

# **ICAR-Indian Agricultural Research Institute, New Delhi**

## **Brainstorming on “Digitally Linked Smart Fruit Farms for Higher Productivity and Profits”**

Digital India initiative of the Government of India has the potential to accelerate development including agriculture sector. Digital linking of Fruit Farms to make them smarter with higher productivity and profits is an important journey towards implementation of Real Time Farm Management and Traceability solutions.

In the past, sporadic efforts have been made by several agricultural institutions to develop smart expert advisory systems like AGRIdaksh, expert systems in wheat and spices, e-learning systems, farmer’s window and agromet advisory etc. However, most of these smart expert systems deal with cereals, oil seeds, spices etc but not the fruit crops. There is a tremendous scope for use of digital information in the form of smart expert systems and technology interventions on fruit cultivation and orchard management. In the above backdrop, ICAR-IARI, New Delhi is organizing a Brainstorming Session on **‘Digitally linked Smart Fruit Farms for higher productivity and profits’ on 7<sup>th</sup> March, 2016 at 10.00 AM in the Library Conference Hall, IARI, New Delhi.**

The proposed brainstorming session aims to discuss about (a) the modalities for making fruit farms smart (b) strategy to transfer climate-smart technologies to fruit growers through digital linkage to transform vulnerable fruit farms into sustainable and productive fruit farms,(c) climate-resilient adaptation technologies, location-specific forecasts, early warnings and advisories for fruit crops and (d) research and policy interventions for developing a challenge program with a broad range of partners under PPP mode to ensure increased fruit productivity and long term competitiveness.

## **Brainstorming on “Digitally Linked Smart Fruit Farms for Higher Productivity and Profits”**

Fruits provide a diversified, flavored, colorful, tasty, low caloric, and protective, micro-nutrient rich diet. Majority of population, around the globe, consistently consume less than the daily recommended fruit requirement of 400 grams per person. Low fruit intake is considered as the sixth main risk factor for mortality in the world. With an estimated 9.6 billion people on the planet by 2050, overall fruit production will need to double in a relatively short period of time to meet the demand. Risk and uncertainty is unfortunately increasing. Climate change, energy costs, availability of skilled labor and market volatility- all add up, constraining decision-making for fruit growers and policy-makers alike.

Digital linking of Fruit Farms to make them smarter with higher productivity and profits is an important journey implementing real Time Farm management and Traceability solutions. Digitizing complete farm operations ensures scalable, sustainable and profitable business on one hand and quality, compliant and traceable product on the other. This is a high visibility initiative providing cutting edge solutions through expert decision support systems, driving operational excellence, cost reduction, continuous improvement and innovation while servicing the fruit business objectives.

ICAR- IARI, New Delhi; IIHR, Bengaluru; CISH, Lucknow; CCRI, Nagpur; CIAH, Bikaner; CITH, Srinagar; NRC on grapes, Pune; NRC on pomegranate, Solapur; NRC on Litchi, Muzafarnagar; NRC on Banana, Tiruchirapalli, Punjab Agricultural University, Ministry of Agriculture, state department of horticulture, state horticultural universities, *Krishi Vigyan Kendras*, regional research institutes, farmer- producers organizations, corporate/industrial/business houses and multinational companies engaged in manufacturing/production and distribution of farm inputs, farm equipment and machinery, rural financial institutions, insurance companies, among others, have a significant role and added responsibility to contribute their professional knowledge to develop digital ecosystem for increasing fruit production and make available the technology to fruit growers for increasing their profits.

There is an urgent need to integrate fruit orchards at all stages of production, from understanding genetics to transport logistics and digitally deliver all the essential services such as agromet advisory, real time price information, online ordering of inputs and online cash, loan, relief payment with mobile banking to fruit growers to transform them into an empowered society and knowledge economy by

leveraging IT. This is expected to ensure long term competitiveness through fruit farm process digitization and could raise the incomes of as many as 100 million fruit growers and bring better nutrition to 300 million to 400 million consumers.

Digital linking of fruit farms with the researchers and other public sector organizations for advisory on agri-inputs, cultural practices, marketing and avenues for processing would benefit producers and diverse end users. In the past, sporadic efforts have been made by several agricultural institutions in the development of smart expert advisory systems like AGRIdaksh, expert systems in wheat and spices, e-learning systems, farmer's window and agromet advisory etc. It is imperative to mention here that most of these smart expert systems are dealing with cereals, oil seeds, spice crops etc. There is a dearth of digital information in the form of smart expert systems on fruit cultivation. The proposed brainstorming session on "digitally linked smart fruit farms for higher yield and profit" aims to discuss about the modalities and way ahead for making our fruit farms more smart and capable. The direct link between seller and buyer will minimise the role of the mediators which will increase the profit margin of farmers and will also benefit the end product customer. The challenges related to digital climate will also be focused.

## A Brainstorming Session on

### “Digitally Linked Smart Fruit Farms for Higher Productivity and Profits”

(7<sup>th</sup> March, 2016 at 10.00 Am in the Library Conference Hall,  
ICAR-Indian Agricultural Research Institute, New Delhi)

#### Tentative Program

<b>INAUGURAL SESSION</b>		
<p><b>Chairman:</b> Dr. Trilochan Mohapatra DG, Secretary, Department of Agricultural Research and Education &amp; Director General, ICAR  <b>Co-Chair :</b> Dr. J.S Sandhu, DDG (CS) ; <b>Co-Chair :</b> Dr. N.K Krishna Kumar, DDG (Hort)</p>		
10.00-10.10 am	Welcome	Dr. Ravinder Kaur, Director, IARI
10.10-10.20 am	Smart fruit farms : Issues and opportunities	HOD (Acting), Dr. K.Usha
10.30-10.40 am	Remarks – DDG, Crop Science	Dr. J.S Sandhu
10.40-10.50 am	Remarks –DDG (Hort)	Dr N.K Krishna Kumar
10.50-11.00 am	Remarks by DG, Secretary, Department of Agricultural Research and Education & Director General, ICAR	Dr. Trilochan Mohapatra
11.00-1.30 am	<p><b>TECHNICAL SESSION-I</b></p> <p><b>OPPORTUNITIES FOR DIGITAL LINKAGE OF FRUIT FARMS</b></p> <p><b>Chairman:</b> Dr. N.K Krishna Kumar DDG (Hort)  <b>Co-Chair :</b> Dr. T.Janakiram, ADG (HS-1)  <b>Rapporteur:</b>Dr. O.P. Awasthi, Principal Scientist, F &amp; HT, IARI</p>	
11.00-12.00 pm	Smart Farm Solution for Growers	Krishna Kumar Founder & CEO CropIn Technology Solutions Pvt Ltd, Bangalore Mobile Bangalore :+91-9986079552
12.00-12.20 pm	Use of digital technologies for fruit Growers	Mr. Narendra Bhushan Jt. Secretary (Extn.) D.A.C., Min. of Agril. New Delhi <a href="mailto:narendra.bhooshan@nic.in">narendra.bhooshan@nic.in</a> 23381757
12.20-12.40 pm	ICT based pest surveillance and pest management in fruit crops	Dr. D. B. Ahuja (Principal Scientist) PI: (HORTISAP)

		National Center For Integrated Pest Management New Delhi- 110 012 Contact No: 09868332755
12.40-1.00 pm	Digital Weather forecasting, early warning and advisory for fruit crop	Dr. K. K. Singh, Head, Agromet Services & Scientist-F; India Meteorological Department; Agromet Service cell, 1 <sup>st</sup> Floor, 12 <sup>th</sup> Block, Mahasagar Bhawan, CGO Complex, Lodhi Road, New Delhi-110003. 011-24694884 (O), 0120-2699307 ®, 9868110771(M), <a href="mailto:kksingh2022@gmail.com">kksingh2022@gmail.com</a>
1.00-1.30 pm	Open Discussion by Panelists followed by Remarks of the Co-Chair&Chair	
1.30-2.30 pm	<b>Lunch Break</b>	
2.30-4.30 pm	<b>TECHNICAL SESSION-II</b>  <b>RESEARCH-POLICY INTERVENTIONS &amp; RECOMMENDATIONS</b>  <b>Chairman :</b> Dr. K.L.Chadha, President, HSI <b>Co-Chair :</b> Co-Chair : Dr. S. D. Sawant, Director, ICAR-NRC for Grapes, <b>Co-Chair :</b> Dr. Ram Krishna Pal, Director, NRC on Pomegranate, <b>Co-Chair :</b> Dr. S Rajan, Director, CISH, Lucknow <b>Rapporteur:</b> Dr. Manish Srivastav, Senior Scientist, FHT, IARI.	
2.30-3.30pm	Open Discussion by Panelists	
3.30-4.00pm	Report by Rapporteurs	
4.00-4.30pm	Remarks by Co Chair & Chair	
4.30-4.40 pm	Vote of Thanks	Dr. M.K Verma

# **Brain storming on Digitally Linked Smart Fruit Farms for higher productivity and Profits**

## **Inaugural Session**

Inaugural session was chaired by the Honourable Secretary Department of Agriculture & Education and Director General, ICAR Dr. Trilochan Mahapatra and co-chaired by Dr. N.K. Krishna Kumar, DDG (Hort.) ICAR.

Dr. (Mrs.) K.Usha, acting Head Division of Fruits and Horticultural Technology who as first speaker of the session shared her views on Smart Fruit Farms: Issues and Opportunities. She opined that smart fruit culture, control on farm and off environment, disease prediction model with robotics, GPS and WEB shops can go long way in boosting horticultural productivity in the country.

DDG (Hort.) suggested that fruit orchards at all stages of production should be integrated with smart expert advisory systems. Challenge programme should be established with broad range of parameters giving due emphasis on the quality attributes and developing proper marketing links as being done in case of grape by the grape growers association. He strongly emphasised on the integration of farmers across the country with a due emphasis on celebrating a day for each fruit crop so that business is opened. Branding of products is essential for fetching more prices through smart horticulture. He suggested that bio scrutiny policy interventions should be taken to the highest level.

Hon'ble Director General, ICAR emphasised that smart horticulture should not be confined only to climate resilient horticulture and it should not target for only making more profit, but should be sustainable. He opined that while planning for digitally smart farms an account of fruit farms available in the country in perspective of organised and unorganised orchards should be taken into account. The vulnerability component needs to be properly mapped in case of banana and papaya. He suggested that insurance schemes should be taken into advantage, while planning smart fruit orchards. He was of the opinion that comprehensive detailed notes in which what we really want from organisations like ISRO

should be formulated. He suggested linking of markets at international and national levels through digital means. At the end he suggested that analysis of traceability should not only be by tags but by product analysis.

## **Technical Session I: Opportunities for digital linkage of fruit farms**

Chairman : Dr. N. K. Krishna Kumar, DDG (Hort.), ICAR, New Delhi  
 Co-Chairman : Dr. T. Jankiram, ADG (HS-1), ICAR, New Delhi  
 Rapporteur : Dr. O. P. Awasthi, FHT, ICAR-IARI, New Delhi

### **Speakers:**

<b>Name</b>	<b>Organisation</b>	<b>Topic</b>
Shri. Krishna Kumar	Founder & CEO Crop In Technologies Solutions Pvt. Ltd., Bangaluru	Smart Farms Solutions for Growers
Dr. D. B. Ahuja	ICAR-NCIPM, New Delhi	ICT based pest surveillance and pest management in fruit crops
Shri. A.K. Bagshla	Agromet Services, IMD, MahasagarBhawan, CGO Complex, Lodhi Road, New Delhi	Digital weather forecasting, early warning and advisory for fruit crops

Mr. Krishna Kumar, Founder and CEO Crop In, Bangalore explained the models in relation to cropping technological solutions. He showed crop digital score cards, auto connect with local weather stations, production approaches followed by his company. His emphasis was more towards traceability and credibility. During his presentation Hon'ble DDG enquired that how people can be linked commodity wise or locality wise. During the discussion Dr. R. N. Sahoo suggested that in perennial crops the biggest challenge is capturing images.

Dr. D.B. Ahuja, ICAR-NCIPM discussed about the ITC based pest surveillance implementation of IPM practices in fruit crops. He emphasised that the lack of information on IPM implementation and poor mechanism of advisory system are the difficulties faced in the programme. He showed WEB base programmes using the multiple stake holder's inputs.

During the discussion Dr. S. D. Sawant, Director, NRC Grapes suggested mathematical models for forecasting and networking with collateral system of information for developing models based on real time data, which was also supported by Dr. ShailaindraRajan, Director, CISH.

Dr. Bakshala from IMD showed different models/ programmes schemes in collaborations with different ICAR organization. He informed that Real time data given by the State Govt. and accordingly advisory is given.

Professor A. M. Goswami expressed that fruit crops like grape growing in different regions behave in different ways; hence collateral information should be generated for making general recommendations particularly for pest surveillance.

Dr. T.Janakiram, ADG (Hort) highlighted initiatives taken in this regard by IIHR who have developed mushroom expert system and advisory developed by CPRI for late blight etc. He emphasized to prioritise the issues and develop ICT based systems like market intelligence, price fluctuations and analysis particularly commodities like onion and tomato. He gave the example of user friendly Apps like Urban Greens, IFFCO Kissan etc. He requested to identify the strengths of the Institutes and the private Partners and come out with common solutions. Lastly the emphasis should be towards improving the productivity, strengthening the farmers with knowledge and know how.

## **Technical Session II: Research –Policy Interventions & Recommendations**

Chairman : Dr. K.L. Chadha, Former DDG (Hort.), ICAR, New Delhi

Co-Chairmans: Dr.S.D.Sawant, Director, ICAR-NRC for Grapes, Pune, Maharashtra

Dr. R. K. Pal, Director, ICAR-NRC on Pomegranate, Solapur, Maharashtra

Dr. S. Rajan, Director, ICAR-CISH, Lucknow, Uttar Pradesh

Rapporteur : Dr. Manish Srivastav, FHT, ICAR-IARI, New Delhi

In the beginning Chairman appraised the theme of session II and informed the house about the subject Research –Policy Interventions & Recommendations. The subject was thoroughly discussed among the panelists in the light of deliberations made in the technical session I ‘Opportunities for digital linkage of fruit farms’.



Dr. Chadha suggested that several hi tech programme are available in horticultural crops. Now it is the time to identify if some programmes can be replicated or some sort of modification is required. He also suggested that farmers need connectivity with government & research organizations, marketing and IT departments. He was of the opinion that literacy of farmers should be taken into consideration.

Dr. S.D. Sawant explained about GrapeNet advisory system used by the Maharashtra farmers. He emphasized that for such advisory systems three things are important.

1. Good network of weather stations
2. Location based advisory
3. Rules based development of logics or models.

Dr. S. Rajan, CISH, Lucknow emphasized the creation of georeferenced orchard database and that too in consultation of farmers or farmers groups. He also emphasized the issue of traceability and credibility in development of such digital smart fruit farms. He was of the opinion that the expert smart system should be developed involving all subject specialists not only by the IT people and opined that Knowledge sharing is another aspect and for remote areas mobile based tools may be effective. Low cost digitization using available shapefiles updated with orchard information will help in linking of orchards with specific characteristics and requirement.

Dr. R.K. Pal, NRC Pomegranate stressed that sustainability, profitability, vulnerability and market linkage are important aspects in relation to digitally linked smart fruit farms. He suggested the need for technology generation in the area of fertigation, robotics, statelites based advisory, use of nano technology, protected cultivation, digital literacy and dissemination of information.

Dr. P. Kalia suggested the role of weather based advisory system in digitaly linked smart fruit farms. Dr. Feza Ahmed, Professor, BAU, Sabour, Bihar suggested crop based database, strengthening of KVKs and technology specific digitalization. Dr Murthy, IIHR, Bengaluru emphasized that more than 80 per cent quarries of farmers are related to plant protection. Therefore, this area should be given due priority in case of digitalization. He explained the example of strawberry system in California. Dr. K.V. Prabhu, Joint

Director Research, ICAR-IARI, New Delhi; while interacting with the panelists suggested that it is the need of time to priorities that either we should go for semi-digitization or complete digitalization of fruit farms. He also emphasized farm characterization at central and state level.

Dr. S.K. Singh, FHT, IARI emphasized the importance of genuine planting materials, addresses of nurseries etc. He also insisted that we should start with Hi Tech production technology information in few crops like mango, citrus and grape. Dr. Gopal Kumar, NRC Litchi, Muzafarpur, Bihar suggested that already available information in different fruit crops should be taken at first for digitalization. Dr. VinayKalia, Entomology, IARI, New Delhi suggested that basic learning materials developed by different organizations should be utilized for digitization. Dr. S.N. Islam, IASRI, New Delhi discussed about the Wheat and Seed Spices experts system developed by his group. He suggested that these expert systems may be used as model for developing suitable expert system in fruit crops. He also stressed that a lab on expert system may be established at IASRI, New Delhi.

**Action points:**

1. Fruit crop mechanism should be there to quantify the digitalised quality parameters. For this IARI can take lead particularly Division of Fruits.
2. It was suggested to develop some models in different fruit crops on the basis of networking where collateral system information is used.
3. It was suggested that the expert smart system should be developed involving all subject specialists not only by the IT people.
4. It was suggested that digitalization should be started with Hi Tech production technology information in few crops like mango, citrus and grape.
5. Smart fruit farming should be included in the Prime Ministers National Digital Literacy Mission as proposed in the budget of FY 2016.
6. A priority list of fruit crops and a creating a digital database of important fruit growers in India should be created if possible with geo tagging.

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**List of Chief Guests**

1. Dr. TrilochanMahapatra, DG, Secretary, Department of Agricultural Research and Education & Director General, ICAR
2. Dr. N.K. Krishna Kumar, DDG (Hort), ICAR, New Delhi
3. Dr. K.V. Prabhu, Jt. Dir. (Res.), ICAR-IARI, New Delhi.
4. Dr. J.P. Sharma, Jt. Dir. (Extn.), ICAR-IARI, New Delhi.
5. Dr. T. Janakiram, ADG (Hort.), ICAR-IARI, New Delhi.
6. Dr. K. L. Chadha, President, HSI
7. Dr.(Mrs.) RavinderKaur, Director, ICAR-IARI, New Delhi
8. Dr. A.M. Goswami, Ex-HOD, FHT, ICAR-IARI, New Delhi
9. Dr. S. D. Sawant, Director, ICAR-NRC for Grapes,
10. Dr S Rajan, Director, CISH, Lucknow
11. Dr. S.K. Sharma, Director, ICAR-IARI, Bikaner
12. Dr. Ram Krishna Pal, Director, NRC on Pomegranate,
13. Dr. K. Pranav, Criyagen Agri. Biotech. Pvt. Ltd.,
14. Sh. VansionarPothula, 5X3 COMECT
15. Dr. Vishal Nath, Director, NRC Litchi, Muzaffarpur
16. Dr. RanjnaNagpal, DDG NIC.
17. Dr. D.B. Ahuja, Principal Scientist, NCIPM, ICAR-IARI, New Delhi.
18. Dr. O.P. Awasthi, Principal Scientist, Division of F&HT, ICAR-IARI, New Delhi
19. Dr. K. K. Singh, Head,Agromet Services &Scientist-F;India Meteorological Department; Agromet Service cell, 1<sup>st</sup> Floor, 12<sup>th</sup> Block, MahasagarBhawan, CGO Complex, Lodhi Road, New Delhi-110003.
20. Sh. Sudhir Gupta, Drishtee
21. Dr. Irani Mukherjee, Agri. Chem., ICAR-IARI, NEW Delhi
22. Dr. B.N.S. Murthy, Principal scientist, ICAR-IIHR, Bengalore
23. Dr. R.N. Sahu, Agril. Phy., ICAR-IARI, New Delhi
24. Dr. P. Kalia, Head, Veg. Sciences, ICAR-IARI, New Delhi
25. Dr. Awtar Singh, Pr. Scientist, Division of F&HT, ICAR-IARI, New Delhi.
26. Dr K Usha, Head (Acting) &Principal Scientist, F&HT, ICAR-IARI, New Delhi
27. Dr SK Singh, Principal Scientist, FHT, ICAR-IARI, New Delhi
28. Dr AK Dubey, Principal Scientist, FHT, ICAR-IARI, New Delhi
29. Dr. R.M. Sharma, Principal Scientist, FHT, ICAR-IARI, New Delhi
30. Dr. Kanhaiya Singh, Principal Scientist, FHT, ICAR-IARI, New Delhi
31. Dr. Jai Prakash, Sr. Scientist, FHT, ICAR-IARI, New Delhi
32. Dr. A. Nagaraja, Sr. Scientist, FHT, ICAR-IARI, New Delhi
33. Dr. (Ms) Nimisha Sharma, Scientist, FHT, ICAR-IARI, New Delhi
34. Dr. Monika Wasan, Agril. Extension, ICAR-IARI, New Delhi

35. Dr. A.K. Jain, AKMU, ICAR-IARI, New Delhi
36. Dr. Rashmi Aggrawal, Pl. Pathology, ICAR-IARI, New Delhi
37. Dr. V.R. Sagar, FS&PHT, ICAR-IARI, New Delhi
38. Dr. A.K. Singh, Genetics, ICAR-IARI, New Delhi
39. Dr. (Ms) Kriti Sharma, Entomology, ICAR-IARI, New Delhi
40. Dr. H.S. Singh, CHES. IIHR, Odisha
41. Dr. Ananta Vashisth, Agril. Physics, ICAR-IARI, New Delhi
42. Dr. Prabhat Kumar, FLS, ICAR-IARI, New Delhi
43. Dr. N.V. Kumbhare, ATIC, ICAR-IARI, New Delhi
44. Dr. Rabindra Padaria, Agril. Extension, ICAR-IARI, New Delhi
45. Dr. B.S. Dwivedi, Soil Sci. & Agril. Chem, ICAR-IARI, New Delhi
46. Dr. S.S. Sindhu, FLS, ICAR-IARI, New Delhi
47. Dr. K. Singh, FLS, ICAR-IARI, New Delhi
48. Prof. M. Feza Ahmed, BAU, Sabour
49. Dr. B.K. Labh, Jain Irrigation System Ltd.,
50. Dr. Vinay Kalia, Entomology, ICAR-IARI, New Delhi
51. Dr. A.K. Baxla, IMD, New Delhi
52. Dr. Anil Kumar San, IMD, New Delhi
53. Dr. Madhubala Thakre, Scientist, FHT, ICAR-IARI, New Delhi
54. Dr. Manish Srivastav, Sr. Scientist, FHT, ICAR-IARI, New Delhi
55. Mr. Nayan Deepak, Scientist, FHT, ICAR-IARI, New Delhi
56. Mohd. Mustaq Journalist, (Rural & Marketing Manager)
57. Dr. G.P. Rao, Pl. Pathology, ICAR-IARI, New Delhi
58. Dr. M.K. Verma, Principal Scientist, FHT, ICAR-IARI, New Delhi
59. Dr. Gopal Kumar, ICAR-NRC
60. Dr. S.K. Sharma, IARI, Pune.
61. Dr. Anita Choudhary, CESCRA, ICAR-IARI, New Delhi





