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Mango Commodity Chain Study:

Knowledge Gap and use of ICTs in the Chain in India

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KNOWLEDGE FOR LIFE

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Executive Summary

A visit was made to India from 21st July 2008- 26th July 2008, to conduct a spot survey of the mango value chain. The main survey area was Lucknow and New Delhi. The purpose of the survey was to study the current situation of Mango value chain and role of information and communication technology in the Agriculture sector in India.

More than 50% population of India lives in the rural areas where agriculture is the mainstay of the people. The green Revolution of the 1960s brought significant increase in the Agriculture productivity through the introduction of improved varieties and new technologies.

India is one of the major producers of mango in the world. Mango is grown in almost all states of India. The major varieties of mango grown in India are; Alphanso, Dashehari, Langra, Fajli, Chaunsa, Totapuri, Neelum etc. It is cultivated on 1.23 million ha with annual production of 10.99 tonnes. This accounts for 57.18 % of the total world production and 22 percent of the total fruit produced in the country.

During the visit different organizations, Agriculture Institutes and Departments like ICAR, APEDA and farming community were interviewed. The detail list of these organization and institutes are give in annex-I.

Of the farmers surveyed over 95 % own a TV, Telephone, Radio and a Mobile phone. 90 % of the farmers use mobile phones to collect market information and other farm related information. The state television and Radio telecast/broadcast agriculture related programmes on a weekly basis. Survey revealed that most of the farmers are aware of these programmes, however except for some progressive growers, do not listen to/watch these on a regular basis. Krishi Darshan, is an agriculture related television programme that is broadcast by the government on its exclusive terrestrial television network – Doordarshan. It is a half an hour programme that runs five days a week at 6.30 pm. All India Radio broadcasts agriculture based programmes on its MW and SW network.

Internet facilities were available at the village level as well. However the farmers do not use these for Agriculture information. 45 % of the surveyed farmers own a PC at home however it is usually used by the children family to do homework from school/college.

Different non-governmental and Governmental organizations are engaged in the dissemination of information regarding agriculture e.g Centre Institute for subtropical Horticulture, has established a Tele-centre at the institute to disseminate technical information to the farming community. ITC has also established an e-Chopal for the farmers. List of these organizations is given in annexure-II.

In the survey, almost all mango orchards were found to be mature and old. 40 % of the orchards were of the age of 35-40 years, 45 % were 10-15 years while 15% of farms were 5-10 years old. This shows that about 85 % farms are at the mature stage. Farmers showed a lack of interest in the proper management of these farms. The harvesting/management rights to these farms are usually sold approximately 3-4 months before the start of the harvest to the contractors. In Lucknow 70 % of the surveyed farmers sold the harvesting rights to their orchards to the contactors. This includes the 20 % that are sold before flowering stage and 50% are sold 3-4 month before harvesting. There appeared to be no coordination mechanism among farmers. Post harvest practices are not up to standard which causes post harvest losses to the farmers and affects profitability of mango crop.

The Centre Institute for subtropical Horticulture Lucknow and State Horticulture Department have introduced new technologies and improved varieties of mango. However, the adoption of these new varieties and technology is very low in the farming community in Lucknow as compared to the other states of India.

Mango marketing system has a complex supply chain. Different supply chain agents are involved in the local markets and they bargain with the farmers at the local level. The market is influenced by middle men and the traders. The lack of market information and other supply chain agents is one of the factors contributing to the low income for the farmers.

Value addition initiatives were not taken by the local farmers. Knowledge regarding value addition and low adoption of new agriculture technology thwart farmer from earning more from mango crop. Lack of farmer's interest in adoption of these new technologies is also due to old age of mango farms. This therefore hampers the quality production of mango.

The current situation needs to be addressed through social mobilization and innovative knowledge dissemination approaches. As the ICTs related infrastructure is in place, these should be used in major way to both gather and disseminate information. These efforts should take advantage of existing resources to enhance quality from farm to market and capacity building of chain actors.

1. Introduction

Mango (Mangifera Indica L) is one of the popular Asian fruits. Mango is also the national fruit of India, where it is known as the “King of Fruits”. India is one of the major producers of mango in the world, growing more than half of the world supply. It is grown on the area of 1.23 million ha with annual production of 10.99 tonnes, which accounts for 57.18 % of the total world production and 22 percent of the total fruit produced in the country.
Major mango growing States are Uttar Pradesh, Bihar, Andhra Pradesh, Orissa, West Bengal, Maharashtra, Gujarat, Karnataka, Kerala and Tamil Nadu. The major mango varieties grown in the country are Alphanso, Dashehari, Langra, Fajli, Chausa, Totapuri, Neelum etc

1.1 Climate

Mango is a tropical and subtropical climate fruit. It thrives in almost all the States of the country and grows at sea level to an altitude of 1500 m. However, it cannot be grown commercially in areas above 600 m. Temperature, rainfall; wind velocity and altitude are the main climatic factors which influence its growth and fruiting. It cannot stand severe frost, especially when the tree is young. High temperature by itself is not so injurious to mango, but in combination with low humidity and high winds it affects the trees adversely.

Most of the mango varieties succeed in places with good rainfall (75 to 375 cm per annum) and dry season. The distribution of rainfall is more important than its amount. Dry weather before blossoming is favorable to plentiful flowering. Rain during flowering is harmful to the crop as it interferes with pollination. However, rain during fruit development is good however heavy rains cause injury to ripening fruit. Strong winds and cyclones during the fruiting season can play chaos as these trigger unnecessary fruit drop.

1.2 Soil

Mango grows well on wide variety of soils, such as lateritic, alluvial, sandy loam and sandy. Although it grows very well in high to medium fertility soils, its cultivation can be made successful even in low fertility soils by appropriate management especially during early stages of growth. Very poor and stony soils on hill slopes should, however be avoided. The loamy, alluvial, well drained, aerated and deep soils rich in organic matter with a pH range of 5.5 to 7.5 are most suitable for mango cultivation. The extremely sandy, shallow, rocky, water-logged, heavy textured and alkaline or calcareous soils are not suitable for mango cultivation.

1.3 Varieties

There are more than thousand mango varieties in India. However, only about 30 varieties are grown on a commercial scale in different states. Important mango varieties cultivated in different states of India are Alphanso, Dashehari, Langra, Fajli, Chausa, Totapuri, Neelum etc and some local verities like, Zahari Sopadi, Lucknowa, Gellas and Khass ul Khass.

1.3.1 Commercial cultivars

The commercial varieties grown in India are as follows:

North India: Dashehari, Langra, S.B. Chausa, Lucknow Safeda, Ratol Gaurjeet, Bombay Green, Khasul Khas

South India: Neelum, Banglora, Mulgoa, Suvaranarekha, Banganpalli, Rumani, Raspuri, Badami

East India: Malda, Fazli, Himsagar, Kishenbhog, Gulabkhas, Jardalu

West India: Alphonso, Pairi, Malkurad, Kesar, Rajapuri, Jamadar
India is the world's largest supplier of mangos, having an annual production of 10.5 million metric tons in 2003 (FAO). This accounted for 41% of the estimated worldwide mango production of 25.56 million metric tons in 2003. During the five–year period from 1998–2002, export of fresh mango from India averaged approximately 42.4 thousand metric tons, or only about 0.4% of mango production during this time period. Data on exports of Indian mango pulp and juice products is rather limited. Data from 1995 (the last year for which FAO reports these data) indicated that India exported 37.7 thousand metric tons of mango pulp. Data from 2001 indicated that India exported 3.2 thousand metric tons of mango juice, but also imported 2.2 thousand metric tons of mango juice. Collectively, these observations indicate that, despite being by far the world's largest mango producer, India exports less than 1% of its mango crop as fresh mangos or as processed mango products. These observations with mango are consistent with aggregate data available on Indian fruit and vegetable exports.
A recent report from the Indian Ministry of Food Processing Industries further details the overly complex supply chain and its contribution to costs and post–harvest losses. This report concludes that it is imperative to streamline the mango supply chain in order to reduce wastage and raw material costs. (Sources: India Ministry of Food Processing Industries and Rabobank Report).

Table 1:Area Production and Productivity of Mango in India

Year	Area (In '000 HA)	% of total Fruit Area	Production (In ' 000 MT)	% total Fruit Production	Productivity (In MT/HA)
1987-88	1232.9	43.5	10350.4	37.4	8.4
1991-92	1077.6	37.5	8715.6	30.4	8.1
1992-93	1136.7	35.5	9223.3	28.0	8.1
1993-94	1217.4	38.2	10113.3	27.1	8.3
1994-95	1228.3	28.5	10993.3	28.5	9.0
1995-96	1283.1	38.2	10810.9	26.0	8.4
1996-97	1344.9	37.6	9981.2	24.7	7.4
1997-98	1384.9	37.5	10234.2	23.7	7.4
1998-99	14.1.6	37.6	9781.8	21.4	7.0
1999-00	1486.9	37.3	10503.5	23.0	7.1
2000-01	1519.0	39.3	10056.8	23.3	6.6
2001-02	1575.8	39.3	10020.2	23.3	6.4
2002-03	1623.4	42.9	12733.2	28.2	7.8
2003-04	1906.4	39.8	11490.0	23.3	6.0
2004-05	1961.9	40.9	11605.2	23.5	5.9

Source: National Horticulture Board of India

1.4 Average Land Holding Size

In Lucknow most of the farmers are engaged in Mango production. During the semi-structured interview it was observed that 2% of the farmers have a land holding of 5 hectare and above, 32% have 2-3 hectare, 20% have 1-2 hectare while 46% of the farmers own up to 1 hectare of land.

In Lucknow the CABI team met with mango farmers and Nursery growers association. The interview and survey reveals that Dashehari is the main variety of mango grown in Lucknow. 80 % of the farmers are engaged in producing Dashehari while others produce mixed varieties like, Chaunsa,

Langra, Lucknow sopaida etc. Almost all the farms are mature and old. About 40 % of the farms are of the age of 35-40 years, 45% are of the age of 10-15 years while 15% of farms are of the age of 5-10 years.

1.5 Survey Methodology

1.5.1 Secondary Data collection

The secondary data for this report was collected from the Department of Agriculture particularly from the Centre Institute for subtropical Horticulture, Lucknow. Information was collected from the Institute regarding Mango Value chain and their current knowledge dissemination approach. Information was also reviewed from the internet.

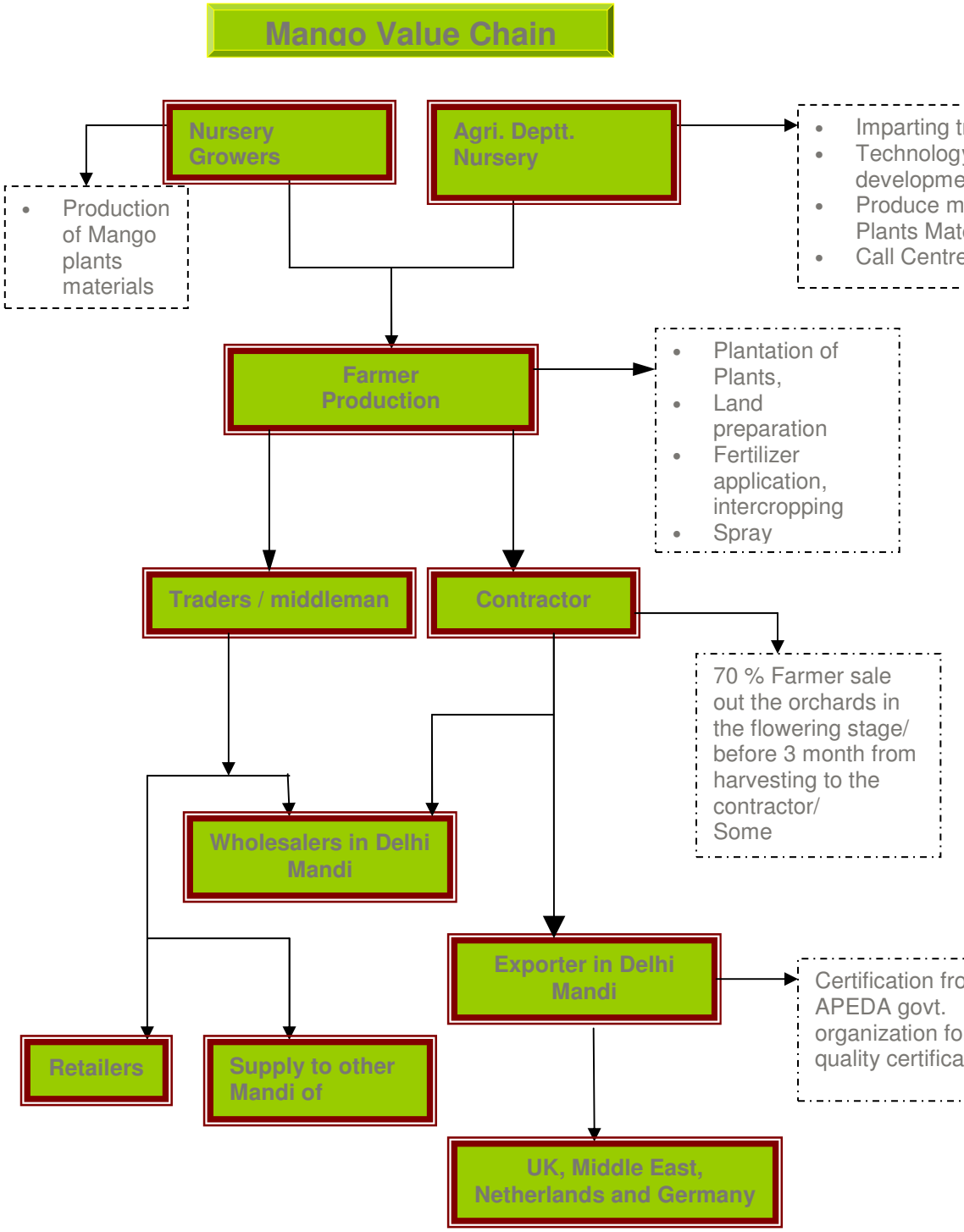
1.5.2 Primary data collection

Different stakeholders like ICAR, CISH, and non governmental organizations involved in knowledge dissemination and market agents were interviewed for primary data collection. On the basis of the information collected from the government institutes/departments and NGOs, meetings with the farming community were planed in Lucknow. Data from the farming community was colleted through focused group discussion and semi structured interview.

Due to shortage of time three villages in Lucknow were visited and meetings with farmers were conducted, in total 6 farmers were interviewed. One meeting was also conducted with the Nursery Grower Association at Lucknow.

2. Mango commodity Chain

The following gives a diagrammatic view of the mango commodity chain as it exists in India.



2.1 INPUTS

In Lucknow, the farmers contract out the harvesting rights to their orchards, sometimes the orchard management is also contracted out. The planting material for mango is available locally and it is grown and supplied by both public and private sector in Lucknow.

2.1.1 Nursery Growers

Plant material / rootstock are the first input and a prerequisite for Mango plants. Different private nurseries and Govt. Sector nurseries are involved in producing mango plant materials/rootstocks. According to ICAR officials, the nurseryman has to obtain a License from the District Head Quarter (DHO) for Nursery raising. All the states have now enacted the Nursery act. The mother plants have to be acquired from the Agriculture Universities or Govt. Nurseries and the mother plants and grafts raised have to be labelled. The concerned Govt. horticulture Officer inspects the nurseries and submits a periodic inspection report.

In Lucknow, a total of 300 private nurseries are registered with the state government. They provide planting materials for Mango and other fruits to the farmers in the country. The price of Mango plant is 12-15 Indian rupees.

2.1.2 Centre Institute for subtropical Horticulture/State Horticulture Department

The government of India has central level and state level Institutes that produce mango plant material. These also impart training to the farming community on different technologies and production methods. The CISH has released export quality red-peeled and regular bearing varieties of Mango. It has also developed a high quality mango hybrid H 3, which is a regular bearing, anthracnose diseases resistant variety. The Institute has also developed standardized technology for post-harvest handling, storage processing and value addition for the horticulture crop in general and for Mango in particular. The CISH is also providing Call Centre facilities for the farmers in the country. The price of CISH plants is slightly higher than the private nurseries at 18-20/plant Indian rupees.

2.2 Major varieties of grown in Lucknow

Dashehari is the major mango variety of the area. Dashehari is famous for its sweet taste but it has less life shelf i.e. 15-25 days. Other varieties e.g. Chaunsa, Langra, Kampala, Malice, Zachary Spade, Locknowai, Galas, Khans are also grown in addition to some local varieties. However these are also grown on a much smaller scale.

3. Production / management of Mango

3.1 Layout of the Land/ Plantation of Mango Plants

Preparing the land for the plants, the older orchards are planted on a spacing of 8 X 8 plant to plant and 4 X 4 row to row, while the newer orchards are planted on 10 X 10 plant to plant spacing. Dashehari, especially is planted this way.

3.2 Fertilizer Application to the land

Farmers are practicing their own methods for fertilizer application. According to the farming community usually after harvesting of the Mango fruit in the month of July- August they apply the fertilizer to their farms. Only those farmers who are in touch with the Agriculture Extension and research Institute are following the recommended dose of fertilizer while other farmers do not know the recommended doses of the fertilizer. These depend on the advice / instruction of the nearby pesticide dealers. Another main reason for improper fertilizer application is that most farmers contract out the management of their orchards as well. In such cases the contactor is responsible for fertilizer application to the farm. The adoption of the new knowledge and technology is very low in the farmers.

3.3 Irrigation

Mango is treated as a rain fed crop with some hand watering in the first 2-4 years. The new plantation is irrigated by using drip irrigation methods but mostly the large farmers are practicing this. From the focus group discussion it was observed that farmers irrigated their mango crop after flowering stage by flooding the orchard.

3.4 Intercropping

The farmer's practices intercropping during the first 4-5 years of a new mango orchard. Mostly vegetables, grain, pulses are intercropped with mango plants.

3.5 Mango Diseases

One of the main constraints in mango production is infestation / infection of insect and disease. Mango Powdery Mildew, Anthracnose, Mango Scab and Mango Malformation were identified by the farming community as the main problems and disease in the mango.
It was observed during the semi-structured Interview that more than 40% of the Mango orchards are 34-40 years old. 45% of the orchards are of the age of 10-15 years while 15% of the orchards are 5-15 years old. The farmers spray pesticides on their orchards approximately three times during December and January. For the pesticide spray application 56 % of farmers consult the nearby pesticide dealer or depend on their own experience.

4. Marketing Mechanism

The farmers usually sell the harvesting/management rights to their orchards to contractors. 70 % of the farmers followed this practice. The contracts are made in the flowering season or up to three months before the harvesting i.e. in the month of March and April. After contract agreement the contractor bears all the expenses related to crop management. Sometimes there is a written (but not legal) agreement between the farmer and the contractor, however if the relationship between the farmer and the contractor is old, the contract is a simple verbal agreement. The contractors mostly sell these mangos in Delhi Central Whole Sale Market. The remaining 30% of the farmers manage their crop themselves. They bring their produce into the local market and sell thought middle man / traders.

4.1 Transportation

It was observed that more 60 % of farmers share vehicle for transportation of mango to the local market. Mangos are only transported by truck. The mango crates are simply dumped into the vehicle, as a result the fruit is damaged. Thus, improper transportation causes a lot of loss to the quality of the fruit, due to which it does not get proper price in the market.

5. ICT Profile of Farmers

The Centre Institute for subtropical Horticulture, under the Federal Govt. has established a Tele-centre at the institute to disseminate technical information to the farming community. ITC has also established an e-Chopal for the farmers. The farmers mostly use the land line phone for queries to the Tele-centre established by the CISH in Lucknow.
More than 95 % of the farmers have TV, Telephone, Radio and Mobile phone. The state television broadcasts an agriculture program on a weekly basis for faming community. 40 % of the farmers watch the Agriculture based programmes; however they do not watch these regularly. 90 % of the farmers use mobile phones to collect market information and other farm related information. 65 % of farmers have a Radio. They listen to agriculture based programmes; however this too is not a regular practice.
45 % of the farmers have a PC at home but it is usually used by the children in the family to do their homework from school/college. Internet facilities are available in the villages but these are not used to gather Agriculture information. Some of the government TV and Radio programmes are:

5.1 Krishi Darshan

Krishi Darshan is an agriculture related television programme that is broadcast by the government on its exclusive terrestrial television network - Doordarshan. It is a half an hour programme that is run five days a week at 6.30 pm. It is available in local languages through Doordarshan relay stations located in different States. The programme is repeated at fixed times during the day. The content is created in collaboration with the Ministry of Agriculture, Government of India, under the Mass Media Support to Agriculture Extension Scheme. Krishi Darshan includes features, documentaries, success stories of farmers, research inputs, quizzes, crop seminars and a live phone in programme. It covers various aspects of agriculture and related activities like horticulture, animal husbandry, dairy and rural life.

5.2 All India radio programmes

At present All India Radio is using the existing MW and SW network for broadcasting agriculture based programmes. The emerging technology is in the form of the FM transmitters. At present 96 FM stations of All India Radio are catering to the rural areas.
These have the capacity to provide high quality output and also deliver local content in the area of its range. As the infrastructure for the FM transmission is already available, the same can be used to broadcast agriculture based programme and thus the major infrastructure related costs can be avoided. The only costs to be incurred will be towards transmission, programme production and playback facilities.

6. Major Problems and constraints

The exceedingly complex supply chain is one of the main hurdles in the development of mango industry in India. A numbers of buyers and other are operating at local Mandis (wholsale markets) to assemble larger lots from the small farmers. Different stakeholders have expressed their concern that this over complex value chain is a hurdle in effective marketing of mango and mango products.
Due to the involvement of the contractor in the farm management and in the marketing mechanism the farming community itself does not take interest in the adoption of new technologies.
The poor management of mango orchards results in poor quality production which can only be sold in the local market. The age of the orchards is another factor contributing to low interest in providing the right inputs (fertilizers, pesticides etc) to the orchard.
The climatic changes like high rain in the month of July affected the quality of mango which further affected the market price.
Majority of the farming community has no knowledge about processing and other post harvest treatment. The old traditional methods for harvesting and post harvesting are still used, particularly in rural Lucknow. Packing material is not up to a quality that would keep the fruit from damage.

6.1 Recommendations

- Social mobilization of the farming community regarding the food security and their role in quality mango production
- Capacity building of local farmers in the proper management of mango orchards.
- Reduction in the number of mango chain actors will simplify the chain. For this purpose it is necessary that the chain actors take on more than their 'one traditional role'
- For above training requirements, ICTs provide an excellent means. The survey has indicated that TV, Radio, Phones and computers are commonly owned by the chain actors.
- Market information networking and dissemination
- Training of farming community on post harvest technology and fruit processing
- Subsidies on improved packaging for mango transportation

Sources Consulted:

- Horticulture Department,

Reliance Agro Initiatives, Reliance Greens, Motikhavadi-361140,
Dist: Jamnagar (Gujarat), India.Tel:91-288-3019841, Fax: 91-288-3019840,

- PFID: F&V India Mango Market Development Project

Partnerships for Food Industry Development: Fruit and Vegetable.

- Institute of International Agriculture Michigan State University

East Lansing, Michigan US

- India Project funding provided by USAID – India Mission, New

Delhi. Focus on fresh and processed Alphonso and Kesar mangoes in Maharashtra state.

- National Horticulture board of India
- Consortium of Indian Farmer Association
- Tamil Nadu Agricultural University (TNAU)
- Market News Service, UNCTAD/GATT, Geneva and APEDA, New Delhi, India

Annexure- I

S.#	Department / person Visited
1	Sh. Ram Autar Deputy Secretary, Department of Agricultural Research & Education, Ministry of Agriculture Government of India Sh. Manjit Singh Under Sectary, DARE Krishi Bhawan, New Delhi
2	Division of Entomology, IARI, New Delhi
3	Dr. B. Lal, Principal Scientist NBPGR / APEDA
4	AGRIWATCH & ISAP(Indian Society of Agribusiness Professionals), Greater Kailash, New Delhi Dr. K.L. Chadha (Chairman) Former DDG (HORT), ICAR Mr. Sunil Khairnair (CEO)
5	Dr. T.P. Trivedi Project Director, DIPA / ICAR New Delhi
6	Pravin Gupta General Manager (Processed Fruits & Vegetables,Other Processed Foods,Trade Fairs,PR,MDA, MAI, APEDA
7	Azadpur Fruits and vegetables Central Wholesale market
8	Central Institute for Subtropical Horticulture Rehmankhera, P.O.Kakori, Lucknow UP
9	Dr. B.M.C Reddy, Director Central Institute for Subtropical Horticulture
10	Growers of Mangoes, Department / Private Nurseary at Rehmankhera, Kakori,
11	Dr. Ram Chand ADG (Agri Extn.) KAB – I Room No. 308

Annexure- II

List of Institute/Organization providing ICT facilities

	Organization of Department	Facilities
	Centre Institute for subtropical Horticulture Luckow	Fee Help line
	E-chopal	Tele Centre
	Government of India	Television Program Krishi Darshan, Doordarshan
	AGRIWATCH	Tele Centre
	All India Radio program	FM Kisan Vani, Choupal, Kheti Bardi

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