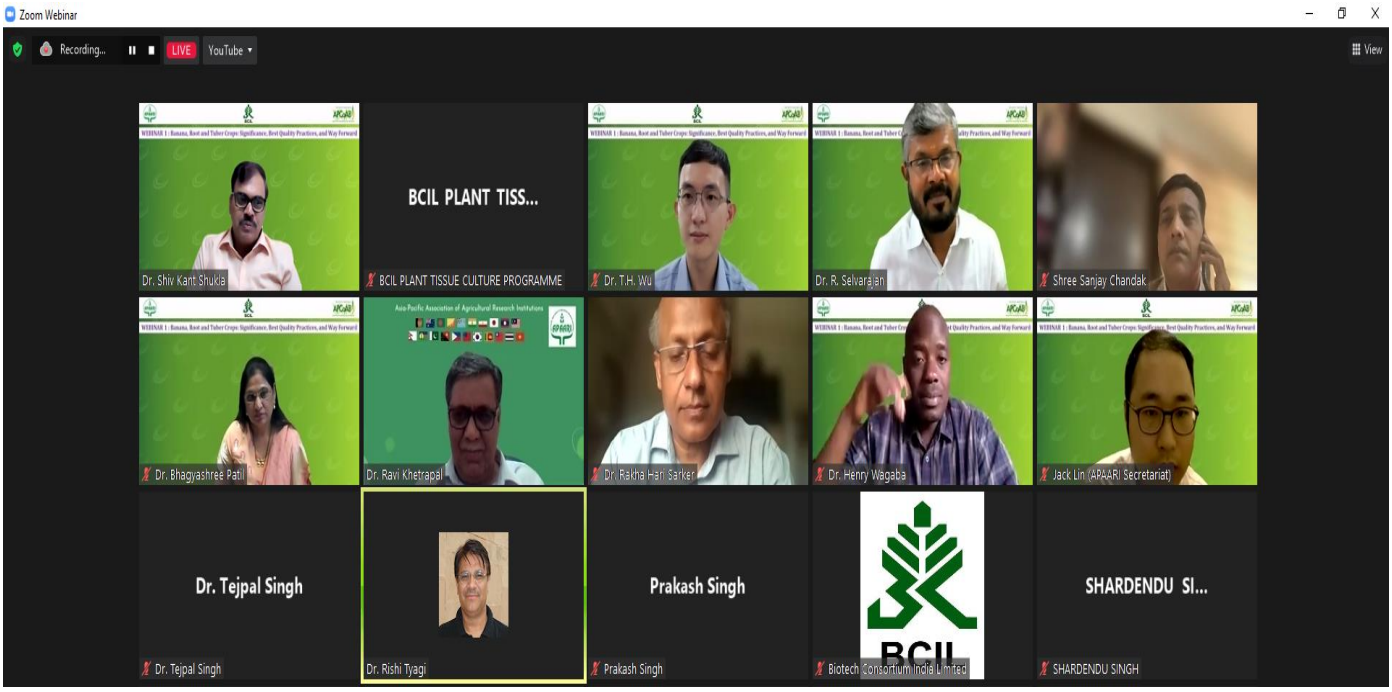
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Dr. Shiv Kant Shukla
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BCIL PLANT TISSUE CULTURE PROGRAMME
Dr. T.H. Wu
Dr. R. Selvarajan
Shree Sanjay Chandak
Dr. Bhagyashree Patil
Dr. Ravi Khetrapal
Dr. Rekha Hari Sarker
Dr. Henry Wagaba
Jack Lin (APAARI Secretariat)
Dr. Tejpal Singh
Dr. Tejpal Singh
Dr. Rishi Tyagi
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WEBINAR 2

Webinar on "Perennial Fruit/Cash Crops: Significance, Best Practices, and Way Forward"

Date: June 30, 2022
Time: 11:30 AM ICT; Bangkok time (10:00 AM IST)

➢ About Webinar:

Perennial Fruit/Cash Crops such as pomegranate, apple, date palm. These crops are very important due to their significant contribution to food security and income generation. The tissue culture of fruit and cash crops are being done commercially in many countries. However, quality practices need to be adopted for production of virus free quality tissue culture plants of these species. The webinar was chaired by Dr. Prabhat Kumar, Horticulture Commissioner, Ministry of Agriculture Government of India. Dr. S.K. Singh, Head, Division of Fruits & Horticultural Technology, ICAR-IARI, India, spoke about the journey of perennial crops from research to commercialization in India. Leading Industries from India and Iran presented their success stories in the field of tissue culture in apple and date palm. Panel discussion was organized with experts from Iran, Nigeria and India deliberated on best practices and the way forward.

AGENDA

WEBINAR 2

Tissue Culture of Perennial Fruit/Cash Crops: Significance, Best Practices, and Way Forward

11:30 AM – 11:35 AM:	**Welcome Note**
Dr. Purnima Sharma, Managing Director, Biotech Consortium India Limited (BCIL), India	
11:35 AM – 11:40 AM:	**Opening Remarks by Chairperson**
Dr. Ravi Khetarpal, Executive Secretary, Asia Pacific Association of Agricultural Research Institutions (APAARI), Thailand	
11:40 AM – 11:45 AM:	**Remarks by Co-chairperson**
Dr. Prabhat Kumar, Horticulture Commissioner, Ministry of Agriculture Government of India	
11:45 AM – 12:05 PM:	**Journey from Research to Commercialization by Academia**
Dr. S. K. Singh, Head-Division of Fruits & Horticultural Technology, ICAR-IARI, India	
12:05 AM – 12:25 PM:	**Success Story by Industry**
12:05 PM-12:15 PM: Apple and Other temperate Fruit Crops Success Story by Industry Expert: **- Mr. Vinod Soni, MD, M/S Nishant Biotech, Bilaspur, HP, India** **12:15 PM-12:25 PM: Date Palm Tissue Culture Success Story by Expert:** **- Dr. Aziz Torahi, Scientist, Date Palm and Tropical Fruits Research Centre, AREEO, Iran**	
12:25 PM – 12:50 PM:	**Panel Discussions**
Moderator:	**Dr. Shiv Kant Shukla, Dy General Manager, BCIL, New Delhi, India**
Panelist:	**1. Mr. Tarun Arora, Director, IG International Pvt. Ltd, Mumbai, India** **2. Dr. Alireza Bonyanpour, Professor, AREEO, Iran** **3. Prof. Inuwa Shehu Usman, Professor, IAR, Nigeria** **4. Dr. Vidya Gupta, Former Chief Scientist, CSIR – NCL, Pune, India**
12:50 PM-01:00 PM:	**Open Q & A Session**
01:00 PM-01:05 PM:	**Brief Closing Remarks**
Dr. Rishi Kumar Tyagi, Coordinator, APCoAB, APAARI, Thailand	

SPEAKER PROFILE

Chairperson

Dr. Ravi Khetarpal

Dr Ravi Khetarpal is the **Executive Secretary, APAARI** since 2017 and is based in Bangkok. He promotes and facilitates APAARI's vision of strengthening agricultural research and innovation for sustainable agricultural development in the region through networking amongst more than 80 members. He coordinates APAARI's projects sponsored by international and bilateral organizations on knowledge management, agriculture innovation systems, agriculture science technology indicators, strengthening phytosanitary compliance for international seed movement and pesticide risk mitigation in various countries of the Asia–Pacific region. He is the current Chair of the Global Forum of Agricultural Research and Innovation (GFAR), and the Tropical Agricultural Platform of FAO – a G20 initiative for developing and promoting the agricultural innovation system. He has served CABI – South Asia (India) as Regional Director and also as its Regional Advisor on strategic science partnerships for a span of more than seven years. Prior to that, he worked for the National Agricultural System in India in the field of plant protection for 30 years. He holds a PhD in life sciences (plant pathology) from the University of Paris and was a Visiting Scientist in an EU Collaborative Project at Institute National de la Recherche Agronomique (INRA), Versailles, France for three years.

Co-chairperson

Dr. Prabhat Kumar

Dr. Prabhat Kumar, **Horticulture Commissioner, GOI & Ex-National Coordinator ICAR-National Agricultural Higher Education Project** was born on 1st July 1973 in Basti (UP). He obtained his B. Sc. Degree from C.S.A. Univ.of Ag. & Tech. Kanpur (U.P.) and M.Sc. degree (Floriculture and Landscaping) from Punjab Agricultural University, Ludhiana, Punjab. He completed his Ph. D. degree (Floriculture and Landscaping) in the year 2002 from IARI, New Delhi. He started his professional career as Assistant Professor at G.B.P.U.A.&T., Pant Nagar in April 2003.

He was selected to the post of Associate Professor at HNBGU, Srinagar, Garhwal (A Central University School of Agriculture) in 2012. Further, he was selected to the post of Senior Scientist at IARI, New Delhi, in 2013 and become Principal Scientist in 2015. Dr. Prabhat Kumar was actively engaged in teaching, research, extension and managerial assignments.

He has handled externally funded and institute research projects and published 75 research papers in various national and international journals, 35 popular articles, 15 book chapters, 11 technical bulletins and 06 Books. He is associated in the development of 4 varieties namely; Pusa Deep, Pusa Bahar (Marigold) & Pusa Sinduri and Pusa Shanti. Established Model Floriculture Centre (MFC) under Horticulture Technology Mission at GBPUA&T, Pant Nagar.

In capacity of National Coordinator he has developed Monitoring and Evaluation cell to coordinate with all partners and facilitated to establish 16 CAAST (Centre for Advanced Agriculture Science and Technology) centres in cutting edge areas like genomics, climate smart agriculture, digital agriculture, conservation agriculture, secondary agriculture, etc. He also organized many national and international conferences and symposiums as organizing secretary.

Dr Kumar visited many countries like The Netherlands, Switzerland, Germany, Belgium, France, Spain, Singapore, Thailand and Maldives. He is a life member of many professional societies in the field of Horticulture and Agriculture. He has been honoured with awards and fellow by many scientific societies. He is member of Board of Management and academic council in state agricultural Universities.

Dr. Purnima Sharma

Dr. Purnima Sharma is the **Managing Director** of **Biotech Consortium India Limited (BCIL), New Delhi**. BCIL is a public limited company promoted by the Department of Biotechnology, Ministry of Science and Technology, Government of India and the all-India financial institutions for facilitating biotechnology commercialization.

Dr. Purnima Sharma is a doctorate in Experimental Medicine from Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh, the prestigious autonomous institution and deemed Medical University of national importance of the Ministry of Health, Government of India with Post-Doctoral experience from IIT, Mumbai, and has to her credit many awards for excellence in academics. She has more than 30 years of experience in the area of technology evaluation and transfer, management of IPR, project consultancy including DPRs for setting up Incubators and Science Parks, managing start-up ecosystem, public-private partnership funding schemes, entrepreneurship development etc. Dr. Sharma is a member of a number of national and state level committees responsible for biotech development and commercialization and also a member of The National Academy of Sciences, India (NASI), the first science academy of the country dedicated towards cultivation and promotion of science & technology in the country.

Dr. Rishi Kumar Tyagi

Dr Rishi Kumar Tyagi is presently working as **Coordinator** in **Asia-Pacific Consortium on Agricultural Biotechnology and Bioresources (APCoAB), APAARI, Bangkok, Thailand**. Dr Tyagi holds a Ph.D. degree in Botany from University of Delhi, Delhi, India and Post-Graduate Diploma in Intellectual Property Rights laws from Indian Law Institute (Deemed University), New Delhi, India. He worked as Post-Doctoral Research Associate in University of Illinois, USA, worked on wide hybridization of soybean employing biotechnological methods. He has more than 34 years of experience in managing plant genetic resources (PGR). Since 2009 to 2017, he was holding the position of Head, Division of Germplasm Conservation at the ICAR-National Bureau of Plant Genetic Resources, New Delhi, India, managing its National Genebank.

Dr Tyagi has to his credit 111 research papers in high impact factor peer reviewed journals, 156 book chapters/policy papers/proceedings, 27 edited books/monographs and 68 invited lectures in international seminar/symposia/conferences. His current areas of interest are promoting agricultural biotechnology and conservation and use of bioresources for sustainable agricultural development in the Asia-Pacific region for the benefits of smallholder farmers, through greater stakeholder partnerships, enabling policy development and advocacy, enhanced capacity building and greater public awareness.

Speakers

Dr. Sanjay Kumar Singh

Dr Sanjay Kumar Singh is the **Prof & Head, Division of Fruits & Horticultural Technology, ICAR-IARI, New Delhi**. Dr Singh obtained his B.Sc. (Ag.) in 1989; and M.Sc. (1991) & Ph.D. (1995) degrees in Horticulture from the Banaras Hindu University, Varanasi with Gold Medal. He did his Post Doc with DBT Overseas Fellowship at the University of Florida, USA (2008-09). He joined as ARS Scientist in 1994 at the Div. of Fruits & Hort. Tech., ICAR-IARI, New Delhi. His research contributions include development of commercial protocol for micropropagation and bio-hardening using arbuscular mycorrhizae in horticultural crops like grape, citrus and pomegranate and their rootstocks; micropropagation protocols in mango, guava, papaya, apple, custard apple, rose, carnation, gladiolus, lilium, chrysanthemum etc. He Further, he developed the in vitro screening procedures for salinity (NaCI) tolerance in grape & citrus and Fusarium tolerance in gladiolus; and also protocol for in-ovulo embryo rescue in seedless grape and mango. He has identified and released four promising seedless grape hybrids (Pusa Aditi, Pusa Trishar, Pusa Swarnika and Pusa Purple Seedless) and two mango varieties (Pusa Deepshikha and Pusa Manohari). Currently, he is working on transcriptomics and functional genomics of mango & grape; and biotic and abiotic stress tolerance in mango and grape.

He has guided 7 M.Sc. and 17 Ph.D. students. He has published over 200 research papers in international and national journals of repute, 12 books, 4 practical manuals, 50 book chapters, 32 popular articles, 15 extension folders, and over 185 symposia/ seminar papers. Dr Singh is the Fellow of the NAAS; IAHS, ISGPB, NABS, HHDS, ISNS, Chennai, SHRD, Ghaziabad; Associate of the NASS (2007) and DBT (2008). He is recipient of Hari Om Ashram Trust Award of ICAR (2005-2006); Bharat Ratna Dr C. Subramanium Best Teacher Award of the ICAR 2018 etc.

Dr. Aziz Torahi

Dr. Aziz Torahi is a **PhD in Pomology**. He has **25 years of experience in Date Palm & Tropical Fruits Research Centre**. For many years, he has been the head of the Breeding research department and the deputy director of research. He has done about 60 research projects and wrote many books, technical reports, articles, leaflets, etc. He has been responsible for studying different generations of tissue culture seedlings of different date cultivars. He was selected as a senior date palm promoter researcher. Currently he is studying on different date palm and Tropical fruits cultivars adaptation in Iran.

Mr. Vinod Kumar Soni

Mr. Vinod Kumar Soni is the **Managing Director** of **Rajat Nishant Biotech, Himachal Pradesh India**.

The company is working in area of Plant Tissue culture for the last 16 years. Rajat Biotech are certified by the Department of Biotechnology, Govt. of India foe Apple Root Stock. A certain brain drain has been happening in Himachal Pradesh for many years where the youth is demoralized and generally feeling that there are not many opportunities to pursue a career locally. But there are people like Mr. Vinod Soni who have set an example by defying this defeatist attitude.

Currently they are Producing Apple, Kiwi, Pear, Walnut, Almond, Pomegranate & Blueberry with an annual production of around one million plants. They have grand expansion plans for multiplication of their production capacity in the very near future.

Moderator

Dr. Shiv Kant Shukla

Dr. Shiv Kant Shukla has made significant contribution in the area of commercial biotechnology and plant tissue culture. He is Doctorate in Biotechnology from Pt Ravishankar Shukla University Raipur. Dr. Shukla is currently working as the **Dy. General Manager, BCIL, New Delhi**, an organization promoted by Department of Biotechnology, Govt of India. Prior to BCIL, he was heading a leading commercial plant tissue culture unit in central India. He has approx. 22 years of diversified experience covering research, production of tissue culture plants, field extension, quality management, biotech parks, technology transfer, administration and management of biotech projects. Dr. Shukla has more than 50 publications and chaired/delivered more than 30 invited/key note speech at national and international forum. He has successfully organized more than 30 Entrepreneurship development programme (EDP) and conferences. Dr. Shukla has managed prestigious international and national long-term projects of Government of India. His contributions have been acknowledged by various recognitions and awards including Certificate of Appreciation from Govt of Chhattisgarh, West Bengal, Hony. Professorship from Amity University Uttar Pradesh, Rastriya Gaurav Award & "Certificate of Excellence" from India International Friendship Society, New Delhi etc.

Panelists

Dr. Ali Reza Bonyanpour

Dr. Ali Reza Bonyanpour, is PhD in Horticultural Science and **Assistant Professor of the Agricultural Research and Education Organization of Iran (AREEO)**. He has 25 years of research experience in pomegranate and olive.

So far, he has done a lot of research on drought and salinity stresses of pomegranate and tissue culture of different pomegranate cultivars. He has also conducted research on various aspects of planting, growing and post-harvest of pomegranates. Due to importance of pomegranate cultivation in Iran, most research is related to the identification of new cultivars and tolerant to environmental stress on tissue culture conditions.

Dr. Vidya Gupta

Dr. Vidya Gupta, a fellow of NAAS, India was working in the area of plant biochemistry and molecular biology at CSIR-NCL, Pune for forty years as **Chief Scientist and Chair followed by Emeritus Scientist**. She has research experience in four areas, namely metabolic pathways analysis and engineering, host-pest/ pathogen interactions, molecular markers based agro-economic trait analysis and genetic diversity and genome organization.

Currently, she has been associated with ICTRC, Pune as Research Adviser and with various scientific committees of CSIR, ICAR, DST and DBT in different capacities. Her post-graduation and doctorate in biochemistry and chemistry, respectively are from Pune University and CSIR-NCL, Pune while postdoctoral research experience is from Texas A&M University, USA.

She has 212 research publications in reputed international journals with h index 53 and citations 10221. Nine national and internationally granted and four filed patents are to her credit. Thirty-seven Ph. D. scholars have received degree under her supervision. She has completed 34 projects from various national and international funding agencies. She has given more than 150 lectures in various national and international conferences and have also organized many such symposia. She has many academic awards and social honors to her credit. Most important of them are Krishnamurthy A. award instituted by SBC/ CSIR Award for S and T Innovations in Rural Development (CAIRD 2007) and Distinguished Women Scientist award

Prof. Inuwa Shehu Usman

Prof. Inuwa was Born on 8th February 1961 in Kano City, Nigeria. He holds a PhD degree from University of Putra Malaysia (UPM), in 1997, **specializing in Plant Physiology**. He was a post-doctoral fellow at the Plant Biotechnology Laboratory, University of Kebangsaan Malaysia, UKM Bangi, (May 1998 – April 1999), in charge of development of protocols suitable for hormone analysis in tissue culture systems. His research interest in Biotechnology is in the development and application plant tissue culture systems to solve problems in the industry, including optimization of secondary metabolites production. He served as the **General Manager** of **Sugarcane Bio-factory** an outfit that is dedicated to large-scale micropropagation of clean seed-cane for the sugar industry and other crops. He is also into secondary metabolites related to in situ and in vitro production of artemisinin from Artemisia annua, and then in vitro production of apigeninidin - an anti-sickening agent from sorghum.

Mr. Tarun Arora

Mr. Tarun Arora, **Director of IG International Pvt. Ltd.**, a company which is into import, growing and supply of fresh fruits through its temperature-controlled warehouses and cold storages along with refrigerated transportations. He joined the family business in 2008 and has represented IG in various global meets and trade shows across the world, his views are featured across prestigious trade news portals throughout the world. He leads the Corporate Finance Team with his innovative and modern outlook in a range of activities, including fundraising from Debt and Equity Markets as well as Banks, Managing M&A and Structuring transactions. At a very early age, he travelled across the globe and has acquired a diploma in private equity at “Harvard Business School”. He has also studied Financial Analysis of Business at "IIM Ahmedabad" and has achieved MBA from "MIT School of business, Pune". Mr. Tarun Arora always had a vision to expand IG’s stretch towards Plant Biosciences which he successfully implemented and played an instrumental role to incorporate the idea of IG Plant biosciences which is focused upon propagating the best quality planting material in India.

Highlights/Outcome Report of Webinar 2

Webinar 2: Tissue Culture of Perennial Fruit/Cash Crops: Significance, Best Practices, and Way Forward

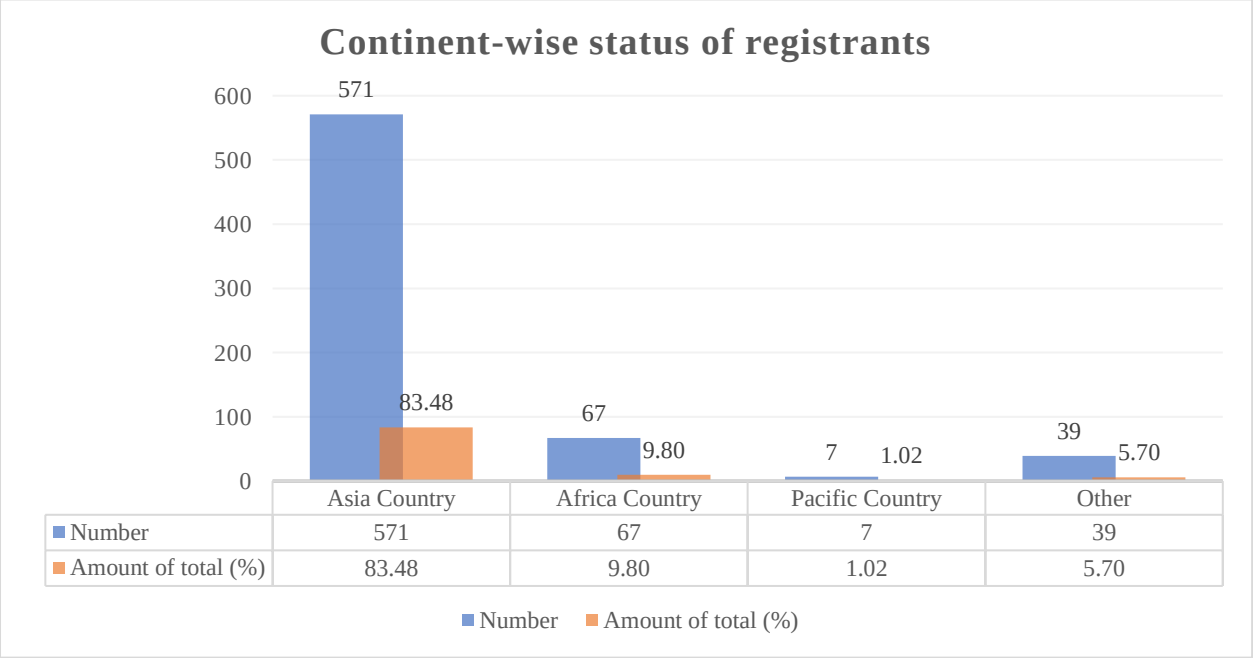
1. Registration Status

- **Number of Registrant**: 684
- **Number of Country**: 53

1.1.1. Country-wise and region-wise status of registrants

S. No.	Country-wise and region-wise status of registrants	Country/Region abbreviation	Number	Percentage (%)
	Total		684	100.00
1	India	IN	462	67.54
2	Nigeria	NG	32	4.68
3	Thailand	TH	16	2.34
4	Pakistan	PK	13	1.90
5	Iran	IR	12	1.75
6	Bangladesh	BD	7	1.02
7	Nepal	NP	7	1.02
8	Philippines	PH	7	1.02
9	Indonesia	ID	6	0.88
10	Malaysia	MY	6	0.88
11	Bhutan	BT	4	0.58
12	Taiwan	TW	4	0.58
13	Vietnam	VN	4	0.58
14	Pacific Countries		7	1.02
15	Other Africa Countries		35	5.12
16	Other Asian Countries		23	3.36
17	Others		39	5.70

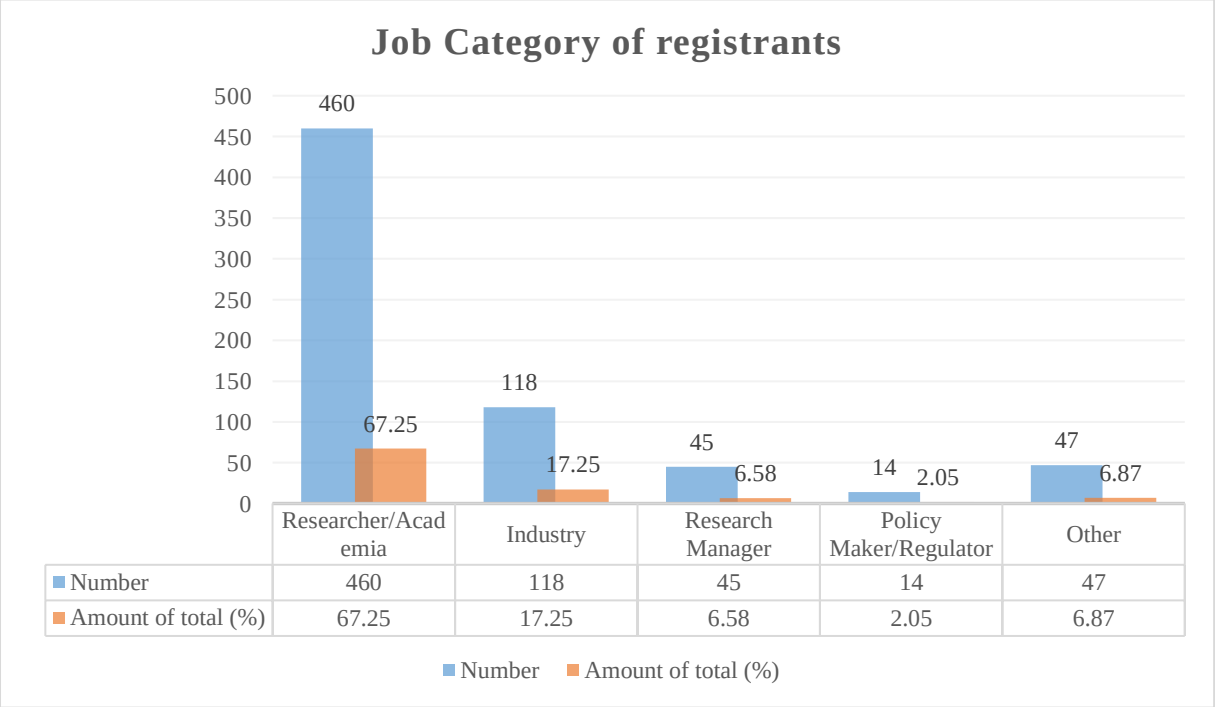
1.1.2.



1.1.2. Continent-wise status of registrants

Continent-wise status of registrants	Number	Percentage (%)
Total	684	100.00
Asia	571	83.48
Africa	67	9.80
Australia	7	1.02
Other	39	5.70

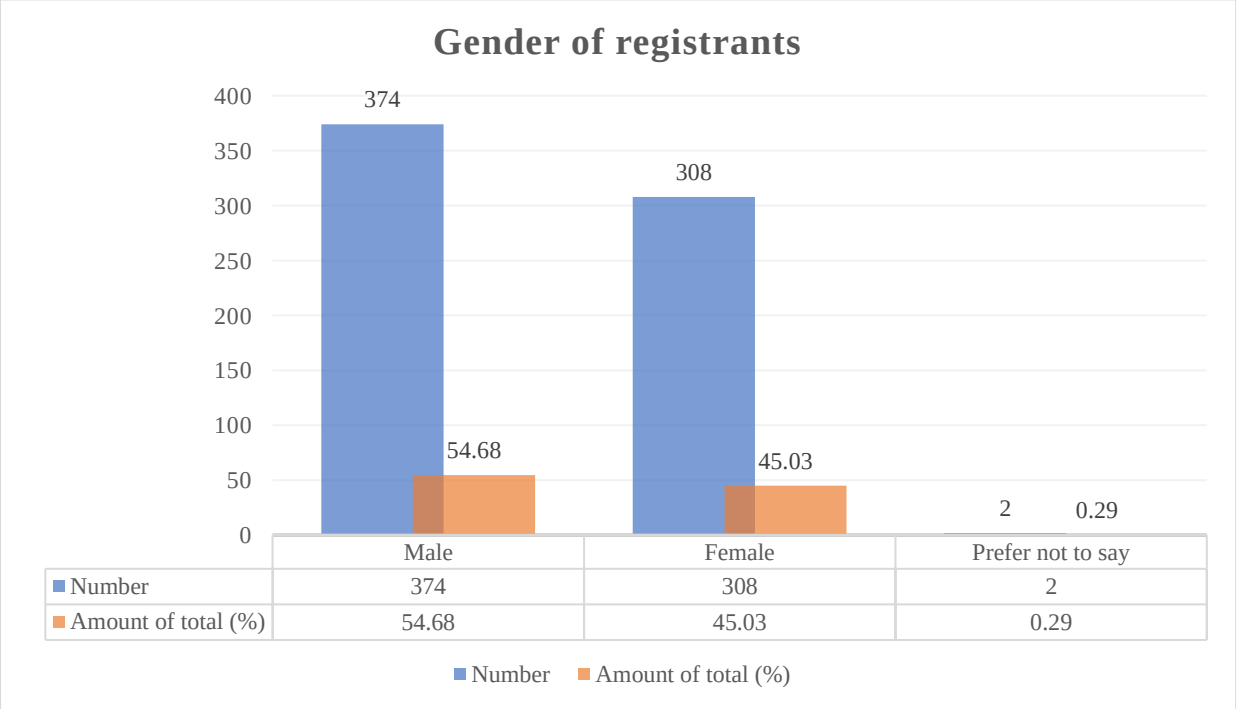
1.2.



1.2. Job Category of registrants

Job Category of registrants	Number	Percentage (%)
Total	684	100.00
Researcher/Academia/NARS	460	67.25
Industry	118	17.25
Research Manager of Academia/NARS	45	6.58
Policy Maker/Regulator of Academia/Industry	14	2.05
Other	47	6.87

1.3.



1.3. Gender of registrants

Gender of registrants	Number	Percentage (%)
Total	684	100.00
Male	374	54.68
Female	308	45.03
Prefer not to say	2	0.29

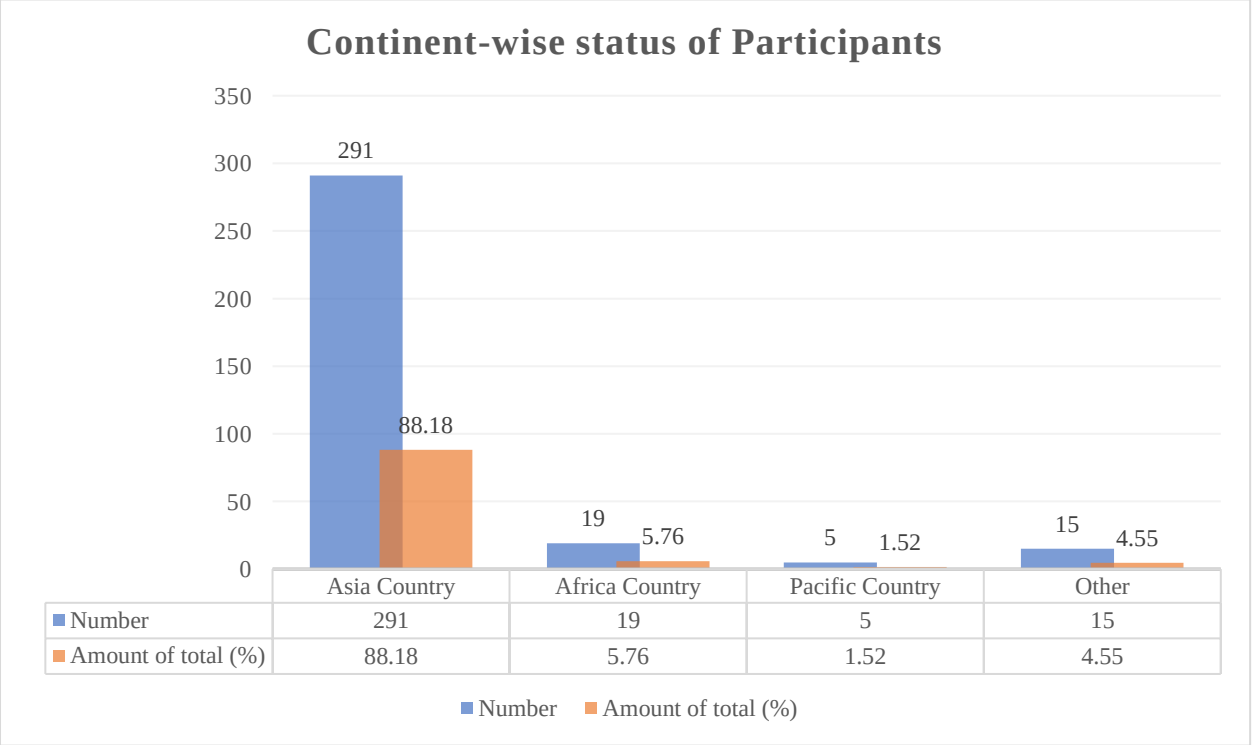
2. Participation status of Webinar 2

- Number of Registrant: 684
- Number of Participant: 330
- Participation rate (%): 48.25
- Number of Country of Participation: 31
- Number of respondents: 143-153
- Respondence of Participants rate (%): 43.33-43.94

2.1.1. Country-wise and region-wise status of Participants

S.No	**Country-wise and region-wise status of Participants**	**Country/Region abbreviation**	**Number**	**Percentage (%)**
	Total		330	100.00
1	India	IN	236	71.52
2	Thailand	TH	14	4.24
3	Nigeria	NG	7	2.12
4	Pakistan	PK	6	1.82
5	Bangladesh	BD	4	1.21
6	Malaysia	MY	4	1.21
7	Nepal	NP	4	1.21
8	Myanmar	MM	3	0.91
9	Philippines	PH	3	0.91
10	Taiwan	TW	3	0.91
11	Vietnam	VN	2	0.61
12	Pacific Countries		5	1.52
13	Other Asian Countries		12	3.64
14	Other African Countries		12	3.64
15	Other		15	4.55

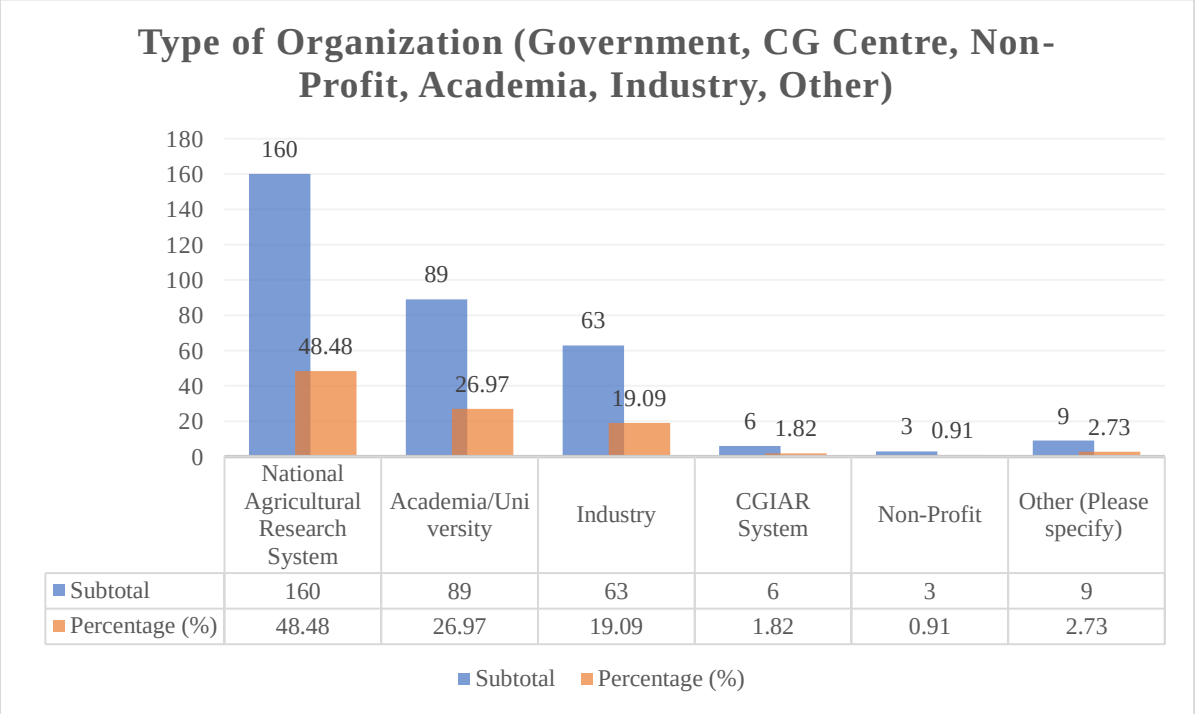
2.1.2.



2.1.2. Continent-wise status of Participants

Continent-wise status of Participants	Number	Percentage (%)
Total	330	100.00
Asia	291	88.18
Africa	19	5.76
Australia	5	1.52
Other	15	4.55

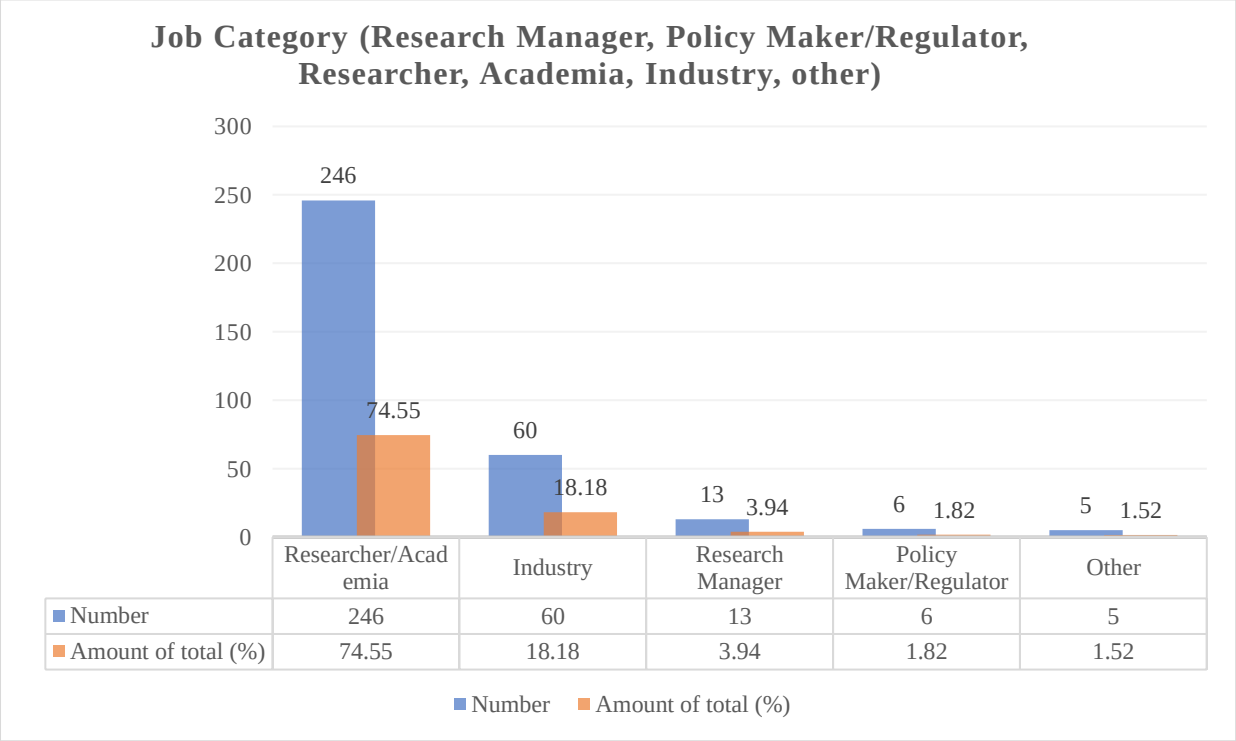
2.2.



2.2. Type of Organization (Government, CG Centre, Non-Profit, Academia, Industry, Other of Participants

	National Agricultural Research System	Academia/ University	Industry	CGIAR System	Non-Profit	Other
Subtotal	160	89	63	6	3	9
Percentage (%)	48.48	26.97	19.09	1.82	0.91	2.73

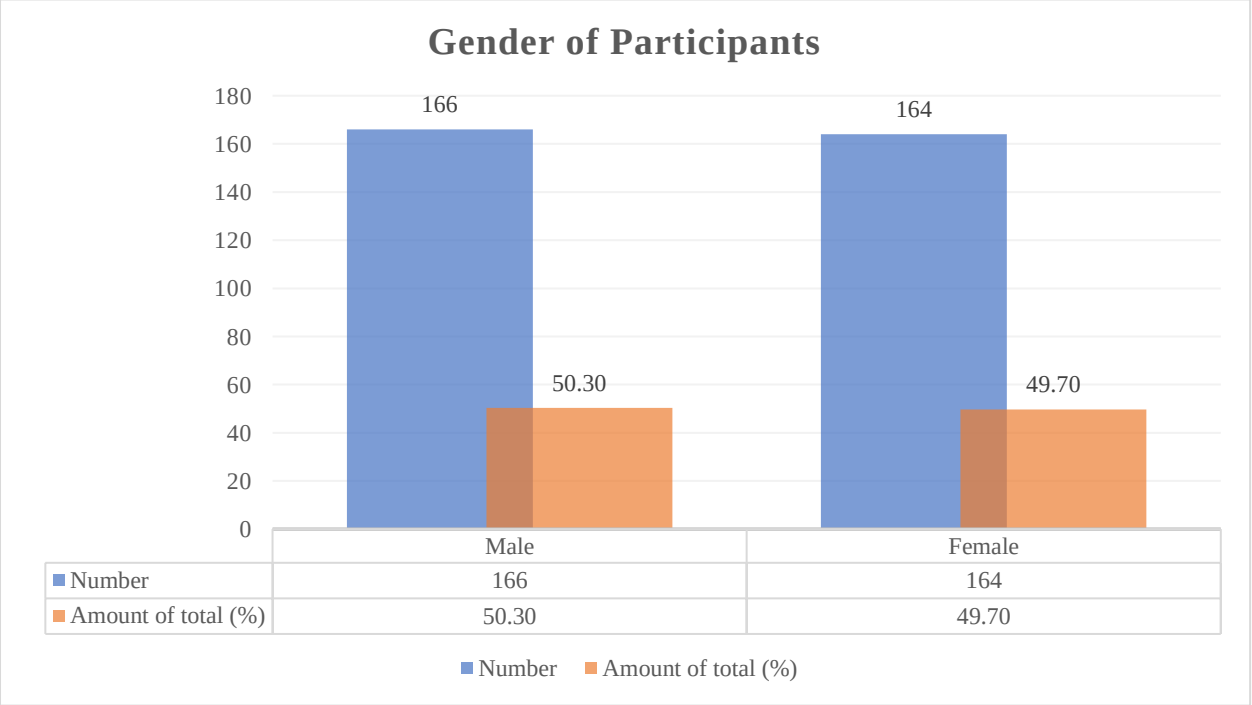
2.3.



2.3. Job Category (Research Manager, Policy Maker/Regulator, Researcher, Academia, Industry, Student, other

	Number	**Percentage (%)**
Total	330	100.00
Researcher/Academia/NARS	246	74.55
Industry	60	18.18
Research Manager of Academia/NARS	13	3.94
Policy Maker/Regulator of Academia/Industry	6	1.82
Other	5	1.52

2.4.

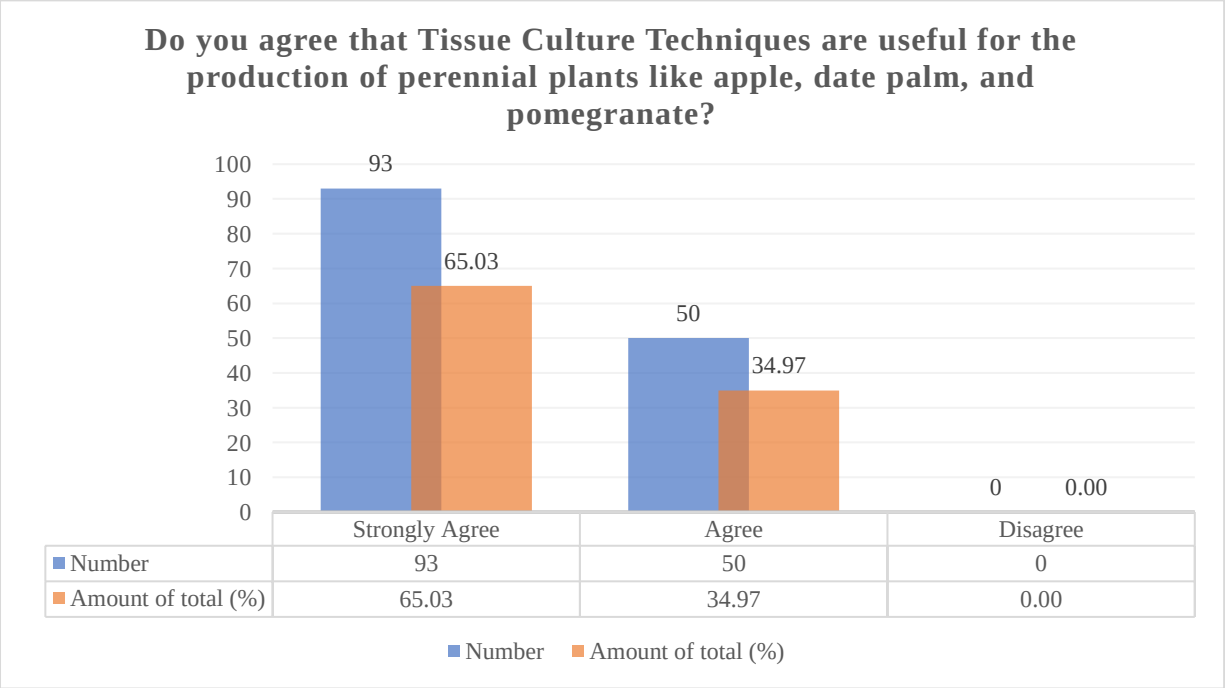


2.4. Gender of Participants

	Number	Percentage (%)
Total	330	100.00
Male	166	50.30
Female	164	49.70

Poll Question Result

2.5.

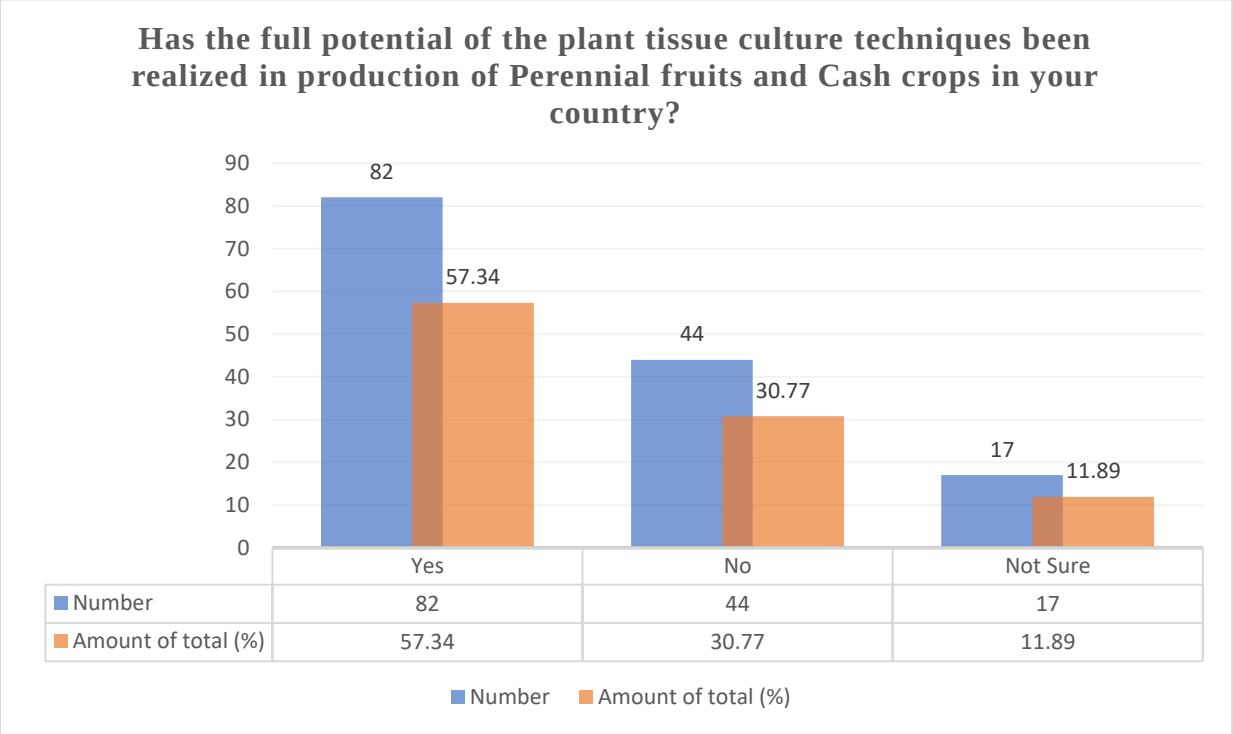


2.5. Do you agree that Tissue Culture Techniques are useful for the production of perennial plants like apple, date palm, and pomegranate?

	Number*	**Percentage (%)**
Total	143	100.00
Strongly Agree	93	65.03
Agree	50	34.97
Disagree	0	0.00

* Respondents rate (%): 43.33

2.6.

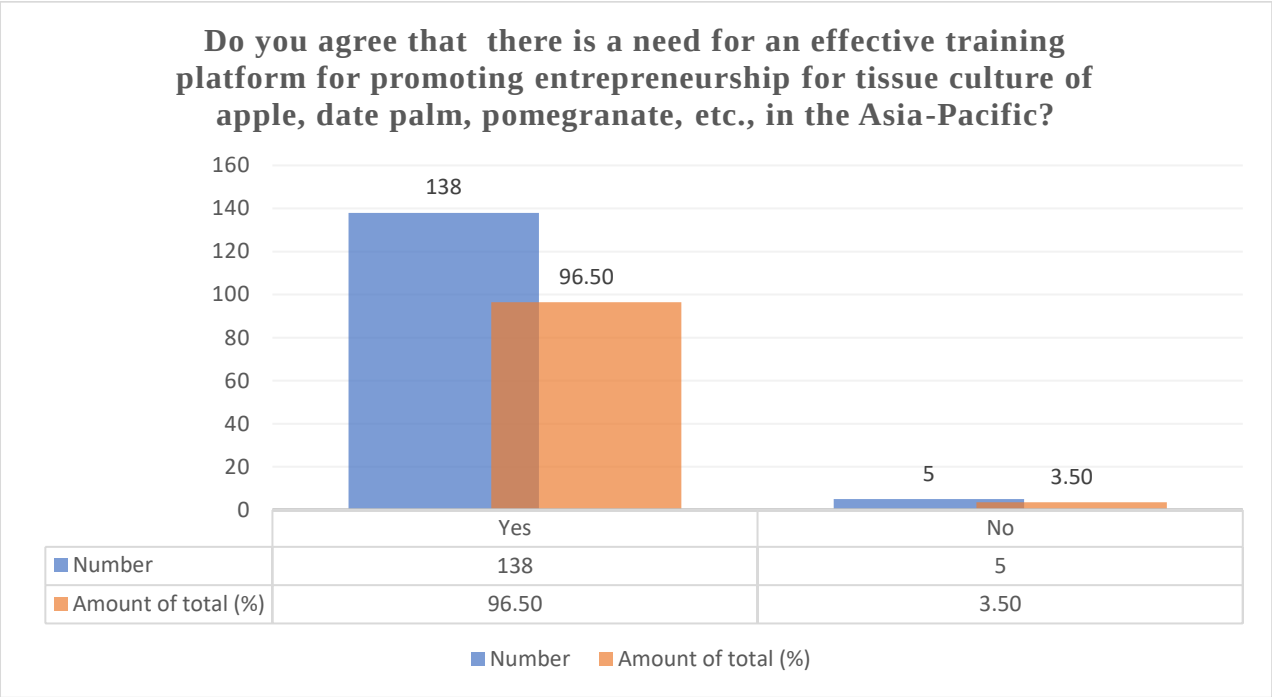


2.6. Has the full potential of the plant tissue culture techniques been realized in production of Perennial fruits and Cash crops in your country?

	Number*	Percentage (%)
Total	143	100.00
Yes	82	57.34
No	44	30.77
Not Sure	17	11.89

* Respondents rate (%): 43.33

2.7.

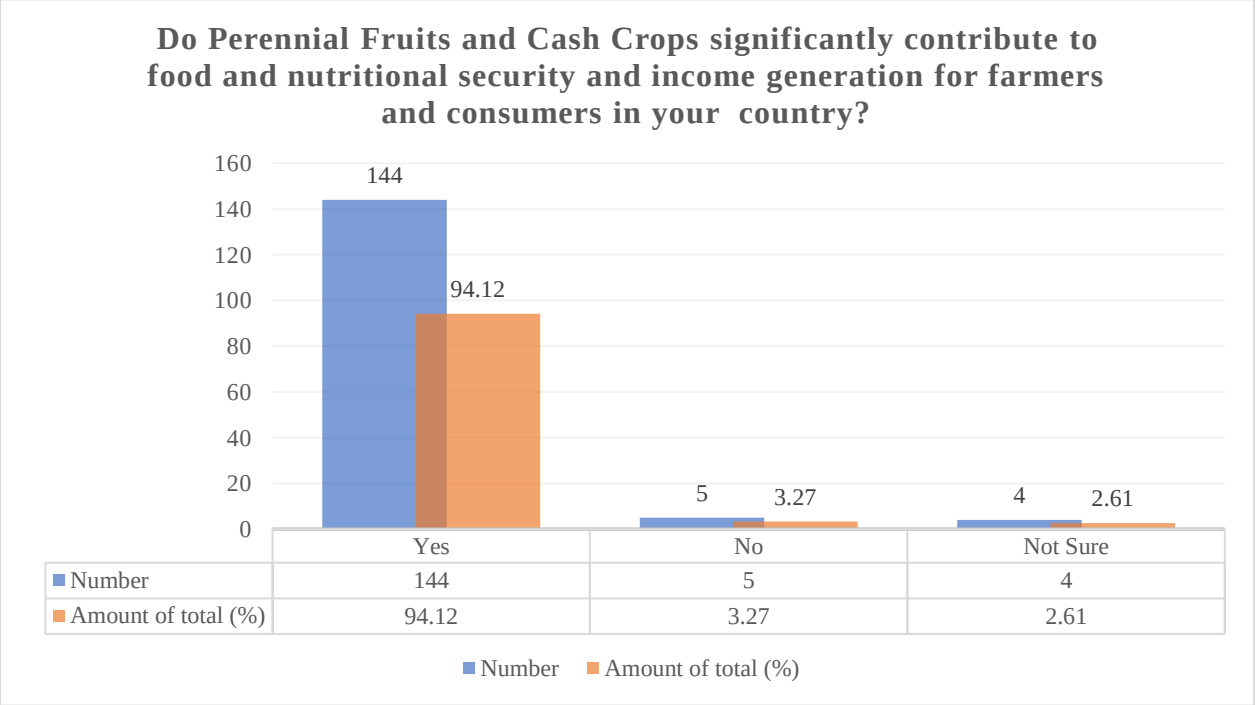


2.7. Do you agree that there is a need for an effective training platform for promoting entrepreneurship for tissue culture of apple, date palm, pomegranate, etc., in the Asia-Pacific?

	Number*	**Percentage (%)**
Total	143	100
Yes	138	96.50
No	5	3.50

* Respondents rate (%): 43.33

2.8.

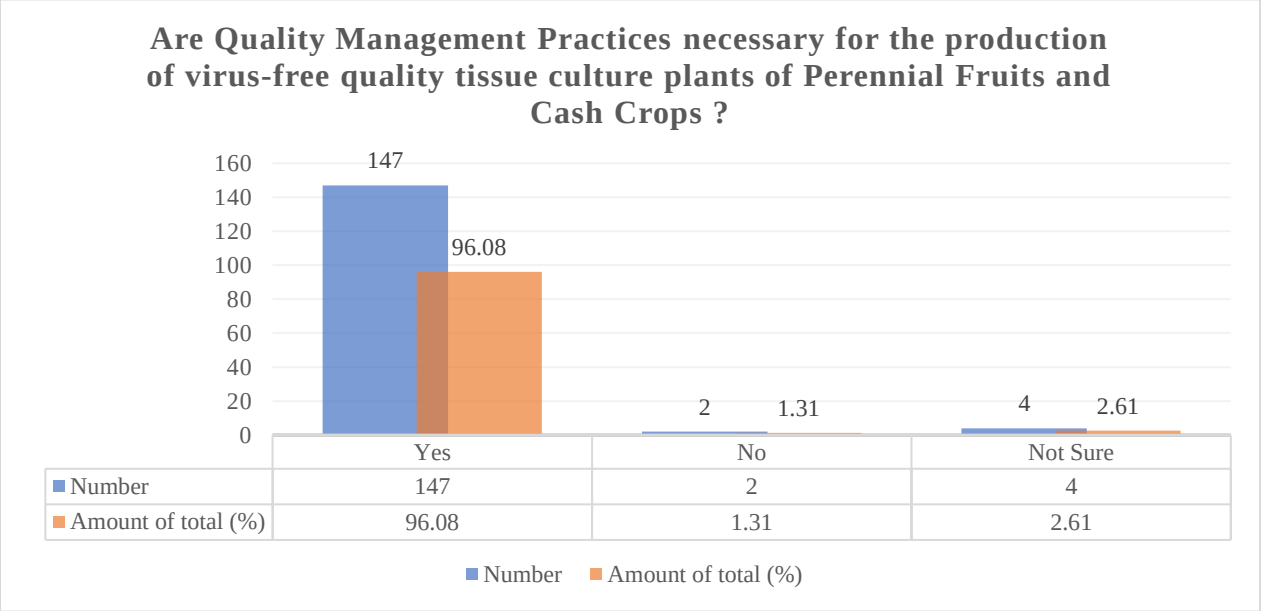


2.8. Do Perennial Fruits and Cash Crops significantly contribute to food and nutritional security and income generation for farmers and consumers in your country?

	Number*	Amount of total (%)
Total	153	100.00
Yes	144	94.12
No	5	3.27
Not Sure	4	2.61

* Respondents rate (%): 46.36

2.9.

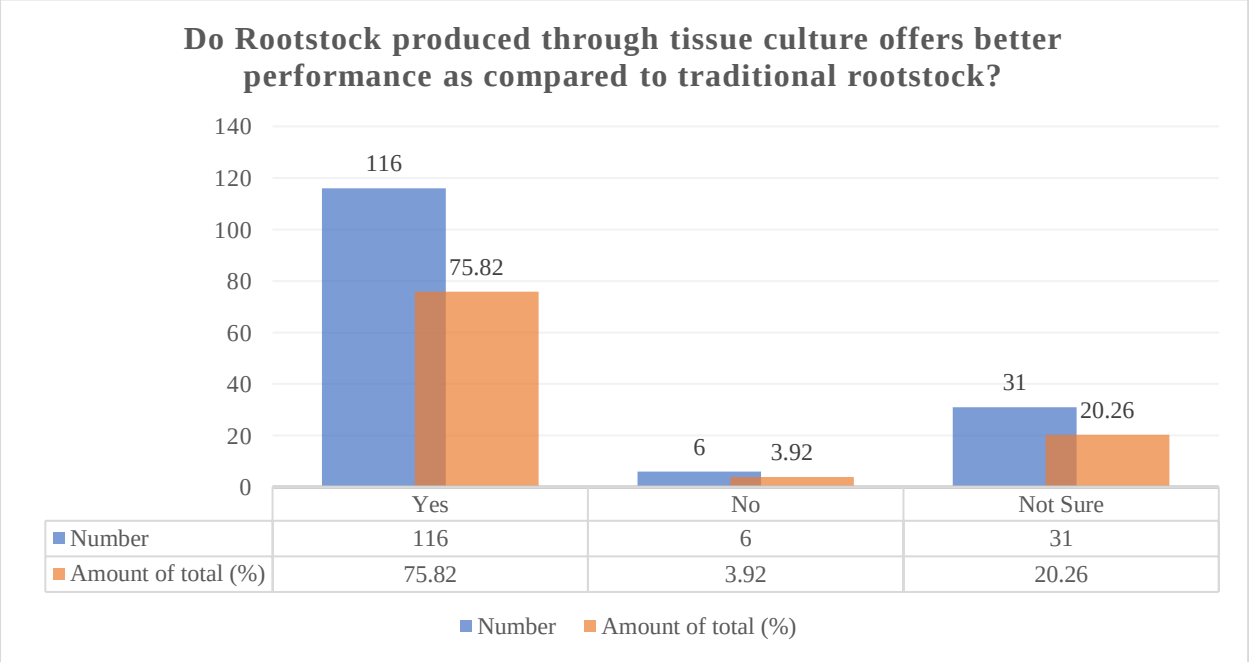


2.9. Are Quality Management Practices necessary for the production of virus-free quality tissue culture plants of Perennial Fruits and Cash Crops?

	Number*	**Percentage (%)**
Total	153	100.00
Yes	147	96.08
No	2	1.31
Not Sure	4	2.61

* Respondents rate (%): 46.36

2.10.

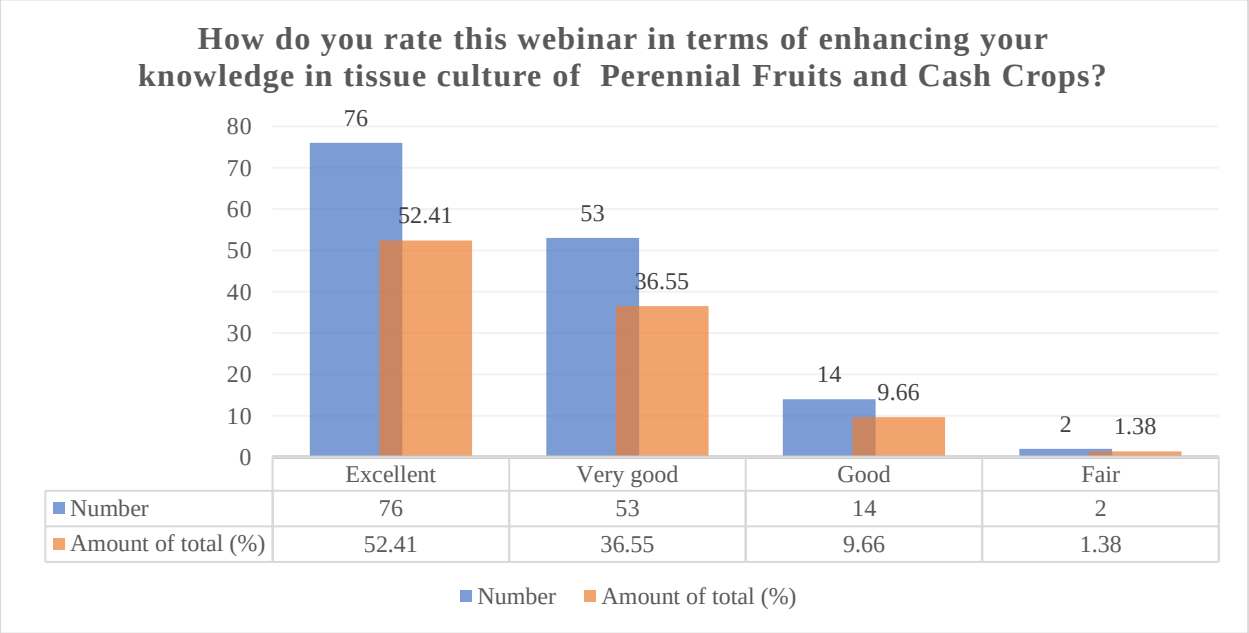


2.10. Do Rootstock produced through tissue culture offers better performance as compared to traditional rootstock?

	Number*	Percentage (%)
Total	153	100.00
Yes	116	75.82
No	6	3.92
Not Sure	31	20.26

* Respondents rate (%): 46.36

2.11.

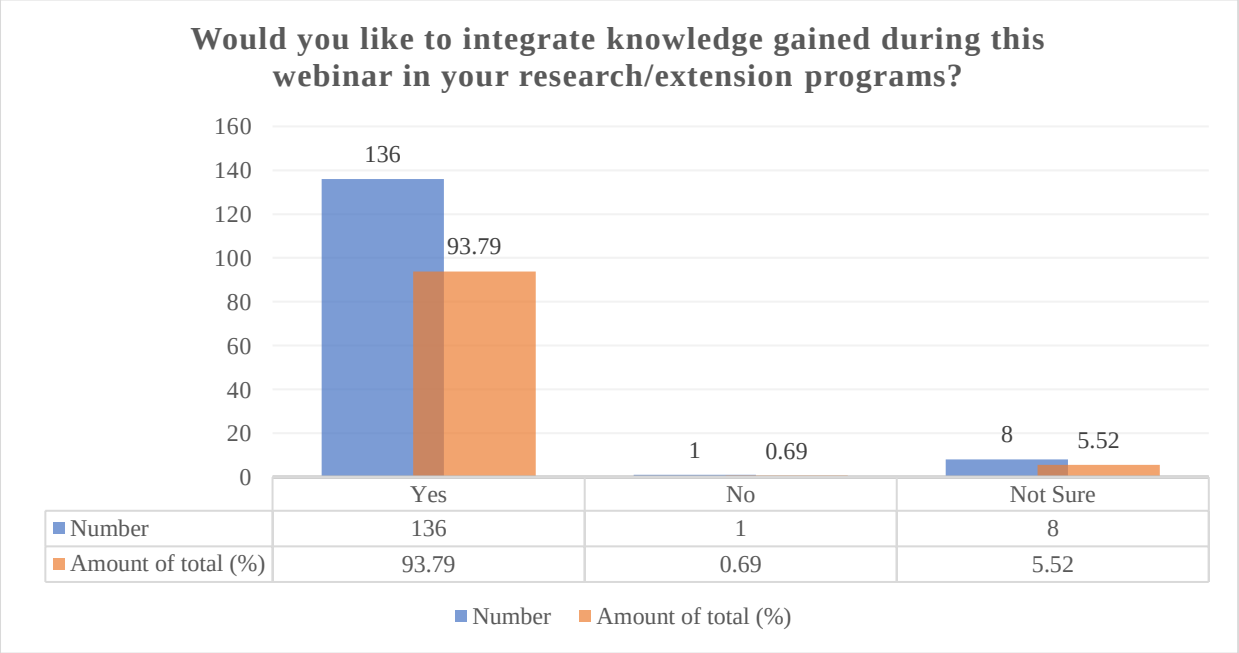


2.11. How do you rate this webinar in terms of enhancing your knowledge in tissue culture of Perennial Fruits and Cash Crops?

	Number*	**Percentage (%)**
Total	145	100.00
Excellent	76	52.41
Very good	53	36.55
Good	14	9.66
Fair	2	1.38

* Respondents rate (%): 43.94

2.12.

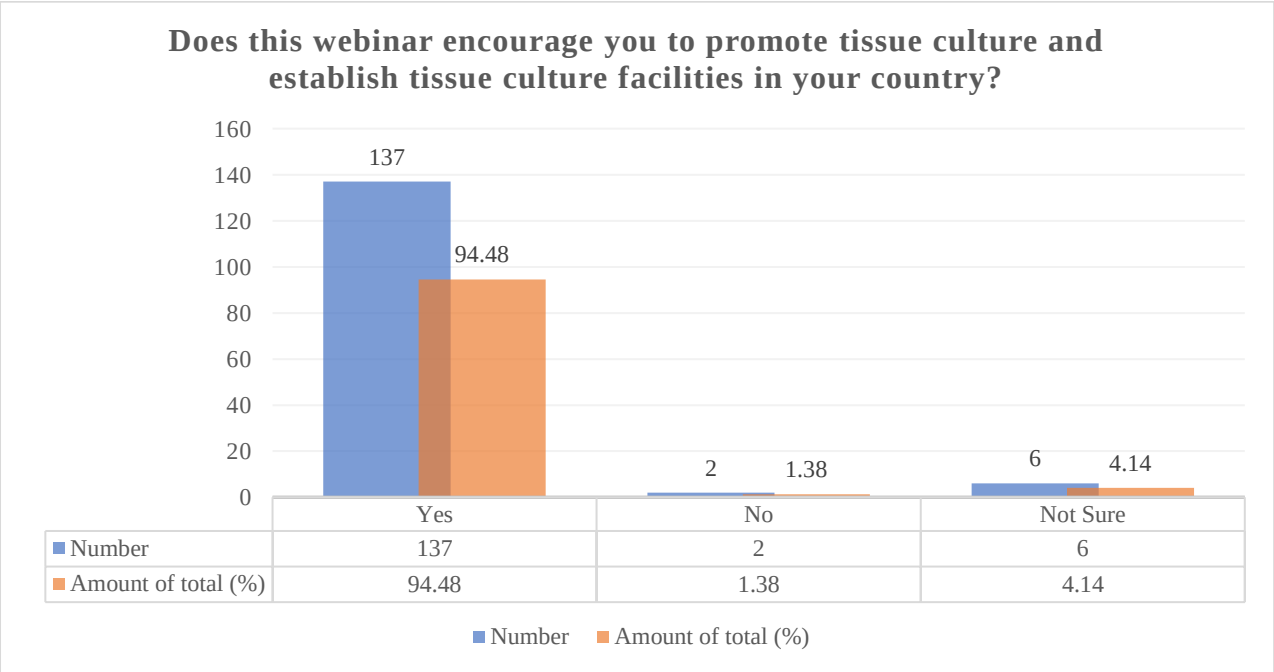


2.12. Would you like to integrate knowledge gained during this webinar in your research/extension programs?

	Number*	**Percentage (%)**
Total	145	100.00
Yes	136	93.79
No	1	0.69
Not Sure	8	5.52

* Respondents rate (%): 43.94

2.13.



2.13. Does this webinar encourage you to promote tissue culture and establish tissue culture facilities in your country?

	Number*	Percentage (%)
Total	145	100.00
Yes	137	94.48
No	2	1.38
Not Sure	6	4.14

* Respondents rate (%): 43.

Brief Proceedings

Dr. Purnima Sharma, Managing Director, BCIL welcomed the Chairperson, Co-chair, speakers and all the participants to the second webinar of the series. She briefed the participants about the various activities being undertaken by BCIL and its experience and expertise in tissue culture being one of the core areas. She also explained the significance of the tissue culture techniques in propagation of cash crops. She further highlighted the scope and potential for Plant Tissue Culture in Asia-Pacific Region and African Countries and importance of the quality management practices.

Dr. Ravi Khetarpal, Executive Secretary, APAARI and Chairperson of the webinar briefed the participants about the proposed agenda. He also briefed the participants about the various activities and initiatives of APAARI and how it was member-based organization working in partnership for the benefit of all the stakeholders in the area of agriculture and tissue culture in particular. Dr. Khetarpal also welcomed distinguished speakers, panelist & participants. He highlighted the importance of tissue culture of perennial fruits and cash crops in Asia-Pacific Region and African Countries. He wished all success for a fruitful webinar and hope that it would result in tangible benefits and successful collaborations.

The webinar was Co-chaired by Dr. Prabhat Kumar, Horticulture Commissioner, Ministry of Agriculture Government of India. He congratulated APAARI and BCIL for initiating this international series of webinar on the theme of popularizing Plant Tissue Culture techniques in Asia-Pacific Region and African Countries. Dr. Prabhat Kumar spoke about need of tissue culture techniques for Perennial Fruit/Cash Crops in India and importance of quality planting material for tissue culture plants. He also highlighted the difference in productivity between India and Asia-Pacific Region for Perennial Fruit/Cash Crops. Dr. Prabhat also spoke for the success story of perennial fruit/cash Crops in Kashmir & Himanchal regions in India.

Academia Experts from India spoke about the journey of Perennial fruit/cash Crops from Research to commercialization. Dr. S.K. Singh, Head, Division of Fruits & Horticultural Technology, ICAR-IARI, India spoke about the commercialization of perennial fruits/cash Crops in India and health benefits & export scenario of the fruit crops. Dr. Singh also presented the necessity of the genetic improvement of the fruit crops. Dr. Singh talked about developing a tissue culture protocol/standard & micropropagation techniques for good planting material for perennial fruits as well as cash crops. Dr. Singh highlighted the benefits of temporary immersion bioreactor (TIB) for large scale production of *in vitro* plantlet.

Mr. Vinod Soni, Managing Director of Nishant Biotech, a leading industrial unit in production of apple located at Bilaspur, in the state of Himachal Pradesh, India shared the success story of their industry and highlighted the advantage of tissue culture rootstock production, market capacity of industry across the world & scope of export of tissue culture rootstock. Mr. Vinod also shared the information on economic benefits from cultivation of the tissue culture of rootstock production in apple.

Dr. Aziz Torahi, Scientist, Date Palm and Tropical Fruits Research Centre, AREEO, Iran spoke about present challenges of Date Palm tissue culture techniques in Iran & potential of tissue culture for Perennial fruit/cash Crops in Iran. Dr. Torahi highlighted challenges for tissue culture of date palm in different parts of the world & present valuable suggestions towards Optimization of existing protocols for mass propagation of different date cultivars, purchasing a reliable protocol for mass production & importing original offshoots or healthy tissue culture seedlings.

Panel discussion with experts from Iran, Nigeria, and India deliberated on best practices and the way forward followed by a question answer session with the participants to address their specific queries

on important issues of common interests. The esteemed panel consisted of Mr. Tarun Arora, Director, IG International Pvt. Ltd, India, Dr. Alireza Bonyanpour, Professor, AREEO, Iran, Prof. Inuwa Shehu Usman, Professor, IAR, Nigeria, Dr. Vidya Gupta, Former Chief Scientist, CSIR – NCL, India. In response to the questions raised by moderator Dr. Shiv Kant Shukla, DGM, BCIL, experts expressed opinion as specified below:

- Mr. Tarun Arora spoke about good tissue culture practices related to better fruit quality & consumer acceptance and market for Perennial Fruit/Cash Crops. Being a leading fresh fruit exporter and global players Mr. Tarun also highlighted importance of root stock business in global scenario.

- Dr. Alireza Bonyanpour talked about progress of tissue culture research of pomegranate in Iran & commercial and mass propagation of pomegranate through tissue culture possible in Iran.

- Prof. Inuwa Shehu Usman highlighted the best practices for micropropagation of sugarcane in African with context particularly for virus indexing. Prof. Inuwa also shared his experience on scaling up of tissue culture operation of sugarcane.

- Dr. Vidya Gupta spoke about advantages of tissue culture plants of perennial horticultural crops & need for testing the genetic fidelity of these crops through available molecular markers.

The session concluded with the closing remarks from Dr. Rishi Kumar Tyagi, Coordinator- APCoAB-APAARI thanked to BCIL for taking up this initiative and associating with APAARI for jointly organizing this webinar series at a global level. Dr. Tyagi thanked to eminent speckers, panelist & participants for joining the webinar series. Dr. Tyagi also spoke about benefits and importance of the tissue culture techniques and the need for popularizing plant tissue culture in Asia-Pacific Region. Online polls on topics of significance were also conducted to keep the audience involved and have a fair idea of the status, progress and requirements of the tissue culture industry in the different regions across Asia pacific and African zones. The results of these polls are tabulated in the data compiled as above. Webinar was moderated by Dr. Shiv Kant Shukla, DGM, BCIL, India

The detailed presentations by the learned academicians and esteemed industry experts are provided as **Annexure 2** for the record and ready reference.

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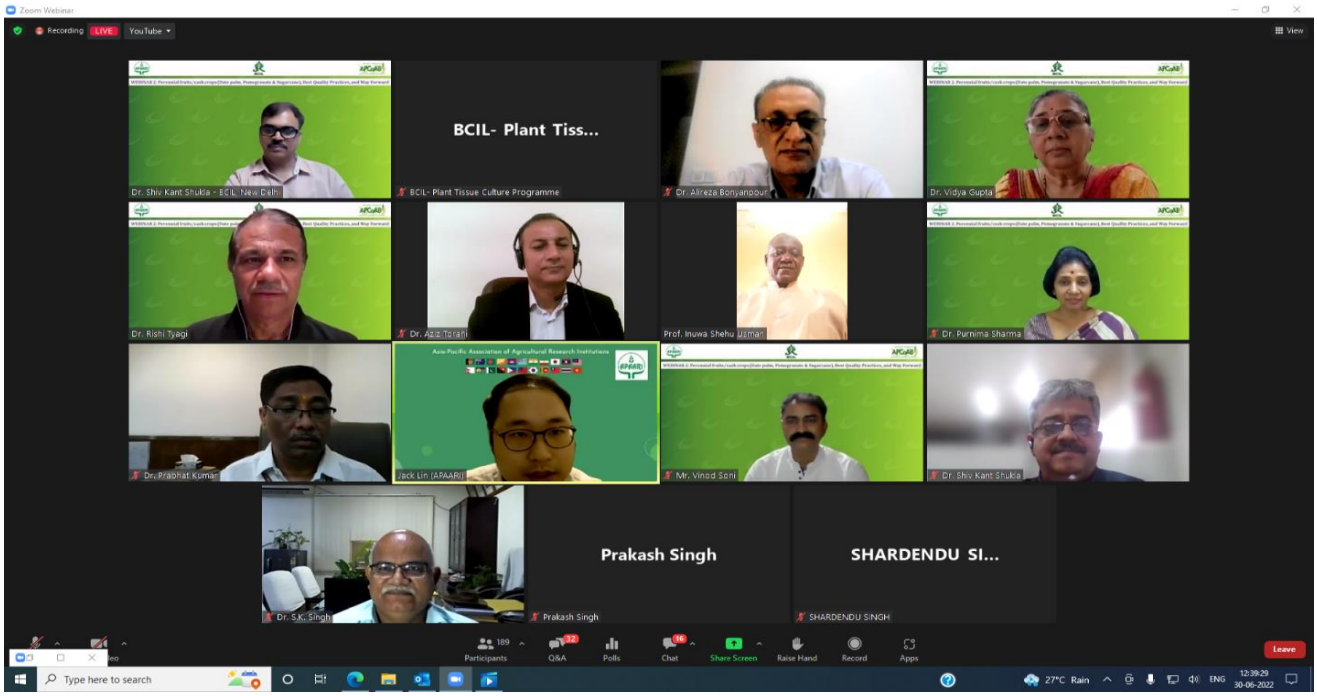
BCIL- Plant Tiss...
Dr. Shiv Kant Shukla - BCIL New Delhi
BCIL- Plant Tissue Culture Programme
Dr. Alireza Bonyanpour
Dr. Vidya Gupta
Dr. Rishi Tyagi
Dr. Aziz Torahi
Prof. Inuwa Shehu Usman
Dr. Purnima Sharma
Dr. Prabhat Kumar
Jack Lin (APAARI)
Mr. Vinod Soni
Dr. Shiv Kant Shukla
Dr. S.K. Singh
Prakash Singh
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"Date Palm Tissue Culture Success Story"
IN IRAN
By: Aziz Torahi
Scientific board member of
Horticultural Sciences Research Institute of Iran
Date Palm & Tropical Fruits Research Center
June, 30, 2022
HSRI
BCIL- Plant Tiss...
Dr. Alireza Bonyanpour
Mr. Vinod Soni
Dr. S.K. Singh
Dr. Purnima Sha...
Dr. Prabhat Ku...
Dr. Ravi Khetrapal
Dr. Vidya Gupta
Jack Lin (APAARI)
Prakash Singh
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WEBINAR 3

Webinar on "Tissue Culture of Tree/Woody Plants (Bamboo & Teak): Significance, Best Practices, and Way Forward "

Date: July 29, 2022
Time: 11:30 AM ICT; Bangkok time (10:00 AM IST)

➢ About Webinar:

The third webinar in this series focussed on the Significance of Tissue Culture of Tree/Woody Plants (Bamboo & Teak). Bamboos are used since ancient times for many applications such as furniture, construction, food, etc. Apart from traditional uses there are ever increasing, contemporary uses in industries like construction, textile, energy production, Bio ethanol, Bio CNG, charcoal, etc. It has the potential to make revolution in agriculture, industrial, economic growth & ecological security of the nation along with supporting in livelihood of rural population. Similarly, Teak has an important application in places where weather resistance is desired. It has high tensile strength, and tight grain that make it suitable for outdoor furniture, cutting boards, indoor flooring, countertops, indoor finishings and boat decks. Plant Tissue culture or micropropagation of teak trees are used because cultivating plants through seeds is a bit difficult because of the hard tegument present on the seeds. Also, the germination from seeds is irregular. Micropropagation provides the best alternative for propagation of teak on a large scale. Tissue culture of Teak and Bamboos are being done commercially in many countries including India but quality practices need to be adopted for production of virus free quality tissue

culture plants of these species for desired field results. Mr. Charanjit Singh, Additional Secretary, Ministry of Rural Development, Government of India was the Chairperson of this webinar. Industry experts from leading companies in India presented their success stories in the field of tissue culture in bamboo and teak.

AGENDA

WEBINAR 3

Tissue Culture of Tree/Woody Plants (Bamboo & Teak): Significance, Best Practices, and Way Forward

11:30 AM – 11:35 AM:	**Welcome Note**
Dr. Purnima Sharma, Managing Director, Biotech Consortium India Limited (BCIL), India	
11:35 AM – 11:40 AM:	**Opening Remarks**
Dr. Ravi Khetarpal, Executive Secretary, Asia Pacific Association of Agricultural Research Institutions (APAARI), Thailand	
11:40 AM – 11:45 AM:	**Remarks by Chairperson**
Mr. Charanjit Singh, Additional Secretary, Ministry of Rural Development, Govt. of India	
11:45 AM – 12:05 PM:	**Journey from Research to Commercialization by Academia**
Tree Tissue Culture:	**Dr. (Mrs.) Susmita Shukla, Associate Professor, Amity University, India**
12:05 AM – 12:25 PM:	**Success Story by Industry**
12:05 PM-12:15 PM:	**Bamboo Success Story by Industry Expert – Er. Goutham Palani, COO, Genewin Biotech, India**
12:15 PM-12:25 PM:	**Teak Success Story by Industry Expert – Dr. Balakrishna Muthukuri, Chairman, Mother Agri Biotech Laboratories India Pvt. Ltd, India**
12:25 PM – 12:50 PM:	**Panel Discussions**
Moderator:	**Dr. Shiv Kant Shukla, Dy General Manager, BCIL, New Delhi, India**
Panelist:	**1. Dr. K. Gurumurthi, Former Director, IFGTB, India** **2. Dr. Chandrashekhar Biradar, Country Director-India, CIFOR-ICRAF and Chief of Party (TOFI), Asia Continental Program** **3. Mr. Abhay Gandhe, Advisor, Transform Rural India Foundation (TRIF), India**
12:50 PM-01:00 PM:	**Open Q & A Session**
01:00 PM-01:05 PM:	**Brief Closing Remarks**

Dr. Rishi Kumar Tyagi, Coordinator, APCoAB, APAARI, Thailand

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SPEAKER PROFILE

Chairperson

Mr. Charanjit Singh

Mr. Charanjit Singh is an **Indian Forest Service Officer** of 1990 Batch – MP Cadre. He is a Masters of Philosophy in Strategic Studies from Madras University and Master of Science (Zoology) from Kurukshetra University. He has an extensive experience as a civil servant. He is an environmentalist with vast administrative experience in the functioning of Central and State Governments. Apart from serving Forest Department in the State of Madhya Pradesh, he has also served as Director in the Department of Land Resources, Govt. of India from 2008-2015.

He is presently heading the Rural Livelihood Division in the Ministry of Rural Development, Government of India with the responsibility to execute the vision of the Government to strengthen community institutions under National Rural Livelihood Mission (NRLM), so that they are efficiently managed and attain self-reliance. He has published articles on Land Acquisition, Land Titling, Land Records and Rural Development.

Dr. Ravi Khetarpal

Dr Ravi Khetarpal is the Executive Secretary, APAARI since 2017 and is based in Bangkok. He promotes and facilitates APAARI's vision of strengthening agricultural research and innovation for sustainable agricultural development in the region through networking amongst more than 80 members. He coordinates APAARI's projects sponsored by international and bilateral organisations on knowledge management, agriculture innovation systems, agriculture science technology indicators, strengthening phytosanitary compliance for international seed movement and pesticide risk mitigation in various countries of the Asia–Pacific region. He is the current Chair of the Global Forum of Agricultural Research and Innovation (GFAR), and the Tropical Agricultural Platform of FAO – a G20 initiative for developing and promoting the agricultural innovation system. He has served CABI – South Asia (India) as Regional Director and also as its Regional Advisor on strategic science partnerships for a span of more than seven years. Prior to that, he worked for the National Agricultural System in India in the field of plant protection for 30 years. He holds a PhD in life sciences (plant pathology) from the University of Paris and was a Visiting Scientist in an EU Collaborative Project at Institut National de la Recherche Agronomique (INRA), Versailles, France for three years.

Dr. Purnima Sharma

Dr. Purnima Sharma is the **Managing Director** of **Biotech Consortium India Limited (BCIL), New Delhi**. BCIL is a public limited company promoted by the Department of Biotechnology, Ministry of Science and Technology, Government of India and the all-India financial institutions for facilitating biotechnology commercialization.

Dr. Purnima Sharma is a doctorate in Experimental Medicine from Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh, the prestigious autonomous institution and deemed Medical University of national importance of the Ministry of Health, Government of India with Post-Doctoral experience from IIT, Mumbai, and has to her credit many awards for excellence in academics. She has more than 30 years of experience in the area of technology evaluation and transfer, management of IPR, project consultancy including DPRs for setting up Incubators and Science Parks, managing start-up ecosystem, public-private partnership funding schemes, entrepreneurship development etc. Dr. Sharma is a member of a number of national and state level committees responsible for biotech development and commercialization and also a member of The National Academy of Sciences, India (NASI), the first science academy of the country dedicated towards cultivation and promotion of science & technology in the country.

Dr. Rishi Kumar Tyagi

Dr Rishi Kumar Tyagi is presently working as **Coordinator** in **Asia-Pacific Consortium on Agricultural Biotechnology and Bioresources (APCoAB), APAARI, Bangkok, Thailand**. Dr Tyagi holds a Ph.D. degree in Botany from University of Delhi, Delhi, India and Post-Graduate Diploma in Intellectual Property Rights laws from Indian Law Institute (Deemed University), New Delhi, India. He worked as Post-Doctoral Research Associate in University of Illinois, USA, worked on wide hybridization of soybean employing biotechnological methods. He has more than 34 years of experience in managing plant genetic resources (PGR). Since 2009 to 2017, he was holding the position of Head, Division of Germplasm Conservation at the ICAR-National Bureau of Plant Genetic Resources, New Delhi, India, managing its National Genebank.

Dr Tyagi has to his credit 111 research papers in high impact factor peer reviewed journals, 156 book chapters/policy papers/proceedings, 27 edited books/monographs and 68 invited lectures in international seminar/symposia/conferences. His current areas of interest are promoting agricultural biotechnology and conservation and use of bioresources for sustainable agricultural development in the Asia-Pacific region for the benefits of smallholder farmers, through greater stakeholder partnerships, enabling policy development and advocacy, enhanced capacity building and greater public awareness.

Speakers

Dr. (Mrs.) Susmita Shukla

Dr. (Mrs.) Susmita Shukla is an **Associate Professor, Women Scientist (DBT-BioCARe)** and Fellow Member of International Institute of Organized Research, Centre for Plant and Environmental Biotechnology, Amity Institute of Biotechnology, Amity University

Dr. Shukla is an M.Sc. and PhD in Biotechnology and has more than 18 years of vast experience of teaching and research in leading Universities and Institutes. She is actively involved in mentoring, guiding, supervising graduates, post graduate students and PhD scholars. Her broad research area is in vitro clonal propogation of elite medicinal and economic tree species, embryo rescue, secondary metabolite production, mass multiplication through tissue culture and transgenics. She has developed robust micropropagation protocols of some rare and endangered tree species, medicinal starch yielding, horticultural crops and involved in establishment of in vitro regeneration via direct and indirect mediated genetic transformation Systems.

She is a recipient of various prestigious award as IASc-INSA-NASI fellowship, DBT travel grant Women Scientist BioCARe, Best Young Scientist Award, Scientist of the Year Award, Best Oral presentation award, Best Educator award, etc. She has run successfully Projects funded by Biotech Industry and Department of Biotechnology, Government of India. She has published research papers in reputed National and International journals. She has presented her research work in National and International conference and filed patent of commercial use. She has organized National, International seminars/conferences, Indo-African Training Program etc. Dr Shukla's Lab's focuses on production of quality planting material by altering the plant hormones for growth and developments and in development of transgenic plants specifically underlying biotic and abiotic stress tolerance.

Er. Goutham Palani

Er. Goutham Palani is basically a **mechanical engineer** but working emphatically on plant tissue culture, pollution control, climate change and biotechnology.

He is the Chief Operating Officer & Partner of M/S Genewin Biotech, Hosur, Tamil Nadu, one of the leading producers of tissue culture plants in India having enough knowledge in production of tissue culture plants namely Banana, Bamboo, Ginger, Turmeric, vanilla, Rose, Aloe Vera and many ornamental plants. Being an entrepreneur, he has already raised awareness among people by educating them about bamboo and its uses and encouraging individuals to abide by the principles of sustainable living to live a healthy life while utilizing the earth's resources and leaving space for the wilderness and wildlife. He believes in practicing ways of living that encourage health and happiness while reducing species' extinction and the environment's destruction and also ensuring sustainable living to revolutionize the growth of agriculture in India.

Dr. Balakrishna Muthukuri

Mr. Balakrishna Muthukuri is the **Founder, Scientist and Chairman** of M/S Mother Agri Biotech Laboratories India Pvt Ltd, Bangalore, Karnataka and has vast experience in Tissue Culture Teak Plants. He has more than 26 years' experience in Tissue Teak & expertise in Clonal propagation of 250 plant species including medicinal plants.

He was scientific consultant for AP Forest Department, in-charge scientist for AP- Netherlands BT Programme & produced 9 best clones of Teak. Apart from being a Guide to budding biotechnologists, he has published a book on micro propagation techniques for multi propagation of trees from Lab to farmers in the fields in 2005.

Moderator

Dr. Shiv Kant Shukla

Dr. Shiv Kant Shukla has made significant contribution in the area of commercial biotechnology and plant tissue culture. He is Doctorate in Biotechnology from Pt Ravishankar Shukla University Raipur. Dr. Shukla is currently working as the **Dy. General Manager, BCIL, New Delhi**, an organization promoted by Department of Biotechnology, Govt of India. Prior to BCIL, he was heading a leading commercial plant tissue culture unit in central India. He has approx. 22 years of diversified experience covering research, production of tissue culture plants, field extension, quality management, biotech parks, technology transfer, administration and management of biotech projects. Dr. Shukla has more than 50 publications and chaired/delivered more than 30 invited/key note speech at national and international forum. He has successfully organized more than 30 Entrepreneurship development programme (EDP) and conferences. Dr. Shukla has managed prestigious international and national long-term projects of Government of India. His contributions have been acknowledged by various recognitions and awards including Certificate of Appreciation from Govt of Chhattisgarh, West Bengal, Hony. Professorship from Amity University Uttar Pradesh, Rastriya Gaurav Award & "Certificate of Excellence" from India International Friendship Society, New Delhi etc.

Panelists

Dr. K Gurumurthi

Dr. K Gurumurthi, is the **Former Director, Institute of Forest Genomics and Tree Breeding (IFGTB), Coimbatore and Chairperson, BCIL's Quality Stock Culture Initiative**. He has also served as a Senior Advisor in the Department of Biotechnology, Govt. of India and as a Scientist in ICFRE for 30 years. He was trained in Oxford and has also served as Assistant Regional Advisor in Food and Agriculture Organisation (FAO) of the United Nations.

Dr. Gurumurthi has served many high-level Task Forces and Committees in Department of Biotechnology, Govt. of India on promoting Agricultural research and commercialization in the capacity of Chairperson. He has an extensive experience and expertise in the area of commercial plant tissue culture. He has a first-hand on-site experience of the Tissue culture Industry all over the country and has widely travelled all over India for physical site visits of Tissue culture production units under the NCS-TCP programme of the Department of Biotechnology, Government of India.

Dr. Chandrashekhar M. Biradar

Dr. Chandrashekhar M. Biradar, is **Country Director, CIFOR-ICRAF-India with Asia Continental Program; and Chief of Party (CoP, TOFI Program-Trees outside Forests in India)**. A landscape ecologist with broad experience in executing agroecosystem research and outreach across the diverse landscapes in Asia, Africa, and the Americas. Dr. Biradar has a multidisciplinary educational background, with B.Sc. in Forestry; M.Sc. Forestry (Tree Improvement and Genetic Resources), and a Ph.D. in Environmental Sciences and Earth Observation Systems. His core expertise focuses on the system approach with digital augmentation, agroecology and functional productions. Before joining CIFOR-ICRAF, he worked with ICARDA, the University of New Hampshire, the University of Oklahoma, IWMI, and the IIRS-ISRO.

Dr. Biradar has over 20 years of experience serving as a Researcher, Principal Scientist, Manager, Head of Units, and Research Team Leader and has published over 380+ research articles, tools, and products and received several national and international awards. His current research & outreach focused on harnessing advances in technologies, trees outside forests, agroforestry, indigenous knowledge, and citizen science to restore functional agroecosystems for ecologically sustainable and economically viable landscapes and livelihoods.

Mr. Abhay Gandhe

Mr. Abhay Gandhe is a **senior independent agriculture consultant & rural livelihoods development** professional having rich experience of 38 years in managing agriculture development programmes in India, including areas like designing proposals, mid-term technical facilitation, grants & budget management, Monitoring & evaluations, stakeholder networking and supply chain management.

Has worked in almost all the states of India through BAIF- Pune, NABARD and Tata Trusts. Has worked intensively on the commodities of Bamboo, Pulses, Apricots, Cashew, Mango etc. Currently he is freelancing as consultant with agencies like TRIF and interested to get associated with programmes for technology-based solutions in agricultural value chain development.

Highlights/Outcome Report of Webinar 3

Webinar 3: Tissue Culture of Tree/Woody Plants (Bamboo & Teak): Significance, Best Practices, and Way Forward

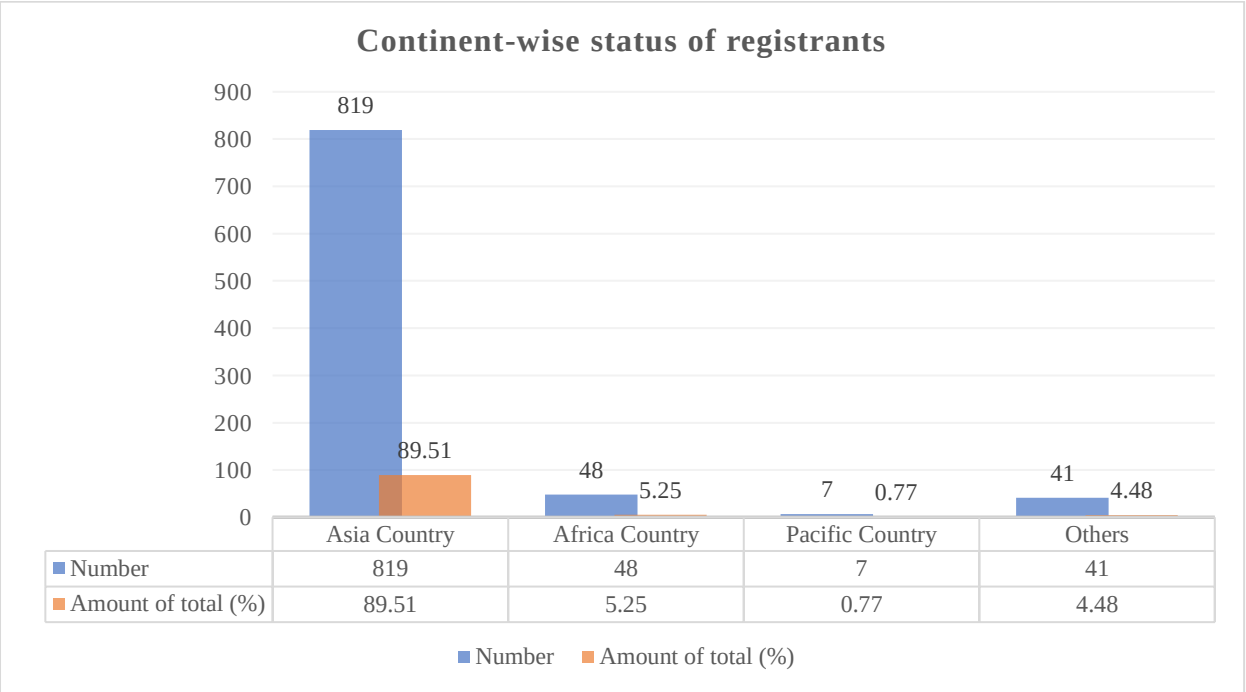
1. Registration Status

- **Number of Registrants:** 915
- **Number of Country:** 51

1.1.1. Country-wise and region-wise status of registrants

Country-wise and region-wise status of registrants		Country/Region Abbreviation	Number	Percentage (%)
No.	Total		915	100.00
1	India	IN	726	79.34
2	Nigeria	NG	16	1.75
3	Philippines	PH	14	1.53
4	Thailand	TH	13	1.42
5	Nepal	NP	10	1.09
6	Indonesia	ID	9	0.98
7	Pakistan	PK	7	0.77
8	Bangladesh	BD	6	0.66
9	Malaysia	MY	6	0.66
10	Iran	IR	4	0.44
11	Taiwan	TW	4	0.44
12	Vietnam	VN	3	0.33
13	Pacific Countries		7	0.77
14	Other African Country		32	3.50
15	Other Asian Country		17	1.86
16	Others		41	4.48

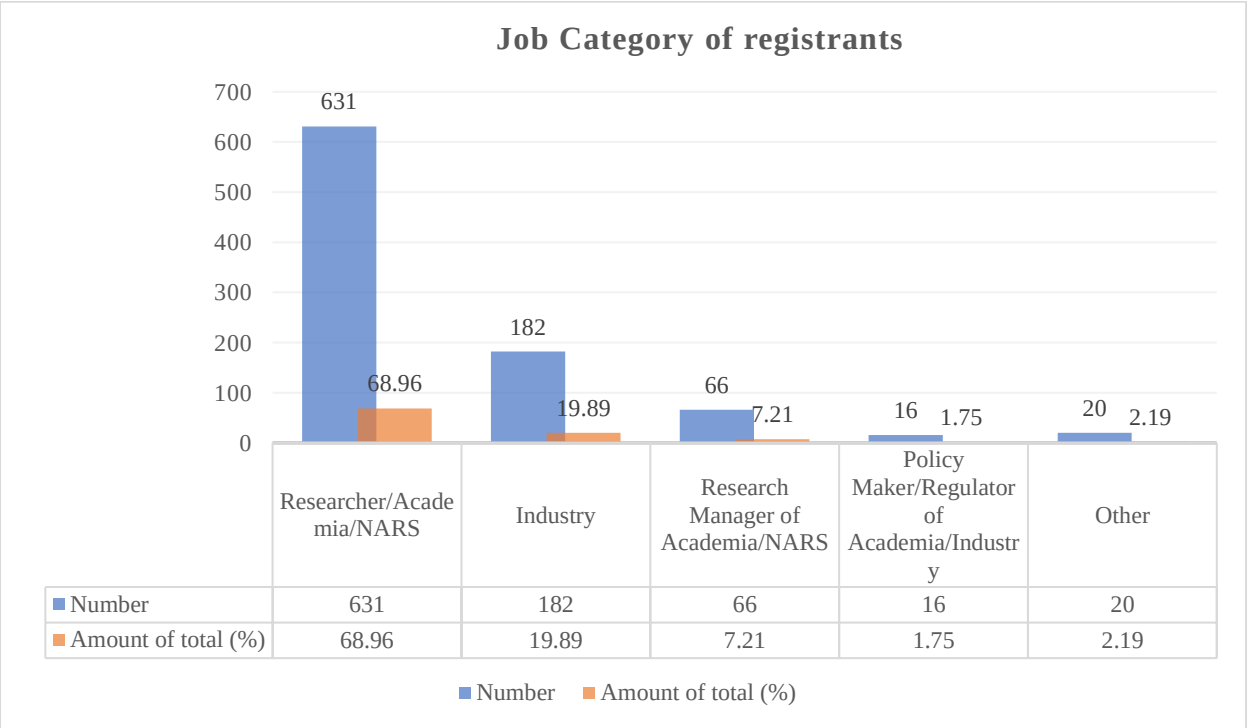
1.1.2.



1.1.2. Continent-wise status of registrants

Continent-wise status of registrants	Number	Percentage (%)
Total	915	100.00
Asia	819	89.51
Africa	48	5.25
Australia	7	0.77
Others	41	4.48

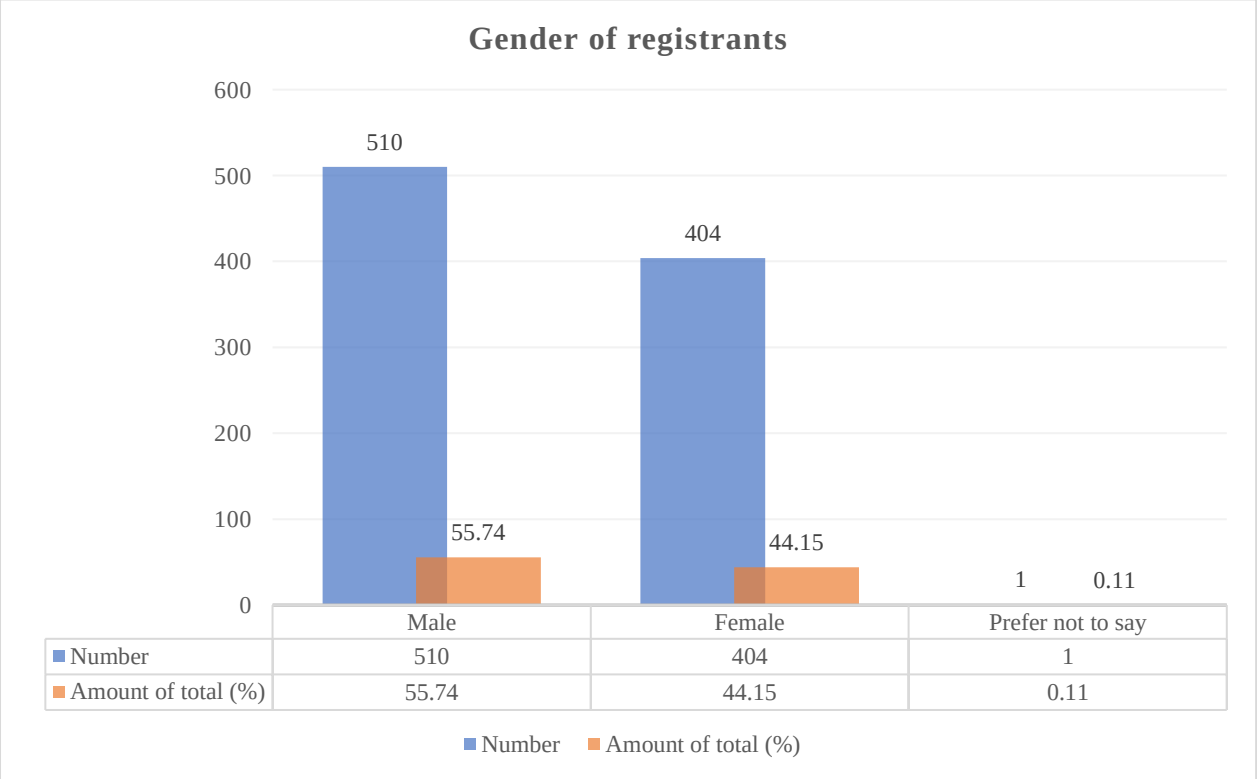
1.2.



1.2. Job Category of registrants

Job Category of registrants	**Number**	**Percentage (%)**
Total	915	100.00
Researcher/Academia	631	68.96
Industry	182	19.89
Research Manager of Academia	66	7.21
Policy Maker/Regulator of Academia/Industry	16	1.75
Other	20	2.19

1.3.



1.3. Gender of registrants

Gender of registrants	Number	Percentage (%)
Total	915	100.00
Male	510	55.74
Female	404	44.15
Prefer not to say	1	0.11

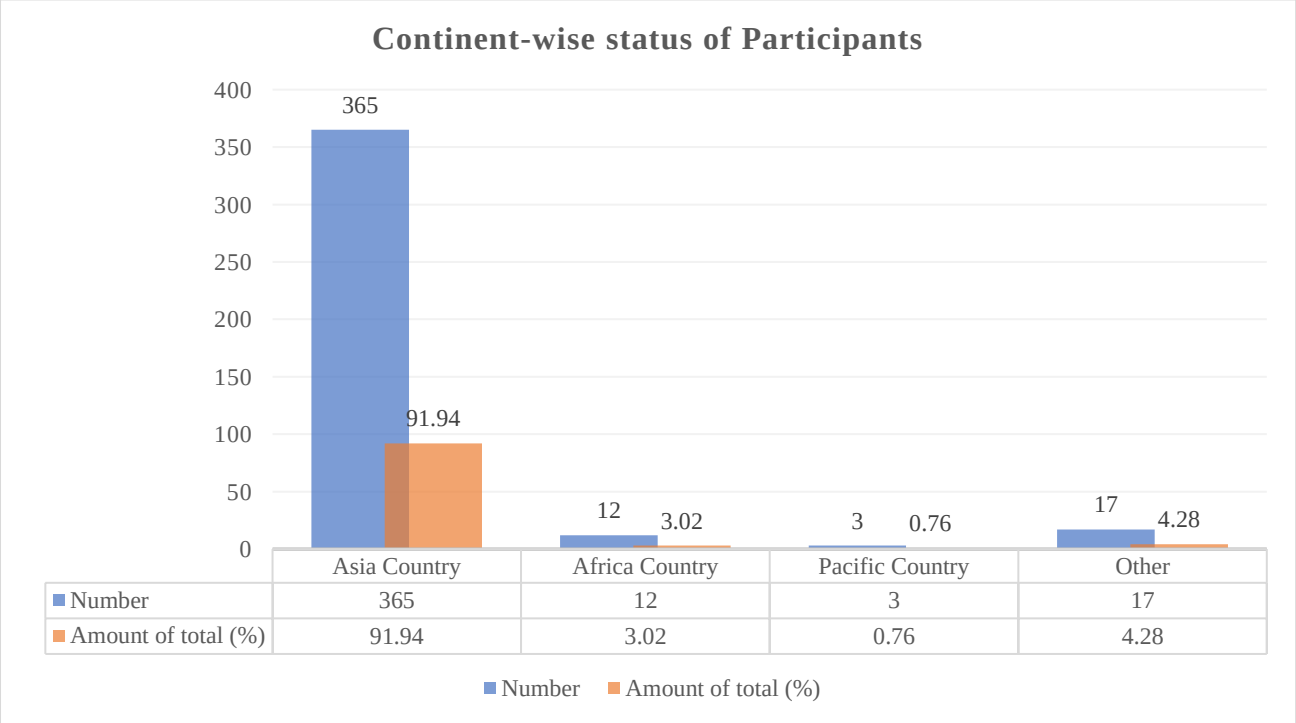
2. Participation status of Webinar 3

- Number of Registrant: 915
- Number of Participant: 397
- Participation rate (%): 43.39
- Number of Country of Participation: 30
- Number of respondents: 136~178
- Respondence of Participants rate (%): 34.26~44.84

2.1.1. Country-wise and region-wise status of Participants

Country-wise and region-wise status of Participants		Country/Region Abbreviation	Number	Percentage (%)
No	Total		397	100.00
1	India	IN	323	81.36
2	Philippines	PH	9	2.27
3	Thailand	TH	8	2.02
4	Mozambique	MZ	4	1.01
5	Bangladesh	BD	3	0.76
6	Indonesia	ID	3	0.76
7	Malaysia	MY	3	0.76
8	Nigeria	NG	3	0.76
9	Pakistan	PK	3	0.76
10	Bhutan	BT	2	0.50
11	Lao People's Democratic Republic	LA	2	0.50
12	Nepal	NP	2	0.50
13	Taiwan	TW	2	0.50
14	Vietnam	VN	1	0.25
15	Pacific Countries		3	0.76
16	Other African Countries		5	1.26
17	Other Asia Countries		4	1.01
18	Other		17	4.28

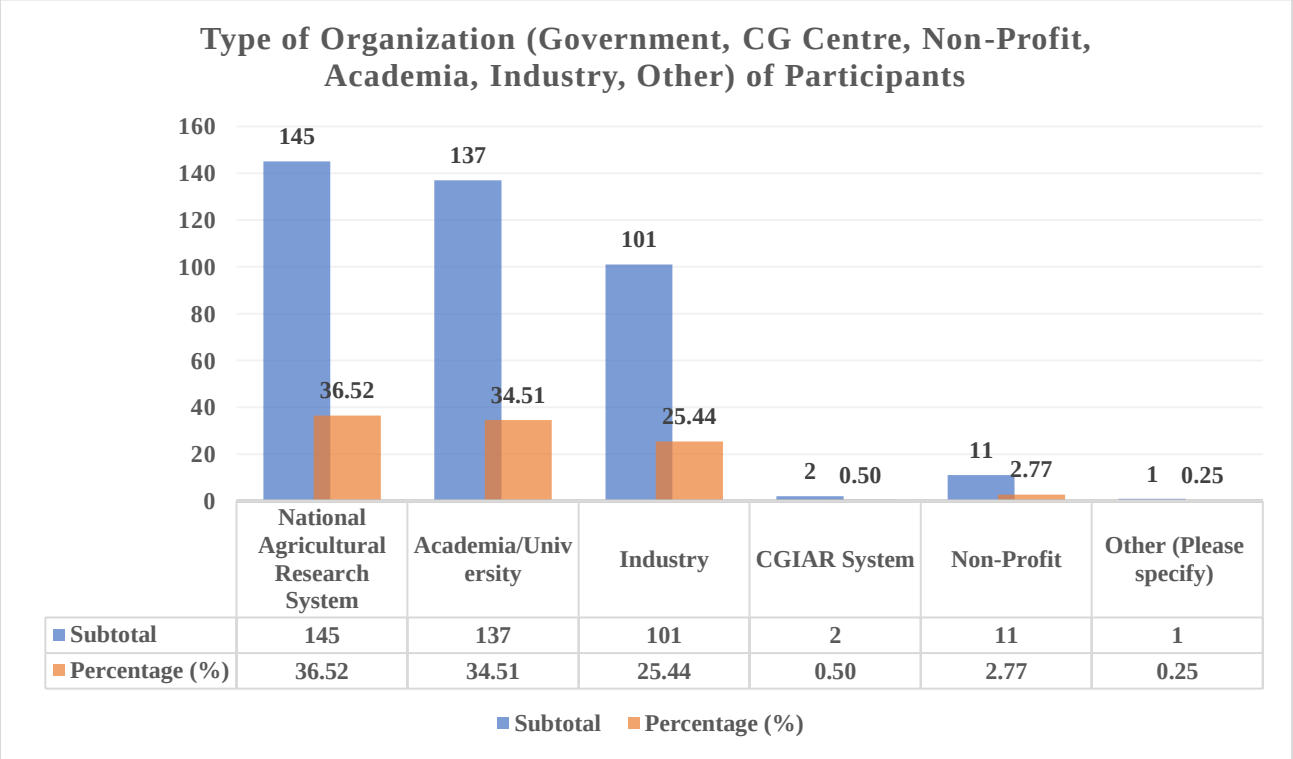
2.1.2.



2.1.2. Continent-wise status of Participants

Continent-wise status of Participants	**Number**	**Percentage (%)**
Total	397	100.00
Asia	365	91.94
Africa	12	3.02
Australia	3	0.76
Other	17	4.28

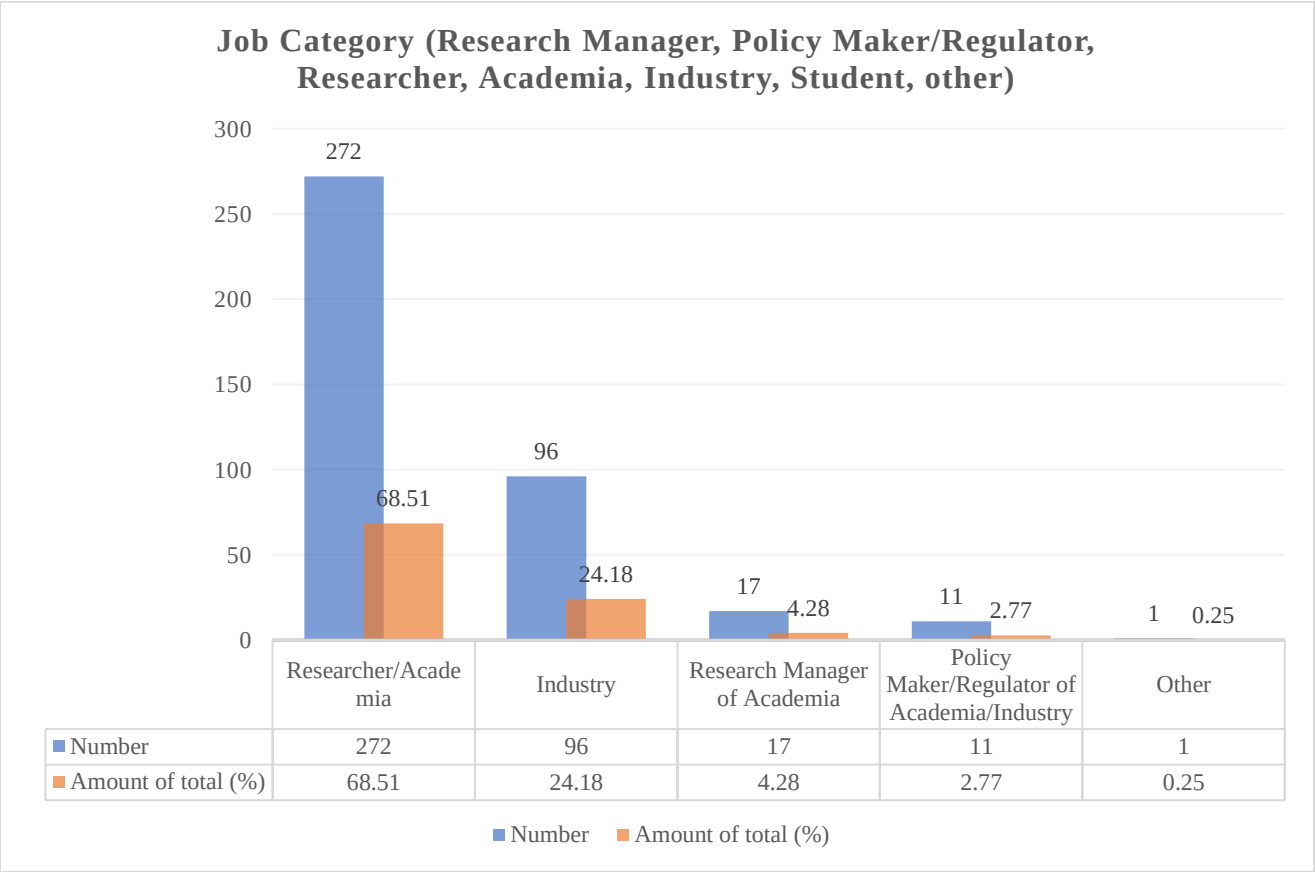
2.2.



2.2. Type of Organization (Government, CG Centre, Non-Profit, Academia, Industry, Other of Participants

Type of Organization	National Agricultural Research System	Academia/ University	Industry	CGIAR System	Non-Profit	Other
Subtotal	145	137	101	2	11	1
Percentage (%)	36.52	34.51	25.44	0.50	2.77	0.25

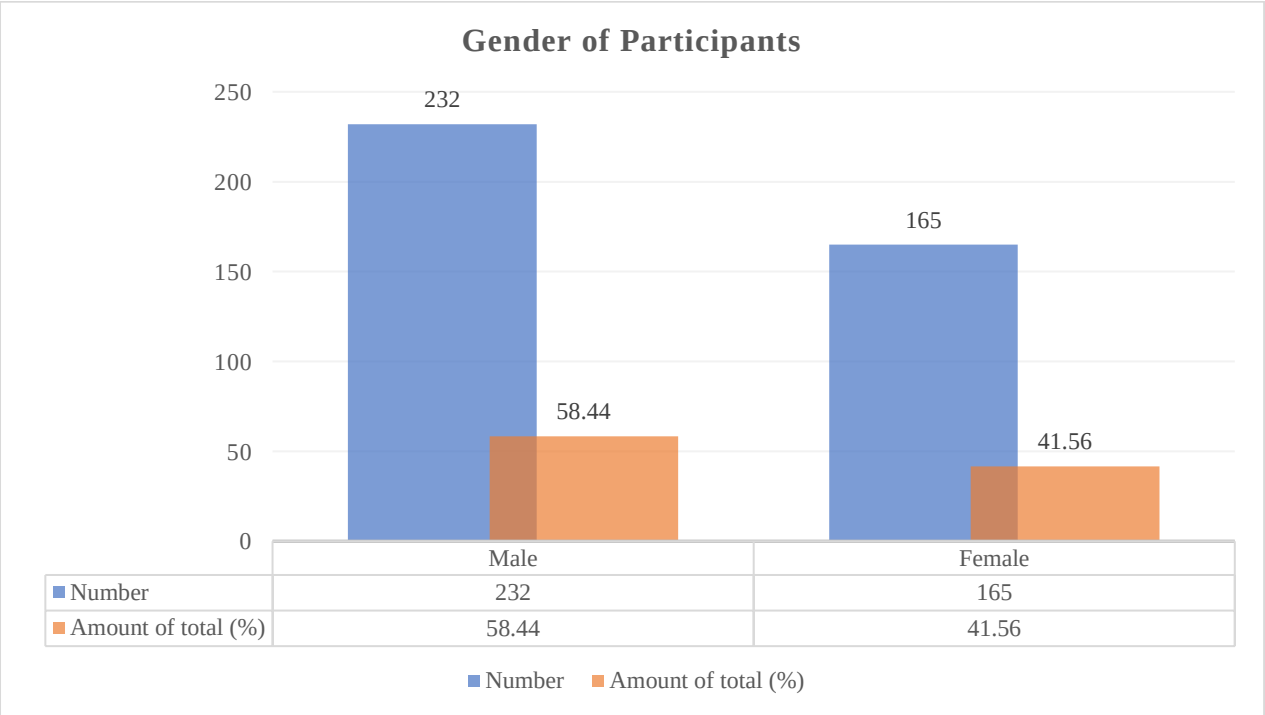
2.3.



2.3. Job Category (Research Manager, Policy Maker/Regulator, Researcher, Academia, Industry, Student, other

Job Category	**Number**	**Percentage (%)**
Total	397	100.00
Researcher/Academia/NARS	272	68.51
Industry	96	24.18
Research Manager of Academia/NARS	17	4.28
Policy Maker/Regulator of Academia/Industry	11	2.77
Other	1	0.25

2.4.

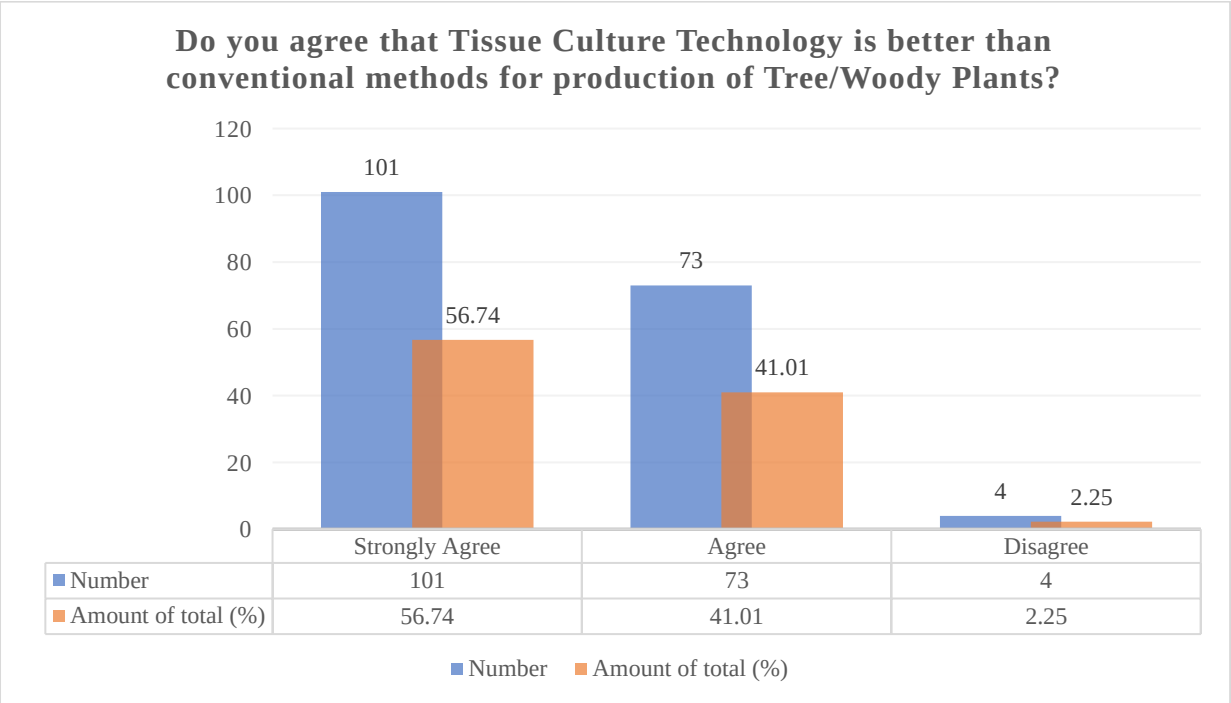


2.4. Gender of Participants

	Number	**Percentage (%)**
Total	397	100.00
Male	232	58.44
Female	165	41.56

Poll Question Result

2.5.

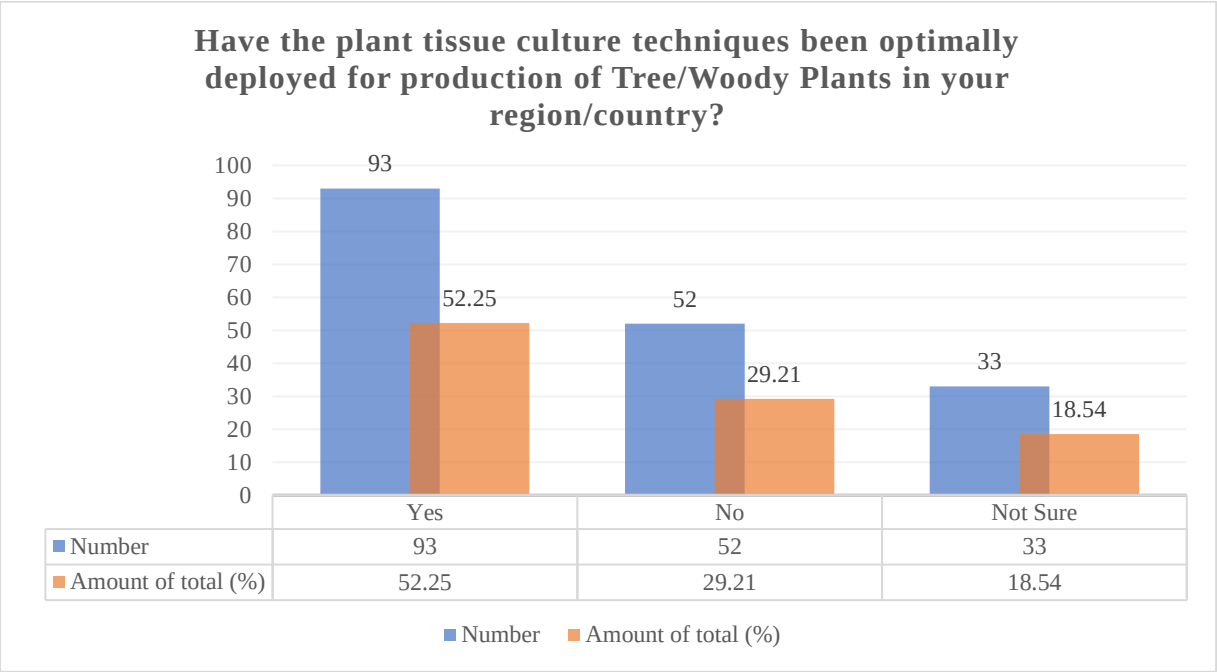


2.5. Do you agree that Tissue Culture Technology is better than conventional methods for production of Tree/Woody Plants?

	Number*	**Percentage (%)**
Total	178	100.00
Strongly Agree	101	56.74
Agree	73	41.01
Disagree	4	2.25

* Respondence rate (%): 44.84

2.6.

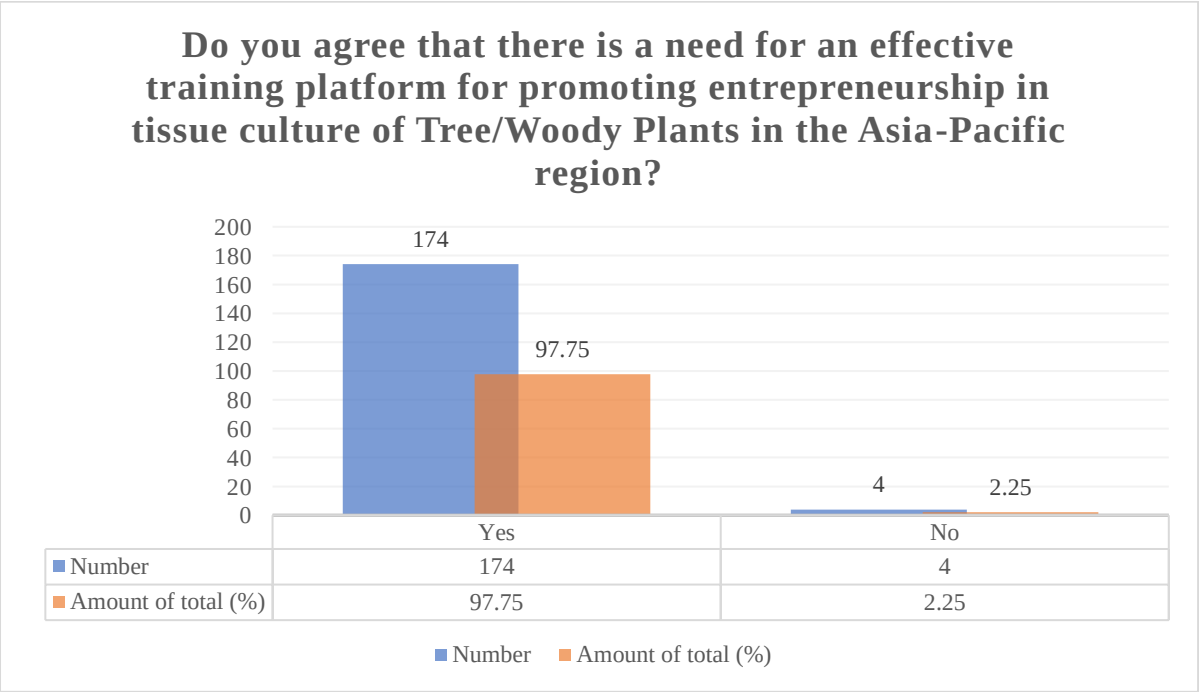


2.6. Have the plant tissue culture techniques been optimally deployed for production of Tree/Woody Plants in your region/country?

	Number*	**Percentage (%)**
Total	178	100.00
Yes	93	52.25
No	52	29.21
Not Sure	33	18.54

* Respondence rate (%) 44.84

2.7.

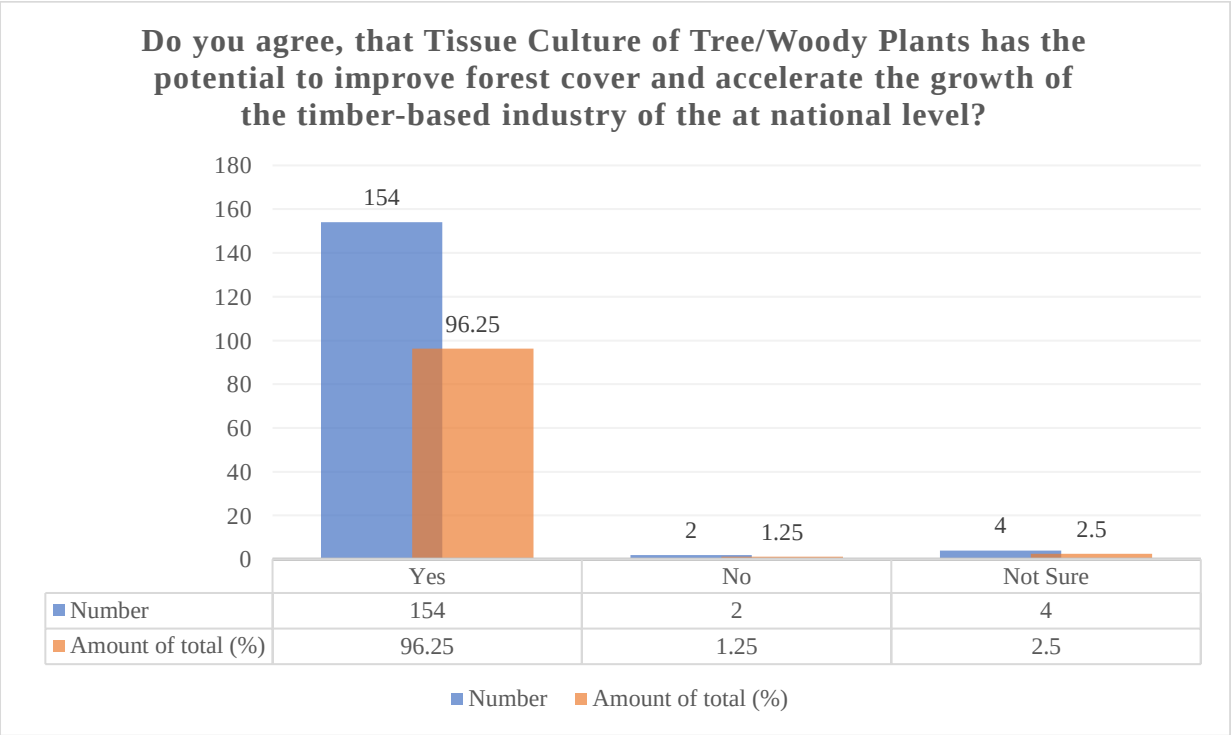


2.7. Do you agree that there is a need for an effective training platform for promoting entrepreneurship in tissue culture of Tree/Woody Plants in the Asia-Pacific region?

	Number*	Percentage (%)
Total	178	100.00
Yes	174	97.75
No	4	2.25

* Respondence rate (%) 44.84

2.8.

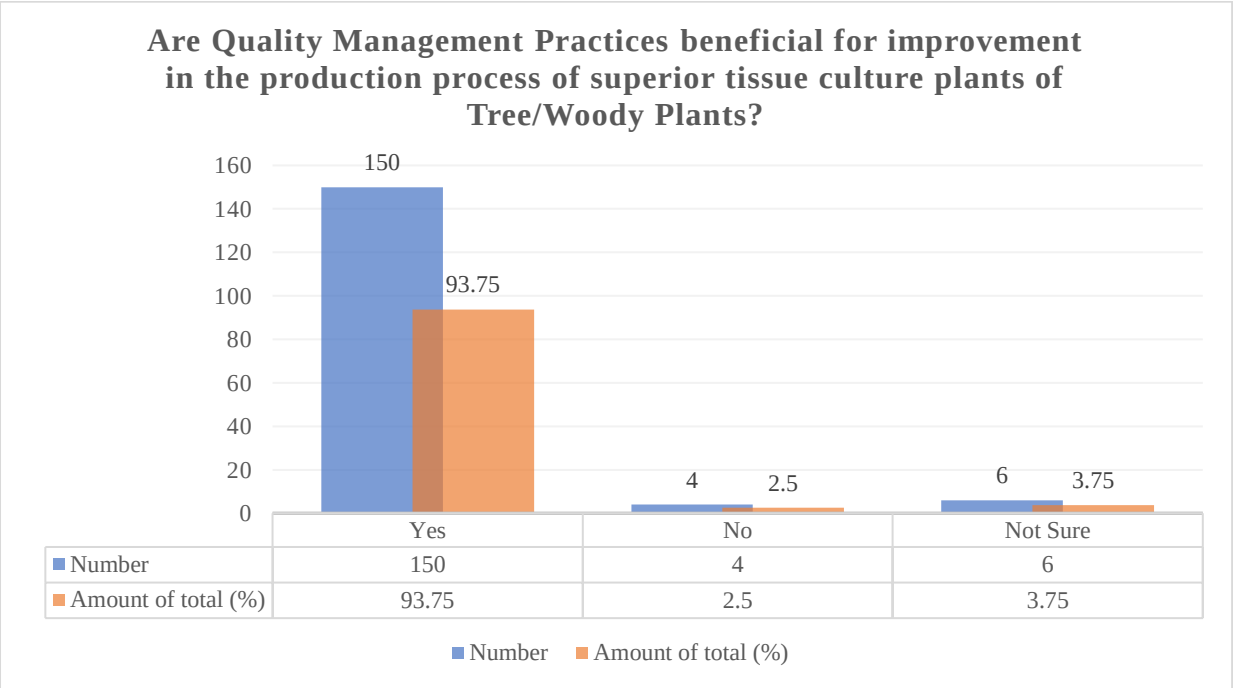


2.8. Do you agree, that Tissue Culture of Tree/Woody Plants has the potential to improve forest cover and accelerate the growth of the timber-based industry of the at national level?

	Number*	**Percentage (%)**
Total	160	100
Yes	154	96.25
No	2	1.25
Not Sure	4	2.5

* Respondence rate (%): 40.30

2.9.

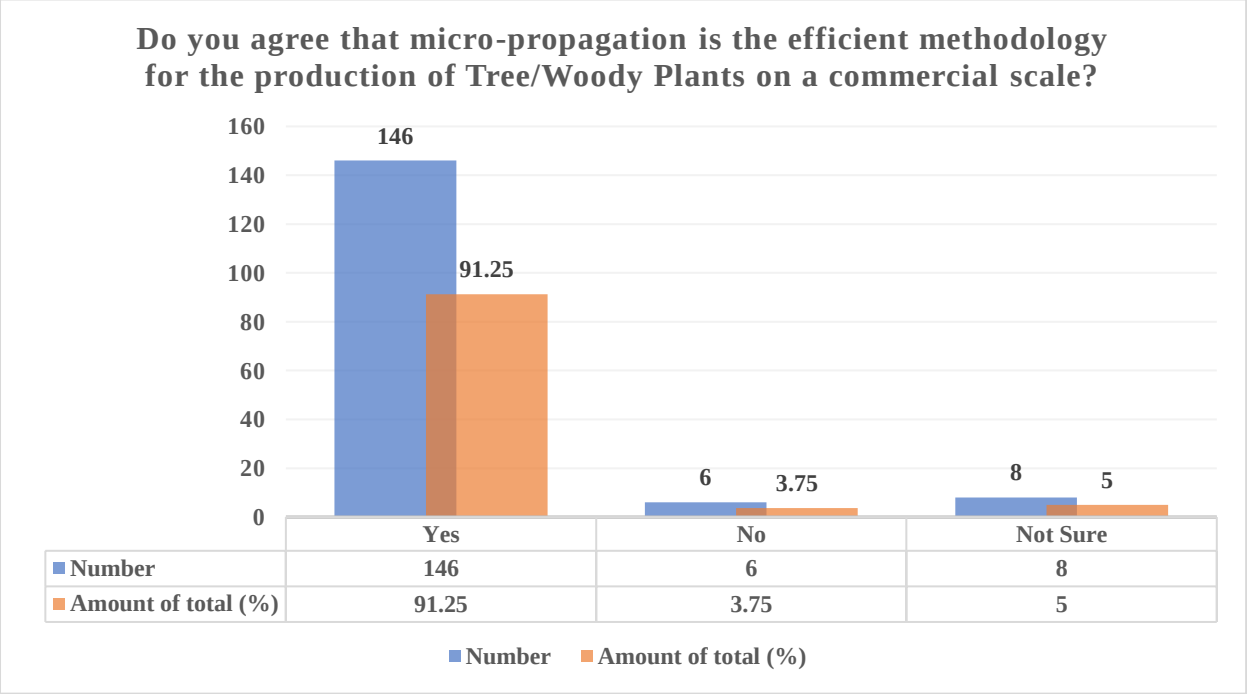


2.9. Are Quality Management Practices beneficial for improvement in the production process of superior tissue culture plants of Tree/Woody Plants?

	Number*	**Percentage (%)**
Total	160	100
Yes	150	93.75
No	4	2.5
Not Sure	6	3.75

* Respondence rate (%): 40.30

2.10.

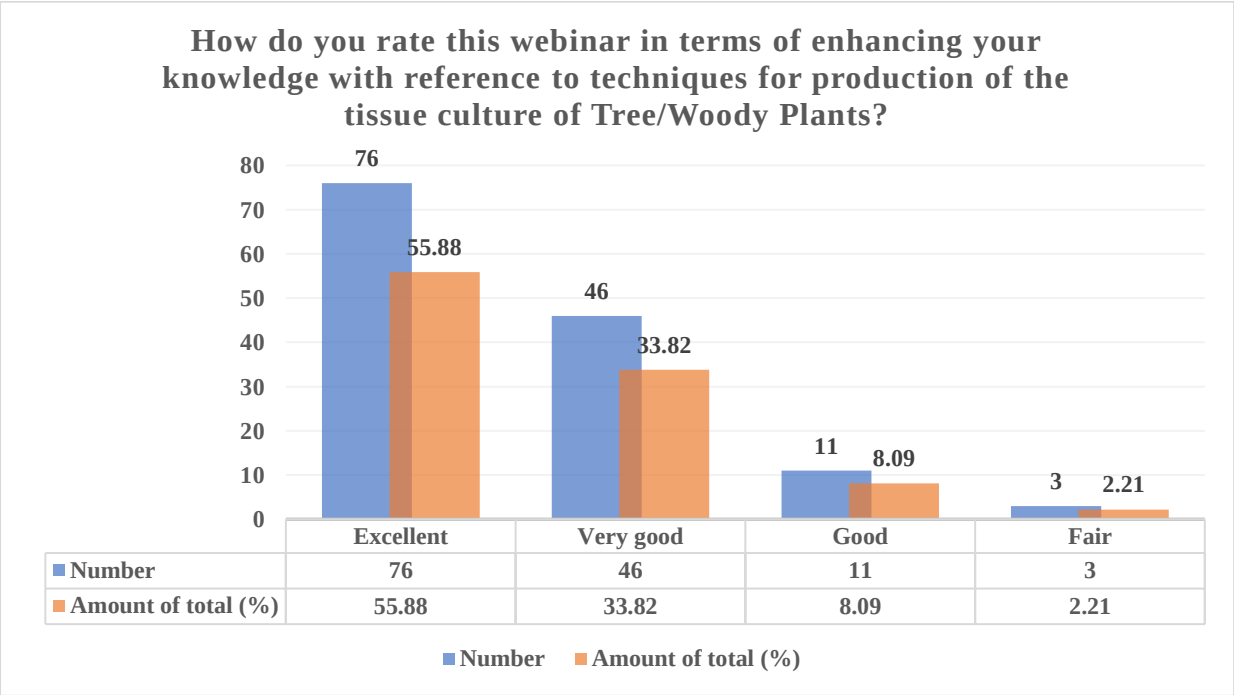


2.10. Do you agree that micro-propagation is the efficient methodology for the production of Tree/Woody Plants on a commercial scale?

	Number*	Percentage (%)
Total	160	100
Yes	146	91.25
No	6	3.75
Not Sure	8	5

* Respondence rate (%): 40.30

2.11.

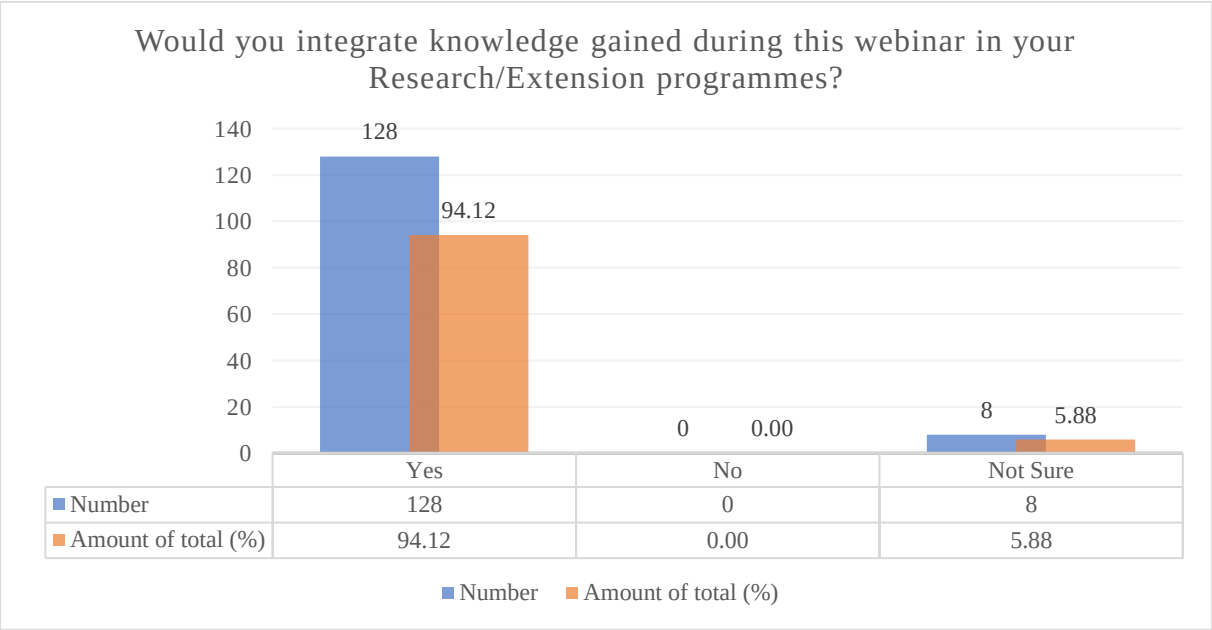


2.11. How do you rate this webinar in terms of enhancing your knowledge with reference to techniques for production of the tissue culture of Tree/Woody Plants?

	Number*	Percentage (%)
Total	136	100.00
Excellent	76	55.88
Very good	46	33.82
Good	11	8.09
Fair	3	2.21

* Respondence rate (%): 34.26

2.12.

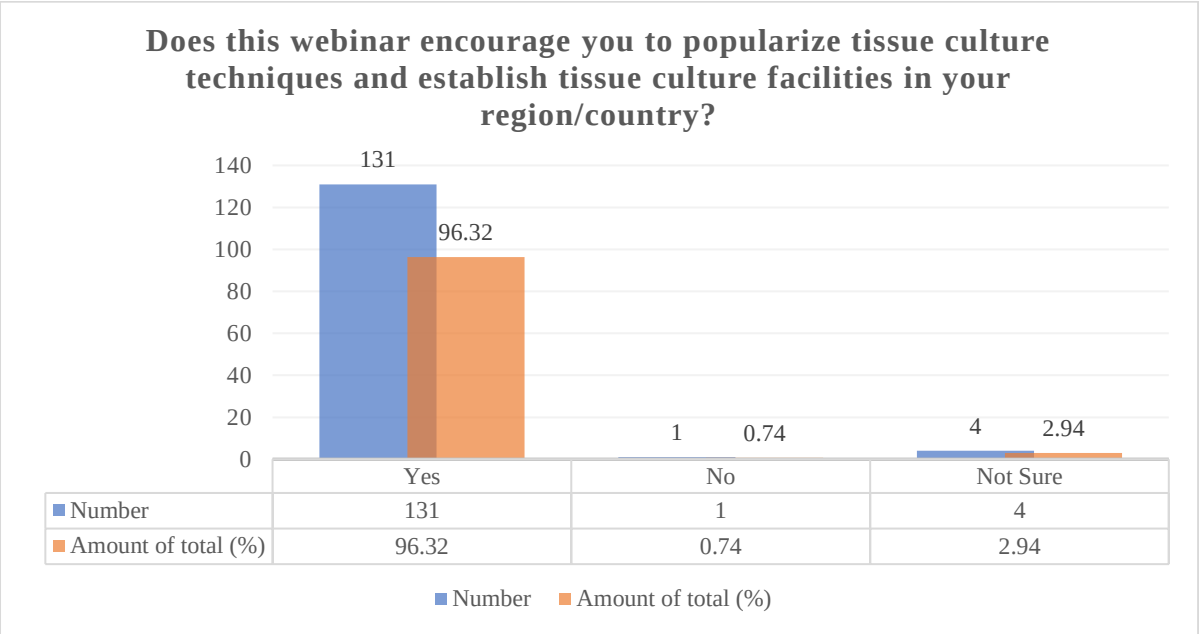


2.12. Would you integrate knowledge gained during this webinar in your Research/Extension programmes?

	Number*	**Percentage (%)**
Total	136	100.00
Yes	128	94.12
No	0	0.00
Not Sure	8	5.88

* Respondence rate (%): 34.26

2.13.



2.13. Does this webinar encourage you to popularize tissue culture techniques and establish tissue culture facilities in your region/country?

	Number*	**Percentage (%)**
Total	136	100.00
Yes	131	96.32
No	1	0.74
Not Sure	4	2.94

* Respondence rate (%): 34.26

Brief Proceedings

The third webinar in the series focused on tissue culture for tree/woody plants. Dr. Purnima Sharma, MD, BCIL initiated the proceedings by welcoming all the participants to the webinar and expressed gratitude to APAARI for taking up this initiative. She reiterated the benefits and importance of the tissue culture techniques and the importance of popularizing plant tissue culture in Asia-Pacific Region and African Countries and its huge potential for the benefit of the agriculture and the economy of these regions. Dr. Ravi Khetarpal, Executive Secretary, APAARI delivered his opening remarks and appreciated BCIL particularly Dr. Shiv Kant Shukla, DGM, BCIL for his contribution in the plant tissue culture sector and taking up this cause. Dr. Khetarpal also welcomed distinguished speakers, panelist & participants from across the globe. He highlighted the importance of Tissue Culture of Tree/Woody Plants (Bamboo & Teak) in Asia-Pacific Region and African Countries.

The webinar was chaired by Mr. Charanjit Singh, Additional Secretary, Ministry of Rural Development, Government. of India. He appreciated APAARI and BCIL for initiating this international series of webinars on the theme of popularizing Plant Tissue Culture techniques in Asia-Pacific Region and African Countries. Mr. Singh stressed upon the significance of tissue culture in agricultural areas. Mr. Singh spoke about the importance of Tissue Culture of Tree/Woody Plants (Bamboo & Teak) for rural development and woman empowerment. He also highlighted the revenue prospects from tissue culture of tree/woody plants.

Academia experts from India spoke about the journey of tissue culture of tree/woody plants (bamboo & teak) from research to commercialization. Dr. (Mrs.) Susmita Shukla, Associate Professor, Amity University, India, made a comprehensive presentation on the commercialization of bamboo & teak in India and tissue culture techniques for production of good quality of planting material. Dr. Shukla spoke about challenges face during *in vitro* propagation of Tree & Woody plant species. Dr. Shukla talked about developing a tissue culture protocol/standard & micropropagation techniques for tree/woody plants. Dr. Shukla also highlighted the health/therapeutic benefits and uses of teak and bamboo trees.

Leading Industries from India, M/S Genewin Biotech, Tamil Nadu and Mother Agri Biotech Laboratories India Pvt. Ltd, Karnataka presented their success stories in the field of Tree/Woody Tissue culture. Er. Goutham Palani, COO, Genewin Biotech, India shared success story of their industry & highlighted the production & market capacity of industry across the world. He highlighted various advantages of tissue culture bamboo plants.

Dr. Balakrishna Muthukuri, Chairman, Mother Agri Biotech Laboratories India Pvt. Ltd, India spoke about scope of tissue culture of teak and production of good quality planting material in India, challenges faced and the way froward. Dr. Muthukuri highlighted on the return on investment in teak tissue culture projects. He also explained plantation process and projected wood yield per acre in the field by using tissue culture plants. He also highlighted advantages & field performance of conventional stump/seedlings teak v/s tissue culture driven teak plant.

Panel discussion with experts from India deliberated on best practices and the way forward was followed up with a question answer session with the participants to address their specific queries on important issues of common interest.

The esteemed panel consisted of Dr. K. Gurumurthi, Former Director, IFGTB, India, Dr. Chandrashekhar Biradar, Country Director-India, CIFOR-ICRAF and Chief of Party (TOFI), Asia Continental Program, Mr. Abhay Gandhe, Advisor, Transform Rural India Foundation (TRIF), India. In response to the questions raised by moderator Dr. Shiv Kant Shukla, DGM, BCIL, experts expressed opinion as specified below:

- Dr. K. Gurumurthi spoke about selection process of juvenile tissue to start the tissue culture process of tree species & need for defining selection criteria of superior/elite plants for bamboo & teak. Dr. Gurumurthi also highlighted on importance for creation of market for tissue culture plants of tree & woody species.

- Dr. Chandrashekhar Biradar talked about need for quality planting material (QPM) for Tree/Woody Plants along with global perspective on QPM. He highlighted for the quality standards/ Certification options available for Quality Planting Material of tree species. Dr. Birader further provided insights on suitable tissue culture based agro- forestry system.

- Mr. Abhay Gandhe spoke about factors to be considered for selection of Bamboo species for tissue culture applications. Mr. Gandhe also talked about the scope of bamboo tissue culture for rural women and capacity building of rural community.

The session concluded with the closing remarks from Dr. Rishi Kumar Tyagi, Coordinator, APCoAB, APAARI who thanked BCIL for taking up this initiative and associating with APAARI for jointly organizing this webinar series at a global level. Dr. Tyagi thanked to eminent speakers, panelist and participants for being a part of the webinar series. In between the above sessions online polls were also conducted to keep the interest of the audience alive and have a good idea of the status, progress and requirements of the tissue culture industry in the different regions across Asia Pacific and African zones. The results of this exercise are tabulated in the data compiled as above. Webinar was moderated by Dr. Shiv Kant Shukla, DGM, BCIL, India.

The detailed presentations by the learned academicians and esteemed industry experts are attached as **Annexure 3** for the record and ready reference.

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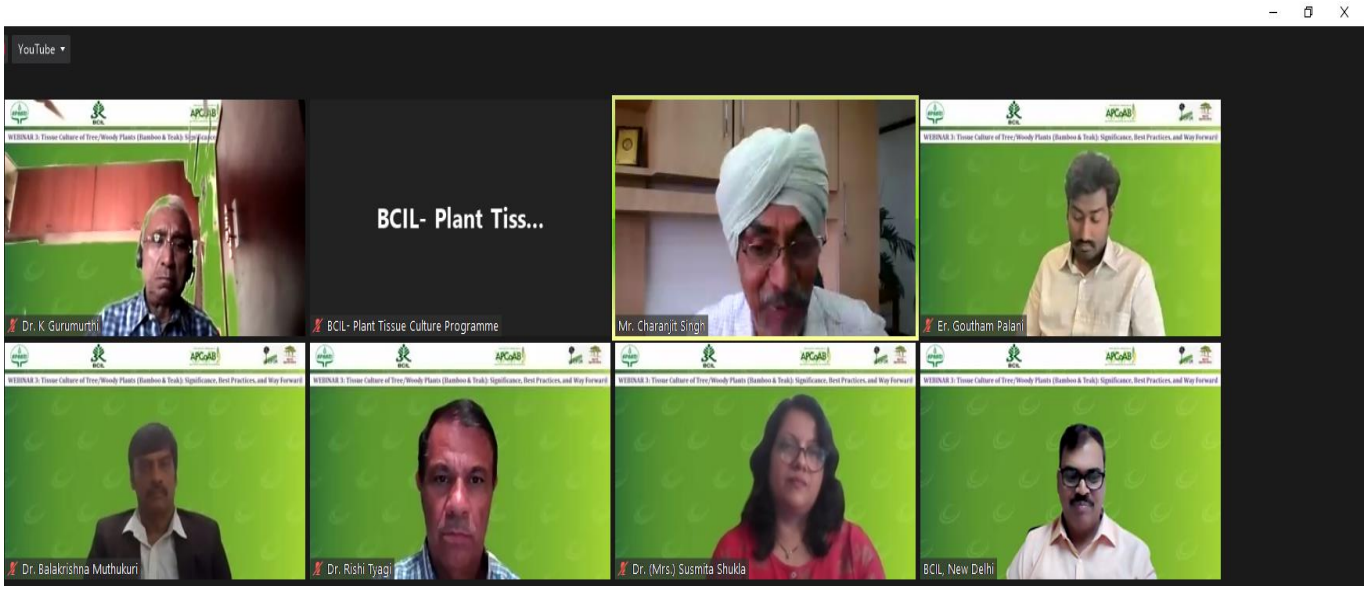
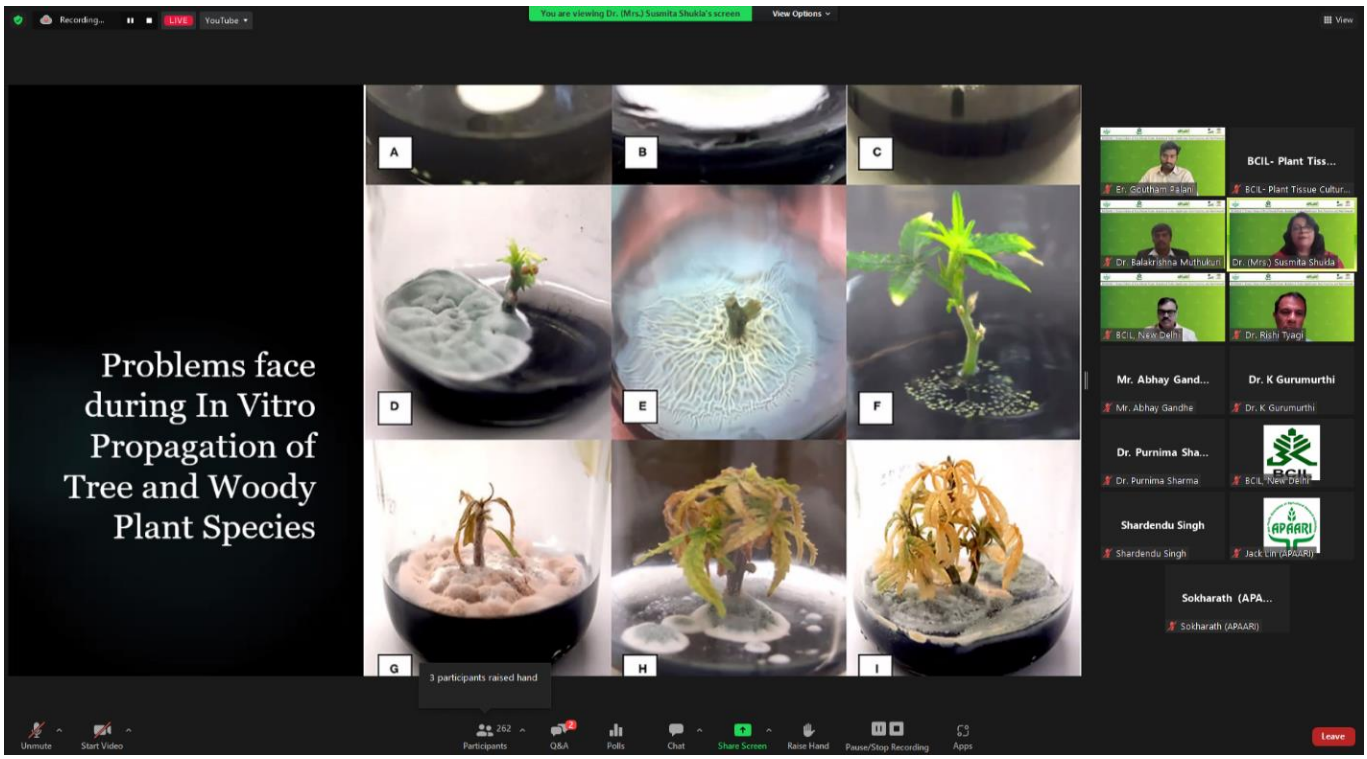

YouTube
BCIL- Plant Tiss...
Dr. K Gurumurthi
BCIL- Plant Tissue Culture Programme
Mr. Charanjit Singh
Er. Goutham Palani
Dr. Balakrishna Muthukuri
Dr. Rishi Tyagi
Dr. (Mrs.) Susmita Shukla
BCIL, New Delhi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Problems face during In Vitro Propagation of Tree and Woody Plant Species
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Er. Goutham Palani
BCIL- Plant Tissue Cultur...
Dr. Balakrishna Muthukuri
Dr. (Mrs.) Susmita Shukla
BCIL, New Delhi
Dr. Rishi Tyagi
Mr. Abhay Gand...
Mr. Abhay Gandhe
Dr. K Gurumurthi
Dr. K Gurumurthi
Dr. Purnima Sha...
Dr. Purnima Sharma
BCIL, New Delhi
Shardendu Singh
Shardendu Singh
Jack Lin (APAARI)
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WEBINAR 4

Webinar on "Tissue Culture of Ornamental Plants: Significance, Best Practices, and Way Forward "

Date: August 26, 2022
Time: 11:30 AM ICT; Bangkok time (10:00 AM IST)

➢ About Webinar:

The fourth and final webinar in this series focussed on the Significance of Tissue Culture of Ornamental Plants and Floriculture. Ornamental plants are used for a variety of purposes, including landscaping, protected cultivation and producing wide range of flowers. Ornamental plants are mostly produced by traditional seeding methods and conventional asexual reproduction, which has many disadvantages. Plant tissue culture technology can play a very important role in rapid propagation, selection and breeding of new varieties, preservation and exchange of germplasm resources etc. Tissue culture of ornamentals and flowering plants are being done commercially in many countries; however, quality practices need to be adopted for production of virus free quality tissue culture plants of these species. This webinar was chaired by Dr. Naveen Kumar Patle, Additional Commissioner (Horticulture), Ministry of Agriculture and Farmers Welfare, Government of India. The journey from research to commercialization in the Asia-Pacific and Indian perspective was presented by Dr. Aswath C., Principal Scientist, ICAR-IIHR, India and Dr. Kanchit Thammasiri, Professor, Mahidol University, Thailand. Mr. Hon-yen Zhao, Director and President, Grand Biotechnology Company, Taiwan and Mr. Kishore Rajhans, Director, KF Bioplants Pvt. Ltd., India presented the success stories in ornamental plants from the industry in Taiwan and India.

AGENDA
WEBINAR 4
Tissue Culture of Ornamental Plants: Significance, Best Practices, and Way Forward

11:30 AM – 11:35 AM:	**Welcome Note**
Dr. Purnima Sharma, Managing Director, Biotech Consortium India Limited (BCIL), India	
11:35 AM – 11:50 AM:	**Brief Address/ Presentations by APAARI & BCIL**
• **Role of APAARI in Sustainable Agriculture and Future Endeavors in the Asia-Pacific region:** Dr. Ravi Khetarpal, Executive Secretary, Asia-Pacific Association of Agricultural Research Institutions (APAARI), Thailand • **Highlights of the Webinar Series & Role of BCIL in the Promoting Plant Tissue Culture in India:** Dr. Shiv Kant Shukla, Dy General Manager, BCIL, New Delhi	
11:50 AM – 12:00 Noon:	**Remarks by Chief Guest**
Dr. Naveen Kumar Patle, Additional Commissioner (Horticulture), Ministry of Agriculture and Farmers Welfare, Government of India	
*Launch of **"Plant Tissue Culture Resource Planning (PTCRP) Software"** for facilitating production management, traceability of TC plants and Quality Management*	
12:00 Noon – 12:30 PM:	**Journey from Research to Commercialization by Academia (India and Asia-Pacific Perspective)**
12:00 Noon – 12:15 PM:	Dr. Kanchit Thammasiri, Professor, Mahidol University, Thailand
12: 15 PM – 12:30 PM:	Dr. Aswath C., Principal Scientist, ICAR-IIHR, India
12:30 PM – 01.00 PM:	**Success Stories by Industry**
12:30 PM – 12:45 PM:	Mr. Hon-yen Zhao, Director and President, Grand Biotechnology Company, Taiwan
12:45 PM-01:00 PM:	Mr. Kishore Rajhans, Director, KF Bioplants Pvt. Ltd., India
01:00 PM-01:15 PM:	**Open Q & A Session**

01:15 PM-01:20 PM:	**Concluding Remarks and Final Outcome of Webinar Series**
Dr. Rishi Kumar Tyagi, Coordinator, APCoAB, APAARI, Thailand	

SPEAKER PROFILES

Chairperson

Dr. Naveen Kumar Patle

Dr. Naveen Kumar Patle is the **Additional Commissioner (Horticulture)** with the **Department of Agriculture and Farmers welfare, Ministry of Agriculture, Govt. Of India.** He also holds the additional charge of Director, Central Institute of Horticulture, Nagaland since February, 2018 and Executive Director, National Bee Board since August, 2021.

He has more than 20 years of varied experience in agroforestry and horticultural research, teaching & extension, nursery & plantation management, clonal forestry, farm management and capacity building. He is a specialist in Nursery & plantation management for horticultural crops, wasteland development, development and extension of agroforestry models, clonal eucalyptus plantation, tree improvement. Dr. Patle's areas of expertise include (i) Planning, Policy formulation & Programme Implementation in Horticulture sector at National level (ii) Research and Extension in Horticulture, Agroforestry and allied fields (iii) Farm Management and Organic Farming (iv) Nursery and Plantation management (v) Capacity Building through trainings & demonstrations and many more.

Dr. Patle has a large number of publications of Scientific Papers, Technical Bulletins, Books and Abstracts to his credit and has attended many national and international level training programmes over the years. He is a member of a number of Horticulture Societies, Board Member of Karnataka state Cashew Development Corporation and a Member of various committees constituted by Ministry of Agriculture & Farmers Welfare.

Dr. Ravi Khetarpal

Dr Ravi Khetarpal is the **Executive Secretary, APAARI** since 2017. Prior to this, he served CABI - South Asia (India) as Regional Director and also as its Regional Advisor on Strategic Science Partnerships over a span of seven years. He worked for National Agricultural Research System in India for three decades. He holds PhD in Life Sciences (Virology) from University of Paris and was a Visiting Scientist in an EU Collaborative Project at INRA, Versailles, France for three years.

His area of interest includes research, development, policy issues and capacity building in areas of biosecurity, biosafety, seed certification and biodiversity. He has worked as consultant of twelve FAO/World Bank Projects notably in Indonesia (as Team Leader), India, Nepal, Mauritius, and Cambodia. He represents Asia as Developing Country SPS Expert in STDF Working Group in WTO. He has published 110 research papers, 19 books, 56 book chapters, 12 review articles and 3 policy papers.

Dr. Purnima Sharma

Dr. Purnima Sharma is the **Managing Director** of **Biotech Consortium India Limited (BCIL), New Delhi**. BCIL is a public limited company promoted by the Department of Biotechnology, Ministry of Science and Technology, Government of India and the all-India financial institutions for facilitating biotechnology commercialization.

Dr. Purnima Sharma is a doctorate in Experimental Medicine from Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh, the prestigious autonomous institution and deemed Medical University of national importance of the Ministry of Health, Government of India with Post-Doctoral experience from IIT, Mumbai, and has to her credit many awards for excellence in academics. She has more than 30 years of experience in the area of technology evaluation and transfer, management of IPR, project consultancy including DPRs for setting up Incubators and Science Parks, managing start-up ecosystem, public-private partnership funding schemes, entrepreneurship development etc. Dr. Sharma is a member of a number of national and state level committees responsible for biotech development and commercialization and also a member of The National Academy of Sciences, India (NASI), the first science academy of the country dedicated towards cultivation and promotion of science & technology in the country.

Dr. Rishi Kumar Tyagi

Dr Rishi Kumar Tyagi is presently working as **Coordinator** in **Asia-Pacific Consortium on Agricultural Biotechnology and Bioresources (APCoAB), APAARI, Bangkok, Thailand**. Dr Tyagi holds a Ph.D. degree in Botany from University of Delhi, Delhi, India and Post-Graduate Diploma in Intellectual Property Rights laws from Indian Law Institute (Deemed University), New Delhi, India. He worked as Post-Doctoral Research Associate in University of Illinois, USA, worked on wide hybridization of soybean employing biotechnological methods. He has more than 34 years of experience in managing plant genetic resources (PGR). Since 2009 to 2017, he was holding the position of Head, Division of Germplasm Conservation at the ICAR-National Bureau of Plant Genetic Resources, New Delhi, India, managing its National Genebank.

Dr Tyagi has to his credit 111 research papers in high impact factor peer reviewed journals, 156 book chapters/policy papers/proceedings, 27 edited books/monographs and 68 invited lectures in international seminar/symposia/conferences. His current areas of interest are promoting agricultural biotechnology and conservation and use of bioresources for sustainable agricultural development in the Asia-Pacific region for the benefits of smallholder farmers, through greater stakeholder partnerships, enabling policy development and advocacy, enhanced capacity building and greater public awareness.

Speakers

Dr. Kanchit Thammasiri

Dr. Kanchit Thammasiri, **Professor, Mahidol University, Thailand**, received Ph. D. degree from University of Hawaii in Horticulture (Orchid breeding). After graduation, he started working in the Department of Agriculture as a researcher for ornamental plant breeding, then moved to Mahidol University to teach and conduct the research on orchid cultivation, micropropagation, breeding, and conservation. He was the author of Orchids in Thailand: A success story book, published by APARRI, FAO, three Thai textbooks, entitled "Orchid Production Technology", "Thai Orchids: Conservation and Sustainable Use", and "Plant Cryopreservation" and 86 scientific papers published in international journals (SCOPUS).

He has also arranged the Workshops on Orchid Production Technology for multiple times over the past years and convened four international conferences, namely TSO 2016, CryoSymp 2018, BGL 2019, and Biotech 2021 in collaborations with The International Society for Horticultural Science (ISHS). In a ddition, he was the speaker at 15, 16, 17, 18, 20, 21, 22, and 23 World Orchid Conferences; and 1, 11, and 13 Asia-Pacific Orchid Congresses, as well as other local and international conferences.

Dr. Chenna Reddy Aswath

Dr. Chenna Reddy Aswath, born on 1st June 1961, got his BSc. (Hort), M.Sc. (Hort.) in Floriculture in 1883 and 1985 respectively from University of Agricultural Sciences, Bengaluru. He completed his **Ph.D. degree** in **Biotechnology** from **Guwhati University, Guwati, Assam** in the year 1995. He started his career from ICAR complex for NEH region Barapani as Scientist in 1989 and promoted as Principal Scientist in 2007 in IIHR, Bengaluru. He has made significant and commendable research and technological contributions in the field of Horticultural Sciences, particularly Floriculture and Biotechnology, during the past 25 years of his career. His innovative accomplishments cover the important horticultural crops namely Citrus, Tomato, onion, Gerbera, crossandra, gladiolus and chrysanthemum, etc. and they include in the fields of breeding, tissue culture, molecular markers and genetic transformation.

He is the recipient of "Dr BP Pal Best Scientist Award for Agriculture" from NABS, Chennai He became Fellow of the NABS, Chennai, ISOH, New Delhi and SAB, Dharwad, CHAI, New Delhi. He is a member of PTCA, Pune. His recent findings in the area of developing SCAR markers in identification of rootstocks in citrus is patented and of immense use for the industry. He got the 2012 SAB Award of Excellence in Horticultural Biotechnology. His work on Tomato and flower crops in the North east has made a significant contribution for breeding advanced lines for the rainfed conditions and in introducing gerberas in the state of Meghalaya. He has released more than 15 varieties in Crossandra, Gerbera, Gladiolus and Chrysanthemum, which are of significant value for the small and marginal farmers.

Dr. Aswath is a recipient of Brain pool Post-Doctoral Fellowship, from South Korea Science Federation for the outstanding research contributions in Horticultural Biotechnology. His short-term fellowship in Japan under INSA has recognized him among the Orchid tissue culture group. He has 110 International and National publications besides several books. He has guided more than 10 post-graduate students. He is the Executive Member of many professional Societies and member, editorial committee member for many journals. He was a Member for Expert Group on Agriculture Biotechnology, Karnataka.

Dr. Shiv Kant Shukla

Dr. Shiv Kant Shukla has made significant contribution in the area of commercial biotechnology and plant tissue culture. He is Doctorate in Biotechnology from Pt Ravishankar Shukla University Raipur. Dr. Shukla is currently working as the **Dy. General Manager, BCIL, New Delhi**, an organization promoted by Department of Biotechnology, Govt of India. Prior to BCIL, he was heading a leading commercial plant tissue culture unit in central India. He has approx. 22 years of diversified experience covering research, production of tissue culture plants, field extension, quality management, biotech parks, technology transfer, administration and management of biotech projects. Dr. Shukla has more than 50 publications and chaired/delivered more than 30 invited/key note speech at national and international forum. He has successfully organized more than 30 Entrepreneurship development programme (EDP) and conferences. Dr. Shukla has managed prestigious international and national long-term projects of Government of India. His contributions have been acknowledged by various recognitions and awards including Certificate of Appreciation from Govt of Chhattisgarh, West Bengal, Hony. Professorship from Amity University Uttar Pradesh, Rastriya Gaurav Award & "Certificate of Excellence" from India International Friendship Society, New Delhi etc.

Mr. Hon-yen Zhao

Mr. Hon-yen Zhao is the **Director and President of Grand Biotechnology CO., LTD. (GBC)**. GBC is located in Hsinchu Science Park, Hsinchu, Taiwan. The founder of GBC includes Known-you Seed CO., LTD. Taiwan, Miyoshi & Co., Ltd. Japan, Arysta LifeScience Japan, and Taiwan Flower Biotechnology. His work focuses specifically on Commercial Plant Tissue Culture Production in the last three decades. He starts GBC to be a reliable plantlet production laboratory. GBC has a cutting-edge cleanroom system guarantees that production is always reliable. GBC has produced Cut flowers, Orchids, Green foliage plants, vegetables, and tree tissue culture plantlets that have been supplying to Japan and the Netherlands non-stop for the last 30 years. This company has become one of the best platforms to connect the Phalaenopsis Industry from Taiwan to the world.

His tissue carrier started from the Taiwan Seed Improvement and propagation station. COA. The Taiwan Improvement and propagation station is the best seed and seedling production station located in the central part of Taiwan. Dr. Weijan Ho, chief of the tissue culture lab. introduced the plant tissue culture mass propagation to him. Mr. Zhao started GBC in 1989, and this company combines AI technology and agriculture forward to the future.

Mr. Kishore Rajhans

Mr. Kishore Rajhans is the **Director of KF Bioplants Pvt. Ltd.** KF Bioplants Pvt. Ltd. is the country's largest plant tissue culture company located at Pune, 1 50 km South of Mumbai. The company have 52 acres of operation which includes 12,000 square metres state-of-art tissue culture Jab & fully monitored greenhouses of 6.5 Ha. KF Bioplants predominantly produce over 80 million plants of various ornamental flowering species of Gerbera, Llmonium, Lilies, Phalaenopsis, Dendrobium, Rananculus, Calla Lilies, Perennials, Carnation and Gypsophila etc.

They export almost 75% of their annual production and 25% for domestic market in India. They have almost 78% global market share for Gerbera planting material supply. This is a Dutch join t venture with HilverdaFlorist B.V. from Netherlands. They do have joint ventures with 13 other companies worldwide for contract production of their varieties. They do export various flowering, fruit plants ex-agar/ bare rooted as well as hardened plants to almost 30 countries around the Globe.

The total strength of the company is over 1200 people working year-round at KF Bioplants. They have well-established marketing and technical team of about 25 qualified people country wide. To provide technical support to growers at their doorstep is their strength. KF strongly believes that formation of GFCI will be the biggest boon to the industry. They take immense pride to be a part of GFCI. It was need of the industry that whole floriculture chain comes under one umbrella and work together for expanding the industry in the country

Highlights/Outcome Report of Webinar 4

Webinar 4: Tissue Culture of Ornamental Plants: Significance, Best Practices and Way Forward

1. Registration Status

- **Number of Registrant:** 686
- **Number of Country:** 48

1.1.1. Country-wise and region-wise status of registrants

S.No.	**Country-wise and region-wise status of registrants**	**Country/Region Abbreviation**	**Number**	**Percentage (%)**
	Total		686	100.00
1	India	IN	497	72.45
2	Philippines	PH	29	4.23
3	Nigeria	NG	21	3.06
4	Thailand	TH	15	2.19
5	Pakistan	PK	8	1.17
6	Indonesia	ID	7	1.02
7	Malaysia	MY	7	1.02
8	Bangladesh	BD	6	0.87
9	Myanmar	MM	6	0.87
10	Nepal	NP	6	0.87
11	Bhutan	BT	5	0.73
12	Iran	IR	4	0.58
13	Taiwan	TW	4	0.58
14	Vietnam	VN	3	0.44
15	Pacific Countries		5	0.73
16	African Countries		25	3.64
17	Other Asian Countries		12	1.75
18	Others		26	3.79

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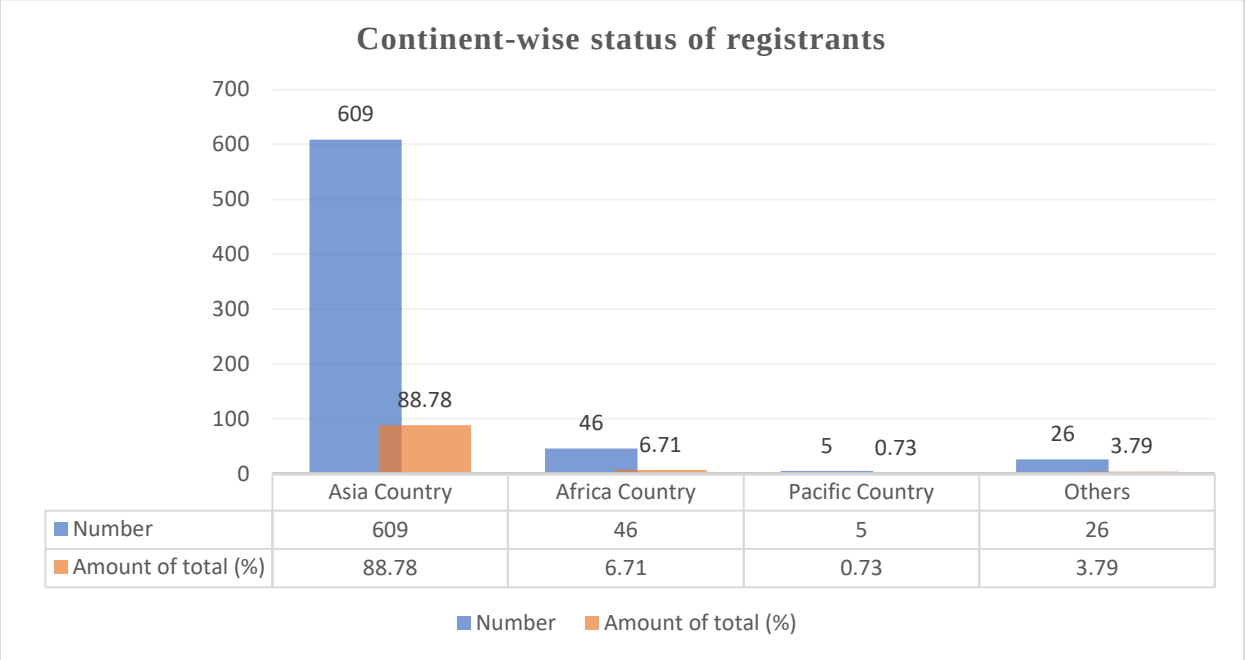
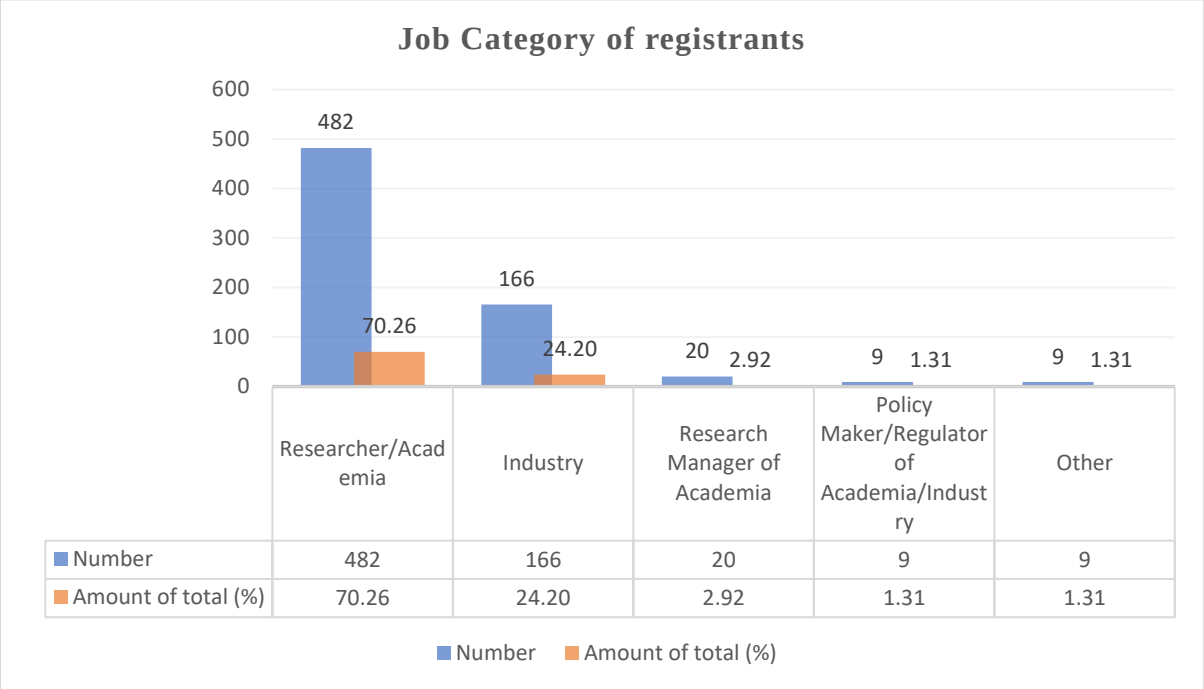


1.1.2. Continent-wise status of registrants

Continent-wise status of registrants	Number	Percentage (%)
Total	686	100.00
Asia Country	609	88.78
Africa Country	46	6.71
Pacific Country	5	0.73
Others	26	3.79

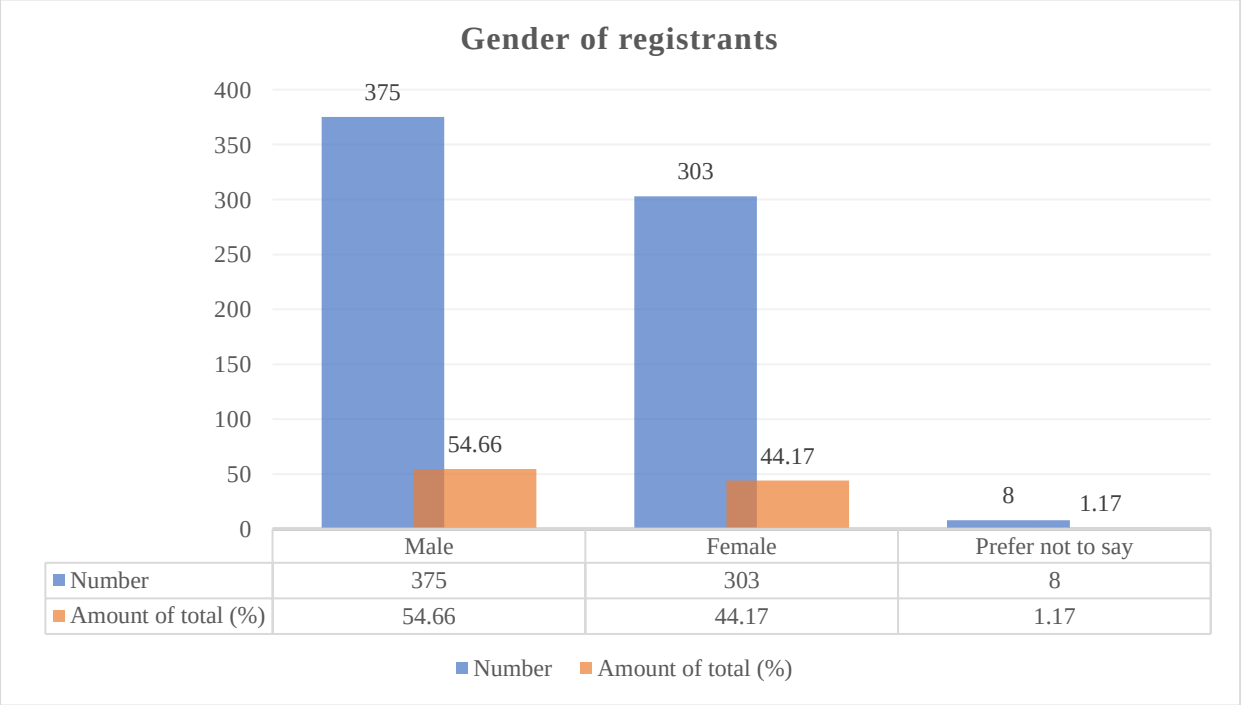
1.2.



1.2. Job Category of registrants

Job Category of registrants	Number	Percentage (%)
Total	686	100.00
Researcher/Academia/NARS	482	70.26
Industry	166	24.20
Research Manager of Academia/NARS	20	2.92
Policy Maker/Regulator of Academia/Industry	9	1.31
Other	9	1.31

1.3.



1.3. Gender of registrants

Gender of registrants	Number	Percentage (%)
Total	686	100.00
Male	375	54.66
Female	303	44.17
Prefer not to say	8	1.17

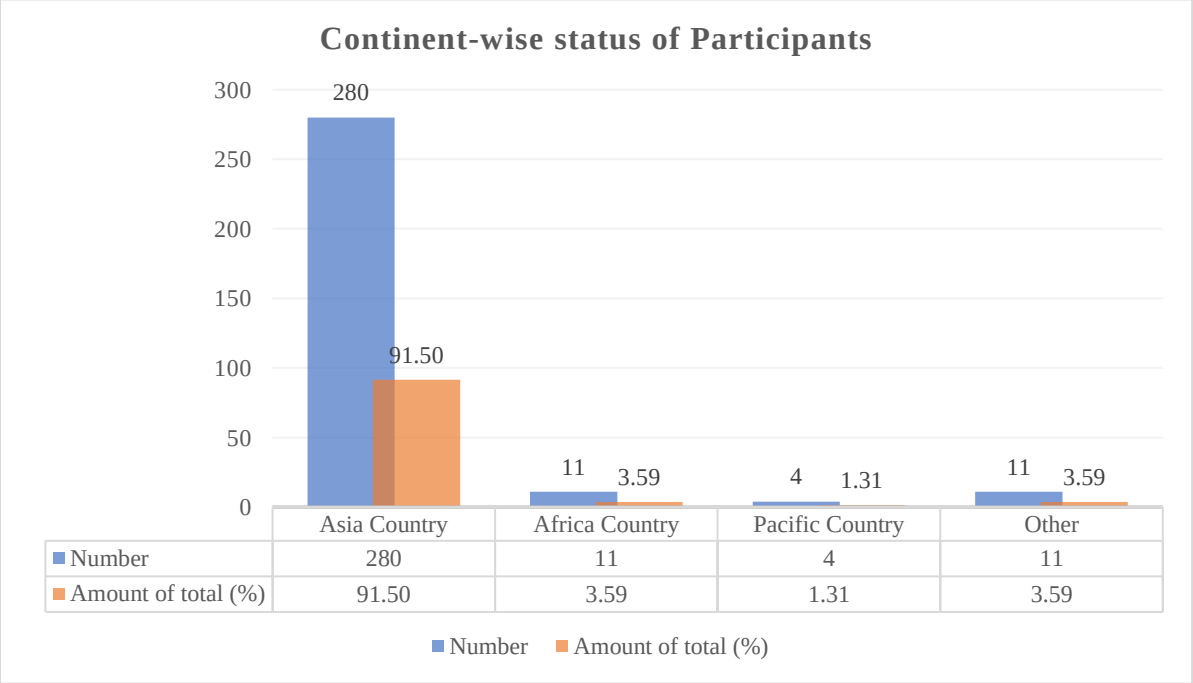
2. Participation status of Webinar 4

- **Number of Registrants:** 686
- **Number of Participant:** 306
- **Participation rate (%):** 44.61
- **Number of Country of Participation:** 28
- **Number of respondents:** 138-153
- **Respondence of Participants rate (%):** 45.10-50.00

2.1.1. Country-wise and region-wise status of Participants

S.No.	**Country-wise and region-wise status of Participants**	**Country/Region Abbreviation**	**Number**	**Percentage (%)**
	Total		306	100.00
1	India	IN	225	73.53
2	Philippines	PH	18	5.88
3	Thailand	TH	8	2.61
4	Myanmar	MM	5	1.63
5	Indonesia	ID	4	1.31
6	Malaysia	MY	4	1.31
7	Pakistan	PK	4	1.31
8	Bangladesh	BD	3	0.98
9	Egypt	EG	3	0.98
10	Nigeria	NG	3	0.98
11	Taiwan	TW	2	0.65
12	Vietnam	VN	1	0.33
13	Pacific Countries		4	1.31
14	Other Asian Countries		6	1.96
15	African Countries		5	1.63
16	Other		11	3.59

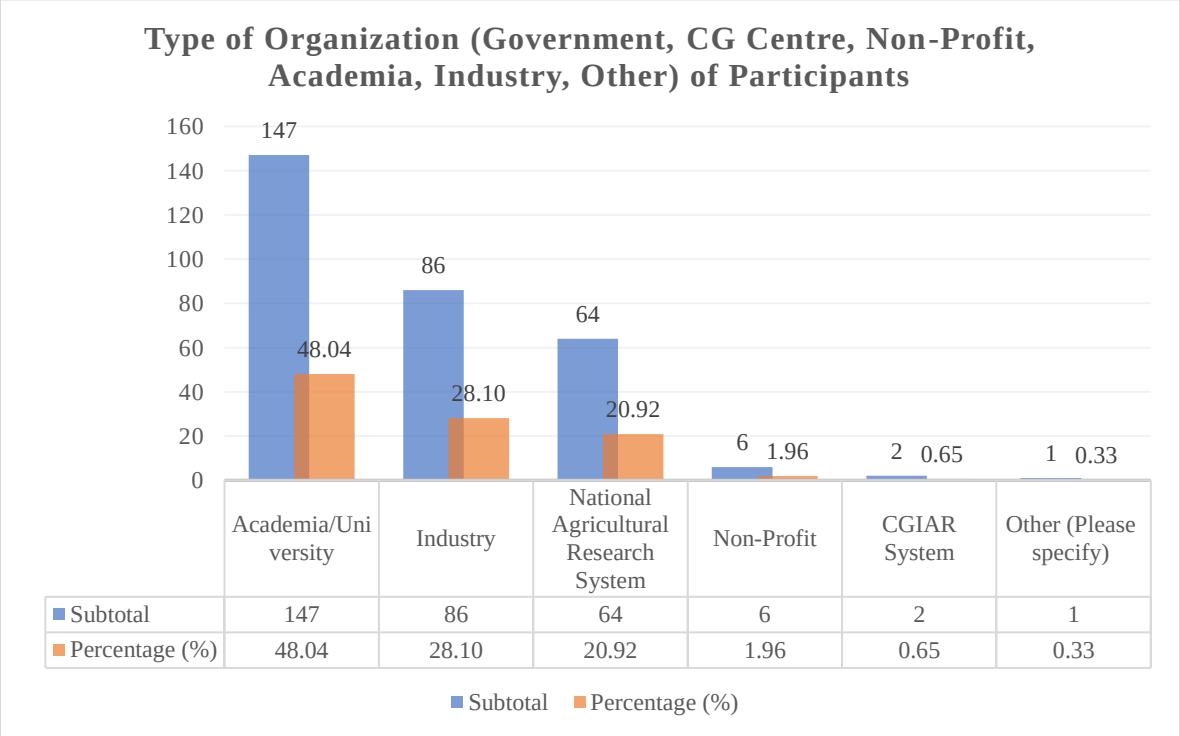
2.1.2.



2.1.2. Continent-wise status of Participants

Continent-wise status of Participants	Number	Percentage (%)
Total	306	100.00
Asia Country	280	91.50
Africa Country	11	3.59
Pacific Country	4	1.31
Other	11	3.59

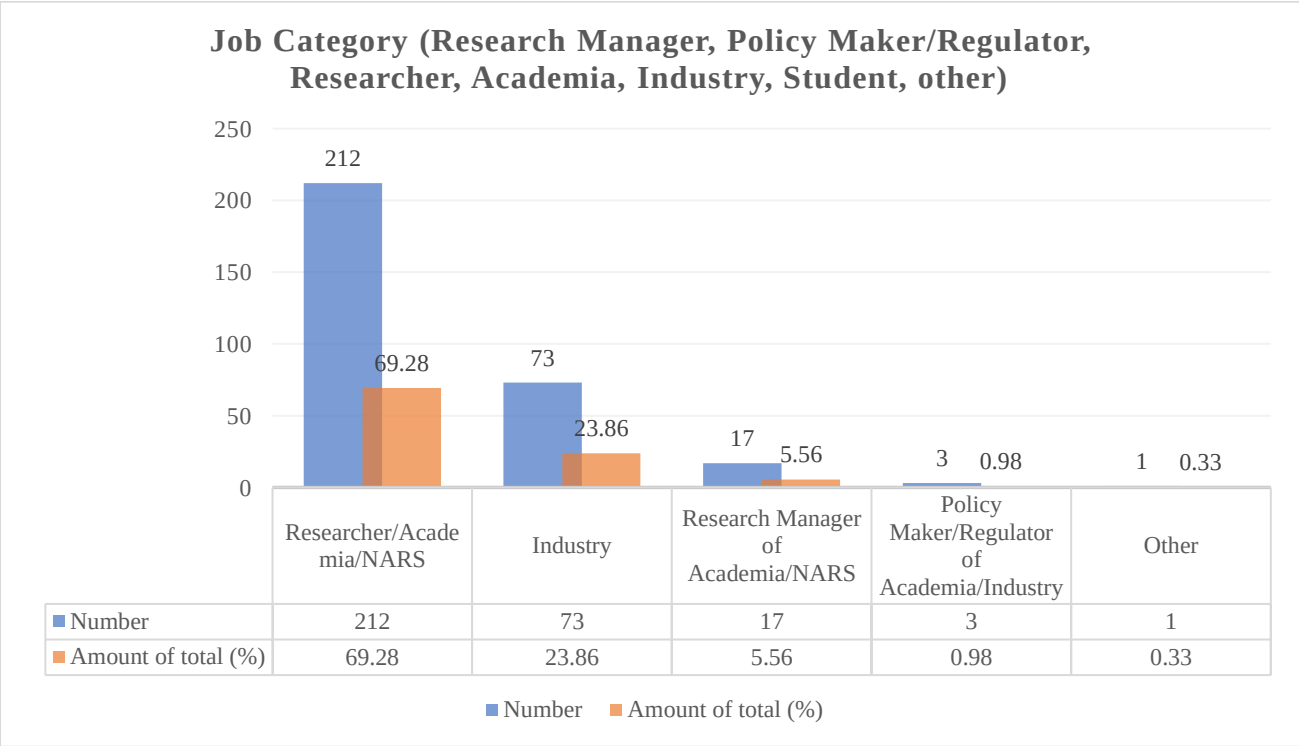
2.2.



2.2. Type of Organization (Government, CG Centre, Non-Profit, Academia, Industry, Other of Participants

	Academia/ University	Industry	National Agricultural Research System	Non-Profit	CGIAR System	Other
Subtotal	147	86	64	6	2	1
Percentage (%)	48.04	28.10	20.92	1.96	0.65	0.33

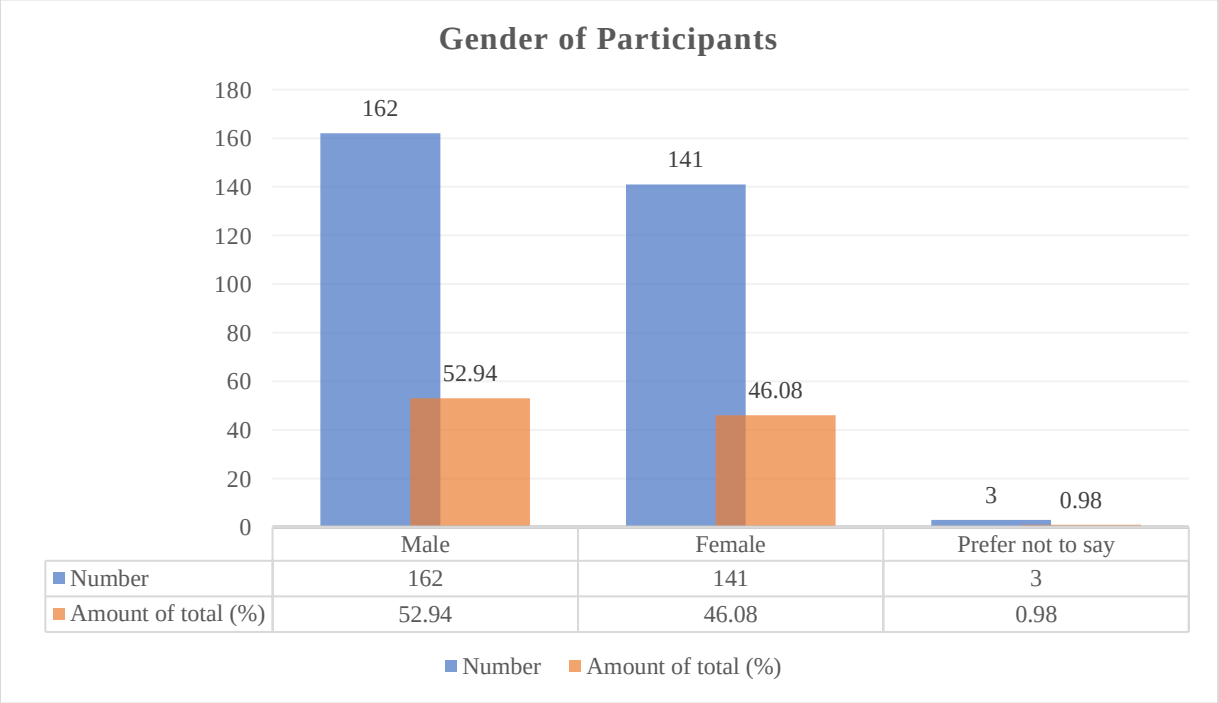
2.3.



2.3. Job Category (Research Manager, Policy Maker/Regulator, Researcher, Academia, Industry, Student, other

	Number	Percentage (%)
Total	306	100.00
Researcher/Academia/NARS	212	69.28
Industry	73	23.86
Research Manager of Academia/NARS	17	5.56
Policy Maker/Regulator of Academia/Industry	3	0.98
Other	1	0.33

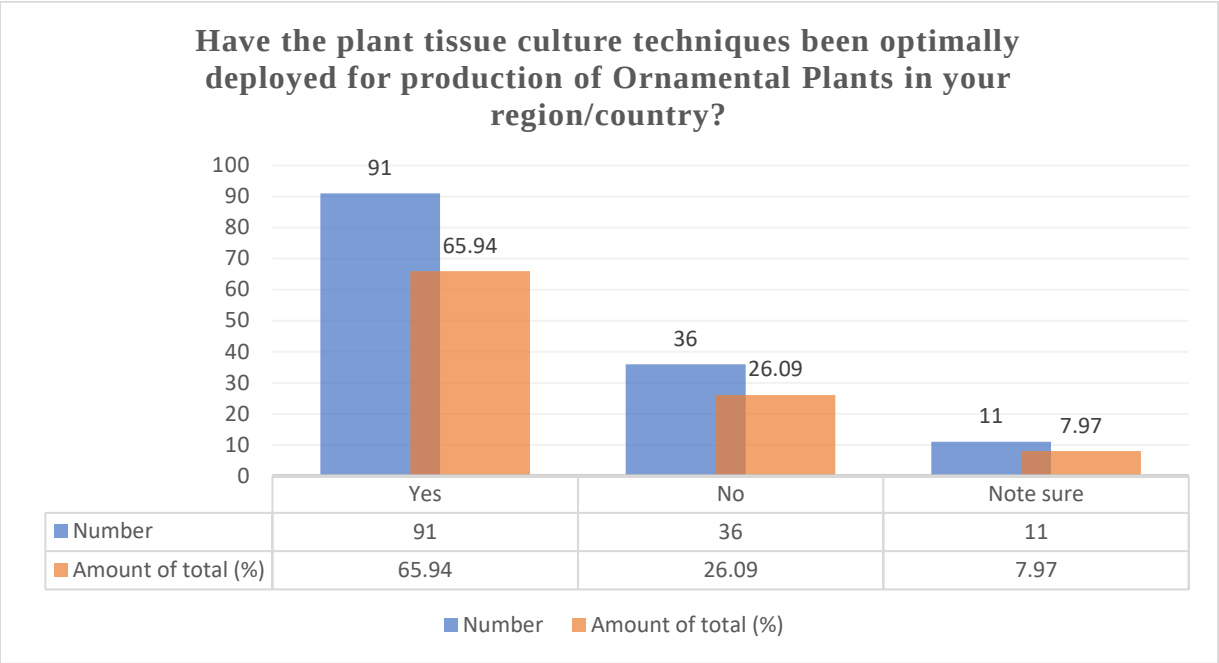
2.4.



2.4. Gender of Participants

	Number	Percentage (%)
Total	306	100.00
Male	162	52.94
Female	141	46.08
Prefer not to say	3	0.98

2.5.



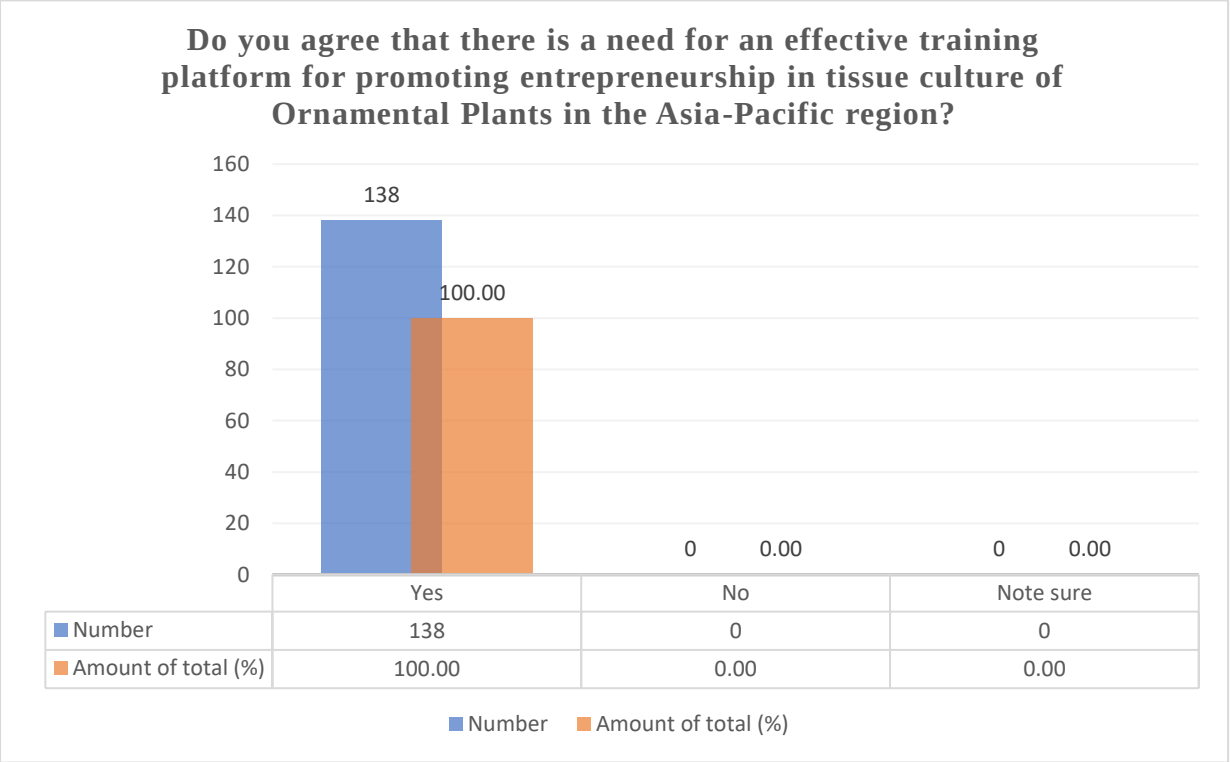
2.5. Have the plant tissue culture techniques been optimally deployed for production of Ornamental Plants in your region/country?

	Number*	**Percentage (%)**
Total	138	100
Yes	91	65.94
No	36	26.09
Note sure	11	7.97

* Respondence rate (%): 45.10

Poll Question Result

2.6.

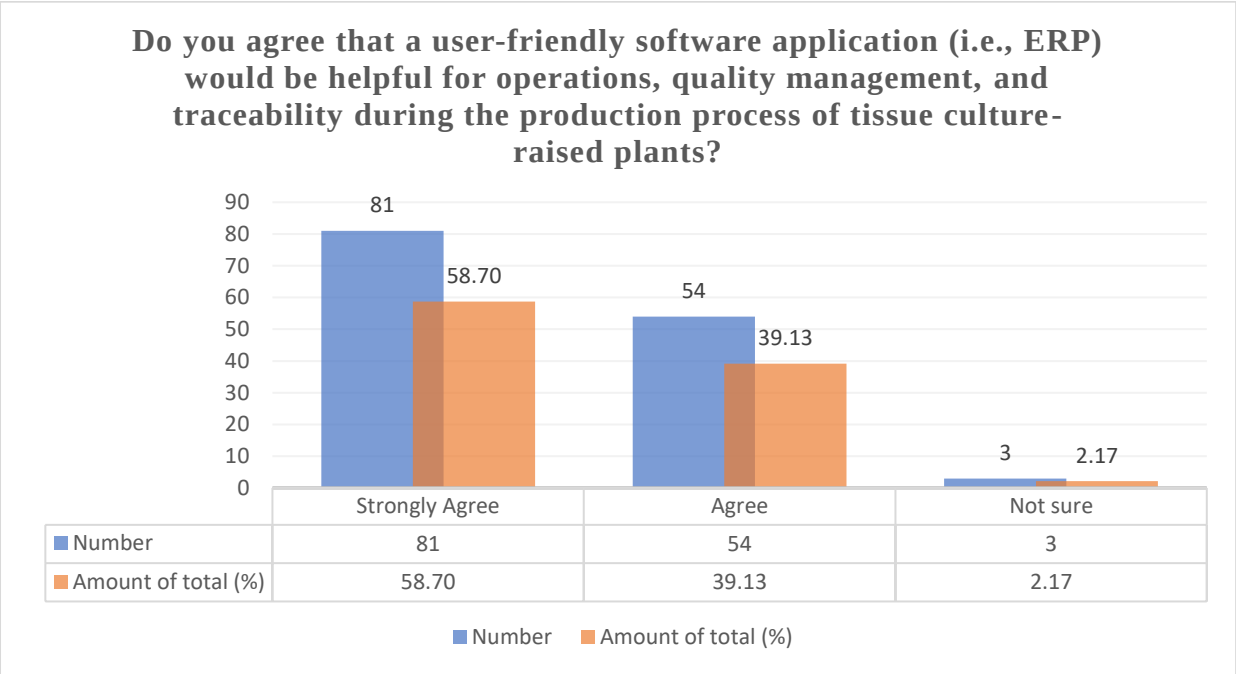


2.6. Do you agree that there is a need for an effective training platform for promoting entrepreneurship in tissue culture of Ornamental Plants in the Asia-Pacific region?

	Number*	Percentage (%)
Total	138	100
Yes	138	100.00
No	0	0.00
Note sure	0	0.00

* Respondence rate (%): 45.10

2.7.

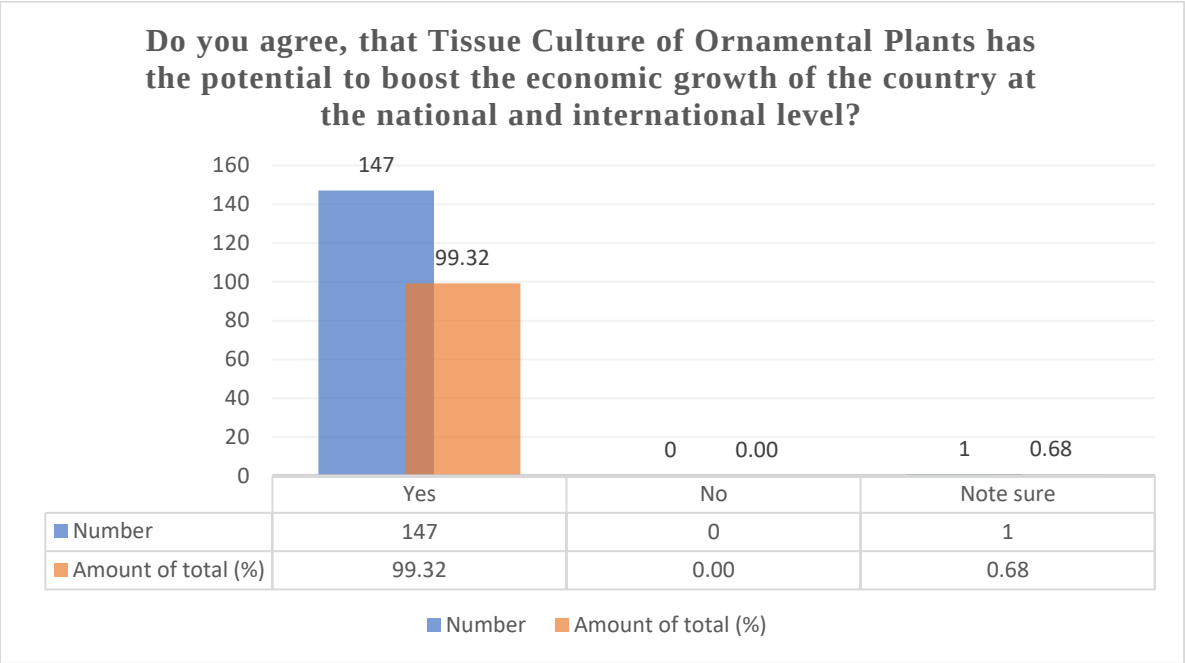


2.7. Do you agree that a user-friendly software application (i.e., ERP) would be helpful for operations, quality management, and traceability during the production process of tissue culture-raised plants?

	Number*	**Percentage (%)**
Total	138	100
Strongly Agree	81	58.70
Agree	54	39.13
Not sure	3	2.17

* Respondence rate (%): 45.10

2.8.

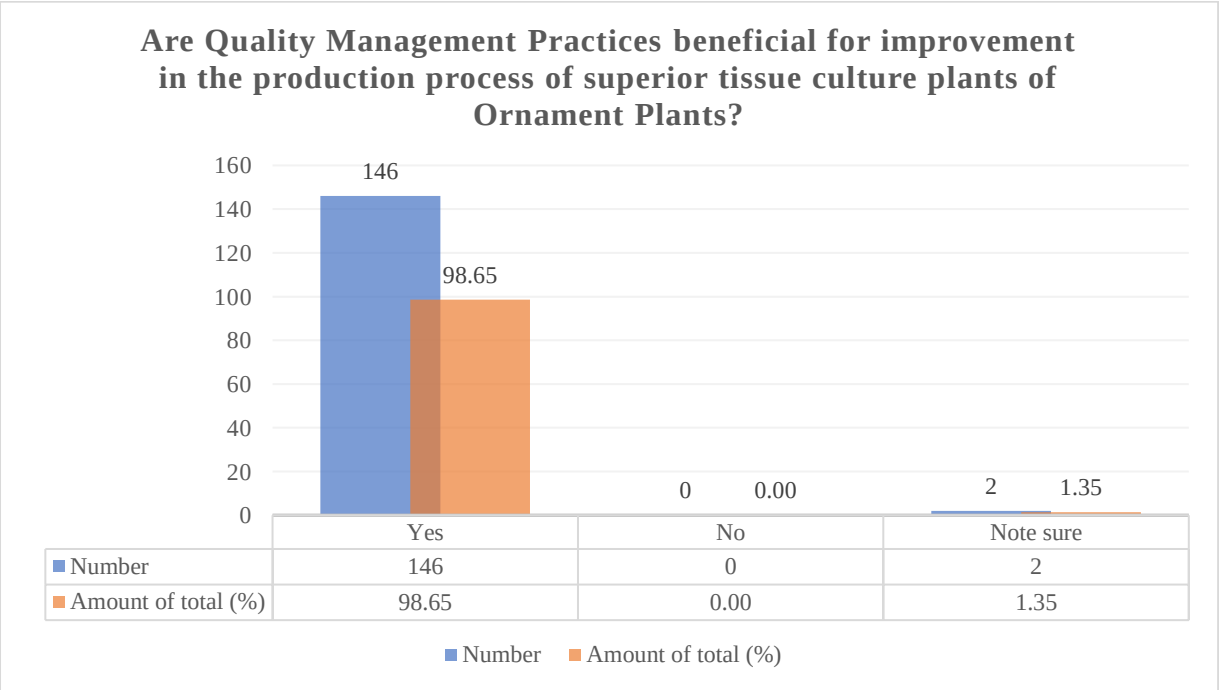


2.8. Do you agree, that Tissue Culture of Ornamental Plants has the potential to boost the economic growth of the country at the national and international level?

	Number*	**Percentage (%)**
Total	148	100.00
Yes	147	99.32
No	0	0.00
Note sure	1	0.68

* Respondence rate (%): 48.37

2.9.

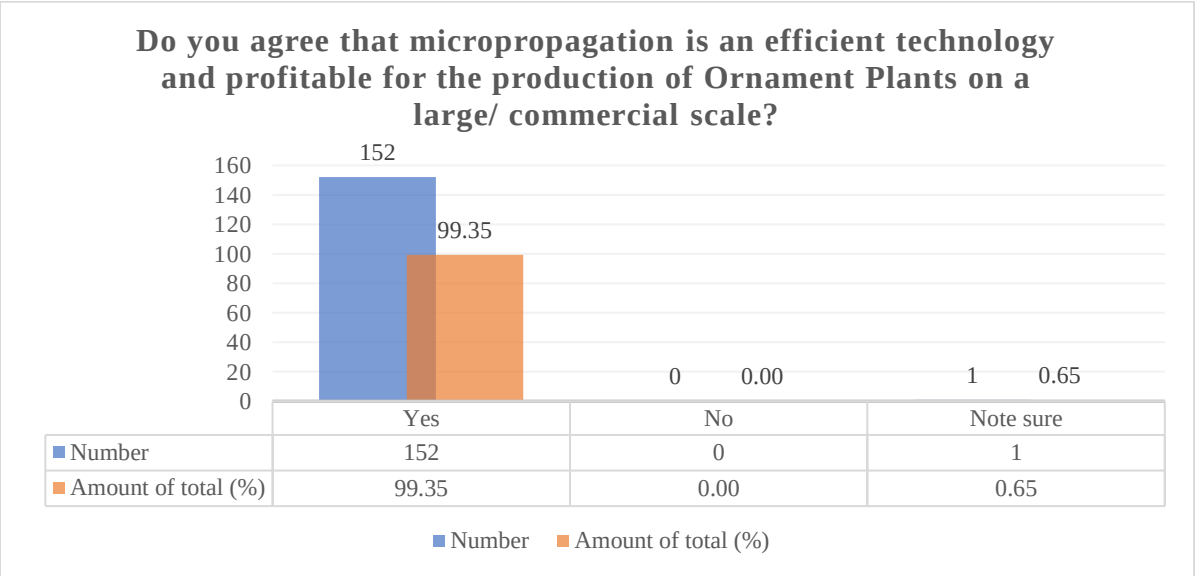


2.9. Are Quality Management Practices beneficial for improvement in the production process of superior tissue culture plants of Ornament Plants?

	Number*	Percentage (%)
Total	148	100.00
Yes	146	98.65
No	0	0.00
Note sure	2	1.35

* Respondence rate (%): 48.37

2.10.

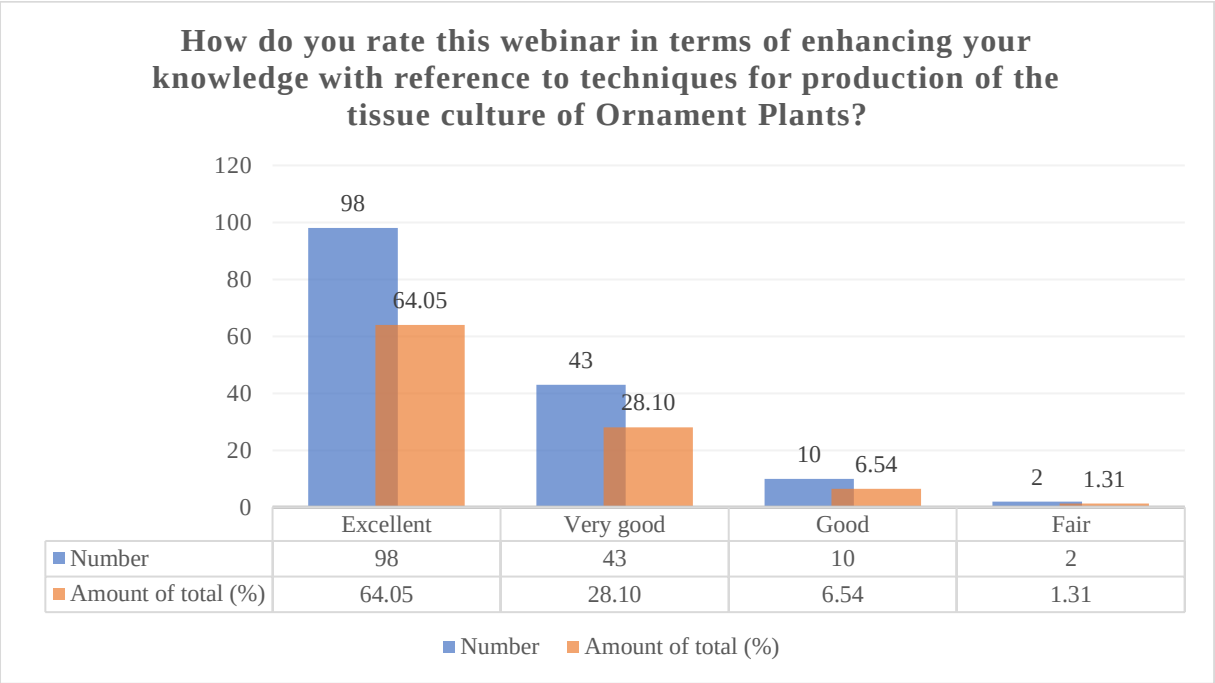


2.10. Do you agree that micropropagation is an efficient technology and profitable for the production of Ornament Plants on a large/ commercial scale?

	Number*	**Percentage (%)**
Total	153	100.00
Yes	152	99.35
No	0	0.00
Note sure	1	0.65

* Respondence rate (%): 50.00

2.11.

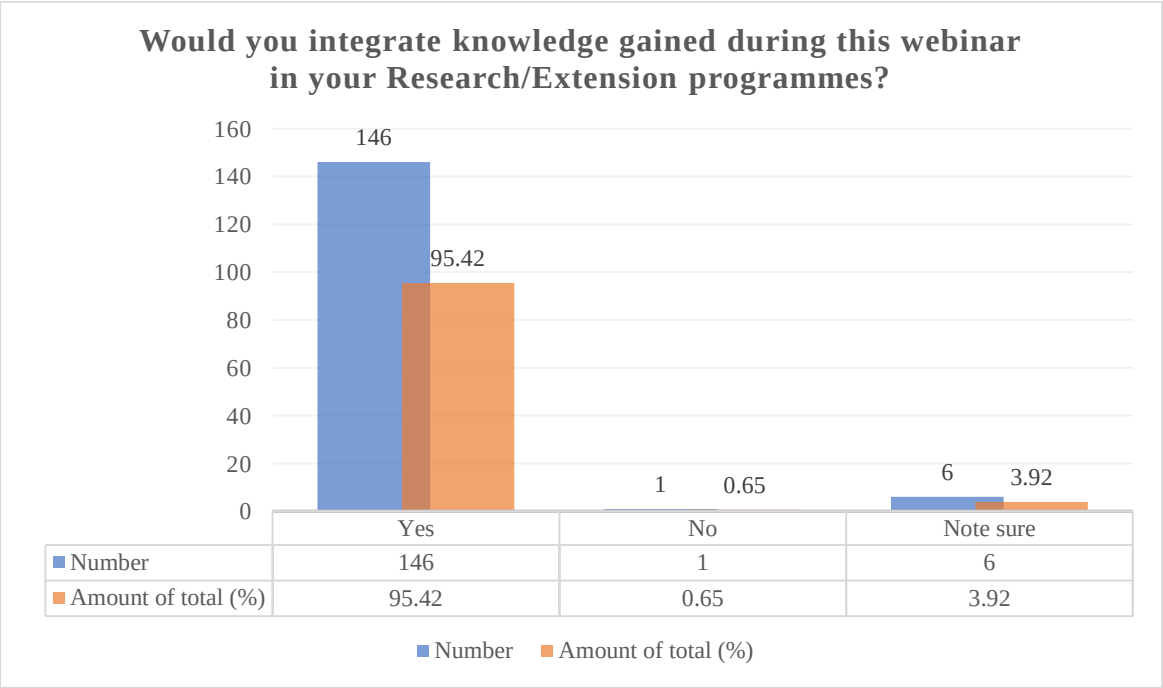


2.11. How do you rate this webinar in terms of enhancing your knowledge with reference to techniques for production of the tissue culture of Ornament Plants?

	Number*	Percentage (%)
Total	153	98.69
Excellent	98	64.05
Very good	43	28.10
Good	10	6.54
Fair	2	1.31

* Respondence rate (%): 50.00

2.12.

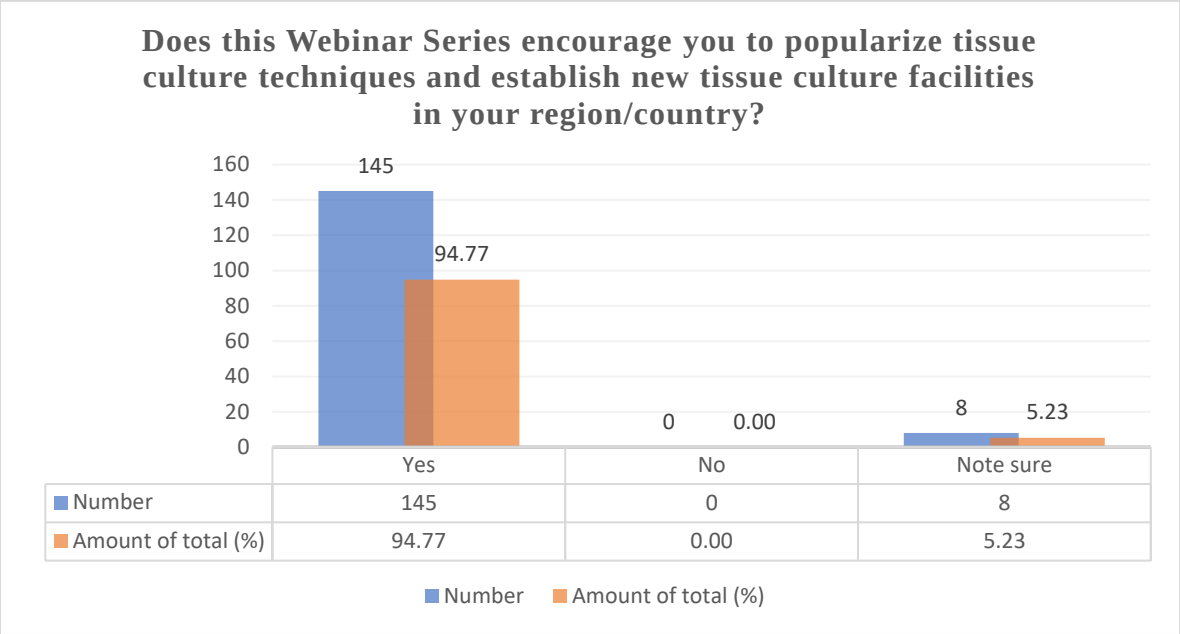


2.12. Would you integrate knowledge gained during this webinar in your Research/Extension programmes?

	Number*	**Percentage (%)**
Total	153	100.00
Yes	146	95.42
No	1	0.65
Note sure	6	3.92

* Respondence rate (%): 50.00

2.13.



2.13. Does this Webinar Series encourage you to popularize tissue culture techniques and establish new tissue culture facilities in your region/country?

	Number*	Percentage (%)
Total	153	100.00
Yes	145	94.77
No	0	0.00
Note sure	8	5.23

* Respondence rate (%): 50.0

Brief Proceedings

The fourth and final webinar of the series was based on tissue culture of Ornamental Plants. Managing Director, BCIL, Dr. Purnima Sharma, extended a warm welcome to the participants to the webinar series and highlighted importance of the tissue culture techniques in propagation of ornamental plants. She stressed on need for popularizing this technique in Asia-Pacific Region and African Countries. The Executive Secretary, APAARI, Dr. Ravi Khetarpal delivered his opening remarks and appreciated the efforts BCIL through its expertise in this sector and taking up this cause. Dr. Khetarpal also welcomed distinguished speakers, panelist and participants from across the globe. He also spoke about role of \APCoAB and APAARI in promoting Sustainable Agriculture. He highlighted importance of ornamental tissue culture plants in Asia-Pacific Region and African Countries.

Dr. Shiv Kant Shukla, Dy General Manager, BCIL, New Delhi made a presentation on the highlights of the Webinar Series organized by APAARI, BCIL and African Countries towards realizing its potential. He further elaborated role of BCIL in the Promoting Plant Tissue Culture in India. He also presented the salient features and components of the BCIL Plant Tissue Culture Programme.

This webinar was chaired by Dr. Naveen Kumar Patle, Additional Commissioner (Horticulture), Ministry of Agriculture and Farmers Welfare, Government of India. He too congratulated APAARI & BCIL for initiating this international series of webinars on the theme of popularizing Plant Tissue Culture techniques in Asia-Pacific Region and African Countries. Dr. Patle stressed upon need of tissue culture techniques for enhancing the production of crops & importance of quality planting material. Dr. Patle launched Plant Tissue Culture Resource Planning (PTCRP) software developed by BCIL for facilitating production management, traceability of Tissue Culture raised plants and their quality management.

Academia experts from India and Thailand spoke about the journey of ornamental tissue culture from research to commercialization in their respective countries. Dr. Kanchit Thammasiri, Professor from Mahidol University, Thailand spoke about commercialization of Orchids in Thailand & tissue Culture techniques for production of good quality of planting material for orchids. Dr. Kanchit spoke about export potential of ornamental plant form Thailand. Dr. Aswath C., Principal Scientist from ICAR – Indian Institute of Horticultural Research, India, spoke about present challenges of tissue culture techniques of ornamental plants in India & potential of tissue culture for ornamental plants in India. Dr. Aswath spoke about global market size of ornamental plants & export market of ornamental plants in India. He also highlighted advantages & disadvantages of bioreactors for production of tissue culture ornamental plants.

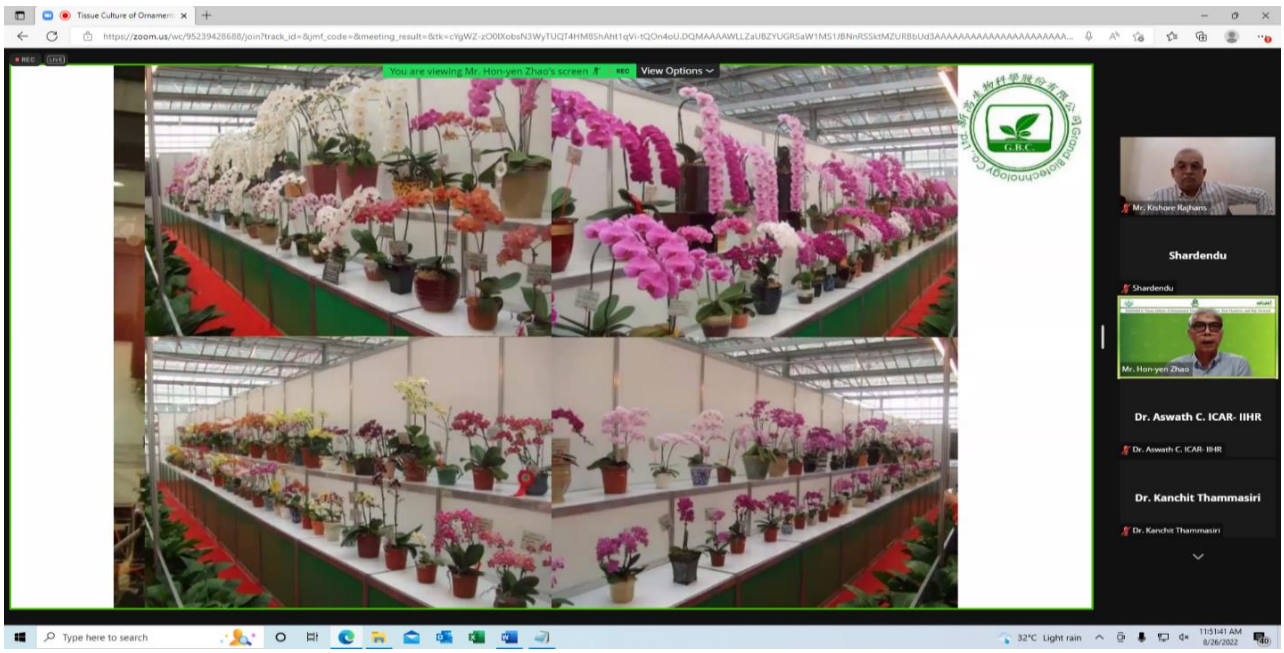
Leading Industries from Taiwan M/s Grand Biotechnology Company and from India M/s KF Bioplants Pvt. Ltd presented their success stories in the field of Ornamental Plants Tissue culture. Mr. Hon-yen Zhao, Director and President, Grand Biotechnology Company, Taiwan shared success story of their industry & highlighted the supply chain & market capacity of industry across the world. Mr. Kishore Rajhans, Director, KF Bioplants Pvt. Ltd., India, spoke about tissue culture ornamental plants production in India, challenges and the way froward. Mr. Kishor highlighted the current scenario of ornamental plants in India, market demand and supply chain. Mr. Kishore highlighted the revenue prospects from tissue culture of ornamental plants.

The session concluded with the closing remarks from Dr. Rishi Kumar Tyagi, Coordinator- APCoAB-APAARI who thanked BCIL for taking up this initiative and associating with APAARI for jointly organizing this webinar series at a global level. Dr. Tyagi thanked to eminent speckers, panelist & participants for being a part of the webinar series. Online polls were also conducted to keep the audience involved and have a fair idea of the status, progress and requirements of the tissue culture industry in the different regions across Asia pacific and African zones. The results of this exercise are tabulated in the data compiled as above. This webinar was moderated by Dr. Shiv Kant Shukla, DGM, BCIL

The detailed presentations by the learned Academicians and esteemed Industry experts are attached as **Annexure 4** for the record and ready reference.

****


Mr. Hon-yen Zhao
BCIL
Dr. Kanchit Thammasiri
Dr. Aswath C. ICAR- IIHR
Dr. Shiv Kant Shukla - BCIL, New Delhi
Dr. Rishi Tyagi
Mr. Kishore Raihans
Dr. Purnima Sharma
Vineet
Jack Lin (APAARI)
Dr. Naveen Kumar Patle
APAARI
Asia-Pacific Association of Agricultural Research Institutions
APAARI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Mr. Kishore Raihans
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Mr. Hon-yen Zhao
Dr. Aswath C. ICAR- IIHR
Dr. Aswath C. ICAR- IIHR
Dr. Kanchit Thammasiri
Dr. Kanchit Thammasiri
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CONCLUSION AND WAY FORWARD

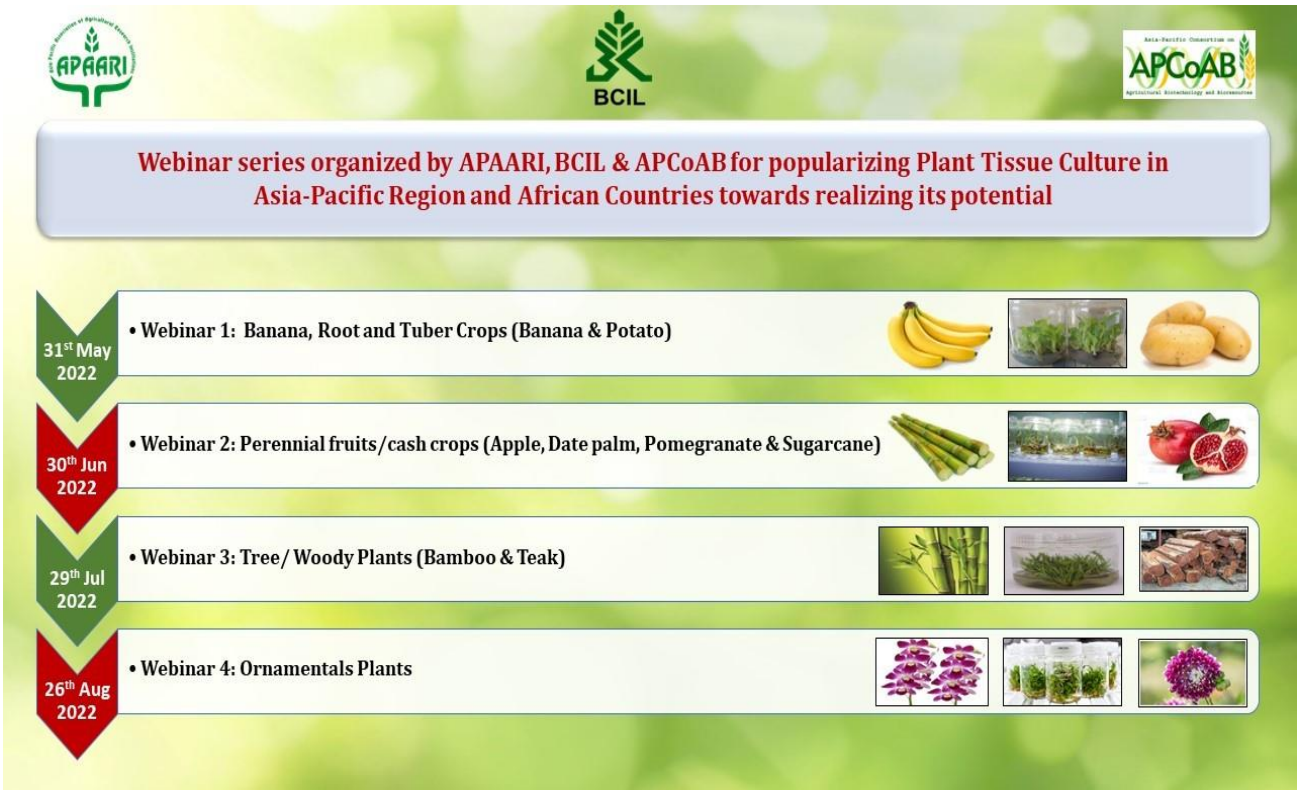
Present assignment of organizing the series of four Webinars with reference to **'Popularization of tissue culture raised certified quality plants for its widespread adoption and realizing its full potential among potential countries in Asia Pacific and Africa'** jointly organized by BCIL, APAARI and APCoAB held from May to August, 2022 was successfully conducted. With an active participation of stakeholders from around 45 countries, the event was a grand success and was very well received by all the participants. The response was excellent with an average of around 250 active participants for each webinar from India and overseas. The webinar generated a great interest among all the stakeholders and resulted in some very thoughtful deliberations during its course among the industry leaders and senior experts. It provided an effective platform to the tissue culture industry to voice their opinions as well as concerns. It was a unanimous view that this sector has a lot of scope and a lot of useful collaborations can be undertaken for further training and development.

BCIL and APAARI expect to continue their joint efforts to develop the relevant support systems to serve the plant tissue culture industry in the future as well and take this into the next phase. **The long-term goal is to develop an effective tissue culture program jointly by BCIL and APAARI for potential countries** to boost the economic growth of the partner countries at the national and international level. The broad objective is to develop a robust tissue culture programme jointly by combining the strengths and resources of BCIL and APAARI for promotion of tissue culture in potential countries. The programme is broadly envisaged to have three phases:

Phase I: Creating widespread **Awareness and Sensitization** about importance of this technology. (*This part has already got a very good start with the successful conclusion of this webinar series.)*

Phase II: **Capacity Building** through skill development/effective training platforms for the interested candidates from the participating countries.

Phase III: Assisting the potential countries for **Establishing QMS** (Quality Management Systems) through implementation of SOPs and technology support through user-friendly software applications for planning of the resources that would be would be helpful for operations, quality management and end to end traceability during production process of tissue culture-raised plants.


APAARI
BCIL
APCoAB
Webinar series organized by APAARI, BCIL & APCoAB for popularizing Plant Tissue Culture in Asia-Pacific Region and African Countries towards realizing its potential
31st May 2022
• Webinar 1: Banana, Root and Tuber Crops (Banana & Potato)
30th Jun 2022
• Webinar 2: Perennial fruits/cash crops (Apple, Date palm, Pomegranate & Sugarcane)
29th Jul 2022
• Webinar 3: Tree/ Woody Plants (Bamboo & Teak)
26th Aug 2022
• Webinar 4: Ornamentals Plants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Dr. Rakha Hari Sarker