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Fruit Diversity Fair and On-farm Conservation–An Indian Experience

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As many as 18 diversity fairs were organised on *Mangifera, Citrus* and *Garcinia* species during the last five years in five sites selected in India with the objectives of creating public awareness about tropical fruit tree (TFT) diversity, using it as a participatory tool for locating trait specific indigenous varieties and to enable marketing the diversity. The research questions revolved around the methodology used for organizing the diversity fairs, display of rich diversity by the farmers and success/failure of diversity fair (DF) in locating the trait specific variety among the vast diversity. The diversity fairs also provided a platform for discussion on linking farmers to market, recognizing the custodians of diversity by honouring them and distribution of elite grafts and harvesting tools. Mango was prominent with more number of diversity fairs as well as identification of varieties in four of the five sites. In case of *Citrus*, Amravati and Pusa organized diversity fairs whereas Sirsi organized *Garcinia* diversity fair as three species of *Garcinia* were located in this site. The success of the diversity may be judged by the indicators such as number of varieties characterized and evaluated, number of varieties registered/sent for registration, number of varieties linked to market, value addition possibilities implemented based on the diversity fair besides meeting the primary objectives of creating awareness and locating the trait specific diversity.

Key Words: Diversity Fair, Conservation, Indigenous variety, Sustainable use

Introduction

Diversity fair is considered a good practice among diverse actors in a wide range of geographical and institutional settings as it provides a good forum that over time and space maintains, enhances and creates crop genetic diversity and ensures their availability to and from farmers and other actors for improved livelihoods on a sustainable basis. Although the diversity fair is started as a popular tool for raising public awareness on the value of conserving local landraces (Tapia and Rosa, 1993), it is now used for many different purposes.

Diversity fairs are organised for different purposes such as creating awareness about diversity in landraces, promoting exchange of knowledge and seed and planting materials amongst farmers (Adhikari *et al.*, 2012; Sthapit *et al.*, 2003), recognition of diversity/custodian farmers, locating trait specific indigenous varieties, identifying the elite materials using characterisation and evaluation and to link diversity to markets. A tropical fruit tree (TFT) project on "Conservation and Sustainable Use of Cultivated and Wild Tropical Fruit Diversity: Promoting Sustainable Livelihood, Food Security and Ecosystem Services" has been in operation in four Asian countries *viz.* India, Indonesia, Thailand and Malaysia for the last five years. As part of the project, 18 diversity fairs were organized in the five project sites [Amravati in Maharashtra, Malihabad in Uttar Pradesh, Pusa in Bihar, Chittoor in Andhra Pradesh and Sirsi in Karnataka] in India on *Mangifera, Citrus* and *Garcinia* species. It would be useful to analyze success or failure of these fairs in achieving the objectives. With this background, a study was taken up to document the Indian experience in organising fruit tree diversity fairs.

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Material and Methods

A total of 18 diversity fairs were organised [mango (13), citrus (4), and garcinia (1)] at different sites over a period of five years under the TFT project "Conservation and Sustainable Use of Cultivated and Wild Tropical Fruit Diversity: Promoting Sustainable Livelihood, Food Security and Ecosystem Services". The diversity fairs were organized at different places for creating awareness about the prevailing diversity, exchange of produce (fruits/products) and planting material, locating trait specific indigenous varieties, linking the farmers to markets, distribution of elite planting materials developed at the research organisations to the farmers, promote characterisation, evaluation and at a later stage, registration of varieties with PPV & FRA.

Organizing the Diversity Fair

The main steps in organising the diversity fairs include:

i. Conduct focus group discussion (FGD), four cell analysis (FCA), resource mapping and baseline survey to assess fruit tree diversity (genetic and species)

ii. Ascertain the available diversity in the respective communities of the sites, hold discussions with the groups to decide the venue, material to be displayed, timing and other logistics of the diversity fair.

iii. Plan and implement the event with participation of local institutions, research organisations, development departments, non-governmental organisations (NGO), Krishi Vigyana Kendra (KVK) etc.

iv. Display of farmers' diversity, followed by stake-holders' meeting.

Normally, the diversity fairs coincided with the harvesting of fruits enabling display of maximum number of varieties. In majority of the cases, diversity fair involved showcasing the diversity of the targeted crops by the community and a stakeholders' meeting involving research scientists, horticulture/agriculture department, KVK, NGO and traders. The event also helped to identify farmers who hold unique and diverse material and provided opportunity to recognize and honour such farmers. Sthapit *et al.* (2003) report that diversity fairs in the region get incorporated into conventional fairs and farmers are recognized for conserving maximum diversity and are awarded prizes. Distribution of superior planting materials, implements like fruit harvesting tools and fruit fly traps (mango), marketing of diversity also took place in these fairs.

Results and Discussion

Crop-wise Diversity Fairs

A total of 18 diversity fairs were organized across five selected sites in India. Crop wise and site wise break up of this is presented in Table 1. As may be seen from the table, 13 diversity fairs were organised for mango alone, 4 for citrus and only one for *Garcinia* species. Further, it is interesting to note that four of the five sites organized mango diversity fairs and Amravati (Mandarins) and Pusa (Pummelo) sites organized citrus diversity fairs. Only site *i.e.* Sirsi where *Garcinia* diversity was located could organize one diversity fair for *Garcinia* species.

Participation and Display of Diversity by the Farmers

A number of species and varieties were displayed during the different diversity fairs. The list of such fairs, participation of farmers and the diversity displayed are presented in Table 2. The results are discussed species wise *i.e. Mangifera, Citrus* and *Garcinia*.

Mango

Mangifera was the most dominant species which found place in four of the five sites in India and as many as 13 diversity fairs organized with different objectives. As regards the display of diversity and participation of farmers also, mango was prominent. The display of varieties ranged from 28 varieties to as high as 460 varieties. Further, it is interesting to note that a large number of farmers also participated in the diversity fair while displaying their mango diversity. The diversity fairs were organized at national level as well as at the village level to locate the mango diversity over time and

Table 1. Species/crop wise diversity fairs organized by the sites in India

Sites	Crop-wise No. of Diversity Fairs			Total
	Mango*	Citrus**	Garcinia	
Amravati	-	3	-	3
Chittoor	4	-	-	4
Malihabad	5	-	-	5
Pusa	1	1	-	2
Sirsi	3	-	1	4
India	13	4	1	18

* at Sirsi site, diversity fairs focusing on aromatic pickle mango (*Appemidi*) was conducted.

** At Pusa site, diversity fair focusing on Pummelo was conducted

Table 2. List of diversity fairs organized by different sites, diversity displayed and participation of farmers

Sites	Name of Diversity Fair	No. of species/varieties displayed	No. of farmers displaying diversity	No. of farmers visiting DF
Amravati	Citrus diversity fair in NEH Region (Tura, Meghalaya), October 24, 2010	15 species 19 varieties	65	200
	Citrus Diversity Fair in Central India, Warud, India), March 8, 2013	10 varieties and 8 species	72	620
	National Citrus diversity fair in Central India at Nagpur, Maharashtra October 30-31, 2014	22 species 105 varieties	70	1145 and 98 students
Chittoor	Mango diversity fair and Stakeholders' meeting in Chittoor, June 7, 2014	125 varieties	145	200
	Mango diversity fair and Stakeholders' meeting in Bangalore, June 3, 2014	460 varieties	118	140
	Mango diversity fair, Chittoor, June 13, 2011	78 varieties		200
	Mango diversity fair, Bangalore, May 30,2010	125 varieties		400
Malihabad	Community fruit diversity fair, Kasmandi Kalan, June 18, 2011	235 varieties	300	
	All India Mango Show during Global Conference on Augmenting Production and Utilization of Mango in Emerging Scenario of Biotic and Abiotic Stresses, Lucknow, June 21- 23, 2011	250 varieties	50	
	Mango exhibition at Kasmandikalan, July 22, 2012	425 varieties	300	
	Pickle making competition from different varieties, July 2013.	83 varieties	42	
	Custodian Farmers' Workshop at Lucknow, June 28-29, 2014	600 varieties	150	
Pusa	Mango diversity fair, Samastipur, July 4, 2013	147 seedling types	176	235
	Citrus Biodiversity fair, Mahamda, November 5, 2011	9 species 127 types	109	260
Sirsi	Diversity Fair of *Garcinia indica*, College of Forestry, SIRSI, May 8-9,2010	45 varieties of mango, 5 species of Garcinia	40	150
	Diversity Fair of Wild- Pickle Mango, College of Forestry, SIRSI, April 9,2011	150 *Appemidi* types	61	380
	Diversity Fair of Tropical fruits, on the occasion of National Symposium on "People and Forestry". May 29,2012	35 varieties of mango, 48 species	24	129
	Village level diversity fair at Menasi (Sunkkatti) hamlet in association with Dhan Foundation, June 10, 2014	28 varieties of mango	15	65

space. While the mango diversity of 250 varieties were showcased at the All India mango show in Delhi, about 460 varieties were displayed at the mango diversity fair in Bangalore. It is to be noted that while the sole objective of mango fair in Delhi was showcasing the rich mango diversity to create awareness i.e. to let the public/consumers know that a vast range of diverse mango fruits were available to meet the needs and tastes of a variety of consumers .

The objective of fair organised in Bangalore was not only to create awareness about the rich mango diversity, but also to bring scientists and farmers face to face to understand the problems associated with the mango diversity and its maintenance. But, the interesting part of the diversity fair is about locating the trait specific diversity of indigenous mangoes. The diversity fairs conducted at Chittoor (2011, 2014), Malihabad (2011, 2013), Pusa (2013) and Sirsi (2011) focused on specific types of diversity. Indigenous varieties in Chittoor, pickling types in Malihabad, seedling types in Pusa and aromatic pickle mango types in Sirsi. Aromatic pickle mango varieties (*Appemidi*) are very unique, provided with Geographic Indication (GI) tag, and have a deep cultural value associated with communities in the Western Ghats. Display of over 150 types of *Appemidi* types collected by the farming communities had huge impact on popularizing these unique and rare types. It is also interesting to note that the communities were empowered to organize the diversity fairs on their own which reflects on the capacity building part of the project. The diversity fair organized by farmers of Kasmandi Kalan is a case in point.

Citrus

In the citrus diversity fair organized at Tura, Meghalaya, 15 species and 19 varieties of *Citrus* were displayed and farmers from Amravati site participated in the fair. The farmers from Amravati site for the first time were exposed to the vast array of diversity present in *Citrus* species. One of the objectives was to send a strong message to the Amravati farmers who are facing the threat of genetic erosion as they are dependent on only one species *i.e. Citrus reticulata* and also to motivate them to conserve the citrus diversity for their livelihood. The other diversity fair at the Amravati site was to create awareness at the community level and also exchange of superior rootstocks for posterity. One mega citrus diversity fair at National level was organized at NRCC, Nagpur where a total of 105 varieties of citrus belonging to mandarin (15), sweet orange (22), acid lime (7), grapefruit (8) pummelo (10), lemon (5), wild species (4), rootstocks (35) were displayed at the site. As many as 1145 farmers and 98 students from 3 colleges of Nagpur visited the fair.

An exclusive diversity fair on Pummelo was organized at Mahamda community in Pusa site and 127 types of pummelo and as many as 8 species of citrus were displayed. The pommelo types were later evaluated for elite types. Subsequently, 13 pummelo types were selected for multiplication and distribution to the community.

Garcinia

The only site where *Garcinia* diversity was located was in Sirsi, in the Western Ghats. Three species *Garcinia indica, G. gummi-gutta* and *G. morella* were identified in the different communities of Sirsi site. A specific variant of *G. indica*, yellow morpho-type (popularly called as 'bili murugalu' in Kannada) was the most popular among the local healers and Ayurveda. About 25 products prepared out of *Garcinia* were displayed at the fair. This was the first ever large scale diversity fair on *Garcinia*. A large number of stakeholders of *Garcinia* growers/gatherers/users were provided with an opportunity to exchange their views.

Involvement of Other Agencies

The involvement of policy makers such as National Horticulture Board (NHB), National Bank for Agriculture and Rural Development (NABARD), development departments like State Horticulture/Agriculture Departments (SHD, SAD), research organisations like Indian Council of Agriculture Research (ICAR), State Agriculture/Horticulture Universities (SAU), nursery men, custodian farmers, extension agencies like Zonal Project Directorates (ZPD), KVK and NGO become crucial in taking forward the outcomes of the diversity fairs. Accordingly, the involvement of these agencies was observed in all the diversity fairs organised by different sites. Social learning happens in such fairs as the participant farmers benefit by direct social interaction with many groups of people to share information and gain access to new planting materials. They learn of each other, NGOs, government departments and research organizations (May *et al*., 2014).

Recommendations of Diversity Fairs

The species wise recommendations/ requirements/ suggestions of the farmers are discussed below:

Mango

The diversity fairs on mango organized by different sites resulted in showcasing the huge diversity available at the community levels, exchange of the elite planting materials, identification of indigenous varieties (Chittoor), different *Appemidi* types (Sirsi), seedling diversity (Pusa and Malihabad), requirements of the farmers for maintaining and promoting diversity. The diversity fairs also facilitated the need to further evaluate the indigenous types for various desirable traits. For example, the seedlings of Dhobgama had the sweetest taste and they also possess the late bearing habits (September).

Broad suggestions emerging are:

- Multiplication of farmers' varieties and their distribution among the other community farmers
- The farmers of Sirsi site required capacity building programmes on pickle making from *Appemidi* mangoes.
- Farmers also wanted literature and training on plant propagation, plant protection and linkage with the markets especially for indigenous and seedling types.
- Creation of *in situ* conservation areas for wild aromatic pickle mango through a policy
- Establishment of network of grafting experts for promoting diversity conservation and popularization of *Appemidi* in non-traditional areas
- Popularization of local varieties of fruit-mango

- Diversity fairs should be an annual event
- Recognition to the progressive farmers who maintain high diversity and awarding them
- Policy environment for the registration of the varieties – Fee structure for registration of varieties and benefits to the farmers by registration of their varieties
- Besides, farmers demanded introduction of new fruit species like Custard Apple (Annona) and Cashew in Chittoor, plant protection trainings in Malihabad and Chittoor, value addition possibilities from mango diversity of the region (Pusa, Sirsi, Chittoor and Malihabad).

Citrus

- Development and distribution of better rootstocks like *Alemow* for mandarins and better lime and pummelo varieties
- Training on preparation of value added products (RTS beverage, *Santra Burfi*, Orange Squash, RTE Slices of pummelo) from different citrus species–Nagpur Mandarins, Pummelo, lime, sweet orange
- Linking Pommelo farmers to market

Garcinia

- Trainings on hygienic processing of *Garcinia* products through self-help groups, Village Forest Committees, *etc*.
- Strengthen association between industries and producers
- Awareness on medicinal importance of *Garcinia* species must be enhanced among farming communities and in the metropolitan cities.
- Driers should be provided to all the farmers to dry the rinds of especially *Uppage* (*Garcinia gummi-gutta*)
- Documentation of important Garcinia resources of Western Ghats should be done.
- Popularize the use of *Garcinia* based value added products like butter, kokum juice/concentrate, candles. Since the *Garcinia* species is still under domestication by the farmers, more than the diversity of species, product diversity should be focused. Awareness on medicinal importance of *Garcinia* species must be enhanced among farming communities and in the metropolitan cities.

Success Indicators

A diversity fair (DF) may be considered a success if it meets the objectives with which it was organised. Considering this criterion, though, on the whole, the diversity fairs were able to meet the objectives; it would be naïve to say that all of them were successful. While creating awareness and locating trait specific diversity were the primary objectives of diversity fairs (Sthapit *et al.*, 2003), characterization and evaluation of identified indigenous varieties, linking the diversity to market, value addition to diversity and registration of varieties are crucial to declare diversity fair a success. While all the diversity fairs fulfilled the primary objectives, only a few of them were successful in enabling registration of varieties, linking the diversity to markets and facilitating value addition possibilities to diversity. While a good number of mango varieties were registered or sent for registration only one citrus variety and none of the *Garcinia* species was sent for registration. Further, as regards market linkage and value addition, road side stalls for sale of indigenous mango varieties (Chittoor), distant market sale of pummelo (Pusa), formation of Society for Conservation of Mango Diversity (SCMD) in Malihabad, value addition to Nagpur mandarin – *Satpuda Santra Burfi* (GI) in Amravati, value added garcinia products like kokum juice, butter, candles from seed, HCA in Sirsi site are to be noted.

Efforts were made in the project to address the concerns of the farmers of different communities and as a result, publications were brought out and distributed to the communities, need based training programmes were organized for conservation of diversity, plant protection, organic cultivation of mango, value addition to mango, citrus and garcinia fruits (Table 3), initiatives on linking farmers' varieties to market, formation of groups and capacity building etc. It is to be noted that the number of training programmes and the aspects covered are almost on par with the requirements and these programmes enabled the community farmers to organize the diversity fairs themselves in Malihabad, Sirsi, Pusa sites.

Publications: Important outcomes based on the recommendations of DF are the publications like National Fruit Catalogue, Custodians of fruit tree diversity, Appeyemba Aparanji (Kannada), Custodian Farmers' Workshop Proceedings, Flyers, TK documentation, Technical Bulletins.

Table 3. Number of training/workshops organized based on the recommendations of diversity fairs

Sites	No. of trainings/ interaction meeting	Aspects covered
Amravati	12	Management of Mrig and Ambia crop of Nagpur mandarin Production of disease-free planting material of Citrus. Identification of Citrus Rootstock, Mother Block Development Product Development from Local Fruit Diversity and Their Marketing - Squash, *Satpuda Santra Burfi* Good practices
Chittoor	12	1. Disease and pest control in mango Organic farming in mango 2. Sensitization workshop on "Mainstreaming of mango biodiversity, September 30, 2014
Malihabad	4	1. Organizing diversity fair 2. Harvesting, ripening and packaging of mango 3. Value addition in mangoesPropagation of mango varieties
Pusa	8	Pickle making from Seedling mango for Value Addition' Propagation methods in Mango and Pummelo '*Good Agricultural Practices'* (GAPs) for Mango diversity, livelihood and ecosystem services"
Sirsi	25 +	Grafting Techniques, Garcinia products – Jam, Candles, Butter extraction Good practices and marketing

Linking of Farmers to Market: Formation of SCMD in Malihabad, linking of indigenous mango varieties with markets through Roadside Stalls in Chittoor and distant market sale of Pummelo fruits in Hyderabad are some of the marketing initiatives taken based on the suggestions of the diversity fairs.

Value Addition Possibilities: Some of the value addition possibilities explored are pickle making from *Appemidi* by SHGs in Sirsi, from *Sukul* mango in Pusa, from indigenous varieties in Malihabad, juice making from indigenous mango varieties like *Atimdhuram* and blending in Chittoor, Preparation of *Satpuda Santra Burfi* in Amravati.

Conservation of Diversity: Steps were taken for conserving the fruit tree diversity and among them, formation of network of grafting experts leading to conservation of elite *Appemidi* mangoes in Sirsi, establishment of diversity blocks in Sirsi, establishment of diversity parks in Chittoor, participation of custodian farmers and awareness creation about mango diversity conservation are noteworthy.

Capacity Building: Capacity building was one of the requirements of the farmers who participated in the diversity fairs and efforts were made in this direction in the form of formation of groups and financial transaction, empowering the farmers to organize the diversity fairs at community level, exposure visits and participation in diversity fairs organized in other sites enabling cross learning and interaction meetings with custodian farmers, scientists, traders, NGO.

Recognition of Custodians: Farmers were recognized for their efforts in maintaining and promoting diversity conservation in the form of awarding them with certificates, prizes, taking them on exposure visits to Workshops in India and Thailand.

Identification, Characterization and Registration of Indigenous/Farmers' Varieties

The most crucial aspect of follow up of diversity fairs recommendations is identification of indigenous types, characterization and evaluation of elite types for specific traits and finally registration of varieties. The details are given in Table 4.

Table 4. Number of indigenous varieties identified, characterized and registered across sites

Sites	No. of indigenous varieties identified	No. varieties characterized	No. of varieties registered/sent for registration
Amravati	Mango (12), Citrus (8)	Mango (12), Citrus (8)	2, 1
Chittoor	Mango (44)	Mango (38)	10
Malihabad	Mango (42)	Mango (42)	37
Pusa	Mango (17), Pummelo (13)	Mango (17), Pummelo (13)	15, 0
Sirsi	Mango (52), *Garcinia* (3)	Mango (52), *Garcinia* (2)	4, 0

Identification and characterization of indigenous varieties, the success may be rated high. However, with respect to registration of evaluated varieties, the success rate may be a bit lower. It may be noted at this juncture that the stringent procedures and guidelines required for registration with PPV & FRA acted as a stumbling block in the process of registration of farmers' varieties. This calls for introducing flexibility in the registration norms.

Conclusions and Recommendations

Mango was prominent both in terms of number of diversity fairs and also the number of varieties displayed. Some of the lessons learnt over time and space were overcoming the problems of logistics to bring farmers, arrange the display of good diversity, timing of the diversity fairs and involvement of the other agencies while organising the diversity fairs. May *et al.* (2014) suggested, after an exhaustive literature review, that gender consideration-participation of women in diversity fairs, timing of diversity fairs – which may be optimized with prior consultation and discussion with farmers and involvement of custodians, development department and policy makers for improved social interactions and promoting conservation of diversity on sustainable basis are the important lessons learnt while organising the diversity fairs. Useful suggestions/recommendations of the diversity fairs are followed up with implementation to a larger extent. The success of the diversity fairs may be judged by the indicators such as number of varieties identified, characterized and evaluated, number of varieties registered/sent for registration, number of varieties linked to market, value addition possibilities implemented based on the diversity fairs besides meeting the primary objectives of creating awareness about diversity and locating the trait specific diversity. There is ample scope for fine tuning the organization of diversity fairs. One of the roles of diversity fairs of identifying the custodians of diversity was effectively demonstrated and supporting these diversity conservers with a policy would strengthen the diversity conservation efforts. Further, though the objective of diversity fairs was not registration of varieties, it is to be mentioned here that the diversity fairs in India facilitated registration of some of the evaluated elite varieties despite stringent procedures and there is a need to introduce flexibility in registration norms.

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