A set of interconnected practices which enhance and conserve mango diversity in Malihabad, India

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Historical, cultural and agro-ecological context

In the great Hindu epic the Ramayana, the poet Valmiki writes of forests of mango trees spread across the land of Rama and his forebears about 4000 years ago. This land is Uttar Pradesh, still one of the centres of mango production and diversity in India. There are three main centres of varietal diversity in India, where wide variability in cultivated types is still available: the Lucknow–Saharanpur belt of Uttar Pradesh, the Murshidabad area of West Bengal and the Hyderabad area of Andhra Pradesh (Yadav and Rajan, 1993; Ram and Rajan, 2003). Uttar Pradesh produces nearly 24 per cent of the mangoes in India, which is 3.6 million tonnes, more than any other state in the country (Yadav and Rajan, 1993; Ram and Rajan, 2003). Lucknow is the current capital of Uttar Pradesh and the former capital of the Nawabi rulers, who were part of the Moghul Empire in the eighteenth and nineteenth centuries. The Nawabs played a major role in making Lucknow a centre of varietal diversity by establishing mango orchards with varieties collected from all over India (Mukherjee, 1953). Similarly, the mango plantations in the subdistrict of Malihabad were developed by Pathans, influential trading families under the patronage of the Nawabs of Lucknow (Rajan et al., 2013b).

Mango plays a significant role in Indian culture. Several Urdu philosophers and poets of the nineteenth century, such as Nazeer Akbar Abadi, Ghalib and Iqbal, have written about mangoes. Ghalib, known as a great mango connoisseur, is said to have loved eating mangoes more than composing his couplets. Mango blossom is used even today for the worship of the goddess Saraswati and mango leaves are strung over doorways on auspicious occasions and as protection against evil spirits.

Malihabad subdistrict, located 20 km northwest of Lucknow, has a population of more than 16,000 people, of which the majority claim Pashtun descent. It is the area of origin of the mango variety Dashehari, which has dominated mango production in Uttar Pradesh over the last four or five decades. Malihabad
GDP ‘passport’

<table>
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| Focus area:     | *All four categories*
|                 | • Propagation and planting materials
|                 | • Production and crop management
|                 | • Commercialization and home use
|                 | • Collective action and social networking |
| Character:      | System of three interacting practices |
| Species and varieties involved: | *Mangifera indica* including:  
|                 | 51 named farmer varieties all gathered in one orchard with trees more than 80 years old. Ramkela, Gola, Surkhi, Sundari, PaudaGaj, Deshi Bombaiya, Machhli, Pan, Matka Gola, Chandni, Bhura, Nauraj, Surkha Matiyara, Nazir Pasand, Baudi, Kamal Pasand and others. About 2,971 seedling trees that can all be considered as varieties as they are all genetically distinct. Amin, August, Bhagwanta, Bhol, Bhuzada Anees, Egrohiya, Jabjanat, Khala Khan, Lambauri, Seedling, Surkha, Suwaswala, Tuhiya Pahad, Tuhur, Tukuroo, Zardalu. More than 600 distinct named varieties or seedling types that have been displayed during several diversity fairs by farmers from Malihabad. |

| Name of location: | Malihabad, Lucknow |
| GIS reference of location(s): | N 26°91′; E 80°71″ |
| Elevation: | 128 masl |

| Name of farmers (data resource): | Heritage orchard: Mr Nawab Hassan  
|                                   | Farmers planting seedling trees: Mr Chhote Lal Kashyap, Mr Raja Ram, Mr Amir, Mr Affak, Mr Anish Ahamad, Mr Shadab Ahmad, Mr Maiku Lal |
|                                   | Nursery owners and mango experts of Malihabad: Abdullah Nursery, Mr Monish Ahmed, Mr Shadab Ahmad |
is richly covered by mango trees and harbours many private and public sector nurseries. About 25,000–30,000 hectares are under mango production alone, comprising a major portion of annual mango production in Uttar Pradesh and India (Plate 16). Nowadays about 80 per cent of the tree population is of Dashehari trees only, 13 per cent of the trees are Lucknow Safeda and 5 per cent are seedling varieties. The remaining 2 per cent comprise all other farmer varieties (Gajanana et al., 2014). Trees that do not have specific names are called just ‘biju’ (i.e. seedling) or ‘deshi’ (i.e. local).

The subdistrict is located in the Central Gangetic Plains, which have a subtropical climate featuring three distinct seasons: summer, monsoon and winter. Winter commences usually in the month of November and extends until March, followed by summer (April to mid-June) and then monsoon starts and lasts up to September or October. The maximum temperature is during the month of May (40–42°C) and the minimum temperature during January (5–7°C). Yearly average rainfall is about 1,014 mm, of which 90 per cent falls during the monsoon. The subtropical climate enables synchronous flowering and fruiting (Ram and Rajan, 2003) and suits varieties that require chilling before flowering.

Soils in Malihabad are deep and have developed from the alluvium deposits of rivers. The soils are neutral to moderately alkaline and calcareous especially at lower depths. Some of the land types around the basins of the Gomti River are sandier and less fertile. The specific climate and soil conditions of Malihabad, with extremely hot, rainless summers, help in developing premium quality Dashehari fruit, which are of better quality compared with other districts (Rajan, 2009). In 2009, the Dashehari mango from Malihabad subdistrict received Geographic Indication (GI) recognition as proof of its distinct quality.

Mango is one of the major income sources in the region, being exported to many neighbouring states. About 70 per cent of the mangoes in Malihabad are sold through pre-harvest contractors for a fixed price per quintal (100 kg) negotiated during fruit setting in April. Besides mango, people grow wheat, rice, pulses, chickpea, sugarcane or vegetables and often keep cows and buffalo for milk and manure. The average orchard size in Malihabad is 1.05 ha, with a few large farmers holding 4–8 ha. Farmers normally plant around 90 trees per hectare. The average household income of mango growers is INR102,131 (US$1,621) per annum and average income per hectare of mango is estimated as INR54,488 (US$865).

**Methodology used for data collection**

Focus group discussions were conducted with community representatives, mostly male farmers, to gather information on good practices in Malihabad. The participatory rural appraisal technique, comprising semi-structured interviews with key informants, was used for further information collection. Informants were identified based on the project baseline data (those farmers with high diversity or many seedlings types) or based on recommendations.
arising from the focus groups. Ten nursery experts, 42 farmers with mango orchards and 51 farmers who grew seedling types on farm boundaries were interviewed to collect information on the practices that contributed to the rich diversity in Malihabad. These discussions and the semi-structured interviews were often combined with other project activities, such as meetings or training courses. 15 custodian farmers in four communities were identified (see Chapter 4 for information about custodian farmers) and information obtained from them was added to further improve and validate the good practice descriptions.

**Description of GPDs**

The historical background of mango production in Malihabad has accumulated in several socio-culturally embedded good practices in the management and use of mango diversity that have contributed to the informal seed system in Malihabad. This chapter describes three practices that have evolved in Malihabad: (1) tradition of maintaining heritage orchards, (2) establishment of seedling types in marginal environments and along land borders and (3) the practice of organizing mango festivals to facilitate taste and trait evaluation and the exchange of knowledge and grafts of preferred seedlings for further multiplication by farmers and nurseries.

Despite the prevalence of the Dashehari variety, some farmers retain an interest in old farmer varieties or seedling types as the market for Dashehari seems saturated and prices have declined in the last few years. Reinvigorating old planting practices could help ensure conservation of these varieties and facilitate access to them, and could form the basis for the exploration of niche markets for mango diversity in Malihabad. The system of exchange of planting materials (grafts) has benefitted the spread of different varieties, as evidenced by the display of farmer varieties and best seedling selections during diversity fairs or gifted to influential noble or business people. Influential nursery families in Malihabad screen the varieties presented at diversity fairs for potential planting material that could be taken up in their mother blocks. Traditional systems such as thick planting of seedling types along the boundary of commercial orchards are considered a good practice that supports on-farm management of mango diversity in the region.

**Heritage orchards**

In the sixteenth century the Moghul emperor Akbar ordered one lakh (100,000) of mango trees to be planted in one estate near Darbhanga in Bihar, which was known as Lakhiragh (Mukherjee, 1953; Singh, 1960). Similarly, the Nawabs of Lucknow, during their reign in the eighteenth and nineteenth centuries, planted a large number of mango trees of different elite varieties in several orchards surrounding Lucknow, including Malihabad subdistrict. These orchards were established as a sign of status and pride, but also for their
economic value. The fruit was widely praised and relished in the Indian subcontinent and popular among rich and poor across all religions. The Nawabs were very fond of this special fruit and took pride in collecting as many varieties as possible in their orchards, ordering and collecting varieties from all over the Indian continent.

Mr Nawab Hassan from Kasmandi Kalan village in Malihabad continues this long family tradition in the cultivation of mango started by his ancestors. He is the proud owner of an old orchard where 40 different varieties are planted in one block (Rajan et al., 2013b), with other varieties planted in other plots, all in all totalling 51 named varieties maintained. The general tendency in the last two decades to plant only commercial varieties such as Dashehari and Lucknow Safeda has not convinced him to cut down the old trees he inherited from his ancestors. Several 100-year-old trees, planted at the time when mango varieties were owned for family pride, feasts and exchange by the Nawabs of Lucknow, are still thriving in his orchard (Rajan et al., 2013b).

Mr Hasan Ahmed, the father of Mr Nawab Hasan, purchased a piece of land about 60 years ago in Kasmandi Kalan. The plot contained a collection of lesser-known mango varieties, including traditional farmer varieties collected not only from Malihabad but also from other mango-growing areas such as Shahbad and Sandila, about 160 km northwest of the state capital, Lucknow. These varieties were collected and planted by the then owner of the land, a wealthy citizen of Lucknow, who had a flair for collecting and maintaining the diversity in his orchard. The collection contains a wide range of grafted non-commercial varieties. Most people were not interested in this plot of land; only people with knowledge of mango varieties admired the richness of the collection. The collection includes some of the unique varieties of Malihabad. Several years ago Mr Nawab Hassan considered cutting down the trees and replacing them with commercial types, but due to his curiosity, family pride and an emerging market interest for rare varieties, he has now been convinced to maintain this old heritage orchard.

**Impact on diversity**

Mr Nawab Hasan maintains 51 different traditional farmer varieties in his orchard, most of which are selections collected from different mango-growing areas. Varieties such as Surkhi, Sundari, Pauda Gaj, Deshi Bombaiya, Machhli, Pan, Matka Gola, Chandni, Bhura, Nauraj, Surkha Matiyara, Nazir Pasand, Baudi and Kamal Pasand may not be available in other orchards in Malihabad (Dinesh et al., 2014). A few of them are the only living trees of these varieties on earth. The age of the trees ranges from 50 to more than 100 years, thus showing a continuous process of augmentation of varieties over decades. The trees are all grafted plants, providing an unbiased collection of trait-specific germplasm, which can be considered like a farmer’s field genebank.

More generally, nursery experts and orchardists have been the curators of mango varieties in Malihabad for several generations. Maintaining diversity-
rich mother blocks adds to the status of the nurseries and their owners (Sthapit, 2010a; 2010b). Traditional nursery families have collected and maintained mother plants of a wide range of traditional and lesser-known farmer varieties for several generations in their nurseries. These superior trees are maintained to take scions for grafting and the multiplication of saplings. Nursery experts have collected these elite materials from farmers all over India and even abroad. For example, Abdullah Nursery in Malihabad has grafted scions of more than 300 distinct varieties on a single tree both to save space and out of curiosity (Sthapit, 2010a; 2010b). Established nurseries such as Abdullah Nursery earned their reputation by maintaining a large number of varieties, while new nurseries tend to be limited to producing commercial varieties only.

**Impact on livelihoods**

The unique varieties maintained in the heritage orchards linked to the Nawabs were mostly used as showpieces during celebrations or used as special gifts in the form of the fruit or a sapling – a custom that has been eroded but still exists. However, many of these varieties were not known to the general consumer, received a low sale price and gradually the owners’ enthusiasm declined. This led to the replacement of many old trees with commercial varieties or other crops. Mr Nawab Hasan, too, was reluctant to keep up the old orchard because of low returns. However, for the last four or five years he has been able to get a better price for the lesser known varieties. His efforts to sell the fruit to selected traders with an interest in old varieties, rather than the general mandi (government-controlled wholesale market), have been successful and at present he feels satisfied with his earnings. The higher price for the fruit has changed Mr Hasan’s views about conserving the varieties. Initially the varieties were conserved because of affection and attachment to the trees planted by his ancestors, whereas now their conservation is also supported by a fair price for the unique varieties available in his orchard.

**Sustainability and other benefits**

So far the practice of maintaining heritage orchards has not been sustainable, as many orchards have been lost or are now limited to a few commercial varieties (e.g. Dashehari, Lucknow Safeda). The loss of the heritage orchards is due mostly to conversion to commercial varieties, but is also a result of the encroachment of Lucknow, where land prices have increased substantially which, in turn, has led to the conversion of orchards into residential areas. If these generations-old mango farming families, such as Nawab Hasan’s, received more recognition for their conservation role and could find niche markets for some of their heritage farmer varieties, they would be more inclined to maintain and conserve them.
Establishment of seedling types in marginal environments and along land borders

Mr Chhote Lal Kashyap is a farmer in Gopramau village and belongs to the middle-income group. There are 19 people in his family, including 12 grandchildren. About five decades ago, Mr Chhote Lal, owner of approximately 2 ha, became interested in mango cultivation after seeing the orchards of the mango farmers in other villages in Malihabad subdistrict. His land is located in the Gomti River basin, where it was not common to grow mango. Nevertheless, he made efforts to plant commercial varieties such as Dashehari, but failed to grow the grafted saplings as a result of the poor sandy soils, undulating landscape and lack of irrigation facilities in his village. He met some farmers that planted seedling mango in a similar environment in the Malihabad-Kakori-Mal area and tried adopting the practices they recommended in his land. Seedling types are trees grown from seed, because of their multipurpose character, for a wide range of uses and their ability to thrive on land where grafts are difficult to establish. Eventually his efforts in planting seedling types were successful, resulting in an orchard of more than 100 seedlings. Initially he planted 150 Dashehari grafts that he purchased from the Malihabad commercial nursery, of which about 35 survived. Dead grafts were replaced with seedling types. Out of these seedling trees he selected the better ones and removed the rest, increasing the number of varieties to 135. Experimenting in this way, he gradually became the owner of an orchard that is very rich in mango genetic diversity (Rajan et al., 2013a).

Mr Maiku Lal, another farmer, started mango cultivation about 35 years ago in Sarsanda village (Rajan et al., 2013c). He developed a flair for the cultivation of seedling types. In addition to planting seedling varieties in sandy soils, he planted grafted saplings of commercial varieties in loamy soils, which retain more water and nutrients. He is convinced that his way of organizing and managing his orchard, including a good mix of common grafted varieties and lesser-known seedling varieties, provides him with the best income possibilities and benefits for his family’s livelihood (Rajan et al., 2013c).

Several other farmers (Mr Amir, Mr Affak, Mr Anish Ahamad and Mr Shadab Ahmad) plant a row of seedling types around their orchard of commercial varieties as a fence or to mark their land borders, as orchards are planted close to each other in Malihabad (Plate 17). Normally farmers plant 100 grafted Dashehari trees per hectare, but when including a hedgerow of seedlings they increase the number of trees to approximately 150 trees per hectare. Mr Amir observed that the seedlings are much more vigorous compared with grafted plants; they can grow twice as fast. Seedling trees grow taller and can survive much better without irrigation or application of compost or fertilizers. They also often require less spraying for pest control; grafted Dashehari is often sprayed two or three times a season, whereas seedlings are sprayed only once for pest management.
Impact on diversity

Mango, being a cross-pollinated and highly heterozygous plant, has high intraspecific diversity (Mukherjee, 1953; Ram and Rajan, 2003). The traditional practices of multivarietal orchards and the planting of seedling types in orchards or as hedgerows allows for cross-pollination across genetically distinct types when multiple varieties or seedlings are planted close to each other (Degani et al., 1997). The combination of such planting practices allows evolutionary breeding and generates rich variability from which the farmer can select. Seedling trees in home gardens, as boundaries or in orchards provide an opportunity for the selection of promising types (Plate 18). Farmers and nursery owners have over generations evaluated seedling trees regarding their performance and fruit quality, and subsequently selected the best plants to take some stones and plant them again as a seedling or, when convinced about its unique quality, taken a scion from the tree for grafting. Almost all the commercial cultivars of mango in India have arisen as a result of farmers’ and nursery experts’ selection from seedlings. Mr Chhote Lal now maintains about 135 different seedling types and three grafted varieties in his orchard, including Biju Deshi Dashehari, Deshi Chausa, Tukmi Heera, Sunehra, Badamba, Gola and Dil Pasand (Rajan et al., 2013a). He has named some of the seedling types on the basis of their resemblance to known parent cultivars or because of the similarity of particular shapes or colours of the fruit. Seedling trees whose seeds were taken from a popular variety are often named after them. For example, Deshi Dashehari means a seedling of Dashehari. He selects the most attractive and high-quality fruits when selecting seeds or stones for planting seedlings. Traits used for this selection are: colour (more yellow than green at the ripe stage), shape (more uniform and less asymmetrical), pulp colour (orange), sweetness and pleasing aroma, as these traits are preferred by local consumers. In this way, this practice contributes not only to the maintenance but also to the enhancement and increase of diversity on farm. This practice allows a kind of evolutionary breeding for the tropical mango crop species.

About 40 different mango varieties developed from seedlings are maintained in the orchard of Mr Maiku Lal. Next to commercial varieties such as Dashehari, he maintains lesser-known varieties such as Tukmi Chausa, Gulab Jamun, Kism Safeda, Deshi Taimuriya, Gola Seb, Lambauri Chausa, Deshi Langra, Tukmi Surkhi, Lambauri, Safeda, Chonha Gola and several unnamed seedlings in about 2 ha of land.

Impact on livelihoods

Mr Maiku Lal considers the non-commercial varieties a better option for household consumption because of their high digestibility, juiciness and variation in taste and aroma. He also thinks that seedling types have a higher nutritional value because of their digestible fibres and suitability for making juice. Some of the seedling types are used for making pickle or are made into
a powdered food ingredient (aamchoor) to impart a sour taste. According to Mr Maiku Lal, the commercial variety Dashehari provides fruit for only about one month. Other farmer varieties are available even after the end of the Dashehari season and a continuous supply of fruit from the orchard is possible for a longer period. In recent years he has noticed that fruit of some seedlings even get a better market price than commercial varieties. He considers an orchard based on seedlings or some lesser-known varieties as the best option for sandy soils with limited irrigation facilities.

Mr Chhote Lal maintains seedlings as the strong tap root system gives them higher survival rates in sandy soils compared with grafted saplings. Over the years he has also observed that harvest of seedling types is possible for a longer period than Dashehari, thus providing a prolonged supply of fruit for home consumption and sale. His income starts with the early sale of fruit from seedling trees suitable for pickle in May and June and continues even after July, which is the end of harvesting of commercial varieties like Dashehari. Seedling varieties mature at different times, thus allowing farmers to avoid the dip in market price due to the Dashehari glut. Recognizing these advantages, he is no longer eager to replace his seedling trees with commercial varieties. The productivity of seedling types is sometimes higher than commercial types; he has noticed that his orchard is much more productive under challenging pest conditions. Under conditions of water scarcity, Dashehari and other varieties produce small fruit, whereas several seedling types ripen late and develop a good fruit size because of rains before their harvest. During the mango season, Mr Chhote Lal devotes most of his time to the orchard. He also has a second occupation, as a tailor, when there is not much work in the orchard.

**Sustainability and other benefits**

It was a difficult task for Mr Chhote Lal to establish the orchard on sandy undulating land where irrigation facilities were not available. Cattle and wild animals damaged the saplings and he often used thorny bushes and shrubs to fence off the plants from grazing animals during the initial years of orchard establishment. However, nowadays Mr Chhote Lal gets half of his income from the orchard with its unique seedling types and prefers to plant new trees as seedlings instead of using grafted saplings. Mr Maiku Lal, together with his son Mr Raja Ram, wishes to continue the cultivation of a mixed and diverse group of varieties in his orchard for income and home use but also to conserve diversity richness. Mr Maiku Lal says it is important to find specific markets where they can obtain good prices for these traditional farmer varieties, as in the general mandi (market) prices and interest are generally low.

**Mango festivals to exchange grafts and fruit**

In the eighteenth and nineteenth centuries, during the harvest season, mango feasts were organized by the then Nawabi rules and the best selections of
Plate 1 Photographs of custodian farmers

Plate 2 Typical commercial vegetable garden in Niamey, Niger

Plate 3 A gardener harvesting vegetables for sale

Plate 4 Selected mango accessions collected from farms in Kenya
Plate 5  Award certificate and bonus

Plate 6  Another award certificate and bonus

Plate 7  A typical Kandyan home garden in Sri Lanka

Plate 8  Roadside fruit stall near Manaus, Brazil

Plate 9  Sweet, white flesh of bacuri
Plate 10  Senhor Roxinho holding uxi fruit

Plate 11  Managing bacuri trees to restore degraded pasture

Plate 12  Two forms of Garcinia found in India

Plate 13  Tree with White Garcinia fruits

Plate 14  Normal tree

Plate 15  Plagiotropic bush with wrong scion selection
Plate 23 Maintenance of Rangpur lime in farmer’s orchard

Plate 24 Maintenance of Rangpur lime in farmer’s orchard

Plate 25 Nursery of Vasant Wankhade

Plate 26 Production systems of mandarin (C. reticulata) in Indonesia

Plate 27 Production systems of mandarin (C. reticulata) in Indonesia

Plate 28 Production systems of mandarin (C. reticulata) in Indonesia

Plate 29 Production systems of mandarin (C. reticulata) in Indonesia
Plate 30 Citrus market in Indonesia

Plate 31 Citrus market in Indonesia

Plate 32 Citrus propagation in South Kalimantan, Indonesia

Plate 33 Suradet Tapuan, innovative grafter

Plate 34 Equipment needed for side-grafting

Plate 35 New mango orchard in sloping land

Plate 36 Fruiting in side-grafted branch
Plate 37 Step by step side-grafting technique

Plate 38 Morphotypes of asam gelugor trees, fruits and their uses
Note: Select scion from healthy female tree. The branch is upright and soft to medium hard wood. While rootstock is 4-6 months old (about a pencil size).

1. Wrap tight with parafilm from the bottom
2. Cover with transparent plastic to avoid excessive evaporation
3. Make a small cut on top of rootstock and insert the scion in the cut
4. Make the V-shape at bottom end
5. Select scion from healthy female tree and cut 2/3 of the leaf

Plate 39 Farmers' practice of cleft grafting of G. atroviridis

1. Select budwood (1) from healthy female tree while rootstock (2) is 4–6 months old (about a pencil size).
2. Cut the rootstock skin along 5 cm at 20–30 cm of height from polybag level, tear the skin (3).
3. Cut the bud from budwood and remove the hardwood underneath (4) and place in the cutting (5).
4. Wrap tight with parafilm from the bottom until it covers the patch (6 & 7). After 4 weeks, young shoot will appear to show the process successful. Cut the main stem above the budded area (8).

Plate 40 Farmers’ practice of patch grafting of G. atroviridis
Plate 41. Traditional marcotting technique through root cuttings

Pull the root of healthy female tree to the surface. Cut the root and raise to the air without touching the ground. The root and the shoot will emerge from the cutting.

Plate 42. Celebrating Chhatha Puja in India

(a) Significance of pomelo amongst landpoor homestead
(b) Local fruit market of pomelo
(c) Offering of pomelo and other fruits during Chhath puja
(d) Ladies holding offerings to God during Chhath puja
(e) Artificial waterbody prepared for Chhath puja
(f) Ladies performing puja during Chhath puja
Plate 43  Mango fruit morphological diversity

Plate 44  A typical integrated home garden in East Java, Indonesia
Plate 45a–h  Production and management of Madan

Plate 46  Farmer practices of value addition of Madan
(h) Multi-species rich home garden.

(a) Aroi Tulen fruit on tree.

(b) Varieties/species.

(c) Traditional sun drying rind.

(d) Farmer using portable solar drying cabinet.

(e) Product label for packaging dried Aroi-Aroi rind designed by Agriculture Department to enhance value.

(f) Dried rinds.

(g) Upscaling of the solar-drying cabinet to a solar-drying house. Credit: L. Jousim

Plate 47 Aroi Tulen fruit on tree
Plate 48. Awareness programme at the fruit diversity garden

Plate 49. Awareness programme at the fruit diversity garden

Plate 50. Kampung Kakeng jungle trek after upgrading

Plate 51. Kampung Kakeng jungle trek after upgrading

Plate 52. Tourist guide training for the community of Kampung Kakeng

Plate 53. Tourist guide training for the community of Kampung Kakeng

Plate 54. Tourist guide training for the community of Kampung Kakeng

Plate 55. Tourist guide training for the community of Kampung Kakeng
Plate 56
A typical Kiriwong village landscape

Plate 57
A typical Kiriwong village landscape

Plate 58
Plant materials required

Plate 59
Capacity building

Plate 60
Market outlet of diverse fabrics

Plate 61
Production of mangosteen soap

Plate 62
Diverse products

Plate 63
Market outlet in Kiriwong

Plate 64
Homestay facilities and surroundings

Plate 65
Homestay facilities and surroundings
Plate 66 Mixed fruit cropping orchard

Plate 67 Mixed fruit cropping orchard

Plate 68 Mixed fruit cropping orchard

Plate 69 Mixed fruit cropping orchard

Plate 70 Processing of young leaves of *G. cowa* in Thailand

Plate 71 Traditional fruit rind dryer

Plate 72 Improved energy-efficient fruit rind dryer
Plate 73 Fruit morphotype

Plate 74 Mr Eshanna, custodian farmer with grafting expertise

Plate 75 Appemidi mango pickle stored in brine

Plate 76 Ready to use pickle

Plate 77 Participatory methods to build social capital

Plate 78 Awareness through Padyatra

Plate 79 Women SHS group meeting

Plate 80 Men SHS group meeting
mangoes were often shared as a gift of pride with influential families, friends and other noble families. For the last two or three decades, similar mango festivals (mango mela) have been organized, where a wide range of varieties are displayed and visitors can buy boxes of their favourite varieties. As costs of organization and publicity are substantial, nowadays mango melas are organized mostly by the government, trade associations or tourism boards in major cities such as Lucknow, Bangalore or Delhi. Examples include the yearly Mango Mela, which was organized for the twenty-sixth time by the tourism board in New Delhi during July 2014. Similar melas are organized yearly in Hyderabad, Bangalore and Pinjore (Haryana) to attract consumers and buyers.

Lucknow has a similar tradition of yearly mango festivals organized in the city. In addition, several mango diversity fairs were organized by the Society for the Conservation of Mango Diversity (SCMD) in Malihabad in collaboration with the Central Institute for Subtropical Horticulture (CISH) in 2011 and 2012, in which the farmers played the central role. In 2014 the Mango Mela of Lucknow was organized for the first time more traditionally inside the Habibullah Estate Orchards in Saidanpur village of Barabanki district, about 54 km outside of Lucknow. The key organizers were an NGO called Agribusiness Systems International (ASI) in collaboration with private sector sponsors (Hindustan Times, a newspaper company; Maaza, a soft drink manufacturer; the Taj Hotel). It was organized as part of a horticultural market development programme targeting women (Sunhara, India).

Impact on livelihoods and diversity

These local festivals contribute to the promotion and maintenance of several lesser-known farmer varieties or superior seedling selections. During such events, consumers, farmers and nursery experts taste, evaluate and ‘discover’ new varieties or seedling selections with market potential. Visitors are interested in discovering new tastes and varieties, while nursery experts are interested in finding potential new plant material to include in their nurseries’ mother blocks. These village festivals or mango melas in the cities provide farmers with the opportunity to sell directly to consumers or retailers their fruit, their processed products or both, especially lesser-known varieties. This increases the price and the margins farmers can obtain, although turnover is often relatively small, especially for lesser-known varieties. Such melas are an ideal place to test and try new varieties and products with customers and to make improvements based on their direct feedback.

In the last few years, the market for saplings of some traditional varieties has been increasing slowly in Malihabad. A few farmers sell, at a good price directly in urban markets, unique farmer varieties such as Ramkela (preferred for pickling), Gola, Katchameetha or Husnara. Reinvigorating a market for seedlings and lesser-known farmer varieties would help to conserve the wide range of diversity found in Malihabad.
Conclusion

The above cases illustrate that the combination of several traditional farmer and nursery practices have generated rich intraspecific diversity of mango in Malihabad despite the prevalence of Dashehari and other commercial varieties. Over generations, a large number of commercial mango varieties have been developed from this diversity, including the now most popular variety Dashehari, which supports the livelihoods of thousands of farmers in Malihabad and beyond. The traditional seed system for mango in Malihabad is built upon the combination of several practices including: (1) tradition of maintaining heritage orchards, (2) establishment of seedling types in marginal environments and along land borders and (3) the practice of organizing mango festivals. These practices promote cross pollination and gene flow that allows the process of evolutionary selection to happen in the informal seed system. Interestingly, these practices were observed separately, as practised by the individuals interviewed, but when put together they sustain a local seed system for a perennial species that is strongly embedded within the socio-cultural traditions of the region.

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**Notes**

2. Nawab was an honorific title ratified and bestowed by the reigning Mughal Emperor to semi-autonomous Muslim rulers in princely states before British colonization (Wikipedia).
3. Pathan is Hindi for Pashtun, the largest Muslim community in north India that migrated to this area from the tenth century onwards from Afghanistan and the Central Asia region.
4. www.boloji.com/index.cfm?md=Content&sd=Articles&ArticleID=6143
7. www.facebook.com/LucknowMangoFestival