



Custodian Farmers of Agricultural Biodiversity: Selected Profiles from South and South East Asia

Proceedings of the Workshop on Custodian Farmers of Agricultural Biodiversity, 11-12 February 2013, New Delhi, India

Bhuwon Sthapit, Hugo Lamers and Ramanatha Rao, editors



This publication presents part of the findings of the regional UNEP/GEF project “Conservation and Sustainable Use of Cultivated and Wild Tropical Fruit Diversity: Promoting Sustainable Livelihoods, Food Security and Ecosystem Services” implemented in India, Indonesia, Malaysia and Thailand. The project is coordinated by Bioversity International with financing from the Global Environmental Facility (GEF) and implementation support from the United Nations Environment Programme (UNEP).

Bioversity International is a world leading research-for-development non-profit organization, working towards a world in which smallholder farming communities in developing countries are thriving and sustainable. Bioversity International’s purpose is to investigate the use and conservation of agricultural biodiversity in order to achieve better nutrition, improve smallholders’ livelihoods and enhance agricultural sustainability. Bioversity International works with a global range of partners to maximize impact, to develop capacity and to ensure that all stakeholders have an effective voice.

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The Global Environment Facility (GEF) unites 182 member governments — in partnership with international institutions, nongovernmental organizations, and the private sector — to address global environmental issues. GEF is the largest public funder of projects to improve the global environment. An independently operating financial organization, the GEF provides grants for projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants.

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National Bureau of Plant Genetic Resources (NBPGR) is the nodal organization in India for exchange, quarantine, collection, conservation, evaluation and the systematic documentation of plant genetic resources.

Protection of Plant Varieties and Farmers' Rights Authority (PPVFRA) aims to ensure protection of the rights of farmers and plant breeders and encourage the development of new varieties of plants.

Contents

Acknowledgements

Title	Profile
Custodian farmers of agricultural biodiversity: putting on-farm conservation theory into practice – what we can learn from them <i>Bhuwon Sthapit, Hugo Lamers and Ramanatha Rao</i>	
Dattatraya Hegde: The custodian of unique 'Appe Mango' of the western ghats, India <i>Vasudeva Ramesh</i>	1/2013
Vishweshwar Ganapati Hegde: The master grafting expert and barefoot breeder of local mango varieties <i>Vasudeva Ramesh</i>	2/2013
K. Ravindranath: The Custodian of Indigenous Mango Diversity in Chittoor District of Andhra Pradesh, India <i>T. M. Gajana, M. R. Dinesh, C. Vasugi and V. Dakshinamoorthy</i>	3/2013
P. Lakshminarayana Reddy: The Custodian of indigenous mango diversity in Chittoor District, Andhra Pradesh, India <i>T. M. Gajana, M. R. Dinesh, C. Vasugi and V. Dakshinamoorthy</i>	4/2013
M. Gunashekhar Reddy: The Custodian of indigenous mango diversity in Chittoor District, Andhra Pradesh, India <i>T. M. Gajana, M. R. Dinesh, C. Vasugi and V. Dakshinamoorthy</i>	5/2013
Chhote Lal Kashyap: Limited resources led farmers to create and conserve mango varieties, Malihabad <i>Shailendra Rajan, Ram Kishore, Shadab and Vijay</i>	6/2013
Nawab Hasan: Conserving century-old mango varieties in KasmandiKalan: The story of the Nawabs <i>Shailendra Rajan, Ram Kishore, Shadab and Vijay</i>	7/2013
Palin Along: Custodian of underutilized wild tropical fruit species Aroi-Aroi (<i>Garciniaforbesii</i>), Malaysia <i>Salma I., Muhammad Shafie M. S. and Wong W. W.</i>	8/2013
Razali Yahya: Promoting the planting of <i>Garciniaatroviridis(asamgelugor)</i> in agroforestry systems, Malaysia <i>Salma I., Muhammad Shafie M. S. and Norhayati M. H.</i>	9/2013
Kailash Prasad Rai: The custodian of high-yielding diversity of 'Bathua mango' in Pusa Block, Samastipur, India <i>Sanjay Kumar Singh and Awtar Singh</i>	10/2013
Maiku Lal: Finding the balance between commercial and seedling trees in Sarsanda <i>Shailendra Rajan, Ram Kishore, Shadab and Vijay</i>	11/2013
Ahmad Kusasi: Mango custodian farmer from TelagaLangsat, South Kalimantan, Indonesia <i>Achmad Rafieq</i>	12/2013
Sudarman: Mango custodian farmer from TelagaLangsat, South Kalimantan, Indonesia <i>PutuBagusDaroini SP</i>	13/2013
Suradech Tapuan: A champion of side grafter and custodian of unique mango diversity <i>Supattanakit Poswang, Chatchanok Nappornphan, Pichit Sripinta and Songpol Somsri</i>	14/2013

Title	Profile
Liam Linlatai: Custodian farmer of Madan (<i>Garciniaspp</i>) <i>Auttaapon Rukkaphan, Chatchanok Nappornphan, Tawatchai Nimkingrat and Songpol Somsri</i>	15/2013
Vinod Rai: The custodian of richest diversity of 'Seedling mangoes' in Pusa Block, Samastipur, India <i>Sanjay Kumar Singh and Awtar Singh</i>	16/2013
Kodukka Malliga Seerangan: Custodian of climate smart nutri-millet: Kolli Hills, Namakkal <i>E. D. Israel Oliver King and M. N. Shivakumar</i>	17/2013
Khem B. Chand: A Custodian of Rare and Indigenous Vegetables <i>Sajal Sthapit</i>	18/2013
Sadhu Oyal: A custodian farmer promotes the conservation of his village's biodiversity Resources <i>Dhan Foundation</i>	19/2013
Vasant Mahadev Rao Wankhade: The self-made nursery man in search for rootstocks <i>I.P. Singh and BMC Reddy</i>	20/2013

Outcomes of the Workshop on Custodian Farmers of Agricultural Biodiversity: Policy support for their roles in use and conservation (New Delhi, 11-12 February 2013)
Bhuwon Sthapit, Hugo Lamers, Ramanatha Rao, Ronnie Vernooy, Vasudeva Ramesh, BMC Reddy, Shailendra Rajan, Pichit Sripinta, Idha Widi Arsanti, Aditya Kiloes, Salma Idris, ShafieMd Sah, EDI Oliver King, Sajal Sthapit, MP Vasimalai, Gennifer Meldrum, GV Ramanjaneyulu, Camila Zanzanaini, R.C. Agrawal, KC Bansal, NK Kishan Kumar and Prem Mathur

Workshop Programme

List of participants

Photographs of Custodian Farmers

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The idea for the workshop on custodian farmers of agricultural biodiversity was conceptualized at the National Project Steering Committee meeting held in Pusa, Bihar. It was later endorsed by Secretary DARE and Director General ICAR, Dr S. Ayyappan at the briefing meeting held at Bioversity International, New Delhi office. Identification and documentation of custodian farmers of tropical fruit tree genetic resources has been an integral part of the traditional knowledge documentation of the UNEP/GEF Project, “Conservation and Sustainable Use of Cultivated and Wild Tropical Fruit Tree Diversity: Promoting Sustainable Livelihoods, Food Security and Ecosystem Services” implemented in 36 rural communities in India, Indonesia, Malaysia and Thailand. So, at the outset we would like to express our thanks to the DG, ICAR for making this meeting possible. The efforts of all the site coordinators and the country coordinators of TFT project in documenting profiles of custodian farmers and providing support for the participation of overseas custodian farmers is greatly appreciated. ICAR support to participants from Dhan Foundation and Society for Sustainable Agriculture and IFAD NUS project’s support to participating farmers from Nepal and India is acknowledged.

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Custodian Farmers of Agricultural Biodiversity: Putting on-farm Conservation Theory into Practice - What We Can Learn from Them

Bhuwon Sthapit, Hugo Lamers and Ramanatha Rao

Introduction

Agriculture is the largest global user of biodiversity. Over-reliance on a handful of crops puts global food security at great risk, especially in the context of climate change. Selected and used by generations of farmers, agricultural biodiversity contributes to reducing malnutrition, alleviating poverty and combating climate change challenges. This diversity has been in decline for decades and is now in danger of disappearing and efforts are needed to conserve them using both *ex situ* and *in situ* approaches. Although *ex situ* conservation is practised by most countries, global commitments to support on-farm conservation efforts have not yet yielded tangible or comprehensive interventions on the ground.

Despite this global scenario of biodiversity loss on farms and in the wild, there are still a few farmers in every country who actively maintain, adapt and disseminate agricultural biodiversity, and who possess the knowledge needed for its use and cultivation. We recognize them as the 'custodian farmers' who maintain portfolios of diverse crop species and varietal diversity. Custodian farmers are conceptually embedded in the informal seed system and/or integrated seed system. These farmers select varieties adapted to local conditions and local preferences and promote the use and conservation of local diversity among their friends and neighbours, even in the absence of any direct or monetary incentive.

Conceptual Rationale

It was not until the 1980s and 1990s that the international community took full account of the fact that a great deal of crop genetic diversity still existed, uncollected and unfrozen, but conserved under the care and management of custodian farmers (although they were not referred to as custodians). The term and concept of 'custodian farmer' is relatively new to *in situ* and on-farm conservation of agricultural biodiversity research. Studies indicate that not all farmers or households are equally involved in the conservation and we are glad that there are at least a few farmers who typically maintain a diverse portfolio of crops and varieties compared to fellow neighboring farmers within their communities (Subedi et al., 2003; Negi, 2003). The general features of such farmers include being located in diverse agro-ecosystems, maintaining rich species and varietal diversity, being driven by conservation ideology, being rich in eco-agricultural knowledge and varieties with unique traits and usually being willing to share their knowledge and materials. They are also highly motivated, self-directed (sometimes becoming so with external support and exposure), with the unshaken commitment for which their communities recognize them as knowledge holders. In that sense, they differ from other common farmers and stand alone amongst their peers as "progressive farmers/leader farmers/village leaders".

Padulosi et al (2011) reported that the sources of their motivation could be diverse: **personal** (driven by passion, hobby, specific family or nutritional preference or sensitivity regarding the need for conserving diversity for future generations); **social** (driven by the desire to conserve particularly relevant crops for the development of the community, the ability to share materials with relatives and friends, the ability to secure the material they inherited from their forefathers and pride of having more diverse or unique material than others in the community); **economic** (driven by the need for safeguarding diversity for economic options and to manage harvests or price risks); **cultural** (driven by the awareness of the intimate link between genetic and cultural diversity); **environmental** (for sake of improved functioning of ecosystem services and health) and **policy/rules** (driven by available policy options).

Such men and women play a crucial role in the management and use of agricultural biodiversity within farming communities (Ruiz and Vernooij, 2011) and function often as intermediaries between traditional and formal seed systems. If we are able to identify and provide direct support to those women and men that we consider custodian farmers, then it could be a very effective and efficient way to strengthen on-farm conservation practices. It will complement *ex situ* conservation in national and international genebanks - such networks of farmers can be considered "community genebanks". Building further upon the intrinsic interest and motivation of those men and women can be seen as a least-cost approach in establishing an on-farm conservation system on a sustainable footing and for the long-term.

Linkages with the Formal Seed System

Custodian farmers playing a crucial role in the farmer seed system and consolidating linkage with custodian farmers formal seed system could result in the following benefits:

- Low cost approach – function as *in situ* genebank often without any support
- Key sources at local level for knowledge and germplasm for scientists and for other farmers (collection efforts)
- Could function as nodal point for the regeneration, dissemination or field testing of released material or promising landraces (participatory evaluations)

- Continuous updating, innovation and adaptation of knowledge and material (climate change)
- A concrete manifestation of farmers' rights by recognizing their breeder and conservation role (empowerment).
- A linkage between *ex-situ* and *in situ* conservation (community seed banks or forest genebanks).
- Best option for the conservation of rare types that are important but that fall outside of the priority list of national and international genebanks (landraces and minor crops).

Definition

The term "custodian" literally means guardian/caretaker/protector/warden. "Custodian" is usually defined as "someone who is responsible for looking after something important or valuable". In the literature, custodian farmers are identified as those "*conserver*" farmers who actively maintain, adapt and disseminate agricultural biodiversity over time and space, including the culture and institutions in which it is embedded, and the knowledge needed for its use and cultivation¹.

The current working definition of custodian farmers is farmers (men and women) who actively maintain, adapt and promote agricultural biodiversity and related knowledge over time and space at farm and community levels and are locally recognized for these efforts.

The term 'custodian' does not necessarily refer to individual people or to either gender; the people it describes do not always act solely in the area of conservation (van Oudenhoven, 2011), as the outcome is often the product of collective action. On-farm genetic diversity assessment reveals that certain farmers maintain richer crop diversity than other farmers in the community although land-holding size is the same (Subedi et al., 2003; Jarvis et al., 2008). However, it is not clearly understood what type of individual in the community is more likely to maintain rich diversity of agricultural biodiversity. On several reported occasions, a group of actors are socially connected in order to ensure access to and availability of the genetic resources that they need. In such a context, the access to and availability of seed and planting materials are ensured by social seed networks (i.e. farmer seed system), an important traditional practice that supports on-farm conservation (Subedi et al 2003). The majority of seed flow occurs within a community in the form of gifts, exchange and bartering within the context of social customs. Within these networks, certain members in the community -- defined herein as nodal farmers² - appear to play a major role in managing the process of genetic flow and crop diversity (Subedi et al., 2003; Badstue et al., 2006; Almekinders, et al., 1994). However, with the strong focus on commercial seeds and government-released material since the Green Revolution, those social networks are often increasingly eroded and dysfunctional when nodal farmers have stopped their traditional roles within the community.

Preliminary results of a survey among custodian farmers (n=17) showed that the majority of custodian farmers have shared their genetic material and knowledge with the modern or formal seed system. Thus, besides playing a key role in the traditional or informal seed system, they also often function as a key link with the formal seed system as breeders and researchers often depend on those custodian farmers during their collection and exploration missions.

With this background, we tried to study 20 cases selected systematically from 36 communities of four countries in South and Southeast Asia to understand the characteristics of such so-called "custodian farmers," to refine the definition of custodian farmers for on-farm conservation and to uncover the motivating factors for such self-driven actions of each individual farmer.

Methodology

A global review of the literature was carried out to understand previous work in these areas within the context of consolidating farmers' roles in the management of agricultural biodiversity. Some characteristics defined by the IFAD NUS Project were initially used to refine the methodology (Padulosi *et al.* 2011). A small group composed of the Regional Project Management Unit (RPMU) brainstormed to arrive at the following list of steps for the identification of custodian farmers in the context of tropical fruit tree diversity on-farm:

- **Discuss the definition and characteristics of custodian farmers among implementation partners** to facilitate the identification of potential candidates (e.g. consult key research staff and conduct planning meetings)
- **Identify potential custodian farmers using existing information** (e.g. results of focus group discussions, such as Four Cell Analysis and baseline survey data that can pinpoint diversity-rich farmers or key diversity knowledge providers)
- **Conduct focus group discussions with community representatives** and discuss the definition and characteristics of custodian farmer to draw on their opinions and gather information on potential candidates (this to avoid a top-down selection procedure).
- **Shortlist five to six potential custodian farmers** in each community in each site based on focus group opinions (internal selection) and earlier information/group discussions (external selection).
- **Validate candidates in the field by personal and informal semi-structured interviews** and document whether the identified farmers match the profile and characteristics of custodian farmer.
- **Use Four Cell Analysis to assess the level of diversity (richness) of individual farmers** and identify the unique traits or characteristics of the genetic resources they maintain, adapt or promote.

- Most importantly, try to understand and document the rationale and motivations of shortlisted men and women by identifying **triggers or driving factors** that encourage them to maintain, promote or adapt local or rare genetic resources by recording their anecdotal stories.

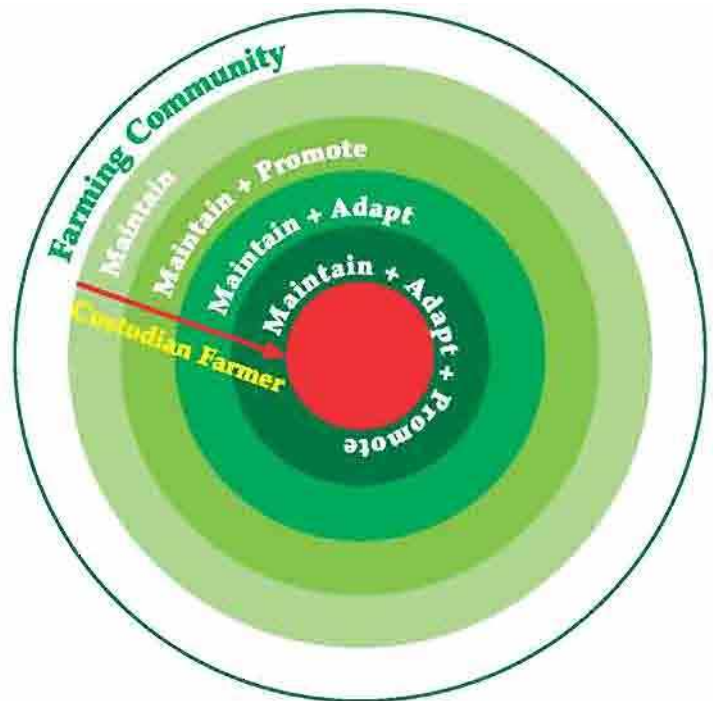
Because of the difficulty in assessing these qualities in a custodian, we should always refer to the judgment of the community in the process of identification and appreciate community recognition as one of the criteria for initial short-listing. However, the intention is not to single out one individual farmer above the other members of the community, but to select one or several 'nodal point(s)' with whom a dialogue can be developed and interventions planned that ultimately benefit the entire community.

Typology

It is obvious from preliminary analysis of case study profiles that all custodian farmers identified cannot be categorized into one group as their roles of conservers, innovators and promoters differ in their treatment of the material in terms of their use and adaption and the ability to take a lead. Figure 1 shows how they could be categorized into four types as described below:

1. Those custodian farmers who *maintain*, over time and space, a portfolio of diverse species and varietal diversity in the community for improved livelihoods on a sustainable basis;
2. Those custodian farmers who *maintain and adapt* a portfolio of diverse species and varietal diversity in the community, over time and space, for improved livelihoods on a sustainable basis;
3. Those custodian farmers who *maintain and promote* a portfolio of diverse species and varietal diversity in the community over time and space for improved livelihoods on a sustainable basis
4. Those custodian farmers who *maintain, adapt and promote* a portfolio of diverse species and varietal diversity in the community over time and space for improved livelihoods on a sustainable basis.

Figure 1. Typology of custodian farmers of agricultural biodiversity



This categorization is not carved in stone and has often proved to be very crop- and context-specific. "Promote" can be the physical exchange of genetic material or just sharing the knowledge of unique material with other farmers as the custodian is often consulted for his/her wisdom on seed material, mother plants or grafting techniques. "Adapt" can

mean that the farmer intentionally experiments with and evaluates different forms/varieties and populations or unintentionally allows seeds to re-generate and then selects the best material emerging from this evolutionary process. Thus boundaries may be blurred and cases may change over time. Consultations have revealed clear cases where farmers with rich agricultural biodiversity also searched for new diversity and traits (from other farmers or even from the wild) and showed fascination with diversity. They disseminate acquired knowledge and planting materials to interested farmers and researchers, thereby contributing to national and global benefits. With external support that increased access to information, materials and knowledge, significant changes were observed in their behavioral actions in support of conservation, innovation and development.

Discussions and case studies showed that boundaries between the categories might be blurred as placing custodian farmers in one of the categories depends very much on local context, including type of crops, local culture and environmental conditions. It is important to note that custodian farmers should be seen as an integral part of community-based management of biodiversity such as community seed banks/community nurseries/local sources of planting materials.

Characteristics and Roles

Using the working definition of custodian farmers, through a literature review and analysis of case study profiles, two groups of characteristics emerge based upon: a) essential characteristics that have recognized values, and b) essential roles of diversity management as per current practices.

Table 1. Characteristics of custodian farmers of local crop diversity (modified from Padulosi, 2011)

Character	Description	Indicators
1. Highly driven by conservation ideology	Maintains strong personal motivation in conserving local varieties and not dependent upon external support for continued conservation and use. Farmers fascinated by portfolio of diversity.	<ul style="list-style-type: none"> Guardian of materials of at least one unique and rare variety-value that is difficult to conserve; Number of genetically diverse improved and local crop varieties maintained.
2. Provider of knowledge and skills	Holds and shares knowledge and skills related to the traits, characteristics and uses of species and varieties. Holds knowledge about propagation techniques, production, storage or processing methods and the adaptation to specific edaphic or local weather conditions.	<ul style="list-style-type: none"> Community members and researchers appreciate knowledge of diversity and its use, thus farmer is often consulted and asked for his knowledge and skills related to unique germplasm.
3. Community recognition	Recognized by his/her neighbours or community members as someone who conserves local seeds and/or knowledge.	<ul style="list-style-type: none"> Community members cite his/her contribution in management of unique local crop diversity; Nodal farmers identified by snow-balling sampling method of farmer seed network analysis (Subedi et al., 2003).
4. Highly motivated and self-directed	Has strong personal motivation in conserving local varieties and is not dependent on external support for continued conservation and use.	<ul style="list-style-type: none"> Empowered local individual, self-motivated and self-directed Demonstrated motivation by example (Walk the Talk)
5. Consistent commitment	Grows the diverse variety (even on small plot of land) over at least the last 5-10 years even without immediate use or income generation from it. Uses varieties and encourages family and others to do the same.	<ul style="list-style-type: none"> Richness of crop genetic diversity on farm or in home gardens/orchards Evidence of selection made from existing and /or newly created diversity Shows willingness to share materials and knowledge with community members Self-driven documentation

Table 2. Essential roles of custodian farmers of local crop diversity

Role	Description	Indicators
1. Maintenance	Over time, maintains rich diversity of species (richness in terms of inter- and/or intra-specific) more than the average farmer	<ul style="list-style-type: none"> Number of species/varieties maintained at HH level Guardian of at least one unique and rare variety Farmers recognized locally and officially Farmer's varieties registered
2. Adaptation	Holds local ecological knowledge on the adaptive traits of varieties. Has some degree of knowledge of heritability and uses such knowledge for selection; holds knowledge and skills on propagation techniques under target production environment	<ul style="list-style-type: none"> Diverse portfolio of species or varieties introduced, selected/domesticated/grafted to match local conditions
3. Promotion	Promotes the exchange of local crop diversity and associated knowledge and enhances seed flow within a community through gifts, exchange and bartering of seed/scions /saplings within the context of social custom and social seed networks. Promotion can also refer to the exchange of knowledge related to agricultural biodiversity, if s/he is exchanging and sharing his/her knowledge.	<ul style="list-style-type: none"> Farmers and researchers frequently cite his/her contribution in management of unique local crop diversity Nodal farmers identified by farmer seed network analysis. These individuals occupy relatively more central positions (nodes) in the network (Subedi et al., 2003).
4. Continuity	Ensures that useful diversity is not only maintained, selected and used but also continues to grow varieties with sets of useful traits that replace old cultivars.	<ul style="list-style-type: none"> If farmer cannot continue to maintain diversity he ensures alternative options in community seed bank or shares with government gene bank/private/friends for maintenance of diversity in danger of extinction.

Documentation of case studies

The 20 cases that are described in this booklet and presented at the workshop are outcomes of such studies (Table 3). The purposes of the workshop are: 1) to develop a deeper understanding of the roles of custodian farmers in conservation, use and dissemination of agricultural biodiversity; 2) to highlight their contribution to the national plant genetic resources system and overall sustainable agriculture development; and 3) to raise their visibility and recognition in the field of genetic resource management. The workshop aims to bring together a few custodians from across India and other South and Southeast Asian countries to share their experiences, refine the earlier described methodology for identifying custodian farmers, debate challenges faced by such farmers and discuss ways to strengthen and/or support their invaluable contributions to society. To systematically document case studies and enable qualitative comparison of case studies, the outline of custodian profiles includes the eight aspects listed below:

- **Introduction** - name of custodian farmer, family members, agro-ecological/geographical region and main livelihood activities
- **Motivation** – evidence-based approach highlighting anecdotal stories
- **Unique features** - why the women or men stand out as custodian farmers or are different from other farmers within her or his community
- **Maintain** – which inter- and intraspecific richness, unique traits and characteristics
- **Promote** – how the custodian is involved in exchange of genetic material or knowledge
- **Adapt** – how the custodian is involved in improvement, evaluation and selection or the re-generation of genetic material
- **Continuation** – interest and involvement of the younger generation (sustainability)
- **Support** – which type of support is required to continue activities as custodian farmer.

The workshop resulted in better understanding of the concept of custodian farmers and facilitated a community-of-practice to consolidate their roles in the context of on-farm conservation of agricultural biodiversity:

- Clarity on the definition of ‘custodian farmers’ and a related typology
- Refinement of characteristics/indicators to assess the efforts of different types of custodian farmers
- Identification of the roles of custodian farmers
- Deeper understanding of key drivers of custodian farmers (nature and degrees of motivations and trade-offs)
- Better understanding of and insight into how to support and strengthen the roles of custodian farmers
- Identification of policy recommendations.

References

- Almekinders, CJM., Louwaars, NP and de Bruijn, GH.1994. Local seed systems and their importance for an improved seed supply in developing countries. *Euphytica*78: 207–216.
- Badstue, LB, Bellon, M, Berthaud, J, Juarez, X, Manuel-Rosas, I, Solano, A M and Ramirez, A 2006. Examining the role of collective action in an informal seed system: a case of study from the Central Valleys of Oaxaca, Mexico. *Hum. Ecol.*34: 249-273.
- Jarvis, DI, AHD Brown, PH Cuong, L Collado-Panduro, L Latourniere-Moreno, S Gyawali, T Tanto, M Sawadogo, I Mar, M. Sadiki, NTN Hue, L Arias-Reyes, D Balma, J Bajracharya, F Castillo, D Rijal, L Belqadi, R Rana, S Saidi, J Ouedraogo, R. Zangre, RO Keltoum, JL Chavez, D Schoen, B Sthapit, P de Santis, C Fadda, T Hodgkin. 2008. A global perspective of the richness and evenness of traditional crop genetic diversity maintained by farming communities. *Proceedings of the National Academy of Sciences PNAS (USA)*: 1-6. Available at:
- Negi, V. 2003. Landraces in Central Italy: where and why they are conserved and perspectives for their on-farm conservation. *Genetic Resources and Crop Evolution* 50:871-885
- Padulosi, S 2011. Guideline note presented at the IFAD NUS planning meeting, Pokhara, Nepal
- Sthapit BR and S Padulosi 2011. On-farm conservation of neglected and underutilized crops in the face of climate change. In: Padulosi, S, Bergamini, N and Lawrence T, Editors. *On-farm conservation of neglected and underutilized species: status, trends and novel approaches to cope with climate change. Proceedings of the International Conference, Friedrichsdorf, Frankfurt, 14-16 June, 2001. Bioversity International, Rome. Pp. 31-48*
- Subedi, A., P Chaudhary, B Baniya, R Rana, RK Tiwari, D Rijal, D Jarvis and B Sthapit 2003. Who Maintains Crop Genetic Diversity and How: Implications for On-farm Conservation and Utilization. *Culture & Agriculture*, 25(2):41-50.
- Ruiz, M. and R Vernooy 2012. *The custodians of biodiversity: Sharing access to and benefits of genetic resources. Earthscan from Routledge. UK*
- Van Oudenhoven, F 2011. *Roots of our people. Fruits trees and their custodians in Kyrgyzstan and Tajikistan. Bioversity International, Rome.*

¹If we have a look at a more 'formal' way of using the term, by ARSIA in Tuscany, for example, the definition used stays closer to the meaning of 'janitor': something like "a person charged with the conservation, or paid to look after PGR." Please see: http://www.futurepolicy.org/fileadmin/user_upload/Axel/Genetic_Resources/Regulation_germplasm_bank_custodian_Tuscany.pdf. Three main types of custodian farmers for animal breeds in Europe are recognized: production-oriented, product- and service-oriented and hobby-oriented farmers. In addition, seven sub-types were characterized under the main types: sustainable, opportunist, multi-user, brand-maker, traditionalist, pragmatist and newcomer.

²Certain individuals in the seed network who play significant roles in the flow of genetic materials and information in the community are referred to as 'nodal farmers'. These individuals occupy relatively more central positions (nodes) in the network (Subedi et al., 2003). These farmers are also perceived to be more knowledgeable in the community, maintaining crop diversity and being innovative but not necessarily leader farmers as defined by extension agents. These nodal farmers are found spatially distributed in different sections of the settlements and tend to have a high natural resource base. They can be recognized by a simple snow ball sampling as described by Subedi et al. (2003).

Table 3. List of documented profiles of custodian farmers from South and Southeast Asia

Profile Number	Custodian farmer	Country	Unique crops (varieties)	Title
1/2013	Mr Dattatreya Hedge	India	52 including 12 appe mango and 4 <i>Garcinia indica</i>	The custodian of unique 'Appe Mango' of the western ghats, India
2/2013	Mr Vishweshwar Ganapati Hedge "Eshanna"	India	25 mango including 14 appe mango	The master grafting expert and barefoot breeder of local mango varieties
3/2013	Mr K Ravindranath	India	24 mango including 4 naati (local) varieties	The custodian of indigenous mango diversity in Chittoor District of Andhra Pradesh, India
4/2013	Mr P. Lakshminarayana Reddy	India	14 mango	The custodian of indigenous mango diversity in Chittoor District, Andhra Pradesh, India
5/2013	Mr M. Gunashekhar Reddy	India	15 mango including 4 naati (local) varieties	The custodian of local mango diversity in Chittoor District, Andhra Pradesh
6/2013	Mr Chhote Lal Kashyap	India	135 mango varieties including seedling type	Limited resources led farmers to create and conserve mango varieties, Malihabad
7/2013	Mr NawabHasan	India	51 mango varieties	Conserving century-old mango varieties in Kasmandi Kalan: The story of the Nawabs
8/2013	Mr Palin Along	Malaysia	16 species of tropical fruits; 2 varieties Aroi – Aroi (<i>Garcinia forbesii</i>)	Custodian of underutilized wild tropical fruit species Aroi-Aroi (<i>Garcinia forbesii</i>), Malaysia
9/2013	Mr Razali Yahya	Malaysia	4 cv. <i>Garcinia atroviridis</i> (<i>asamgelugor</i> , 1 mangosteen and 3 cv of rambutan with 6 other species	Promoting the planting of <i>Garcinia atroviridis</i> (<i>asamgelugor</i>) in agroforestry systems, Malaysia
10/2013	Mr Kailash Prasad Rai	India	13 varieties of seedling mango	The custodian of high-yielding diversity of 'Bathua mango' in Pusa Block, Samastipur, India
11/2013	Mr Maiku Lal	India	42 varieties of mango	Finding the balance between commercial and seedling trees in Sarsanda
12/2013	Mr Ahmad Kusasi	Indonesia	6 <i>Mangifera spp</i> with Kasturi, Rawa-rawa, Kuini and Hambawang (3) are unique types	Mango custodian farmer from TelagaLangsat, South Kalimantan, Indonesia
13/2013	Mr Pak Sudarman	Indonesia	10 varieties of pummelo and other 4 citrus <i>spp</i>	Leader and custodian of "Javanese Pummelo"
14/2013	Mr Suradech Tapuan	Thailand	21 varieties of mango and 4 wild relatives	A champion of side grafter and custodian of unique mango diversity
15/2013	Mr Liam Linlatai	Thailand	3 types of Madan (<i>Garcinia schomburgkiana</i>)	Custodian farmer of Madan (<i>Garcinia spp</i>)
16/2013	Mr Vinod Rai	India	35 mango varieties	The custodian of richest diversity of 'Seedling mangoes' in Pusa Block, Samastipur, India
17/2013	Ms Kodukka Malliga Seerangan	India	6 small millets varieties and other crops	Custodian of climate smart nutri-millets: Kolli Hills, Namakkal
18/2013	Mr Khem B. Chand	Nepal	Indigenous vegetables	A Custodian of Rare and Indigenous Vegetables
19/2013	Mr Sadhu Oyal	India	21 varieties fingermillet, 6 minor millets, 3 horsegram and 4 other minor crops including niger	A custodian farmer promotes the conservation of his village's biodiversity Resources
20/2013	Mr Vasant Mahadev Rao Wankhade	India	3 Citrus <i>spp</i> and 2 mango varieties	The self-made nursery man in search for rootstocks

The Custodian of Unique 'Appe Mango' of the Western Ghats, India

Dattatreya Hegde

Profile 1/2013

Thousands of years of domestication of food plants by human societies has resulted in the generation of a large array of local varieties. Until recently in every part of the world, local farming communities were responsible for the maintenance of this stunning varietal diversity as a heritage. However due to various reasons, today we are witnessing a colossal erosion of such diversity. Fortunately, despite the pressure of the modern agriculture, which favours uniformity and profit, at least a small percentage of farmers are still actively engaged in maintaining locally important varieties. Many a times such attempts are successful in those plant species that have a deep cultural attachment with the communities. Farmers who guard such varietal diversity unique to an area, passionately maintain them on their farm, genuinely share varieties among fellow farmers as well as pass on the knowledge to the next generation could be called the 'Custodian Farmers'. They are indeed the custodians of the future! Mr. Dattatreya Hegde, from a remote village in the Central Western Ghats, India, is one such custodian farmer who maintains a large diversity of locally important 'appe mango', a kind of unique aromatic pickle mango.

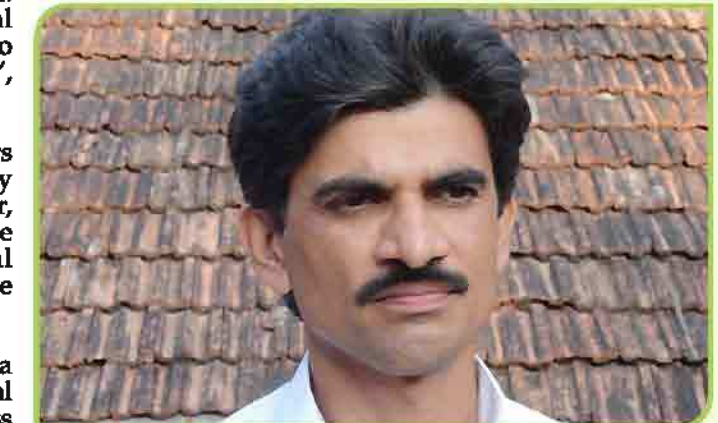
Recognizing and typifying such custodian farmers appears very easy since the number of local varieties maintained by a farmer is often considered as a main criterion. However, it is necessary to take into account the motivations and role the men or women play into the inter-generational sustainability of varieties and the associated knowledge before labeling a farmer as a custodian.

Uttara Kannada is one of the forest-rich districts of Karnataka state in southern India, and well known for its grand biological diversity, rich cultural heritage and a higher level of awareness among people on issues related to conservation. Majority of the households maintain their own multi-species plantation in which they practice vertical farming system wherein the species of different heights that occupy different stories are maintained. Traditionally betel nut (arecanut), banana, pepper, cardamom, turmeric and vegetables are the common species. Marginal farmers with very small land holdings are involved in wage labouring, wild fruit gathering and petty business.

Mr. Dattatreya Hegde, a farmer in a remote village of Salkani in Sirsi taluk of Uttara Kannada district, has a flair for maintaining a large number of mango and garcinia genetic resources. However his main income comes from an agro-forestry system comprising of betelnut, black pepper, cocoa, cardamom and banana.

Motivation

Coming from an agricultural family, he has grown up amidst forested landscapes of the district and brought up in a culture that has nature worship in its core. Since the childhood he has been interested in introducing locally important 'Appe-mango' varieties into cultivation and diversifying the fruit crops (see Box for details on 'Appe mango' types). "Since 'appe mango' is a delicacy in our daily meals, I have been naturally inclined to conserve more of the traditional varieties of this species" says Mr. Hegde. Because of the deep cultural attachment with *Appe Mango* varieties, he thoughtfully allocated his garden for these varieties a decade and a half ago. Though growing arecanut (betelnut) as a main cash crop was in vogue then, this graduate farmer had a vision that these local varieties were equally important.



Maintenance

Spread over an area of 15 acres in the serene environs of the Western Ghats forests, he has 52 varieties of Mango (both 'Appe mango' types and fruit mango) and half a dozen types of *Garcinia indica*. All mango trees in the plot are derived through grafting of the original parent recognized in natural habitats. He is part of the grafting team and this also helps him to promote the newly identified types among the farmers in his and nearby villages. Several *Garcinia gummi-gutta* and *Garcinia indica* are included in the orchard.

Adaptation

The farmer has recognized three different varieties of *Garcinia indica* (bright red, red-big and pale yellow). In a way his farm acts like a local-repository of these valuable and rare varieties therefore deserves to be called "diversity block". He looks

out for variants in wild and fellow homegardens, continued 'experimentation' with new types etc. He has been constantly engaged in innovating good practices to grow and maintain genetic resources of tropical fruits. He has been a pioneer in making large number of grafted plants of locally important but rare types of mango. Grafting seven different varieties of *Appe* mango on to a single stem, providing support grafting to boost the growth of the main stem, minimizing the use of pesticides and increasing the bio-pesticides are some of the good practices. He has been

a pioneer to identify the limitation of grafting *Garcinia*, wherein he has shown that only straight growing scions, taken from tree tops grow straight when they are grafted.

Promotion / Dissemination

Today he gets about 20% of his family income by selling fruits as well as grafted planting stocks of these diverse varieties. He has recently invested on private sapling nurseries to disseminate unique planting materials and associated knowledge.



'Appe Mango' : a unique pickle type in the Western Ghats

Appe midi, as it is known in Kannada, literally meaning the raw, unripened mango, is a special type of pickling mango relished by people in Uttara Kannada every single day. No meal is complete without the extraordinary aroma of this *appe* mango pickle in this part of the country. Because of this attachment, people have developed a special mental faculty to recognize, typify, cultivate and conserve dozens of varieties of *appe* mango in the district. These varieties are recognized basically with respect to their aroma and taste apart from their colour, shape, size, pulp content, shelf life, consistency and season of harvest. One can get an *appe* with an array of aroma ranging from that of Jeera (Cumin seeds) to that of camphor. Today there is no commercially released variety of '*appe*', every variety is a farmer-recognized varieties maintained through vegetative propagation.



Interestingly his wife, Bharathi D. Hegde is an active member of a self-help group in the village that is currently engaged in making a brand of '*appe*' mango pickle for the local markets. Complimenting her husband she is motivating other ladies in the village to popularize products of Mango and *Garcinia* and help them to become more independent. Together the couple is doing a yeoman service to the cause of conservation and utilization of local varieties. The couple has two daughters, Bindu and Disha, who are studying in their primary school. The younger one has already made a toddler's storyline to tell how she likes '*appe*-mango' and learnt to recognize these varieties!

In addition to all these progressive traditions, Mr. Hegde freely shares his rich knowledge on selecting pickling varieties from the wild, standardizing protocols for grafting and maintaining the orchard. One of the major contributions to the community is to share genuine scion material of local varieties from his farm since all most 10 years and he is very happy about it. He is a recipient many recognitions from local bodies for his contribution. In a recent visit to Thailand, he also shared his experiences on pickle mango conservation with international audience. Further he has started involving more and more community members and started working with them as a unit. This has created a social forum to appreciate and encourage conservation of local varieties.

Salkani village has now become a hub activity for Tropical Fruit Tree Conservation Project with the active participation from the College of Forestry, Sirsi, where a local group is involved in the conservation of Mango and *Garcinia* types. Definitely there has been an increase in the economic gain of families' income through the sales of local fruit varieties as well as planting stocks of these varieties. Mr. Hegde believes that the income has grown by at least 5 – 10 per cent through these sales after they started participation in the TFT project activities. "There must be a system to recognize and provide incentives to the farmers who are engaged in conserving such local varieties. This may result in the development of a network of custodian farmers all over the Western Ghats which would be a great contribution to the conservation of local varieties", believes Mr. Hegde.

Passport Data

Name of the custodian farmer	Contact address Coordinate (GPS)	Production system and area (Ha)	Species and intra specific diversity
Dattatreya Hegde	Bhairesmane village, Salkani Community, Uttara Kannada district, Karnataka Phone: 09480018844 Longitude: 74° 43' 9.0 E Latitude: 14° 39' 32.6 N	orchard system (6 ha)	<p>1. About 52 varieties of Mango Including the following very rare 12 <i>Appe</i> mango varieties (wild pickle mango varieties) and two:</p> <ol style="list-style-type: none"> 1. Nandagar <i>Appe</i> 2. Malanji <i>Appe</i> 3. Purappe 4. Haladota <i>Appe</i> 5. Kalkai <i>Appe</i> 6. Kadagai 7. Chowthi <i>Appe</i> 8. Kalgar <i>Appe</i> 9. Mavinakatta <i>Appe</i> 10. Jeerige <i>Appe</i> 11. Danalli <i>Appe</i> 12. Gadehalli <i>Appe</i> <p>Fruit types:</p> <ol style="list-style-type: none"> 1. Varate Giduga 2. Manadooru Katte 2. <i>Garcinia indica</i>: <ul style="list-style-type: none"> • Red type • Red-big type • Pale yellow type 3. <i>Garcinia gummi-gutta</i>

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The Master Grafting Expert and Barefoot Breeder of Local Mango Varieties

Vishweshwar Ganapati Hegde

Profile 2/2013

Popularly known as “Eshanna” among fellow farmers, Mr. Vishweshwar hails from a remote place in the central Western Ghats - ‘Amchimane’, which could hardly be called a village. Set in one of the forest-rich districts of Karnataka state in southern India, this hamlet comprises only a handful of houses. Until recently people had to tread 3-4 km on foot on a ‘kachcha’ road to reach the place. Almost every household is a garden-home amidst traditionally grown multi-story farms with betel nut (Areca nut), banana, pepper, and cocoa crops. Receiving about three meters of rains every year spread over five months, communities have to be seriously self-sufficient for food, shelter and medicine. Wild animals such as Sambar deer and Indian Gaur are not an uncommon sight near this hamlet. ‘Eshanna’s farm may be very small in size and his income may be only moderate, but the knowledge base and the insights on ‘*appe*-mango’ selection and domestication skills are immensely rich. ‘*Appe*-mango’ is the group of varieties of mango (*Mangifera indica*) that are native to the Western Ghats and used for pickle making instead of fresh consumption mostly because of their strong aroma.

Maintenance

Mr. Eshana is the proud owner of 25 genuine rare varieties scrupulously sought from the riverine forests of Uttara Kannada District. This custodian of the rare varieties is not just a collector of the varieties; he is truly an innovator and a practicing conservation biologist. The 25 varieties include 14 very rare types of ‘*appe* mango,’ which he maintains in his homegarden of 0.75 hectare. In addition, he maintains four local and native mango varieties in his homegarden that are used for their fresh fruit: 1) Varate Giduga, 2) Manadooru Katte, 3) Bhadrapura Local and 4) Amrutha Local. In addition he has tremendous knowledge about the ‘*appe* mango’ trees found in the surrounding forests.

Motivation

Marginal farmers like Eshanna depend mainly on wild forest trees for various needs such as fruits for consumption, thatch, biomass etc. Collecting fruits from remote locations is a heavy job. However, come summer, harvesting highly aromatic pickle mango (‘*appe*-mango’) from the specific trees of wild populations is one of the favorite hobbies of Eshanna. His wife, Lalita, is an expert pickle maker and would put up a long list of specific traits that are necessary for a variety to be called a good ‘*appe*’ variety. Eshanna would venture into remote corners of the riverine forests looking for the best *appe* types among hundreds of trees. According to him the best *appe* types should be highly aromatic (ranging from that of cumin to camphor to even that of lime!), should have a longish fruit form, possess a long shelf life, and the inner pulp should remain white and crispy even after two years of preservation in brine. He has gained this insight over a period of thirty years of experience in selecting pickle mango types from the wild. Driven by this zeal to identify the best

appe-mango, Eshanna has been very successful in identifying and developing half a dozen varieties of *appe*-mango. In the process, he has become an acclaimed expert in grafting who earns good returns through the sale of the grafts.

Adaptation and Domestication

“Identifying an off-season type called ‘Chouti-*Appe*’, which comes to bearing typically in the month of September, was the best” says Eshanna. The name of this variety suggests that the fruits would be ready to be harvested during the time roughly coinciding with the festival of Lord Ganesh, when none of the other varieties would yield the ‘*appe*-fruits’. He had to struggle for years to get sufficient number of scions from a single



tall mother tree to make several copies through grafting and then to test them for their consistency of fruiting phenology before distributing to the farmers. 'Kengreappe', 'Amrutha', 'Mandoor-katte' are some of the other mango varieties that were identified in the forest and introduced to homegardens by him.

He has been constantly innovating techniques to identify and maintain germplasm of mango. Perhaps the best testimony to his experimentation is a quick 'on-site' test to assess the relative shelf-life of *appe*-mango varieties. He says "Appe-mango varieties that burn for 1-2 minutes when the sap from the fruit pedicle is lighted could be easily stored for two years compared to those which do not burn at all". He was the first person to demonstrate successful grafting of several fruit mango types and *appe*-mango types onto a single mother tree. Furthermore, the use of arecanut shell waste to smoke the canopy during full bloom to reduce insect pest problem is another innovation. Truly, he is an innovative *appe*-mango breeder!



Promotion / Dissemination

On an average day, during every post-rainy season, Eshanna starts at 7:00 am from his tiny, old-style tiled home to visit various farms around Sirsi. Equipped with locally-made gear such as grafting knives, secateurs and plastic sheets, he aims to reach another farm as quickly as possible on a bicycle (rarely on a motorbike) before the valuable scions he has collected wilt. He carries about 30 scions of locally valuable *appe* and fruit mango collected from a nearby riverine forest. Soon after reaching the target farm, he spends the day finishing the grafting. People are very happy to invite him since the success rate of his grafts is over 95%. In a single season, he says, he would do some 2500 grafts. He has been busy doing this work for the last 30 years. People would pay him a small honorarium for his service and time. He would accept it with a smile. Nearly a hundred thousand grafted plants have been made by him over a period of 25 years and today a few thousand are already yielding fruit, making the farmers very happy. "Once I was even called by a landlord in Goa to rejuvenate his farm and today they are relishing *appe* types of Uttara Kannada," this high-school drop out remembers with a sense of satisfaction. Nearing the age of 50, his enthusiasm to teach skills of grafting has not diminished. Eshanna is invited in every season by various groups to engage with them for a day or two on grafting skills.

Sustainability and Support

While he fondly remembers his father Ganapathi Hegde and his uncle who taught him the skills of

working with mango, he is not very convinced that the family tradition would continue since the younger generation is inclined to take up more lucrative jobs such as engineering. However, he is hopeful that at least a few young lads from his hamlet would continue to innovate. "Popularizing genuine *appe* and making it a brand among the elite markets could provide lot of impetus to the development of this neglected type", he opines. "Clearly, the demand for the *appe* grafts has increased at least two-fold in the last three years because of the efforts of College of Forestry, Sirsi to create a network of grafting experts" says Eshanna. "Providing the genuine grafts in large quantities and in a decentralized way is the key to making it penetrate to the remotest farmers", he adds. He does not forget to thank the Tropical Fruit Tree Project for the assistance he obtained in the form of a decent nursery to maintain grafts and good grafting equipment.

"There could be about 200 *appe* mango varieties lurking in the riverine forests of Uttara Kannada that have been identified by the communities over hundreds of years, each with a unique set of traits. There must be a centralized activity to preserve them" suggests Eshanna.

Passport Data

Name of the custodian farmer	Contact address Coordinate (GPS)	Production system and area (Ha)	Species and intra specific diversity
Vishweshwar Ganapati Hegde	Amchimane village, P.O. Hulekal Uttara Kannada district, Karnataka Phone: 08283 260022 Cell: 9481220524 Longitude: 74° 45' 52.6 E Latitude: 14° 40' 8.3 N	Traditional horticulture garden (0.75 ha)	25 varieties Including the following very rare 14 <i>Appe</i> mango varieties (wild pickle mango varieties) and four fruit types: 1. Nandagar <i>Appe</i> 2. Malanji <i>Appe</i> 3. Purappe 4. Haladota <i>Appe</i> 5. Kalkai <i>Appe</i> 6. Kadagai 7. Chowthi <i>Appe</i> 8. Kalgar <i>Appe</i> 9. Mavinakatta <i>Appe</i> 10. Jeerige <i>Appe</i> 11. Danalli <i>Appe</i> 12. Gadehalli 13. Tuduguni 14. Kengre Fruit types: 1. Varate Giduga 2. Manadooru Katte 3. Bhadrapura Local 4. Amrutha local

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The Custodian of Indigenous Mango Diversity in Chittoor District of Andhra Pradesh, India

K. Ravindranath

Profile 3/2013

Introduction

Mr. Ravindranath hails from a family of traditional mango growers, as his grandfather had planted number of mango trees of different varieties and also seedlings in 1922. Mr. Ravindranath's father maintained this mango diversity as a source of income to the family and also as a nutritional supplement for his family. Ravindranath is following in the footsteps of his ancestors by conserving about 24 varieties, including several indigenous types such as Atimadhuram and Gaddemar and including seven trees of four different naati (naati means local) types, thereby adding to the rich mango diversity.

He is a 47-year-old high school-educated farmer with a family size of five, which includes his wife, son, daughter and aged father. His other subsidiary occupation is raising milk cattle and he is a member of the local milk cooperative society. In addition, he is also a member of the Federation of Farmers Association, Chittoor and 'Raita Mitra' (an organization of farmers).

The success story of Mr. Ravindranath is reflected in his economic status as he has an RCC house with amenities that include a TV set, telephone, refrigerator and a motorcycle. He also places an emphasis on his children's education as his son is doing MBA and his daughter is in her final year of a degree program.

Motivation and Major Drivers for Maintaining Mango Diversity

According to him, the major drivers for maintaining this mango diversity are:

- 1) It is a source of income and livelihood since he is getting 14.5 per cent of his income from indigenous mango varieties.
- 2) He has a sentimental attachment as the trees had been planted by his ancestors way back in 1922.
- 3) It is a source of delicious fruits and supplies nutrients to their family. The family retains part of the produce from varieties like Kudadut, Green Baneshan, Lalbaba, Mittigiri, naati (1-4) for home consumption and for exchange with near relatives and friends. They also prepare pickle from the Gaddemar variety, which tastes good and also lasts for almost a year.
- 4) Maintaining this diversity reduces the risk posed by fluctuations in yield and price. Mr Ravindranath is able to minimize his these risks by combining commercial, early-bearing (Pulira), late-bearing varieties (Neelum, Green Baneshan, Mittigiri), table and processing types [Totapuri (pulp) and Gaddemar (pickle)] in such a way that he gets maximum profit from mango diversity.

Unique Feature of Farmer

Chittoor is basically a dry district in Andhra Pradesh and the livelihood of the rural economy depends to a greater extent on mango, which suits the climate of the region. While others in the community focus only on Totapuri, this particular farmer, in addition to maintaining the traditional varieties, also grows indigenous varieties like Atimadhuram (table purpose),



Gaddemar (pickling type) and Jumbo Kesar (commercial table purpose). In addition, while other farmers are either uprooting the indigenous/naati varieties or topworking these naati types with commercial Totapuri, Mr. Ravindranath withstood the temptation to go totally commercial and still maintains the local traditional varieties. In his own words, "most of the indigenous varieties are regular bearers (e.g. Naati-3, Mittigiri, Green Baneshan), heavy yielders (for example, he harvested five tonnes of Kudadut, three t of Reddy Pasand, 1.5 t of Green Baneshan and one tonne of Mittigiri from a single tree each in 2012 and received Rs 12-20/kg in the local market), bear tasty fruits (e.g. Naati-3, Kalepadu, Kudadut), have a long shelf life (e.g. Lalbaba), and also are subject to good demand in far-away markets in northern India".

Maintenance

The mango diversity of Mr. Ravindranath consists of commercial types (Totapuri, Neelum, Banganapalli, Pulira, Mulgoa and Alphonso) as well as indigenous varieties like Lalbaba, Kuddus, Mittigiri, Kalepadu, Reddi Pasand, Gaddemar, Raja Pasand, Kudaduth, Thorapadu, Green Baneshan and seven trees of four Naati (local) types.

Unique Varieties Maintained: Mittigiri, Green Baneshan and Naati-3



Mittigiri: Regular bearer, late-maturing, creamy yellow pulp, used for commercial and for home consumption



Green Baneshan: Late variety (comes along with Neelum) and fetches a good price (Rs.15-20/kg) in the market. The skin remains green but tastes like Baneshan.



Naati-3: The seedlings maintained by him are regular bearers, have good color and size (500 g) and fetch a price not less than Rs.10/kg. These fruits are in demand in Maharashtra and M.P. Naati-3 is almost like Atimadhuram with a creamy yellow pulp.



Reddy Pasand: Regular, heavy bearer and tasty fruits. In 2012, Ravindranath harvested three tonnes from one tree. This variety is not good for long distance transport as this is a tasty but juicy fruit.



Gaddemar: Regular bearer and used for pickle making. This variety enjoys a very good demand in Chennai.

Adaptation

In addition to maintaining the old trees of indigenous varieties planted by his forefathers, Ravindranath kept the naati types grown from seed on his farm, of which Naati-3 is rather promising as it is a regular bearer with large fruits and sells at a reasonable price not below Rs. 10 per kg. He also introduced some of the mango varieties such as Atimadhuram, Gaddemar, Mallika and Jumbo Kesar in his village. The farmer received a prize from the District Collector for maintaining the Kudadut variety, which is of large size (1.5 – 2.00 kg/fruit), regular bearing and is a table purpose fruit. There has been a good demand for saplings or scions of this variety from fellow farmers.

Mr. Ravindranath runs his farm with the help of his family and support from three male and two female full-time labourers on a weekly payment basis and an additional 10 labourers are hired during the harvest season for about 10 days. In addition, his family members are also involved in the agricultural operations, harvesting, grading and transportation of mango. The farmer, besides maintaining a multi-varietal mango orchard, follows other good agricultural practices as well. Some of them include: filling the pits with pongamia and neem cake, applying compost in combination with NPK, irrigating the orchard using

pipes and using a basin formation for water conservation. He also does thinning and pruning of fruit-bearing twigs or overcrowded branches and practices inter-cultural operations like ploughing between the trees to keep the orchard weed-free. He uses a mango harvester instead of shaking the branches. The farmer sorts and grades the produce before it is transported to the market yard in Bangarupalyam or to processing units.

Promotion/ Dissemination

The family exchanges fruits of traditional varieties like Green Baneshan, Mittigiri, Naati-3, Kalepadu and Kudadut with their relatives and friends solely for consumption. In addition, the farmer has also promoted the Lalbaba variety by giving scions to some other farmers in his village. This variety is a regular bearer with an attractive red color, thick skin and a good storage quality. Hence, this is very well suited for long-distance transport.



Kudadut



Lalbaba

Continuation and support

During the documentation process, it was observed that the entire family is involved in the mango diversity conservation and promotion activities. We also ascertained from family members that they will continue to conserve the rich mango diversity that is available to them. For this, they need support in the form of grafting of indigenous varieties like Kudadut and naati types. Although his varieties are in good demand in local markets, Mr. Ravindranath needs support for marketing his diversity in distant markets with remunerative prices.

Passport Data

Name of the custodian farmer	Contact address Coordinate (GPS)	Production system and area (Ha)	Species and intra specific diversity
K. Ravindra nath	Palamakulap alle village, Bangarupalyam Community, Chittoor district, A.P. Phone: 09000475713 Longitude: 78.5237 Latitude: 13.1124	Orchard system (12.0)	Mango (<i>Managifera indica</i>): 24 varieties (20 + 4 naati –local) Totapuri, Neelum, Alphonso, Banganapalli, Mulgoa, Mallika, Atimadhuram, Lalbaba, Jumbo Kesar, Kuddus, Mittigiri, Kalepadu, Reddi Pasand, Gaddemar, Raja Pasand, Kudaduth, Thorapadu, Green Baneshan, Pulira, Peter and Naati. Jack fruit (<i>Artocarpus heterophyllus</i>): 1 tree Jamun (<i>Syzigium cumunii</i>): 1 tree

Contributed by:
T.M.Gajana, M.R.Dinesh, C.Vasugi and
V.Dakshinamoorthy
IIHR, Bangalore, India

The Custodian of Indigenous Mango Diversity in Chittoor District, Andhra Pradesh, India

P. Lakshminarayana Reddy

Profile 4/2013

Mr. P. Lakshminarayana Reddy, a 70-year-old farmer, lives in Reddivaripalli Village, in the Polakala community of Chittoor District in Andhra Pradesh. His orchard of 6.8 ha is located at 79.0103° Longitude, 13.2614° Latitude. He is a high school -educated farmer with an extended family of eight members, consisting of him and his wife, his two married sons and their children. His other subsidiary occupations are dairy farming and sugarcane cultivation and he is a member of the local milk cooperative society. He is also a member of Federation of Farmers Association, Chittoor. Mr. Lakshminarayana Reddy's family lives in a decent RCC house with amenities such as a TV set, telephone, a motorcycle and also a computer with internet access. Mr. P. Lakshminarayana runs his farm with the help of his family members and two male and two female labourers on daily basis. They also hire additional labourers depending upon the work load especially during harvest season when his whole family will help in the field.



Motivation and Major Drivers for Maintaining Mango Diversity

According to him, the major drivers for maintaining this mango diversity are that they are a source of income, provide the family with tasty fruits and raw fruits for making pickles and also that this diversity occupies an important place in social ceremonies and celebrations. In fact, special pickle prepared from var. Chakkaraguttulu mango is a delicacy; this pickle has a long shelf life and lasts for more than a year. The farmer derives about 16 per cent of his mango income from indigenous varieties.

The farmer is also of the view that the indigenous varieties help overcome both yield and price risks associated with mango cultivation and marketing. He combines commercial, early-bearing (*Pulira*), late-bearing varieties (*Neelum*), table (*Kalepadu*, *Gadiyaram*), heavy bearers like Reddy Pasand and pulp processing types (*Totapuri*), sucking types as well as those for pickling (*Chakkaraguttulu*) and he maximizes profits from his mango diversity.

Unique Features of the Custodian Farmer

The family of Mr. Lakshminarayana Reddy is a joint family consisting of his two sons with their spouses and children. All of them are involved in agriculture, especially mango cultivation. Very few farmers in the community maintain rare varieties like *Manoranjitam*, which has a good taste, very good storage quality and is suited for long-distance transport. Mr. Reddy is one



of them. Although the farmer has good opportunities to cultivate commercial varieties and obtain more profit, he still conserves this variety. He says, "I maintain this tree mainly for home consumption because of its superior taste, flavor and good keeping quality".

Maintenance

He is primarily a mango grower who has maintained 14 varieties of mango, including indigenous types. The mango diversity of Mr. Lakshminarayana Reddy consists of commercial types (*Totapuri*, *Neelum*, *Banganapalli* and *Alphonso*), indigenous varieties such as *Kuddus*, *Kalepadu*, *Gadiyaram*, *ReddyPasand*, *Dil Pasand*, *Manoranjitam* and *Chakkaraguttulu*, and other varieties like *Rumani* and early-bearing *Pulira* as well as the choice variety *Mulgoa*.

Unique Varieties Maintained

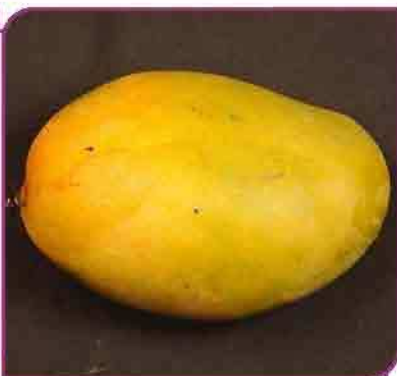
Gadiyaram, Manoranjitam, Chakkaraguttulu and Dil Pasand



Gadiyaram: The special trait of this variety is that it remains green even after ripening and the pulp is of light orange colour.



Manoranjitam: The family maintains this variety mainly for home consumption because of its taste and good storage quality.



Dil Pasand: The fruit of this variety is of attractive bright yellow colour and is in high demand in the northern parts of the country. The fruits are of a large size.

Promotion/ Dissemination

Mr. Reddy has promoted the Chakkaraguttulu variety among the community by giving scions of this tree to his neighbours. This particular tree maintained by the

farmer is unique as the pickle made out of the semi-mature fruit is good tasting and it lasts for more than one year.

Adaptation

The family exchanges fruits of Kalepadu, Gadiyaram and Chakkaraguttulu pickles among their relatives and friends. The farmer, in addition to maintaining a multi-varietal mango orchard, follows other good agricultural practices like applying tank silt to mango trees. The farmer also carries out agricultural operations like thinning and pruning of fruit-bearing twigs or overcrowded branches.

Continuation and Support

It is interesting to note that both of his educated sons are in agriculture and they are adopting modern agricultural practices like the use of harvesters instead of shaking the branches of the tree, irrigating the orchard using pipes and making basins around the trees so as to conserve water. His wife makes special pickle from Chakkaraguttulu and exchanges it among the neighbors, relatives and friends. Mr. Lakshminarayana Reddy believes that the mango diversity maintained and promoted by him is in safe hands. His son Mr. Terin Kumar Reddy says, "So far we have maintained the mango diversity on our own and any support in the form of grafting of other indigenous varieties in addition to Chakkaraguttulu is welcome".

Passport Data

Name of the custodian farmer	Contact address Coordinate (GPS)	Production system and area (Ha)	Species and intra specific diversity
P. Lakshmi narayana Reddy	Reddivaripalli Village Community: Polakala Phone: 08573-288156 Longitude: 79.0103 Latitude: 13.2614	Orchard system (6.8 ha)	Mango (<i>Mangifera indica</i>): 14 varieties Totapuri, Neelum, Banganapalli, Mulgova, Pulira, Alphonso, Dil Pasand, Gadiyaram, Chakkaraguthulu, Reddi Pasand, Kalepadu, Kuddus, Rumani, Manoranjitam Citrus: Citron (<i>Citrus medica</i>) (Northankai) – 1 tree Jack fruit (<i>Artocarpushetero phyllus</i>): 3 trees

Contributed by:
T.M.Gajanana, M.R.Dinesh, C.Vasugi
and V.Dakshinamoorthy
IIHR, Bangalore, India

The Custodian of Local Mango Diversity in Chittoor District, Andhra Pradesh

M. Gunashekhar Reddy

Profile 5/2013

Chittoor district lies extreme south of the Andhra Pradesh state approximately between 12°37' - 14°8' north latitudes and 78°3' - 79°55' east longitudes. About 30% of the total land area is covered by forests. Mango and tamarind groves surround the city of Chittoor, and cattle are raised in the district. Chittoor District receives an annual rainfall of 918 mm and the climate is tropical with summer temperatures touching 46°C in the eastern parts, whereas in the western parts it ranges from 36°C to 38°C. Similarly the winter temperatures of the western parts are relatively low, ranging from 12°C to 14°C and in eastern parts the range is 16°C to 18°C. The soils in the district consist of red-loamy 57%, red sandy 34% and the remaining 9% are covered by black loamy clay, black sandy and red clay.

Mr. M. Gunashekhar Reddy, a 32-year-old farmer, lives in Baitapalli Village in the Talupulapalle community of Chittoor site in Andhra Pradesh. His mango orchard of 4 ha is located at 79.0259° E and 13.22252° S and is his major source of livelihood. This young farmer is high school-educated, with a joint family of five members. His other subsidiary occupations are dairy production, cultivation of sugarcane and groundnut and he is a member of the local milk cooperative society. He is also a member of Federation of Farmers Association, Chittoor. Mr. Gunashekhar Reddy has a RCC house with amenities that include a TV set, telephone, and motorcycle.

Motivation and Major Drivers for Maintaining Mango Diversity

According to him, the major drivers for maintaining this mango diversity are that they are a source of income and livelihood, tasty food and also supply nutrients to their family. The farmer says, "I maintain this diversity because the trees planted by my father are already grown and I am getting good yield and reasonably good prices". In fact, varieties such as Kalepadu have very high demand in the local market and fetch about Rs.12-18/kg. He also stated that because of the water scarcity in that area, it is difficult to raise new plants on his farm.

Outstanding Feature of the Farmer

He maintains more varieties than other farmers in his village. Peddarasam is one of the rarest and unique varieties maintained by this particular farmer along with other commercial and indigenous varieties.

Maintenance of Genetic Diversity

He is primarily a mango grower who maintains 15 varieties of mangoes, including four indigenous (naati)



types. The mango diversity maintained by Mr. M. Gunashekhar Reddy consists of commercial types (Totapuri, Neelum, Banganapalli and Alphonso), indigenous varieties (Kalepadu, Reddy Pasand, Gaddemar and Chakkaraguttulu), other varieties such as early-bearing Pulira as well as the choice variety Mulgoa and a very tasty, sucking type and juicy Peddarasam.

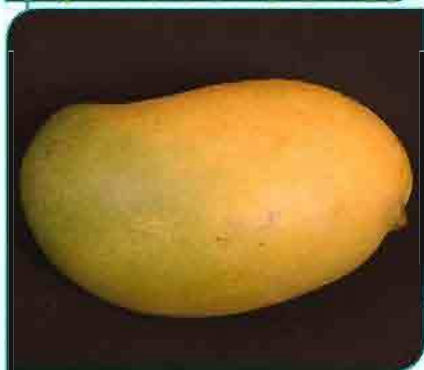
Unique Varieties Maintained: Kalepadu, Peddarasm



Kalepadu: Medium sized tasty fruits used both for commercial and home consumption. He prefers to give the fruits of this variety to his relatives and friends because of its excellent taste. In the market, this variety fetches a price ranging from Rs.12 to 18/kg.



Peddarasm: Large sized (>1 kg) fruits with excellent taste and flavor. It is a fibrous fruit, sucking type with full of juice. This variety is primarily retained for home consumption.



Adaptation

He has identified Peddarasam for grafting purposes. The farmer follows intercropping of mango with groundnut and horsegram for enriching the soil with nitrogen. He practices intercultural operations like ploughing between the trees to keep the orchard weed-free. He uses a mango harvester so as to get the fruit harvested without damage. His wife makes pickles from tender pickling mangoes like Gaddemar for home consumption.

Promotion/ Dissemination

The special variety Peddarasam which is a sucking type maintained by Mr. Reddy primarily for home consumption and exchange with relatives and friends because of its excellent taste, good flavor and large size (>1kg/fruit). He is willing to share the scions of this variety for grafting purposes.

Continuation and Support

The farmer would like to continue with the already maintained mango diversity and is willing to share scions of elite varieties like Peddarasam and Kalepadu for grafting. He requires support for grafting and distribution of identified unique varieties to fellow farmers. Any support for marketing his indigenous varieties at a better price is welcome, he says.

Passport Data

Name of the custodian farmer	Contact address Coordinate (GPS)	Production system and area (Ha)	Species and intra specific diversity
M. Gunashekhar Reddy	Baitapalli village, Community: Thalupalla Phone: 09701870105 Longitude: 79.0259 Latitude: 13.22252	Orchard (4.00 ha)	Mango: 15 varieties (11 + 4 naati) Totapuri, Neelum, Banganapalli, Reddi Pasand, Peddarasam, Kalepadu, Pulira, Mulgova, Chakkaraguttulu, Gaddemar, Alphonso, Naati (4) of seedling origin

Limited Resources Led Farmers to Create and Conserve Mango Varieties, Malihabad

Chhote Lal Kashyap

Profile 6/2013

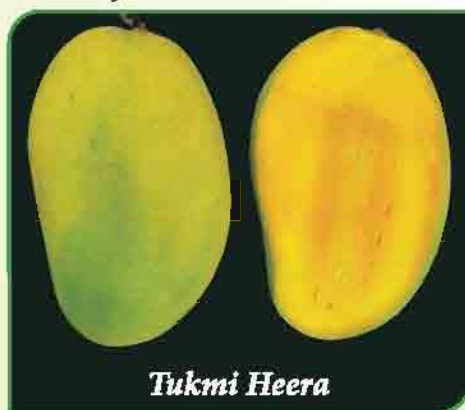
Malihabad, one of the three tehsils (smallest political unit) of Lucknow, has several claims to fame but it is the mango varieties that have put the town on the world map, as when the Malihabadi Dashehari variety was granted Geographical Indication registration in 2009. The Malihabad forms a part of Central Ganga Plains. The climate is subtropical with three distinct seasons, namely summer, monsoon and winter. Winter commences usually in the month of November and extends until February, followed by summer from April to the middle of June. Then the monsoon starts, lasting upto September or October. The temperature is at its maximum during the month of May and at its minimum in January. Gopramau is one of the villages in Kakori Mandal in Lucknow District, Uttar Pradesh State, and is located at 16 km distance from the major city of Lucknow. Towns located nearby are Malihabad, Sarojaninagar and Bakshi-Ka-Talab.

Mr. Chhote Lal Kashyap is a farmer of Gopramau village and belongs to the middle-income group. His family has 19 members, including 12 grandchildren. He started mango cultivation about 40 years ago in the basins of the Gomti River, where it was not common. He developed a unique attachment to farmers' mango varieties, which are mostly grown from seed and which can thrive well under abiotic and biotic stresses. He 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. During the mango season, he devotes most of his time to the orchard. Tailoring is his secondary occupation when there is not much work in the orchard.

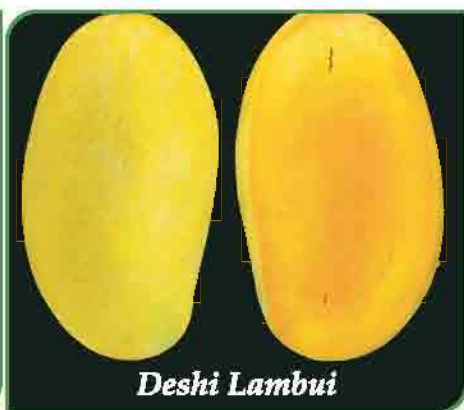


Motivation

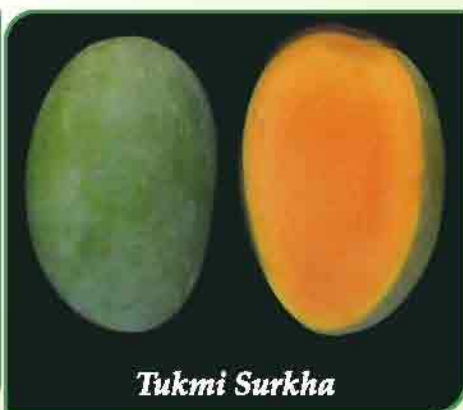
Malihabad is not only important for numerous varieties but also for the fact that the majority of agriculture land is under mango cultivation. About five decades back, Mr. Chhote Lal, owner of approximately 2 ha, became fascinated with the mango farmers of the area and made efforts to plant an orchard on his own land, which was not suitable for cultivation of arable crops. He made efforts to plant commercial varieties and failed to grow grafted saplings due to the poor sandy soils, undulating landscape and lack of irrigation facilities. He met with the people planting seedling mango in Malihabad-Kakori-Mal areas and eventually his own efforts in planting seedlings was successful, resulting in an orchard of more than one hundred varieties. Initially he made attempts to plant 150 Dashehari grafts purchased from the Malihabad nursery, with a survival of about 35 grafts. Dead grafts were replaced with seedlings. Out of these seedling trees he selected good ones and removed rest of the seedlings and the number of varieties increased to 135. He gradually became an owner of an orchard rich in diversity. The genetically diverse varietal collection of trees provides major support for his family' livelihoods.



Tukmi Heera



Deshi Lambui



Tukmi Surkha

Mr. Chhote Lal maintains seedlings because of higher survival rates in sandy soils. Over the years he also observed that harvest of seedling types is possible for a longer period than Dashehari, thus providing a prolonged supply of fruits for home consumption and sale. His income starts with the early sale of seedlings suitable for pickle in May-June and continues even after 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 Dashehari glut. Recognizing these advantages, he is no longer eager to replace his seedlings with commercial varieties. The productivity of seedlings is sometimes higher, as he noticed his orchard is much more productive under challenging pest problems. Under conditions of water scarcity, Dashehari and other varieties produce small fruits. Several seedling types ripen late and develop a good fruit size because of rains before their harvest.

Maintenance

Mr. Chhote Lal maintains about 135 different seedling types and three grafted varieties in his orchard, most of which originated from seed (bijju). Bijju Deshi Dashehari, Deshi Chausa, Tukmi Heera, Sunehra, Badamba, Gola, Dil Pasandare



some of the seedling types that he has named on the basis of their resemblance to known parent cultivars or because of the similarity of particular shapes or colours of the fruit. 'Deshi' or 'biju' means 'local' and seedling trees that did not receive specific names are called just that. Since most of the trees are seedlings grown from the seeds taken from commercial varieties, they resemble these cultivars in one or more characters. For example, Deshi Dashehari means a seedling of Dashehari. 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 plants and he often used the fencing of small plants with bushes and shrubs to save the plants from grazing animals during the initial years of orchard establishment. He has maintained the genetic diversity of seedlings in his orchard for the last 40 years and is interested in maintaining it also in the future.

Adaptation

Soils in Gopramau are sandy in the basins of Gomti River and the land owned by Mr. Chhote Lal are not level and lack irrigation facilities. He faced difficulties in establishing trees of grafted varieties like Dashehari and Lucknow Safeda and thus planting of seedlings was the easiest and cheapest way out. Seedlings are hardy in nature and one does not need to purchase grafted saplings from nurseries. The source of planting material was mainly seedlings and only a few grafts of commercial varieties were planted. Planting seedling has helped him to create new mango varieties through the selection of superior ones from the population. This became a routine activity of Mr. Chhote Lal during the process of orchard development.

Seedlings of attractive and high quality fruits are sought when selecting the best seeds/stones for planting seedlings. For growing seedlings, the farmer selects fruit on the basis of fruit colour (more yellow than green at the ripe stage), shape (more uniform and less asymmetrical), pulp colour (orange), sweetness, sugar acid blend and pleasing aroma.

Promotion/ Dissemination

Mr. Chhote Lal considers the uniqueness of seedling types and non-commercial varieties as strength. In recent years, he says, the price of these mangoes has been increasing with the declining number of seedling types or non-commercial varieties. Most orchards with seedling types are replaced by commercial cultivars such as Dushaheri and Lucknow Safeda or cut down because of urbanization. The large-scale replacement and planting of commercial varieties like Dashehari, Chaise and Lucknow Safeda by many farmers is the reason for the market glut of these cultivars and the subsequent steep decline in prices. Farmer varieties and seedling types, being rare and limited, can bring better prices if consumers are aware of their quality and nutritional aspects.

In markets, commercial varieties are available in huge quantities and non-commercial varieties are available only in some areas of a city and that too with few fruit vendors. Attractive appearance and good taste fetch better prices for the farmer's varieties and seedling types, so that the market

trend in the last few years has motivated him to continue with the cultivation of these lesser-known varieties. Several of the seedling types are suitable for pickle and fetch a good price in the market at the immature stage. Demand is increasing every year, according to Mr. Chhote Lal.

His livelihood is mainly dependent on lesser-known varieties and he earns income by selling fruits in selected markets. According to him, large mandis (local markets) are not good places for farmers' varieties because of malpractices and the very low prices offered for the produce. The majority of the fruit vendors in urban areas purchase commercial varieties like Dashehari, Lucknow Safeda and Chausa; only a few go for rare or lesser-known varieties. Gradually, sucking mangoes are regaining the preference of city dwellers. He says that cultivation of these varieties is becoming profitable and that farmers no longer want to switch to plant commercial varieties. He has very limited plants of commercial varieties like Dashehari and Lucknow Safeda, and these mostly for his own consumption.

Continuation and Support

Mr. Chhote Lal is proud of being an owner of several varieties. The conservation of diversity adds to his self-esteem in the community. He exchanges fruit with others and earns his livelihood by selling fruit in the market. He sets an example for a sustainable livelihood through mango diversity conservation and expects that his son will continue the cultivation of seedlings and non-commercial varieties. He would like a tube well in his orchard to support this venture and expects financial help for the maintenance of the diversity needed for the development of niche markets for farmers' varieties.

Passport Data

Name of the custodian farmer	Contact address Coordinate (GPS)	Production system and area (Ha)	Species and intra specific diversity
Chhote Lal Kashyap	Goparamau, Block Kakori, District Lucknow	Orchard system (2 ha) Sandy soil	<p>About 135 seedling types and varieties of mango, including varieties such as: Deshi Dashehari, Biju Tukmi, Deshi Chausa, Tukmi Heera, Sunehra, Badamba, Gola, Dil Pasand and several other seedling types</p> <p>Commercial varieties such as Dashehari, Lucknow Safeda</p> <p>Other fruits: Lemon and custard apple</p>

Conserving Century-old Mango Varieties in Kasmandi Kalan: The Story of the Nawabs

Nawab Hasan

Profile 7/2013

Introduction

Long known for its mango orchards, Kasmandi Kalan is surrounded by mango trees all around, including a wide range of traditional varieties, both commercial and non-commercial. Kasmandi Kalan is the birthplace and residence of several Muhammadans distinguished for learning and wealth. The interest of those *nawabs* in mango and its diversity as an item of celebration and wealth has created a niche for this village in creating and conserving promising mango varieties. Kasmandi Kalan is a small village in the Lucknow District of Uttar Pradesh, India. It is situated on the outskirts of the city, 11 km away. The village is located in Malihabad sub-district within the central Gangetic Plain and the climate is a subtropical type with three distinct seasons: summer, monsoon and winter.

Among different mango varieties grown in Kasmandi Kalan, Dashehari is by far the most popular. Other more common varieties such as Lucknowa, Chausa, Fazli and Jauhari Safeda are also grown by several households but not on a large scale. Several rare varieties not known to most people are also grown by the farmers of this area. Varieties like Gilas, Malihabad Safeda, Abdul Khalid Khan and Acharwala, among many others, evolved through seedling selection and are cultivated by a few farmers and that too on a very small scale. Mr. Nawab Hasan is one of them. A resident of Kasmandi Kalan, he has a long family tradition of mango cultivation that was started by his forefathers. The general tendency in the last two decades to plant only commercial varieties such as Dushaheri and Lucknow Safeda has not convinced him to cut down the old trees he inherited from his forefathers. Several selected hundred-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.

Motivation

Mr. Hasan Ahmed, the father of Mr. Nawab Hasan, purchased a piece of land about 60 years ago in Kasmandi Kalan along with fruiting trees of several non-commercial mango varieties. The plot contained a collection of trees including traditional farmer varieties collected not only from Malihabad but also from other mango-growing areas like 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 a knowledge of mango varieties admired the richness of the collection. The collection includes some of the unique varieties of Malihabad. Malihabadi nurseries and the *nawabs* played an important role in the conservation of troves of uncommon varieties with rare fruit characteristics. Those unique varieties were mostly used as show pieces during celebrations or used as a special gift, in the form of its fruits or as a sapling, a custom that eroded but still exists.

However, many of these varieties were not known to the general consumer, received low sale prices and gradually the enthusiasm of owners declined. This led to the replacement of many old trees with commercial varieties or other crops. Mr. Nawab Hasan was also reluctant to keep up the old orchard because of low returns. However, for the last four or five years he was able to get a sustainable price. His efforts to sell the fruits to few selected traders with interest in the old varieties instead of the general mandi was successful and presently he feels satisfied with the



earnings. The higher price of fruits has changed the view of Mr. Hasan about conserving the varieties. Initially the varieties were conserved due to affection and attachment to the trees planted by forefathers and now their conservation is also supported by a fair price for the unique varieties available in his orchard.

Maintenance

Mr. Nawab Hasan maintains 51 different traditional farmers' varieties in his orchard, most of which are selections collected from elsewhere. Varieties like Surkhi, Sundari, Pauda Gaj, Deshi Bombaiya, Machhli, Pan, Matka Gola, Chandni, Bhura, Nauraj, Surkha Matiyara, Nazir Pasand, Baudi, Kamal Pasand and several others may not be available in other orchards of Malihabad. A few of them are the only living trees of their varieties on earth. The trees ages range from 50 to more than 100 years, thus showing a continuous agumentation process of varieties over decades. These are grafted plants, thus providing a biased collection of trait-specific germplasm, which can be considered a farmer's field genebank. Observing the market trend of a small group of consumers interested in lesser-known traditional farmers' varieties, he is now also interested in planting some attractive collections that are available in the National Field Genebank of Mango at the Central Institute of Subtropical Horticulture (CISH) in Lucknow. The community nurseries established under the UNEP-GEF TFT project will play a key role in duplicating and distributing the diversity of this orchard in other villages so that these varieties will not vanish. The



livelihood of Mr. Nawab Hasan is not mainly dependent on the earnings of this orchard. However, if he can support the maintenance of the orchard through the yearly returns from the varieties it would mean conservation is not a loss-making enterprise. He has been conserving the diversity for the last 60 years and also interested in maintaining it in the future.

Adaptation

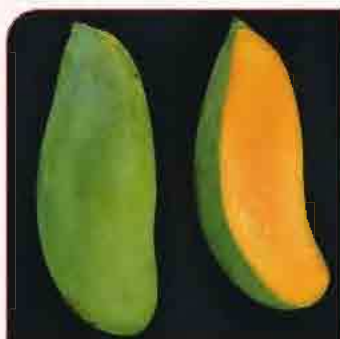
Mr. Nawab Hasan's collection includes grafted trees with a wide range of particular fruiting traits well adapted to use for sucking, table and pickle purposes. His collection serves as a repository of rare farmers' varieties of Malihabad and other mango-growing areas and therefore deserves to be called a farmer's field genebank. A rich array of old varieties in the orchard indicates that the grafts were prepared from promising mother trees and planted in the orchard by the owners at the time.

Promotion/ Dissemination

Maintenance of a good number of old Malihabadi varieties by Mr. Nawab Hasan also encouraged other farmers in Kasmandi Kalan to retain century-old superior seedling trees, withstanding the dominance and popularity of commercial varieties like Dashehari, Chausa and Lucknow Safeda. His orchard, with grafted trees of 51 distinct farmer varieties, is an excellent example of on-farm conservation of mango diversity. The preference for commercial varieties for new plantation in the last two or three decades has sharply narrowed the ratio between commercial and traditional varieties, he says. However, he continues, in recent years farmer varieties could fetch better prices. The sometimes forgotten cultural heritage connected with these varieties can be used to improve the marketing of these fruits. He now will surely advocate the cultivation of farmers' varieties to people known to him.

Support and Continuation

He is interested in planting red-colored and new types missing in his collection on a different piece of land. The gradual increase in demand for rare and sucking type mangoes among a select group of consumers in Lucknow helped him to cover the maintenance costs of this orchard. However, the difficulty is to find those consumers who have an interest in these heritage varieties. Assistance in the collective marketing of those varieties is required, especially for smaller farmers, he says.



Pauda Gaj



Matka Gola



Surkha



Navras



Nazir Pasand



Dashehari (Improved)



Paan



Deshi Bombay

Passport Data

Name of the custodian farmer	Contact address Coordinate (GPS)	Production system and area (Ha)	Species and intra specific diversity
Nawab Hasan	Kasmandi Kalan, Block Malihabad, District Lucknow	Orchard system (1.5 ha), loamy soil	<p><i>About 51 unique varieties of Mango:</i> Surkhi, Sundari, Pauda Gaj, Deshi Bombaiya, Machhli, Pan, Matka Gola, Chandni, Bhura, Nauraj, Surkha Matiyara, Nazir Pasand, Baudi, Kamal Pasand and other</p> <p>Commercial varieties: Dashehari, Chausa, Lucknow Safeda, Amrapali, Fazri, Amrapali, Gulab Khas</p>

Custodian of Underutilised Wild Tropical Fruit Species, Aroi- Aroi (*Garcinia forbesii*), Malaysia, Palin Along

Profile 8/2013

Mr. Palin Along from Kampong Penampang Baru, Papar is a full-time farmer. He is married with five children and four grandchildren. He is also a committee member of the village society and president of the Agriculture Bureau, covering two villages – Kampong Penampang Baru and Kg. Daigin, a part time president of the Custom Court (Mahkamah Adat) for Kimanis District and a carpenter. He maintains ten underutilised fruit species of *Mangifera*, *Garcinia* and *Nephelium* in his homegarden and orchard. In addition, there are also six other fruit species in the orchard. His main income is from rice and from his work as a president of the Custom Court. Fruit trees such as *Garcinia forbesii* (aroi-aroi), *Mangifera pajang* (bambangan), *Nephelium lappaceum* (rambutan) and including other fruits such as *Durio zibethinus* (durian), *Lansium domesticum* (langsap), *Artocarpus integer* (cempedak) and *Artocarpus odoratissimus* (terap) provide him with about 10% additional income each month.

Papar is situated in the West Coast Division about 38 km to the south of Kota Kinabalu. The area is flat and characterized by low-lying coastal areas extending inland towards Crocker Range. Most of the homegardens and orchards in Papar are on flat land and consist of mixed fruit species. Sometimes the rare fruit tree species are integrated with rubber, traditional vegetables and other commercial fruits. Other agricultural crops that are cultivated include rice, banana, commercial fruits like durian, vegetables and commodity crops such as rubber and oil palm.

In Papar the major ethnic groups are Kadazan (60%) and Dusun (28%), with 12% belonging to other groups. They are both full-time or part-time farmers and some work for either the government or private companies.

Motivation

Mr. Palin Along has an interest in planting fruit trees as a hobby since childhood. He used to follow his father to the nearby forest to collect wild fruit relatives and helped his father to grow them in their homegarden and orchard. Gradually, he also realized the importance of wild fruit relatives to future generations and started to find and plant wild fruit species from the nearby forest. He also planted clonal fruit species obtained from the Department of Agriculture, bought from nurseries and also obtained from friends. He owns aroi-aroi (*Garcinia forbesii*) trees that produce fruit with thick skin. The skin of the aroi-aroi fruit is sliced and dried and used in cooking to give a sour taste in local cuisine. The dried aroi-aroi is also used as medicine to treat women after childbirth. It is believed that long stored dried aroi-aroi is a good medicine. Mr. Palin Along has ten aroi-aroi trees in his orchard that contribute to his income.



Although his orchard is small (about one hectare), it is rich in wild relatives of fruit species. He still maintains some underutilised wild fruit species. These include species such as *Nephelium cuspidatum* var. *robustum*, *Garcinia cowa* and *Mangifera caesia*, which are more than 70 years old and are considered rare. He has superior fruit quality *Mangifera pajang* with fine fibres and sweet fruits for fresh consumption. He raises seedlings of *G. forbesii* and distributes them to his friends in the village. He uses his capacity as the village committee and as the president of the Agriculture Bureau for the village society to raise public awareness on the importance of conservation of fruit trees, especially the wild relatives of the cultivated crops among the farmers in the village. Recently he planted 50 new fruit trees, including four trees of *Mangifera pajang* and 20 trees of *G. forbesii* and other fruit species.



Adaptation

The wild relatives of fruit species are maintained in Mr. Palin's orchard, which can be considered on-farm conservation. He is passionate about looking for new diversity from the nurseries or wild fruit relatives in the forest that he then domesticates in his homegarden. He selects superior varieties of aroi-aroi and bambangan and sows the seedlings. He will always give away these seedlings to his friends. He also grows the seedlings of other exotic fruit species such as *Pouteria champetchiana* (yellow egg) and *Chrysophyllum cainito* (kameto) planted in his orchard.

Promotion/ Dissemination

Dried aroi-aroi skin contributes to Mr. Palin Along's income. In this way, he has motivated the villagers to plant more trees of aroi-aroi that have potential for commercialisation. He is also interested in learning about products developed from aroi-aroi in order to fully utilise the fruit. In addition, he also distributes seedlings of wild fruit species to other farmers so that they can benefit from them and conserve the species. Since he joined the TFT project, he has become aware of the importance of the conservation of wild fruit species. In a short time, he has managed to persuade many of the farmers (about 100) in his community not to cut down the wild relatives of fruit species in their orchards.

Mr. Palin Along always takes two of his children to the orchard to teach and explain to them about fruit trees. One of the boys who obtained a certificate from the Agriculture Institute seems to be interested in continuing the work with plants.

Expectation

He hoped that the government would recognise those farmers who are involved in conserving wild fruit tree species and give some incentives for their contribution. After joining the project, his awareness of the importance of conservation and products that can be developed from underutilised fruits has greatly increased. He hopes that he can conserve wild fruit species for the use of future generation.

Contributed by:
Selma, I., Muhammad Shafie, M.S. (MARDI) and Wong, W.W. (DOA)

Passport Data

Name of the custodian farmer	Contact address Coordinate (GPS)	Production system and area (Ha)	Species and intra specific diversity	Types of agrosystem
Palin Along	Kg. Penampang Baru, Papar, Sabah N 5.605° E115.957°1°	Home garden (0.5 ha) and Orchard (1 ha)	<ol style="list-style-type: none"> 1. <i>N. lappaceum</i> (6trees/2 var. rambutankekela, rambutanmasam) 2. <i>M. pajang</i>(1 tree) 3. <i>M. forbesii</i> (30 trees/ 2 var- big fruit and thick skin; small fruit and thin skin) 4. <i>M. odorata</i> (2 trees) 5. <i>M. indica</i> (6 trees/ 3 var – Mangga epal, Mangga pau, Mangga manila) 6. <i>Garcinia mangostana</i>(5 trees- 2 var -fruit round; fruit ovoid) 7. <i>N. cuspidatum</i> (1 tree) 8. <i>M. caesia</i> (1 tree) 9. <i>N. ramboutan ake</i> (2 trees) 10. <i>Garcinia parvifolia</i> (1 tree) <p>Other species maintained in the orchard</p> <ol style="list-style-type: none"> 1. <i>Artocarpus odoratissimus</i> (11 trees) 2. <i>A. integer</i> (10 trees) 3. <i>Baccaurea motleyana</i> (2 trees) 4. <i>Durio zibethinus</i> (9) 5. <i>D. graveolens</i> (2 trees) (small g) 6. <i>Lansium domesticum</i> (100 trees) 	Mixed orchard

Promoting the Planting of *Garcinia Atroviridis* (Asam Gelugor) in Agroforestry Systems, Malaysia

Razali Yahya

Profile 9/2013

Mr. Razali Yahya from Kampong Changkat Ibol, Changkat Jering, Perak is a fireman and a part-time farmer. He has a family of five that includes three sons. When he was young his father asked him to grow fruit trees and after looking around the village he observed that '*asam gelugor*' trees have great commercial potential and thus he decided to plant the trees in his 3.2 ha rubber plantation.

Bukit Gantang is located in the district of Larut-Matang Selama District in the state of Perak. It is famous for the cultivation of underutilized fruit species *Garcinia atroviridis* (*asam gelugor*). The most important product made from '*asam gelugor*' fruit is the dried '*asam keping*,' which is used in dishes to give them a sour taste. The leaves and fruits can also be used for medicine. '*Asam gelugor*' is found planted in homegardens or orchards. The trees are normally grown from seedlings that are raised by the farmers themselves or bought from private nurseries. Trees grown from seedlings will produce either male or female trees. About 70% of these would be male trees that will be cut down. The growing of '*asam gelugor*' trees is very lucrative since the dried product '*asam keping*' fetches a high price. 'Having about three trees of '*asam gelugor*' in the home garden is just enough to provide substantial income for a month' said one village housewife.

Motivation

Mr. Razali was the first farmer to grow '*asam gelugor*' in an agroforestry system with rubber trees as the anchor crop in Bukit Gantang area in 1990. The rubber trees also provide shade to '*asam gelugor*' trees. The other farmers grow '*asam gelugor*' in mixed fruit orchards or as a monocrop. There are 60 trees of which 45 are seedling trees while the others are grafted trees. The '*asam gelugor*' trees start to bear fruit at the age of seven years. Mr. Razali earns an additional income of about RM 2,000.00 monthly from the selling of matured '*asam gelugor*' fruits.

He noticed that most of the farmers in his area only plant fruit trees that have commercial value. The fruit trees that he used to see when he was small are difficult to find now. Therefore, he started to find seedlings of wild relatives of tropical fruits from the forest, from nurseries or from friends. At present, he is involved in producing planting materials of '*asam gelugor*' seedlings. He is also one of the farmers who contributes to the community nursery. In addition, he also gives away seedlings of '*asam gelugor*' to his friends.

Maintenance

In fact, he has had an interest in planting fruit trees since he was small. He recognised four varieties of '*asam gelugor*' of various fruit shapes and sizes from his orchard: round and small, round and big (> 500



g), ovoid and oblong. In addition to '*asam gelugor*,' he also planted *Lansium domesticum* (10 trees), *Nephelium lappaceum* (29 trees), durian (30 trees) and bananas (300 clumps) in his orchard. In his home garden (about 0.5 ha) he has planted fruits such as rambutan (*Nephelium lappaceum*) and manggis (*Garcinia mangostana*). Other underutilised fruits cultivated include salak (*Salacca edulis*), Jering (*Archidendron jeringa*) and kerdas (*Archidendron globosum*).

Adaptation

Mr. Razali's systematic planting of '*asam gelugor*' by integrating them with rubber trees seems to be successful. Whenever he managed the rubber trees he manages the '*asam gelugor*' trees as well. In this way he will receive income not only from rubber but also from '*asam gelugor*'. Having seen Mr Razali's work, many other farmers started to integrate '*asam gelugor*' with durian (*Durio zibethinus*) or other fruit trees in their orchards.



Promotion/ Dissemination

The Department of Agriculture at Bukit Gantang has found that his system of planting '*asam gelugor*' can provide a good income and recognised him as a successful custodian farmer of '*asam gelugor*' diversity. The Department adopted his orchard as a demonstration plot for farmers and visitors, both local and international. His effort in planting '*asam gelugor*' on a big scale has created interest on the part of many of the farmers in the nearby areas. In addition, his eldest son has shown interest in fruit trees and always helped his father in his orchard whenever he came back for holiday in the village.

Expectation

Mr. Razali hopes that the government would recognise the initiatives of the village and provide farmers with incentives for their contribution in conserving fruits of wild relatives. He also hopes that the farmers will not cut down the old fruit trees but will instead plant new ones. He wants some awareness programmes so that other farmers also become aware of the importance of keeping the fruit species not only for increased income but also for good of future generations.

Passport Data

Name of the custodian farmer	Contact address Coordinate (GPS)	Production system and area (Ha)	Species and intra specific diversity	Types of agrosystem
Razali Yahya	JBS 27a, Kampung Changkat Ibol, 34850 Changkat Jering, Taiping, Perak N 4.7600°, E100.742 1°	Home Garden (0.5 ha) and Orchard (3.2 ha)	<ol style="list-style-type: none"> 1. <i>Garcinia atroviridis</i> (60 trees/ 4 varieties) 2. <i>Nephelium lappaceum</i> (29 trees/3 varieties- deli, gading and anak sekolah) 3. <i>G. mangostana</i> (20 trees) <p>Other species maintained:</p> <ol style="list-style-type: none"> 1. <i>Salacca edulis</i> (30 trees) 2. <i>Lansium domesticum</i> (dokong-10 trees) 3. <i>Durio zibethinus</i> (30 trees) 4. <i>Archidendron jeringa</i>) 5. <i>Archidendron globosum</i> 6. Bananas 	Agroforestry

Contributed by:
Salma, I., Muhammad Shafie, M.S. (MARDI) and Norhayati, M.H. (DOA)

The Custodian of High-Yielding Diversity of 'Bathua Mango' in Pusa Block, Samastipur, India

Kailash Prasad Rai

Profile 10/2013

Sri Kailash Prasad Rai, 76, is an intermediate-educated farmer of Jagdishpur for whom agriculture is his main means of livelihood and income for supporting his family. He has a joint family consisting of him and his wife, two married sons and grandchildren. He has about 15 acres of arable land and a mango orchard of 1.2ha.

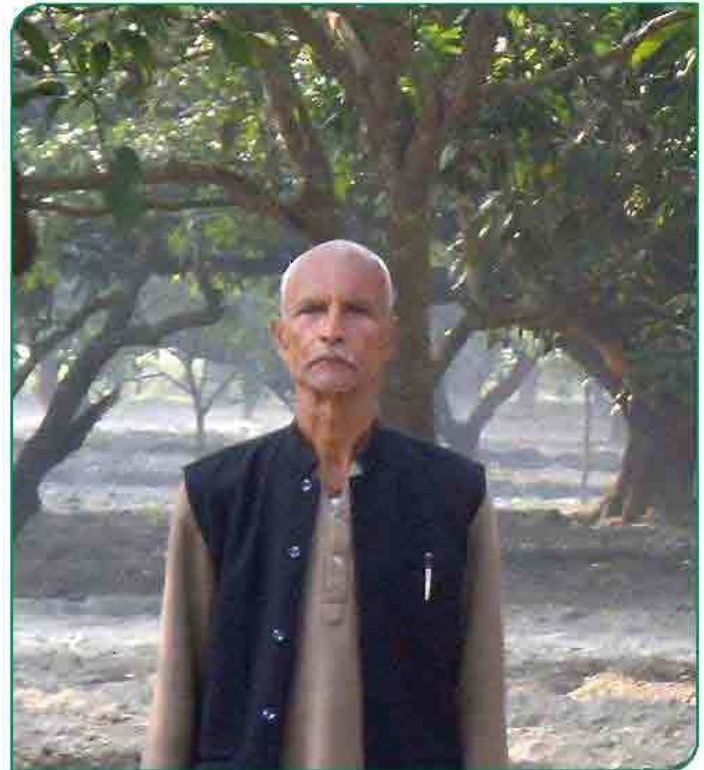
Jagdishpur village is located 5 km south of Pusa block, Samastipur District, Bihar, with rich mango, litchi and pummelo diversity. The seedling mango orchard of Sri Kailash Prasad Rai is located opposite the orchard of Sri Vinod Rai, another Custodian farmer of the same village. In his orchard, mango fruits are laden on the branches like grape bunches. Fruits of *Bathua mango* are green in colour, very late bearing, available when other mango varieties have been harvested and its fruits are very tasty. Although seedling in origin, these mango trees provide regular income due to their annual bearing habit.

Every day since his childhood he used to go to the orchard, which he has kept very clean, well-maintained and nurtured for over 50 years. His orchard is about 80 years old and new trees are planted when any old trees are cut. His main source of income is through the sale of farm produce such as wheat, mustard, rice, red gram, maize, potato and mangoes for pickle-making and table purposes. Two cows reared by him give sufficient milk required for the requirements of his family and also provide a source of farmyard manure used in the mango orchard.

Motivation

Sri Kailash Prasad Rai inherited the orchard from his forefathers. The orchard survived because of the old customs of not cutting any trees that provide food (as table-purpose fresh fruits), fodder (for goats reared by *dalit* communities of the villages residing adjacent (200-300mts) to his orchard), fuel (from the dead trees), timber (thick-trunked trees are cut when dead) and above all regular source of income while fruiting. These benefits are enjoyed without much effort and with no financial liabilities. He is so fond of mango trees that he does not want to sell the fruits to pre-harvest contractors as he is afraid that they will damage the trees while harvesting. Pre-harvest contractors also do not pay on time, saying that they are in loss due to fruit drop/theft. He harvests the fruit and then sells it to the vendor/local *arhatiyas* (i.e. commission agent). He offers mango fruits to whoever comes to his house although he is reluctant to sell the fruits to others in the village or nearby villages. Sri Rai also sells old and thick-trunked mango trees, when they are dead, to saw mill/local residents and gets from this a handsome profit used for festivals/occasions. He gets 20 % of his income through the sales of mango fruits.

His wife, Smt. Asha Devi, 70, a 10th passed, is involved in pickle/chutney/amawat making. She is teaching daughter-in-laws (Smt. Babita Devi, 43, and Smt. Nisha Devi, 40) to get involved in pickle /chutney making from the mango she gets from her orchard. She prefers to prepare different types of mixed pickles



(small- to large-sized mango) and motivating other ladies in the village to popularise mango products.

Different from Others

Other growers of this region do not have many peculiarities in seedling mango trees. One of the seedling trees (a mango variety he calls '*Chinia*') bears colorful fruits which are totally different from other mangoes. The late variety mango '*Bathua*' bears heavily, and suffers the least damage due to high winds and hailstorms in comparison to other varieties. Many farmers have taken the stones of that mango for planting in their own kitchen gardens. He has also supplied scion sticks to various nurseries and plants are already grafted and to be distributed to interested mango farmers very soon.



Maintenance

Sri Rai has almost 105 trees of seedling mangoes in the area of 1.2 ha and most of the trees are over 80 years old. In his kitchen garden, he has planted litchi, guava, banana, aonla, bael, pummelo, all of which are bearing fruit. Spread over the area of 1.2 ha, he has also planted potato, pigeon pea, wheat and mustard near the periphery of the orchard. He visits his orchard every day and plants new trees of elite mango varieties as gap filling (he has already established 10 new varieties) whenever land is available after the cutting of very old and thick [diameter] trunked trees to sell for timber, fetching Rs 50,000-70,000 per tree. He shares the fruits of 'chinia' mango with farmers, villagers and relatives freely and gets feedback on the taste and storage quality. There is demand for stones/scions by reputed nurseries for propagation of this variety. Another seedling mango variety 'Bathua' in his orchard fruits heavily and very late in the harvest season, bringing a smile to face because of the High Yield and better price.

Adaptation

Sri Rai is interested in having different types of mango. Fruits of the varieties grown in his orchard carefully checked by Sri Rai for their characters such as sweetness, lack of fibre and attractive colour while ripening and then he plants the stones in his kitchen garden for further propagation. After one year, he transfers such seedlings to the orchard for filling gaps. He also purchases grafted plants of 'Safeda Malda' and 'Malda' for gap-filling. He has been constantly engaged in innovating good practices such as regular ploughing, application of Bordeaux paste to trunks, removal of unwanted/dead wood, application of pesticides in the form of soil drenching/and spray on tree canopy, irrigation after fruit set to grow and maintain these valuable mango trees.

Promotion/ Dissemination

Sri Rai is determined to save his mango orchard at any cost but wants ensure that his produce will be sold or exported to distant markets rather than selling to retailers or *arhatiyas*. One of his major contributions to the community is to share elite scion material/stones of 'Chinia' and 'Bathua' varieties from his orchard. He is also interested in propagating the good diverse planting materials and plants them himself together with other community members. He is afraid that if his sons do not take care of the orchard, then one day

the diversity will vanish. He always advises his sons to take care of orchards, whenever they are at home. He regularly convinces his wife and in-laws to go for preparation of pickles, amawat, chutney and other products of seedling mangoes in their spare time.

Continuation and Support

He wants his sons to get more involved in orchard establishment with training on grafting/budding techniques, marketing of mango fruit and its products. He does not want to depend on any nursery for planting material.

Farmers of the area wants training on grafting/budding techniques in mango for establishment of community nurseries, rejuvenation techniques for old and senile mango plantations, and methods for ensuring markets for pickles/amawat/chutney of seedling mangoes and table varieties.

Passport Data

Name of the custodian farmer	Contact address Coordinate (GPS)	Production system and area (Ha)	Species and diversity (with some peculiar characters)
Kailash Prasad Rai	Vill. Jagdishpur, P.O. Pusa, Samastipur, Bihar, India Phone: +91 8809300311 Longitude: 86°30'E Latitude: 24°18'N	Orchard system (1.20 ha) (105.0 trees)	Mango (<i>Mangifera indica</i> L.): 13 varieties of mango (all are seedlings) 1) Malda (late bearer) 2) Safeda Malda 3) Shukulia (pickle purpose) 4) Sepia 5) Hajipur malda 6) Ladurwee (Round in shape, colour red/yellow) 7) Chinia (very sweet) 8) Bhemha 9) Mithua 10) Kerwa (shape like banana) 11) Mithua 12) Ghevahi (ghee like pulp consistency) 13) Sinduria (very late in bearing)

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Finding the Balance Between Commercial and Seedling Trees in Sarsanda

Maiku Lal

Profile 11/2013

Introduction

Mr. Maiku Lal started mango cultivation about 35 years back in Sarsanda village. He developed a flair for cultivation of seedling types, which are trees grown from seed, because of their multi-purpose character for a wide range of uses and their ability to thrive on land where grafts are difficult to establish and survival rates are poor. Apart from 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 organising 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 livelihoods.

Sarsanda is a town in Kakori block (sub-district) in the Indian state of Uttar Pradesh situated 14 km north of Lucknow. It is located on the Central Gangetic Plain, with a subtropical climate with three distinct seasons, namely summer (April-mid June), monsoon (mid June-September/October) and winter (November-February). The farm land in Sarsanda is characterized by loamy and sandy soils on mostly undulating terrain. This area is widely known for its mango, particularly the famous variety Dashehari that originated from Dashehari village in Kakori block. Mango cultivation in the village of Sarsanda was however not a commercial venture until recently (the last 25 years) and most of the older orchards were of seedling origin. The orchards planted about 50 years back were established without irrigation facilities. The planting of grafted plants was rare and was limited to a very few plants in the orchard.

Motivation

About 50 years back, mango cultivation might have been an important occupation in Malihabad, Kakori and other nearby sub-districts of Lucknow, but in Sarsanda the average man was not able to plant mango due to several environmental but also socio-cultural reasons. In Sarsanda the villagers were not allowed to develop orchards and only Jamindars or influential people owned orchards. Other households had to work on their orchards or could grow annual crops only following the old traditions. In addition, the lack of tube wells and unleveled sandy land were some of the factors which restricted mango cultivation in this village. Efforts made by Mr. Maiku Lal, 35 years ago, to plant grafts were not very successful and he decided to replace dead grafts with seedling plants. After seeing the better survival rates of seedlings, he gradually started planting seedlings in the gaps or on the sandy undulated farm land that he had available.

Mr. Maiku Lal considers those non-commercial varieties as 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 fibers and suitability for making juice. Some of the seedling types are used for making



pickle or are made into powder to serve as a food ingredient. According to him, one of the leading commercial varieties, Dashehari, provides fruit for only about one month. Other farmers' varieties are available even after the end of the Dashehari season and a continuous supply of fruits from the orchard is possible for a longer period. Several of the seedlings even get a better market price than that of commercial varieties he noticed in recent years. He considers an orchard based on seedlings or some lesser-known varieties as the best option for sandy soils with limited irrigation facility. The cultivation of diverse mango varieties (both seedling and commercial types) provides his family with a sustainable income and he realized that an orchard with seedlings or lesser-known varieties is also profitable due to its lower establishment and maintenance costs.

Unique Features

Nowadays most of the orchards in Sarsanda are of Dashehari grafts only and, therefore, farmers are facing a lot of competition in the market for just a very short fruiting season, resulting in very low prices. Mr. Maiku Lal is one of the few farmers who utilized both type of soils in the village. While others merely focused solely on loamy soils or were persuaded to grow grafts of commercial varieties, he is one of a small group of



farmers that has mixed orchards and has maintained many seedlings and lesser known varieties in his orchard.

Maintenance

About 40 different mango varieties are maintained in the orchard of Mr. Maiku Lal. Most of them are developed by growing seedlings. 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. He named his varieties on the basis of their resemblance to the cultivar name or features of the mother tree that was used for raising the seedling. In addition, he has planted several grafts of commercial varieties such as Dashehari, Lucknow Safeda, and Langra along lesser-known traditional varieties such as Amin which he collected from nurseries in Malihabad and Mal. He combined late maturing varieties including five types of Savnaha seedlings which mature in August and are a good source of income. Furthermore he has seedling types and varieties such as Thukmi Gola for pickle and Gola Seb and Tukmi Lamboi (sucking types), that produce fruits merely for home consumption for a longer period of time.

Adaptation

In Sarsanda, the type of soil played an important role in the selection of the variety to be planted. The difficulties faced in orchard establishment gave Mr. Maiku Lal an alternative way of growing seedling mango trees and also of expanding the total area under mangoes. Thus his passion for collection and growing farmers' varieties was triggered by the soil type of his land. He used seedlings and purchased grafts of non-commercial varieties from nurseries to enrich his collection. While other farmers simply bought grafts of commercial types, he selected a combination of varieties with different times of harvest which are suitable for sucking¹, pickle and table purposes. In the last few years he found some traders who provide attractive prices, which motivated him to continue their cultivation. He made selections from seedlings and introduced varieties from many different sources. He selected the seeds for planting based on their colour, shape, taste and time of ripening. His quest for diverse varieties from Malihabad nurseries helped in maintaining varieties that probably are not available anymore. He recalls that nurseries were most respected if they had a large number of varieties available, but nowadays most nurseries only provide the few commercial cultivars that are now in fashion.

Promotion/ Dissemination

Since he realized that he maintains wide range of diversity, Mr. Maiku Lal is eager to share mango

varieties and associated knowledge with his friends. He also makes available scion sticks of promising types to the community nursery that was established with the help of the tropical fruit tree project for their multiplication and distribution. Mr. Maiku Lal is proud that his varieties are taken up and will be promoted in Sarsanda and surrounding villages such as Kasmandi Kalan, Gopramau and Mohammad Nagar Taluqedari. Until recently he was only aware of inarching, a traditional method of grafting by growing together the branches of the mother plant and the rootstock plant. This method requires the rootstock or new tree to be planted next to the mother plant and thus it was not possible to multiply the varieties for exchange or sharing with other farmers. With the establishment of community nurseries and the use of propagation methods like wedge grafting, he will be able to duplicate the diversity in his orchard and share his varieties with other community members.

Continuation and Support

Mr. Maiku Lal and his son Mr. Raja Ram wish to continue the cultivation of a mixed and diverse group of varieties in his orchard for income and home use but also to conserve the diversity. He suggests that recognition of those farmers who are engaged in conserving farmers' varieties will motivate farmers to strengthen on-farm conservation activities. Up to now most attention has gone to farmers that grow commercial varieties only. He says it is important to find specific markets where they can obtain good prices for those non-commercial varieties, as in the general mandi (market) where prices and interest are generally low.

Passport Data

Name of the custodian farmer	Contact address Coordinate (GPS)	Production system and area (Ha)	Species and intra specific diversity
Maiku Lal	Sarsanda, Block Kakori, District Lucknow	Orchard system (1.5 ha), loamy soil and sandy soil	About 42 unique varieties of Mango: Tukmi Chausa, Gulab Jamun, Kism Safeda, Deshi Taimuriya, Gola Seb, Lambauri Chausa, Deshi Langra, Tukmi Surkhi, Lambauri, Safeda, Chonha Gola and seedlings Commercial varieties: Dashehari, Chausa, Lucknow Safeda, Fazri

Contributed by:
Shailendra Rajan, Head, Division of Crop Improvement and Biotechnology
CISH, Ram Kishore, Site Officer Malihabad, Shadab, Community Motivator, Kasmandi Kalan, Vijay, Community Motivator, Sarsanda

¹Sucking types are mangoes with thick skin and small stones which are pierced on the top so they can be squeezed to drink the pulp, a preferred traditional way of consumption.

Mango Custodian Farmer from Telagalangsar, South Kalimantan, Indonesia

Ahmad Kusasi

Profile 12/2013

TelagaLangsar is one of the sub-districts of Hulu Sungai Selatan District, Province of South Kalimantan, Indonesia. Ahmad Kusasi lives in Mandala village in TelagaLangsar. This small village of about 200 households is located at an average height of between 18-120 masl close to the forests that start at the base of the Meratus Hill range. This site represents a dry land agro-ecosystem in the humid tropics where rice and rubber are the main sources of income. Rubber is found in large plantations but also in many small plots grown by smallholder farmers. In addition to the main crops such as rubber, upland rice, and irrigated rice, the community also cultivates some tropical fruit trees such as mango, rambutan, mangosteen, durian, and minor tropical fruit trees such as Kuini (*Mangifera odorata*) and Kasturi (*Mangifera casturi*). These fruit trees are found mostly in homegardens, mixed with rubber trees in orchards or between the paddy fields. Fruits are also collected from the forest in the Meratus Hill range. In this site, mango gives about a 0.6% contribution to family income as the main income source is rubber and fruit trees grown on a homestead are mostly used for home consumption.

In this site there is a farmer with a big concern for the diversity of the tropical fruit trees, especially mango and its wild relatives. He is Ahmad Kusasi, who was born in Telaga Langsar about 64 years ago. Pak Kusasi is neither highly educated nor has any formal training in agriculture. He did not even finish his elementary school level. When Pak Kusasi and his compatriots were young, there was civil unrest in the area and many teachers in the village did not have the courage to teach and many young children dropped out of school.

Pak Kusasi grows a portfolio of crops like rice, rubber, and tropical fruits. He has a vast experience in farming from a young age, as he started helping his parents planting rice in Telaga Langsar at the age of 13. When he cultivated rice, he also planted mango trees and their wild relatives on the elevated borders between the rice fields. The main purpose was to mark the border between his land and his neighbour's land. However, later he realized that the fruits also contributed to his family's nutrition as well as to its income. Since he got married in 1964, Pak Kusasi has been running his own farm together with his wife and separate from that of his parents. Now he holds 0.3 ha of homegarden, 0.11 ha of orchard, and 0.5 ha of rice field.

Maintenance

In his plot of 0.3 ha of homegarden, he maintains six different *Mangifera* species among other fruit species such as banana, mangosteen (*Garcinia mangostana*), rambutan (*Nephelium lappaceum*) and durian. He has a tree of kasturi (*Mangifera casturi*), which has a strong sweet aroma and gets the best price in the local market, one tree each of Hambawang tapah, Hambawang pisang, Hambawang kalambuai (three types of *Mangifera foetida*). In addition, he has a Palipisan (*Mangifera applanata*) tree, the fruit of which is used for sambal (a kind of local hot appetizer) and acar (local pickles) with a distinct aroma, flavour and taste for family consumption. His homegarden also has: a tree of Rawa-rawa (*Mangifera griffithii*) for the family's fresh consumption; a tree of kuini (*Mangifera odorata*), which is resistant to fruit borer according to Pak Kusasi; and five young trees of Hampalam (*M. indica*). In addition, he has a tree of Tandui (*Mangifera* spp.), which species is not yet identified taxonomically. From the months of May to June both husband and wife collect wild fruits of Rawa-rawa and Tandui from the nearby forest for food and extra income.

Historically, the people of Telaga Langsar believed that the old and big trees, both in their village or in the buffer forest area, were sacred and should not be felled. This belief passed from generation to generation, strengthened by distress stories and natural calamities experienced by the community. This belief or fear protected many of the big old trees that were found in and surrounding the village, including trees of the species Kasturi, Rawa-rawa, Tandui, Kuini and Palipisan. Some of the *Mangifera* species, such as Kasturi and Tandui, take a long time to grow big and it can take 10 to 15 years before they reach fruit-bearing stage. *M. foetida* and *M. applanata* grow faster and already bear fruit after 5 to 7 years.

Lately, this belief is not as strong as it used to be. The people in his village feel that some of the mango trees do not have an economic value for their livelihoods, especially the large and tall *Mangifera* trees as it is difficult to harvest their fruits. So the people of Telaga Langsar began to cut the trees and sell the wood to the timber mill. The worst example is the species Kasturi, which is endemic to the south of Kalimantan and often used as the mascot of South Kalimantan, which has been felled for quick income. In spite of its status as mascot, the species was declared extinct in the wild in 1998 according to the IUCN Red List and is only found rarely in homegardens or farmers' fields.

To preserve the ancient and big trees, Pak Kusasi, together with all of the community members, is collaborating with village and the Forestry Service management to develop some informal/village regulations that are enforced by the village protection group, so that the community members can no longer cut down trees as they like. These regulations apply a fine for those who break the rules and the funds collected from such fines thus go to the village treasury to be used for propagating and distributing mango seedlings to the community.

Recognized by the UNEP GEF TFT Project, Pak Kusasi has been encouraged and he is now more determined to preserve the diversity of mango trees in his village and to build social capital for such community actions.

Motivation

The main reason for planting the mango wild relative trees such as Kasturi and Hambawang was to mark the border between Pak Kusasi's and his neighbour's land. Kasturi (*Mangifera casturi*) and Kuini (*Mangifera odorata*) are sold to the local market for additional family income; *Mangifera foetida* types and Palipisan (*Mangifera applanata*) are used by his wife for making sambal (hot spice) and pickles with a distinct aroma, flavor and taste; Rawa-rawa (*Mangifera griffithii*) is used for the family's fresh consumption. The root and bark of Tandui are used for medicinal purposes such as for curing diabetes mellitus. They still like to collect fruits from the forest because it is close to their home.

However, the specific uses that each type of mango has for income generation, family food, dietary diversity, nutrition and other uses further strengthened Pak Kusasi's determination to continue to maintain more mango trees with the different mango types. He has also suggested to his neighbours that they preserve mango and its relatives because he believes that all





mango species have their own specific uses either for fresh consumption or for processing, such as several varieties of *M. indica* sold in the village market.

Promotion/ Dissemination

Pak Kusasi, together with several other community members, has initiated and established a small community nursery to produce saplings of local and introduced fruit species and varieties by grafting. The saplings will be sold in the market or given for free to his close friends in his own and two other villages. They raise saplings of species such as rambutan and durian but also endemic *Mangifera* species such as Kasturi (*M. casturi*), various types of Hambawang (*M. foetida*), Kuini (*M. odorata*), Rawa-rawa (*M. griffithii*), Palipisan (*M. applanata*) and Tandui (*Mangifera* spp. unknown).

His efforts to propagate and conserve the diversity of endemic *Mangifera* species has earned the respect of the other community members, who recognize him as the 'father of mango diversity' in Telaga Langsat. In addition to propagating mango saplings by grafting, he has organized processing activities of some mango varieties. Upon the request of Mrs. Nor Irani, who is the leader of the women's group in the village, staff of the Assessment Institute for Agricultural Technology provided training to several women on making juice, dodol (a traditional delicacy in Indonesia) and jam from Kasturi fruits. The women sold the juice and dodol at the roadside to earn extra income and now they would like to make more products during the next fruiting season.

Adaptation

Pak Kusasi has also been actively searching for new planting materials in the market and from the local agricultural extension station, as well as for technologies that can be applied in his community to support his efforts in preserving mango diversity. He gets the new technologies from various sources, such as the agricultural extension, the Provincial Assessment Institute for Agricultural Technology, the Ministry of Agriculture,

and also from researchers involved in the UNEP GEF TFT Project. He has not propagated mango by grafting in the past, but since he received training from the local agricultural service, he has now learned to propagate mango and its wild relatives by grafting. He rejuvenated old Hampalam trees of *M. indica* with their good yield and healthy performance located about 5 km from his house and has produced the best saplings from it.

Continuation and Support

Given the poor status of affairs for Kasturi, Pak Kusasi is worried that in the future his offspring may never see the unique diversity in mango and its relatives. Although he may be able to maintain the mango trees in his garden and field, he feels that trees growing elsewhere in the village or surrounding forest may be lost forever. He was afraid that some mango relatives like Tandui, Pulasan, and Hambawang will only be known from stories.

He feels that some kind of support from the government is necessary to continue the maintenance of such unique and rare diversity *in situ*. His efforts on the dissemination of grafting propagation techniques, together with the assistance from the local government of the village, has had a positive impact in preserving the old and tall trees. Without support from the local government, he could not have done it. He also feels that support will be needed from local agricultural organizations. The South Kalimantan Assessment Institute for Agricultural Technology and the Hulu Sungai Selatan Agricultural Extension builds capacity in disseminating new propagation technology. The people of Telaga Langsat believe they can be on-farm conservationists of mangoes of South Kalimantan origin if Pak Kusasi and the community organization get more assistance in processing technologies, equipment, promotion and marketing support, as well as good agricultural practices in maintaining South Kalimantan mango diversity, so that that there is continued motivation for such initiatives.

Passport Data

Name of the custodian farmer	Contact address Coordinate (GPS)	Production system and area (Ha)	Species and intra specific diversity
Ahmad Kusasi	Telaga Langsat Village, Subdistrict of Telaga Langsat, District of Hulu Sungai Selatan, South Kalimantan Province, Indonesia	Home garden (0.3 ha)	Six species: 1. Kasturi (<i>Mangifera casturi</i>) 1 tree 2. Rawa-rawa (<i>Mangifera griffithii</i>) 1 tree 3. Palipisan (<i>Mangifera applanata</i>) 1 tree 4. Kuini (<i>Mangifera odorata</i>) 1 tree 5. Tandui (<i>Mangifera</i> spp.) 1 tree Three types of Hambawang: 1. Hambawang Tapah (<i>Mangifera foetida</i>) 1 tree 2. Hambawang Pisang (<i>Mangifera foetida</i>) 1 tree 3. Hambawang Kalambuai (<i>Mangifera foetida</i>) 1 tree 4. Hampalam (<i>M. indica</i>) 5 trees
		Orchard (0.11 ha)	
		Rice field (0.5 ha)	
	Longitude: 02°43'52.3" S		
	Latitude: 115°19'06.5" E		



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Leader and Custodian of "Javanese Pummelo"

Pak Sudarman

Profile 13/2013

Bibis village is one of the pummelo production centers in the District of Magetan, East Java Province, Indonesia. This is a dry irrigated area. Bibis is the village that must be passed through if tourists want to go to Telaga Sarangan, one of the tourism destinations in Magetan. Approximately 80% of Bibis villagers earn their livelihoods from pummelo production and marketing. They grow citrus, mainly pummelo (*Citrus grandis*), on their farm-land and in homegardens.



Citrus has become the main crop of the people in Bibis since 1985. Before that time, Bibis villagers earned their livelihoods from smallholder rice and secondary crop farming, resulting in low family income and poverty. Only one or two trees of pummelo were grown naturally in the homegardens of a few farmers, without much management or care. Fortunately, after growing citrus as the main source of their livelihoods for almost 30 years, they have achieved better socio-economic conditions. These improvements in the lives of Bibis villagers trace directly back to the figure of 58-year-old Pak Sudarman.



Motivation

Pak Sudarman, as a youth of the village over 30 years ago, was much concerned with the condition of his village, especially his family's poverty. At the same time, he noticed that pummelo was expensive in the local market and decided to capitalize on this natural asset belonging to the community. So, together with some of the other young villagers, he tried to grow this crop and developed the pummelo farming system.

He learned how to grow pummelo from his friend in the neighbouring village, Sukomoro.

Pak Sudarman had an unpleasant experience when he first cultivated pummelo in his homegarden. At that time he planted two 'jeruk jowo' marcottage saplings that he got from the agricultural extension officer in his village. *Jeruk Jowo* (Javanese citrus in English), is one of the pummelo varieties of Bibis village origin. His parents scolded him for the planting because they were not used to cultivating pummelo and only grew rice as their main source of livelihood. But Pak Sudarman believed that from *Jeruk Jowo* he could obtain more income. His hunch became reality when a few years later those trees yielded fruit. Pak Sudarman received three times more income than his parents derived from rice.

Since then the villagers of Bibis have been cultivating pummelo and currently almost 100% of Bibis villagers have pummelo in their homegardens. Due to citrus farming, the income of Bibis villagers increased considerably. They were even able to build their own mosque, village facilities, maintain their village road, and carry out other development projects. All were made possible from citrus farming.

Maintenance

Before the 'Boom Era of Citrus' in Bibis, '*Jeruk Jowo*' was not cultivated. There were only natural untreated pummelo trees grown in the homegarden of some villagers. After Pak Sudarman and some village youths found profit in cultivating *Jeruk Jowo*, more pummelo trees were cultivated. Moreover, villagers have learned accidentally that a single branch of a pummelo tree can yield bigger-sized or better-tasting fruits than other branches in the tree. From this experience, they tried to produce planting materials of the branch by the marcotting technique that they had practiced for years. There are thus a total of 14 different pummelo varieties in Bibis including local varieties originating from the village, such as *Jeruk jowo*, Sri nyonya, Bali, Adas, and Gulung, as well as the other varieties that comes from other neighbouring villages. Pak Sudarman himself cultivates about 10 varieties of both large-and small-sized fruits with red or white flesh and thick or thin rind, such as Adasnambangan, Adasduku, Sri nyonya, Keproksiem, Jerukjowo, Bali merah, Jerukpurut, Jerukgulung, Jerukpecel and Sunkiast.

Adaptation

Pak Sudarman said that some of those varieties have good traits for consumer preference and some do not. But he believed that there are some benefits that can be taken from all of those varieties. Every variety of pummelo has its own characteristic and is different from the other varieties and so that one should have knowledge about these varieties. For example, fruits of '*Jeruk Jowo*' and '*Adas*' varieties have a shelf life of 6 months. This specific trait can stabilize the price of *Jeruk Jowo* not only in the harvest season, since the growers or traders can control the supply to the market by keeping them in the storage room. Some varieties of pummelo have thick rind and a sweet taste, some

varieties have fresh fruit flesh but are less sweet. There are also some pummelo varieties which are resistant to disease and some varieties which instead are vulnerable. In such cases, Pak Sudarman and the villagers cultivate not only one type or variety of pummelo because in the event that one variety of pummelo is destroyed by pest and diseases, they can offer a basket of options of pummelo varieties and price levels for the consumers in the market.

Pak Sudarman's efforts to keep the diversity of pummelo in Bibis include maintaining and propagating many forms of pummelo varieties and disseminating the planting materials to other farmers. He believes that all the villagers will realize that all of the pummelo varieties have their own specific uses and, with this awareness, the villagers of Bibis will then cultivate many varieties of pummelo even if in the beginning they do not like them.



entrance to the village. Through these two activities, people who travel to Bibis or pass through the village on the way to Sarangan Lake, one of the tourism destinations in the District of Magetan, can stop by and see many kinds of pummelo varieties in Bibis village, recognize and also learn about their specific characteristics. In addition, Bibis Villagers can market their pummelo and other fruit crops directly to the fruit market, so they no longer have to sell them to the traders and certainly they will receive more profits.

In the future, Pak Sudarman also wants to collaborate with the Agricultural Service, the Forestry Service, the Trading Service, NGOs, and other stakeholders in order to continue this activity for the next few years, especially activities on pest and disease control and those designed to broaden the pummelo market.



Propagation of citrus in Indonesia must follow a procedure of disease-free citrus planting material multiplication, and if the saplings are sold commercially they must be certified by the Seed Certification and Control Institute (BPSB *in bahasa*). To support the development of a community nursery, Pak Sudarman collaborates with the Agricultural Extension of Magetan, which has the disease free materials of some pummelo varieties found in Bibis from the Indonesian Citrus and Sub-Tropical Fruits Research Institute (ICSFRI). However, he faced the problem that not all of the citrus varieties in his village have disease-free certified mother plants. A collaborative activity of the community with the Agricultural Extension of Magetan and the Indonesian Citrus and Subtropical Fruit Research Institute has been established to produce disease-free mother trees of some pummelo varieties that have not been certified. Temporarily, the people of Bibis may only distribute the saplings they have produced to fellow farmers in Bibis.

Not only does Pak Sudarman engage in the development of propagation and cultivation technologies for pummelo fresh fruits but also, as Head of Bibis Village, he has also been active in searching for ways to support village activities in developing post-harvest pummelo technologies for the production of juice, jam, sweets, and other added-value processing technologies

Promotion/ Dissemination

In addition to being a community figure, during the last 10 years he has been elected by the villagers of Bibis to lead them as the Head of Bibis Village. Through a collaboration with the Agricultural Services of Magetan in developing agriculture in Bibis, an agrotourism activity involving Bibis' citrus and fruit markets have been established right in front of the

Passport Data

Name of the custodian farmer	Contact address Coordinate (GPS)	Production system and area (Ha)	Species and intra specific diversity
Sudarman	Bibis Village, Subdistrict of Sukomoro, District of Magetan, East Java Province, Indonesia Longitude: 7°38'5.5"S Latitude: 111°21'52.3" E	Tanah Bengkok (0.6 ha) Home garden (0.1ha)	<ul style="list-style-type: none"> ■ adasnambangan (<i>Citrus grandis</i>) 225 trees ■ adasduku (<i>Citrus grandis</i>), 40 trees ■ srinyonya (<i>Citrus grandis</i>), 15 trees ■ jerukjowo (<i>Citrus grandis</i>), 25 trees ■ balimerah (<i>Citrus grandis</i>), 20 trees ■ jerukgulung (<i>Citrus grandis</i>), 25 trees ■ keproksiem (<i>Citrus reticulata</i>), 15 trees ■ jerukpurut (<i>Citrus histryx</i>), 3 trees ■ jerukpecel (<i>Citrus aurantifolia</i>), 4 trees ■ sunkiest (<i>Citrus sinensis</i>), 10 trees

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Mr. Suradech Tapuan, a farmer at Ban Mae-O- Nai village, Mae Na sub-District in Chiang Dao District in Chiang Mai Province, Thailand, is the third generation, following his parents and grandparents, to live on his farm of 16.8 hectares. He lives with his wife and his two sons. Their house is located at latitude 19.289067 N, longitude 99.0294 E on a highland over 527 meters above sea level. The farm includes orchards of various kinds of fruit trees, namely *Mangifera indica* (24 var.), *Citrus* sp. (3 var.), *Citrus grandis* (4 var.) and other kinds of fruit trees such as longan, lychee, salak, banana and avocado. He and his wife earn a living from selling fruits and fruit products during the fruiting season and he himself earns additional income from plant propagation and some wood crafting work during the off season. Mr. Suradech's fruit tree orchard, situated on the upper lowland area extending about 1 to 1.5 km along the Ping River basin next to alluvial benches that rise 5 to 10 m above the 3 km-wide floodplain of the Ping River. The upper lowlands consist of fruit orchards, field crops, paddy rice fields and urban areas and villages. Cultivated crops include corn, upland and lowland rice, vegetables and flower farms. His orchard occupies an area of one large farm among the top ten landholders in this village, who belong to the category of medium-income farmers.

Mr. Suradech loves to grow multiple fruit trees in his orchard since he noticed that growing many varieties is a low-risk source of food and income for his family and the mixed orchards help ensure his family of a year-long food supply. They also afford the family adequate self-employment opportunities all year round. He also discovered that mixed orchards help improve environmental conditions on his farm by providing more pollinators for ecosystem services, lowering the incidence of pests and diseases, better agroecological conditions with greater soil fertility due to an increase in the earthworm population and a decrease in weed infestations. Mr. Suradet noticed that his neighbors' orchards that apply monocropping are sometimes heavily ruined by insect/pest attacks. He told his friends that there is insect preference on each specific variety and if you grow only a few varieties

or species, then there is great risk of damage caused by a specific kind of variety-preference insect. For example, fruit flies tend to damage mango varieties of MaHaChaNok and NamDoKMai-SiTong as compared to Kaew, ChokeAnan and MunKhunSri. Thus, lowering the risk of pest damage means that he can sell the fruit of unaffected varieties during an outbreak of insect infestation. Of course, he also learned that ChokeAnan and SamRuDu varieties naturally fruit around three times a year, giving the family a year-round supply of fresh fruits for consumption. He also witnessed that increasing the multiple cropping population by

intercropping provides lower temperature, higher humidity, and lower heat effect of sunlight under and around the fruit canopy, which is good for plant growth and development. Mr. Suradech noticed the soil improvement after finding greater numbers of large-sized earthworms inhabiting the topsoil under the fruit tree canopy. Because of his personal interest, Mr. Suradech taught himself grafting techniques, which he mastered better than the other villagers. He most enjoys working with all the different varieties and species of *Mangifera* and through his grafting work has learned much about its diversity.

Mr. Suradech has devoted his time not only to taking care of his own orchards, but also the trees of many other farmers. He is recognized for providing high-quality grafting services to other farmers and using

and optimizing the side grafting technique, which is best suited for rain-fed mango cultivation or when growing mango under poor soil conditions. This grafting method increases the survival rate of trees as many farmers found that grafted saplings bought from nurseries often did not survive in rain-fed or poor soil conditions. By first growing sturdy rootstock, mostly using *Mangifera indica*, Kaew and TaLubNak varieties, and apply side grafting when rootstock plants are bigger with well developed roots, the survival rate of plants increased. Later on he tried using wild mangoes as rootstock, such as KhiYa (*M. duperreana* Pierre), Fai (*Mangifera* sp. (not yet identified)), JingReed (*M. odorata* Griff), KhaiLaen (*Mangifera cochinchinensis* Engl.) His neighbours appreciate his high-quality work and, as he often provides the grafting services for free, his friends or fellow villagers often give him some money to compensate him for the time he spends helping people propagate various mango varieties in their orchards or homegardens. His special propagation service helps him to locate local fruit tree diversity and supports conservation efforts.

Mr. Suradech himself maintains 24 varieties of *Mangifera indica* plus four wild mango species: KhiYa (*M. duperreana* Pierre); Fai (*Mangifera* sp. (not yet identified)); JingReed (*M. odorata* Griff); KhaiLaen (*Mangifera cochinchinensis* Engl.). His purpose over the last 10 years was to collect and maintain all of the different mango varieties found in his region (namely Pom, Sam Pee, Kaem Daeng, Ku) and additional varieties from other regions in Thailand, especially for the four wild species, as he is concerned that these wild *Mangifera* species could disappear forever if no one pays attention to the conservation of these natural genetic resources. Nowadays, people are aware that his side grafting technique is actually a traditional practice that helps to maintain mango diversity, enhancing inter-specific- and intra-specific diversity on a variety level. This technique is not reported elsewhere. As he carefully selects the scions for grafting from a wide range of fruit trees found in his own garden as well as in those of other farmers, he helped to maintain the local variability compared with the planting material that is purchased in nurseries.

Mr. Suradech has been engaged in the cultivation and propagation of mango for more than twenty years. This enabled him to gain more knowledge than other farmers and, because of this, he is often asked for advice by his neighbors. They now recognized him as their key informant when they have a problem with

their trees or need to decide which variety or rootstock to select for grafting. Every year he makes about 1200-2400 grafts for farmers in his own village but also in neighbouring villages. Most of the grafts are for the varieties MunkhunSri and NamDokMai SiTong but some farmers also ask for the rare varieties such as ChinHuang. These types will not be found in the nurseries. Mr. Suradech himself promotes the use of this rare native variety, which he discovered himself, to his fellow farmers as it is very good rootstock material (fungus resistant and with strong roots).

Most farmers buy their saplings from the local nurseries. They provide mostly only the most common varieties such as NamDokMai and ChokeAnan. Mr. Suradech provides a much wider range of varieties and uses scions of both native and commercial varieties that are introduced. For example, he uses a wide range of scions and mother plants as compared to commercial nurseries that mostly sell only commercial varieties of one single mother plant. Mr. Suradech found some very strong and good-performing trees of the varieties Fai (*Mangifera* sp. (not yet identified)), JingReed (*M. odorata* Griff) in the forest and the fields of some other farmers, all of which had strong roots and performed well on poor soils. He collected fruits from these trees for rootstock material. He collected fruits and planted the seeds in his own orchard, and now promotes these for rootstock material.

Mr. Suradech is now 61 years old and is doing now, and it is anticipated that one of his sons will continue performing his task as they have over the years learned from their father.

Government support is expected from the Department of Agricultural Extension as they have initiated a programme for establishing a grafting network. If this network proves effective, then Mr. Suradech could become one of the theme experts, introducing awareness to many communities regarding conservation and utilization of mango diversity. However, these communities should get together to build up their own expertise in the effective management of local genetic resources.

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Custodian Farmers of Madan (*Garcinia spp*) Liam Linlatai

Profile 15/2013

Introduction

Mr. Liam Linlatai, the third generation in his line of farmer ancestors, is a farmer at Ban Huai Tap Tan village, Huai Tap Tan sub-District, Huai Tap Tan District, Si Sa Ket province, Thailand. He lives with his wife, two sons and one daughter-in-law. Their house is located at Latitude 15.055379 N, Longitude 104.016841 E in a lowland area, with a homegarden of one hectare and a paddy field of one hectare. They earn their living from growing paddy rice in the rainy season and from being wage-earners in the dry season. His homegarden is planted with four varieties of *Mangifera indica*, two species of Citrus, one kind of home madan (*Garcinia schomburgkiana* Pierre, *G. fusca* Pierre), one kind of wild madan (*Garcinia*), *Garcinia cowa* Roxb. and *Elaeocarpus hygrophilus* Kurz. Traditionally, madan is used as a flavouring agent in Malaysia and Thailand, but local people from Sisaket have discovered a unique way of using the madan stem. When chicken is impaled with a madan stick and grilled over a fire, gum secreted from the stick mixes with the chicken meat, giving it a distinctive flavor and aroma and making it a favourite among locals.

The community and visitors consume approximately 2,000 chickens every day and about 1,000 tons of madan sticks are consumed every year. So the grilled chicken provides a huge income to the community. Originally, madan bushes growing along the river were enough to meet the local demand. However, due to the soaring popularity of the grilled chicken and the destruction of the madan's natural habitat in the Tap Tan's watershed, the plant species is now extremely vulnerable to overexploitation and sticks are in short supply.

Motivation

In 2002, Mr. Liam Linlatai observed that the natural habitat of the wild madan tree was threatened with destruction and possible extinction. He saw this as an opportunity to earn income if he was able to domesticate and propagate the madan sticks on a large enough scale to meet local demand and conserve the population of madan. He then collected wild madan saplings at 2-3 months of age and planted them in his homegarden. They grew successfully, so that he continued planting from time to time to save the tree for sale to traders of grilled chicken.

Outstanding

The objective of growing wild madan in homegardens is at first only to increase the tree population so that the tree can be continuously cut and sold to grilled chicken traders all year round. Mr. Liam Linlatai developed a specific cutting method, after which the tree is able to proliferate branches within a shorter period as compared to the natural growth of branches.





Maintenance

Over a period of ten years, Mr. Liam Linlatai has established his wild madan in his homegarden. This can be considered wild madan conservation and it was observed that the wild madan trees in his homegarden can be scientifically classified into at least three kinds or three species, which should be further scientifically identified.

Promotion/ Dissemination

He indirectly promoted wild madan tree conservation for grilled chicken and for fruit processing into madan juice, helping to improve the livelihoods of many households in the Huay Tap Tan community.

Adaptation

Mr. Liam Linlatai used his traditional knowledge on local propagation practices, i.e., proper plant spacing, suitable patterns of branch cutting and selection of the best-performing individual trees. He really carried out his own traditional experiments. He has three forms of madan and needs taxonomic assistance to identify them.

Future

He and his family will continue working on wild madan cultivation, conservation and production of processed madan fruit products.

Support

Mr. Liam Linlatai is the first farmer who has ever initiated the cultivation of wild madan. This has indirectly helped to conserve or maintain wild madan trees, resulting in the protection of endangered species. This is one unique example of how a local action to conserve diversity from over-exploitation that may lead to local extinction. Community and local governments should take action and discuss with this farmer ways to create more options for the protection of unique wild madan tree resources in this area.



*Contributed by:
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The Custodian of Richest Diversity of Seedling Mangoes in Pusa Block, Samastipur, India

Vinod Rai

Profile 16/2013

In spite of the years that have gone by, this old (almost one hundred years) orchard still has natural plantations of seedling mangoes with unique fruit qualities. Whether it is for pickle-making or as sucking type, or has a delicious sweet 'rasgulla'-like taste, bunch-bearing trees laden with colourful fruits can be seen in his orchard.

Sri. Vinod Rai, 55 years old, is a 10th passed farmer of Jagdishpur, Pusa, Samastipur, Bihar, India with two sons and a daughter. He is involved in agriculture for livelihood security as it provides the bread and butter that sustain his life and that of his family.

His sons are also engaged in agriculture, particularly in sowing and harvesting of potato, pigeon pea, turmeric, mustard, cauliflower, rice, wheat and maize. His main source of income is the sale of spices (coriander, chillies, turmeric, ginger and mustard), pulses (green gram and red gram), tuber crops (potato, ginger and sweet potato) and mangoes for pickle-making and table purposes. He reared two cows, which provide income through the milk which he sells in the market or to the rural households. Jagdishpur village is located five kilometers south of Pusa block of Samastipur district, Bihar and is very rich in mango, litchi and pummelo diversity.

Motivation

Sri Vinod Rai inherited his orchard from his forefathers. He never considered cutting down any of the trees as the full-grown orchard provides food, fuel, timber and, above all, a regular source of income without much effort or financial liabilities. In addition, he mostly followed the local traditional custom of not cutting any of the old trees if those were not affected by diseases or is showing signs of decline. He instead treated mango trees as 'kamdhenu cow' meaning something like a one-time investment in orchard establishment to provide fruit, fuel and timber, which pays money during emergencies (one or two trees are cut when they die). The mango trees showed regular fruiting and their timber provide readymade income. He used that money for his daughter's marriage in the year 2000, after which he has never cut any trees. About 25% of his income comes from the sale of mango fruits. His wife, Smt. Manorama Devi, 50 years old, 9th standard pass, is an active member of the self-help groups formed in Jagdishpur for pickles and *amawai* (a fruit leather made out of mango pulp mixed with concentrated sugar solution and sun dried) making from the seedling mangoes of her orchard. She prefers to prepare different types of pickles (small- to large-sized mangoes), mixed pickles and motivates other ladies (by demonstrating the methods of pickle-making) in the village to popularize mango products and help them to become more independent by selling to the local residents.

Different from Others

No other farmer of the region has as much variability of seedling mangoes combined in one orchard as Sri Vinod Rai has. He has one seedling type called



'Alphonso,' of which the fruits can easily be kept for 12-15 days at room temperature. Many farmers have asked him to provide them with a grafted clone of this seedling type of 'Alphonso' and he has also given scions of this tree to several farmers and various nurseries for multiplication.

Maintenance

Sri Vinod Rai has a total of 212 trees of seedling mangoes in his orchard of 2.10 ha. Most of these trees are over 100 years old. The orchard includes 36 different varieties of mango, all of which are seedlings (i.e. grown from seed) in origin. He has also planted grafted plants of 'Maldah', 'Shukul', 'Sipia' and 'Paharpur Sunduria' as gap-filling in the orchard. In his kitchen garden, he has planted litchi, guava, sapota, pomegranate, acid lime, banana, aonla and pummelo. He has also planted wheat and mustard on the periphery of the orchard or between the rows of the trees.

Since he took over responsibility for this garden about 30 years ago, he has planted 20 new trees in the orchard to replace trees that died off or were infected with diseases. He visits his orchard frequently and the rejuvenation of his orchard was a part of UNEP-GEF TFT- project. They have removed dead wood, carried out pruning, weeding, fertilization application and beds were formed to increase water holding capacity. The timber from old trees was sold to the saw mill which provided Sri Vinod Rai with Rs.50,000-70,000 per tree as income.



Adaptation

Before he decides which stone are to be planted, he searches for new variants in mango trees in his own orchard through tasting, and observing fruit colour and size. Then he collects the fruit and extracts the stone for planting. He has been constantly engaged in good practices (regular ploughing, application of manure and insecticides as and when required, and removal of deadwood) to grow and maintain the genetic resources of mango trees.

Promotion/ Dissemination

Sri Rai is eager to share his knowledge on selecting the best pickling and table purpose mango varieties. One of his major contributions to the community is to share elite scion material (of *Alphonso*, *Paharpur Sinduria*) with the local nursery. Furthermore, he has started involving more and more community members and is working with them as a unit as his orchard is surrounded by old mango plantations of other farmers. His neighbours have now started to rejuvenate and reinvigorate their orchard as a tool of good agricultural practices that have been adapted by him for mango. Before interest created by UNEP-GEF TFT Project, they were planning to cut the old mango trees. Sri Vinod Rai informs all farmers about his produce, he gives best selected fruits to others and obtains their feedback on the taste, creating demand for plant/scions by nurseries.

Continuation and Support

Sri Rai's two sons (Mr. Niraj Kumar, 30 and Mr. Dheeraj Kumar, 25) are already involved in rejuvenating the old orchard and he is sure that, they will continue to keep the orchard in good shape if they get training (on propagation, rejuvenation of old trees, harvesting and packaging for export quality mango) and also get assistance in linking produce with the market. Sri Vinod Rai himself wants to learn grafting and budding techniques in mango for further propagation of the elite trees which he has identified (*Nakuva*, *Madukupia*, *Alphonso*, *Shukul*, *Lali*), rather than being dependent on any nursery for qualitative planting material. Other farmers also want to get training on grafting and budding techniques in mango for establishment of a community nursery, rejuvenation techniques of old and senile mango plantations, and ensuring markets for pickles/*amawats*/*chutneys* of seedling mango and table varieties. There is no demand for mango pickles, *amawat* or *chutneys* or even fresh fruits [as such] in local markets, as every household has 10-15 trees in its own farm or home garden and produces for their own consumption. They need to sell their products to city or town dwellers in Muzaffarpur or Patna city.

Passport Data

Name of the custodian farmer	Contact address Coordinate (GPS)	Production system and area (Ha)	Species and diversity (with some peculiar characters)
Sri. Vinod Rai	Vill. Jagdishpur, P.O. Malikaur via Pusa, Samastipur, Bihar, India Phone: +91 9835008757 Longitude: 86° 30'E Latitude: 24° 18'N	Orchard system (2.10 ha) (212.0 trees)	Mango (<i>Mangifera indica</i> L.): 36 varieties of mango (all are seedlings) 1) <i>Sipia biju</i> (late bearer) 2) <i>Mirjafar biju</i> 3) <i>Shukulia</i> (pickle purpose) 4) <i>Nakua</i> 5) <i>Lalpadi</i> 6) <i>Kapuria</i> (table purpose) 7) <i>Mordia</i> (Bunch bearing) 8) <i>Laduwee</i> (Round in shape colour red/yellow) 9) <i>Padoria</i> (shape like pointed gourd) 10) <i>Sanaha</i> (pickle purpose) 11) <i>Kathami</i> (stony, small and bunch bearing) 12) <i>Lali</i> (pickle purpose) 13) <i>Konala</i> (green colour remain after ripening) 14) <i>Chinia</i> (very sweet) 15) <i>Chaparia</i> (flat in shape, table purpose) 16) <i>Bombaiya</i> (early in bearing) 17) <i>Bhemha</i> 18) <i>Mithua</i> 19) <i>Kerwa</i> (shape like banana) 20) <i>Bolwa</i> 21) <i>Chorma</i> 22) <i>Ghewahi</i> (ghee like pulp consistency) 23) <i>Mudhukupia</i> (honey like taste) 24) <i>Sinduria</i> (very late in bearing) 25) <i>Badwaria</i> (pickle/chutney purpose) 26) <i>Alphonso</i> (keeping quality up to 12-15 days at room temperature) 27) <i>Rohania</i> (early in bearing) 28) <i>Kharbujia</i> (taste like muskmelon) 29) <i>Jarda</i> 30) <i>Zardalu</i> 31) <i>Maldah</i> 32) <i>Kalkattia</i> 33) <i>Lal maldah</i> 34) <i>Paharpur Sinduria</i> 35) <i>Kanchan</i> 36) <i>Mithua Maldah</i>

Contributed by:
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Custodian of Climate Smart Nutri-millet: Kolli Hills, Namakkal Kodukka Malliga Seerangan

Profile 17/2013

Village Background

Padasoali village is located in Thirupuli Nadu Panchayat in the Kolli Hills of central Tamil Nadu; the village altitude is above 1100 msl at latitude N11°20.972, longitude E078°22.004. Agriculture is the main source of income in this dryland region with forests. The main cash crops grown are coffee, paddy rice and several spices. Kolli Hills is part of the Eastern Ghats. The hills region receives both southwest (June-July) and northeast monsoons (November). Most of the tribal families practice rainfed agriculture, which is the main source of livelihood in this region. A farm family depends on staple food crops like paddy rice and millets. They grow cash crops such as tapioca, banana, coffee and pepper. While some of the families migrate to Kerala or Karnataka to serve as labourers in the

Introduction

Name	Kodukka Malliga Seerangan
Husband Name	Mr. Elamanda Seerangan
Age	30
Education	7 th Standard
Village Name and Address	Padasolai, Thirupuli Nadu, Kolli Hills, Namakkal. Pin Code 637 411.



estates during the lean season, some of the families find income opportunities in the villages as non farm labourers.

Village farmers in this area cultivate *Eleusine coracana* (Ragi), *Panicum sumatrense* (Samai / little millet), *Setaria Italica* (Thinai / foxtail millet), *Cajanus cajan* (Red gram/ pigeon pea), *Phaseolus sps* (beans), *Lab lab purpurians* (Avara motchi), *Brassica juncea* (mustard), *Coriander sativam* (coriander), green gram, *Annas sativas* (pineapple), *Zea maize* (maize), *Permisetum glaucum* (Kambu), *Oriza sativa* (paddy rice), *Manihot utilissima* (tapioca), *Musa sps* (banana), *Grevillea robusta* (silver oak), *Piper nigrum* (pepper), *Coffea Arabica/ Coffea robusta* (coffee) and *Artocarpus heterophyllus* (jackfruit).

Introduction

Ms. Kodukka Malliga Seerangan's main source of income is from coffee and paddy rice. However, she also works in the processing mill located in her village. The family owns four acres of land, of which one acre is upland farmland (*viz. mettankaddu*) for coffee, three acres are rocky undulating terrain (*viz kollakadu*) for a wide range of grains and spices and her wetland area is mostly for paddy rice. Her family maintains a diverse variety of landraces of small millets. She adopted a newly introduced variety of ragi (GPU 48) and intercrosses this variety with tapioca. With the farm activities and her work at the mill she and her husband

earn about 5,000 rupees a month, enough to feed her family and save a bit for future needs.

Maintenance

Next to her cash crops (paddy rice, coffee) Ms. Malliga maintains diversity of six millet varieties (ragi), including the local variety Perunkelvaragu and improved variety GPU 48. In addition, she grows two local landraces of little millet (Perumsamai and Thirigulasamai) and two local landraces of Italian millet (Perumthinai and Palanthinai) as monocrops. She combines these millets, which she grows on the rocky kollakadu fields, with other crops at her farm.

Motivation

Millet is a nutritious food according to Ms. Malliga. Since her childhood she noticed that some elderly people in her village who cultivated and consumed millet for their daily food intake have lived longer, some more than 90 years. She wondered why they were so very healthy, as they have never been to hospital or take any medicines. Now she is sure it is because they consume food based on highly nutritious millet that helps them to lead a healthy life. This understanding has kindled her interest in cultivating millets and to prepare millet-based food items for her family. Her family regularly prepares kalli (porridge) and roti (bread), both made from millet. Based on the



millet value-addition training that was provided by the IFAD project, she learned new recipes of Ragi laddu (Sweet balls made of finger millet) and Ragimalt (porridge powder made of finger millet, green gram and wheat) Ragi Chakli (a friend snack made of finger millet, gram and rice flour). Based on the training, she can now also prepare these improved dishes made of millets at home. Her children started consuming millet-based food on a regular basis. This knowledge and the availability of seeds had helped her to continue to be a millet farmer in her village.

Unique Features

Ms. Malliga and her family used to conserve and cultivate a greater number of varieties of small millet than most other households in her village. Within her family, she manages the millet diversity and her family is interested in continuing to cultivate those millets on a large scale with different compositions based on the weather and rainfall conditions. She is proud of her diversity and during the years has developed considerable knowledge and skills with regard to millet cultivation and value addition. For this she is respected by her family and other villagers. She is also a facilitator of the women's self help group that takes part in the millet crop improvement programmes in her village. Her enthusiasm has motivated not only her family but also other villagers to continue the cultivation and use of many local types of millets.

Promotion/ Dissemination

Ms. Malliga facilitates the exchange and sharing of various millet seeds in her role as the facilitator of the village seed bank, which was established as part of the IFAD-Bioversity International programme and contains local varieties of finger millets such as Perunkelvaragu, Sundangi kelvaragu, Karakelvaragu, improved GPU varieties; local varieties of Palanthinai, Senthinai, Perunthinai, Koranthinai; little millet local landraces such as Thirikula samai, Perunsamai, and Sandan samai. Seeds from the seed banks catered to the needs of about 30 farm families during Kharif 2012 in her own and neighbouring settlements by conserving and distributing distinct species and varieties, of which the majority is of local origin. She helps other households as a master trainer in millet value addition. She participated in many millet exhibitions and contributed to several millet awareness programmes in other villages or public campaigns.

Adaptation

Ms. Malliga has developed excellent knowledge and skills to produce quality seeds. She knows the best cultivation practices of traditional landraces of crops

like Ragi (Perunkelvaragu, Karakelvaragu), Little Millet (Perumsamai, Thirigulasamai), Italian Millet (Perumthinai and Palanthinai). She knows about the common diseases and which varieties or species are best suited to the soil and weather conditions of her region.

Continuation

She has picked up advance skill sets in conservation (quality seed production, varietal selection), cultivation (improved agronomic techniques) and value addition in millets. Her family now has access to quality seeds and technology and she can create improved dishes or food items that are appreciated by her family. She trusts that the new knowledge, combined with traditional knowledge, will ensure continuity of millet farming by her children.

Support

Most of the farm families in her village cultivate ragi (finger millet) over large areas. One of the main reasons behind this is the accessibility of a ragi processing mill in the vicinity of the settlement. This facility has enabled farmers to cultivate and consume ragi. Farmers at her village cultivate other small millets such as little millet and Italian millet in a very small area. She observes that the post-harvesting processing in the case of little millet and Italian millet is cumbersome and time- and energy-consuming as processing involves drudgery for the women. If suitable machinery could be developed and introduced in her village, she thinks that more farmers would come forward to cultivate all types of millets and continue to consume diverse millet-based food products. In addition, a threshing yard is a priority according to Ms. Malliga, along with necessary training on value addition. In addition, she explains, "state support in millet crop insurance, crop subsidy and financial support for enterprise development for self-help groups like we have would help us a lot to popularise and maintain millet diversity on our farms."

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A Custodian of Rare and Indigenous Vegetables

Khem B. Chand

Profile 18/2013

Introduction

Mr. Khem Bahadur Chand lives with his wife, teenage daughter and a young boy in a home surrounded by a fruit tree nursery, several bee boxes, and trees (Photo 1). His homestead in Patharaiya Village Development Committee of Kailali District in the farwest region of Nepal resembles a botanical garden, with plants of all shapes and sizes, as well as a fish pond, ducks and pigs. Aside from his homestead, he has limited paddy rice-growing land of around 0.2 hectares. Yet his dedication to diversity is apparent and he is befitting of the moniker 'custodian farmer.'



Photo 1. Khem Chand and his family.

Why is He Different?

Compared to other farmers in the area, Mr. Chand expresses greater interest in identifying differences within the population of crops. Although he has several varieties of a crop, if he notices something new in another orchard or home garden in the village, he adds it to his collection. This process of collection also becomes an occasion for him to start a conversation with the farmer that has a different variety and to evangelize about the value of diversity. He is a leader of the farmers' groups and is actively involved in raising awareness of the local varieties in his village.



Photo 2. Khem Chand with different beans he is growing for comparison of traits.

Motivation

Mr. Chand wasn't always like this however. Although always interested in farming and plants, until five years ago, Khem did not care much about what varieties he grew. He did not save his own seeds, nor did he concern himself with the different merits and limitations of landraces, improved varieties and hybrids. He simply bought whatever seeds he could find in the market and often he paid the price due to poor seeds.

Only after being involved in various training courses, diversity fairs and exposure visits through the agrobiodiversity component of the Western Terai Landscape Complex Project, he developed an understanding of the value of diversity. He internalized the fact that different landraces have different useful traits, such as tolerance to water stress or water-logging, pest resistance, and medicinal and nutritional values. If farmers are able to discern the differences in traits, then they can manage the variety of options for their unique needs. Armed with this realization, Khem and other like-minded farmers have been searching and finding rare and lost traditional landraces from their own and surrounding villages and rehabilitating their populations.

The amount of diversity he has amassed in mere five years, despite limited resource base, is commendable and very rare among other farmers in the area.

Maintenance

Mr. Chand's farmland has around 30 species of fruits and 28 species of other trees, 15 species of vegetables, pulses and oilseeds, 20 species of ornamentals and 30 species of medical plants. Within these, he currently maintains 22 varieties of beans, 15 of cowpea, 11 of taro, 11 of yam (Photo 2), 10 of potato, 10 of bottle gourds, and 5 of sponge gourd. Working with the local farmers' organization, he also maintains 22 varieties of rice in a diversity block. In terms of fruits, he grows 10 varieties of mango out of which 7 are grown by only a few households in the village. "The number [of varieties] themselves are not important and keep fluctuating from year to year," he says. "Some years I lose a few varieties or find they are the same, and some years I add a few more." The important part is that he constantly seeks out diversity and tries to maintain it.

Promotion/ Dissemination

For the past five years, Mr. Chand has been an active member of the Patharaiya's farmers' Biodiversity

Conservation and Development Committee. This committee manages a community seed bank that maintains the seeds of rare landraces, raises awareness about these landraces and provides access to interested farmers. They also operate a revolving community biodiversity management fund that provides farmers with access to credit for building livelihood assets. In return, the farmers contribute their land or labor to help maintain populations of selected local landraces.

As a resource home gardener, he has integrated fish, pig, vermicomposting, apiculture, vegetables, fruits, and medicinal plants into his home garden. He produces saplings of local fruit trees and medicinal plants from seed, grafting and layering for sale and distribution. Last year he sold several hundred saplings of mango, litchi, pear and at least five species of medicinal plants.



Photo 3. Fished black potato from Kh. Chand's farm.

Adaptation

After becoming conscious of the value of diversity, Mr. Chand is now constantly in search of diversity. For example, he knew of a black variety of potato (kaloaloo) that used to be common in his village but has become increasingly difficult to find. People did not prefer it due to its color, but he was able to see beyond that single trait. He went to neighboring villages and collected the seed from three farmers and now maintains the variety on his farm (Photo 3). This variety has higher iron content, cooks well, tastes better and the sizes of the spuds are uniform. Likewise, he has been collecting seeds of varieties that he does not have whenever he comes across them. In the process, he tries to explain the difference in the traits to the farmers that he collects from. Often he pays for the seed or exchanges them with the varieties he possesses. He grows several varieties of a crop in his home garden so that he can compare traits.

Future

"What else can I do?", responds Chand when asked about the future of his work. He definitely plans to continue it. Continuing to collect and add a diversity of vegetables, fruits, and medicinal plants is the best option he sees for making a livelihood. By maintaining diversity, he aims to derive income while also inspiring others to do the same. He is also considering school children as a worthy target group to influence. In fact, two schools have already visited his farm and learned from his work.

Support from Community and Government?

According to Chand, the support from which he can benefit the most is promotion of the work he has been doing. This will raise the awareness of biodiversity among a wider range of people, ranging from farmers and school children to researchers. And if many people visit his farm, they can learn from his experience, and this in turn will motivate him to carry on. The visitors will invariably learn about the wealth of diversity and will be interested in buying some seeds or saplings, which will also be a source of supplemental income for him.



Contributed and Pictures by:
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A Custodian Farmer Promotes the Conservation of His Village's Biodiversity Resources

Sadhu Oyal

Profile 19/2013

Profile of the Custodian farmer

Name : Sadhu Ayal
Village : Gelhaguda,
Total Number of Households in Gelhaguda: 64
ST (Scheduled Tribe) – 61 households
OC (Other Caste) – 3 households
Grama Panchayat : Khudi
Block : Semiliguda
District : Koraput (Odisha)
Age : 39
Education : 2nd Standard
Family Members : Wife, 1 Son (4th standard), 3 daughters (4th, 2nd and 1st standard)
Landholding : 5 acres
Lowland – 3 acres – A single crop (paddy rice) is grown
Leveled midlands - 0.5 acre – Crops grown are paddy rice and vegetables
Mid to upland - 1.5 acre – Rainfed millets, vegetables and ginger are grown
Farming experience: 23 years (independent)



Like most of the villages in Koraput District of Odisha State, Gellaguda comprises a combination of mountain forests (Dangar-Upland or mountainous forested terrain), streambeds (Jhola), flat midland (Saria), mid to upland (Vatta) and upland patches on the mountain. The soil is red loamy with sandy loam in rare patches. Many forest species are available in the forest even where forest density has been reduced. This diversity emerged through natural regeneration and a careful selection process based on the efforts of villagers over many generations. Due to heavy deforestation, the forest has been degraded, which has severely impacted on diversity. Recognizing the significance of the loss, the villagers have been protecting the forest on four mountains for the last eight to ten years. This has been facilitated by local Vana Surakshya Samiti (VSS), of which Sadhu Oyal is a member. This diversity includes jackfruit, pongamia, tamarind, amla, country mango (semi-wild mango trees grown from seed), Harida (local name), and Gambhari (Local name), which are all kept for different uses in the tribal culture of the villagers. Animal resources are almost lost in the forest. Gelaguda and its surrounding villages form a big vegetable belt with number of native species and varieties. Now most of the vegetable varieties are improved/hybrid. The villagers grow native as well as improved varieties of paddy rice, a range of small millet varieties and a few pulses in healthy rotation with vegetables and cash crops like ginger.

This is true also of Sadhu Oyal; he cultivates paddy rice, finger millet, little millet, sweet potato, ginger, pulses like horse gram, black gram, red gram and several types of vegetables. He uses two acres of mid-upland and flat midland in rotation for vegetable and ginger. In addition to this, he works as a mason and hardware salesman in the Kunduli weekly market. He



rates both agriculture and business as of equal importance for his livelihood.

Sadhu Oyal maintains by far the most diversity in his village, including 21 local varieties of finger millet and six of little millet with support and motivation from DHAN for last two years. Before that he had three varieties of finger millet, four varieties of little millet, three types of horse gram, one semi crippler, black gram, sorghum and niger. In addition, he is actively involved in the forest regeneration program which is implemented by local government/Odisha State Government in the four mountains surrounding his village (around 1500 acres).

Sadhu Oyal is a hard worker. His involvement and commitment makes him different from others. For his selfless efforts, he is nominated as the innovative farmer

of the block. He is still interested in collecting seeds of native and promising crop species and varieties through various sources. He also encouraged and included students and other villagers (villagers/community members of his village and nearby villages) in the regeneration programmes in their local forests as well as forestation activities. His promotion and dedication to the programme ensured the revival of many lost species in the forest, although they are not as dense as they had been earlier. He also established, together with his fellow community members, a biodiversity block and community seed bank. Biodiversity block means a small piece of land cultivated with proper layout for all the available varieties of the locality. The community seed bank is now working as a collection centre of native and promising seeds maintained by the community (Sadhu keeps their records). From the next season onwards, it is planned to institute seed loans and exchange. He is actively involved in participatory varietal selection (PVS) activities conducted by the DHAN Foundation. Moreover, because of his dedication and personal efforts he became a resource farmer and trains other farmers in participatory plant breeding.

Sadhu conserves seeds in his biodiversity block from the seed samples collected from different areas of Koraput region. He collects seeds from different sources - through relatives, friends and other interested people. He demonstrates and cultivates whatever seeds he gets. Selection is done by a group of progressive farmers. For example, Sadhu Oyal collected the Sunamani variety of finger millet from Koraput block and the Bhallu variety from Nandour block.

He had fewer seed varieties for himself before DHAN Foundation came. He and a group of knowledgeable community members (male & female) select promising varieties through preference analysis. He does participatory varietal selection. On his land, he actively participates in the whole process, in which five little millet varieties are taken up for seed purification and mass production. Similarly, one wet sowing (wet sowing means sowing the seeds when the soil is wet, from 2 July fortnight to 1 August week) little millet (Machlisuan) has been identified and revived. Generally, little millet is sown during summer or at the onset of the monsoon. This adds flexibility to the cultivation of little millet, which can even be planted late in the season. Sadhu was not recognized earlier by other farmers as a guide/advisor as he had no designated position. Now he is getting recognition with the activities that he is currently carrying out.

Sadhu collects seeds and conserves them. He has undertaken the selection of promising varieties from his block and their supply to interested and progressive farmers for promotion. The community seed bank is in the collection and preservation stage. Seed exchange will result in more varieties and, most importantly, with more participating farmers.

Nowadays, communities chase sources of income (cash crop cultivation, vegetable cultivation, business, etc.) Gellaguda village is characterized by poor families living in a remote location. Due to the increasing need to raise family income and growing population pressure, all natural resources and habitats surrounding his village are disturbed and degraded, except the



places of sanctity. These sacred forest patches need to be protected. Sadhu Oyal says that through existing local institutions like the temple or village committees, the forest can be protected. He wishes the government could provide support to organize and train the farmers and community leaders for this noble cause. His children are very young and expect his support for conserving local seeds. A group of young farmers in his village are beginning to take up this purpose. For example, Komlu Pamia is coming forward to establish a biodiversity block in his paddy. Sadhu continues to create awareness among his villagers and gets their support for conserving the local seeds and the forest.

Contributed by:
Dhan Foundation

The Self-made Nursery Man in Search for Rootstocks

Vasant Mahadev Rao Wankhade

Profile 20/2013

The Vidarbha region of Maharashtra state is famous in India for citrus cultivation. Over 350 public and private Nagpur mandarin nurseries raise and sell about 60 lakhs of saplings per year. In this area farmers' livelihoods depend on citrus. Most of the private nurseries are located in the Warud area of Amravati District of Maharashtra. Rangpur lime (*Citrus limonia*) and rough lemon (*Citrus jambhiri*) produce extremely acidic fruits that are sour and unpalatable, but their hardy root systems make them valuable as rootstock for other citrus species. The Nagpur mandarin fruits fetch good prices; however farmers often have difficulty growing them due to their poor root system and the high prevalence of *Phytophthora* foot rot disease. By budding technique a Nagpur mandarin scion onto a



Rangpur lime or rough lemon rootstock, farmers can overcome this problem. But, very few farmers in community are growing mother plant of these rootstocks for seed purpose. Illegal private nurseries are often using seeds of galgal (*C. pseudolimon*) to meet the demand.

Twenty five years ago, local farmers used to grow their own rootstock mother plants or buy them from trusted local nurseries. Farmers shared the seeds of their own plants with a nursery that used these seeds to grow the requested saplings. Nurserymen today rely solely on buying seeds of rootstock material from distant locations. Most of the nurseries do not maintain mother blocks of Rangpur lime or Rough lemon and procure the seeds in large quantities from Himalayan foothill states. In reality many saplings are raised using seeds of inferior species like Galgal (*C. pseudolimon*) while claiming it as Rangpur lime or Rough lemon. In addition, these seedlings are raised without much care. Nagpur mandarin scions budded onto Galgal rootstocks initially look vigorous and healthy but eventually reduce the lifespan of trees from 25 years to 10 years and make the trees susceptible to *Phytophthora* disease. Consequently, in recent years, farmers had to replant orchards every 10 years resulting in huge economic losses. This huge shortage in genuine rough lemon and Rangpur lime and quality rootstock seedlings has resulted in unnecessary replanting and a decline in both production and productivity.

Motivation

This tragedy happened to Mr. Vasant Mahadev Rao Wankhade. He is a poor farmer with only four acres of land. He planted Nagpur mandarin 10 years ago with budlings procured from a private nursery. His orchard started declining at an early stage and he suspected that it was due to poor quality rootstock. Farmers in this area have now realized that they are not getting Nagpur mandarin budded plants on genuine recommended rootstocks like Rangpur lime and rough lemon. While cutting the plants in his own orchard, he noticed two Rangpur lime plants in his field. The confirmation by scientists from the National Research Centre for Citrus (NRCC) that these were genuine Rangpur lime plants suitable for rootstock purpose motivated him to raise his own budded plants.

Mr. Wankhade decided to raise his own Nagpur mandarin plants on this rootstock. He extracted the seed and raised a few plants of Rangpur lime and budded the Nagpur mandarin on this rootstock. Meanwhile he used his land for other annual crops. When he planted his own plants in the field, the growth was excellent and, most important, he was sure that the rootstock was genuine and genetically pure. Because of his success, other farmers asked him for saplings and assured him that they will use plants from his mother plants of Rangpur lime. This success and the assistance and training he received from NRCC as part of the UNEP-GEF TFI project encouraged him to start his own small nursery. Now he is earning about Rs 1.25 -1.50 lakhs per year from this nursery. Farmers are willing to pay an additional Rs 5 per sapling for the Nagpur mandarin plants budded on Rangpur lime rootstock.

Maintenance and Unique Feature

His land holding is four acres, in which four fruit crops, mainly Nagpur mandarin (450 plants), Kagzi lime (2 plants), Rangpur lime (40 plants) and Mango (2 plants). As the leading farmer in his community, he now has planted about 30 to 35 mother trees of Rangpur lime along the boundary of the nursery to have more quality seed for rootstock purpose. Not only does the owner of the nursery get paid an additional 5 rupees per sapling, but the local farmers increase their income by



enhancing their productivity and by extending the lifespan of the orchard. His main source of income is the Citrus Nursery next to his other farm activity of sericulture (silk farming).

Adaptation and Promotion

Mr. Wankhade has been constantly engaged in growing and maintaining genetic stocks of citrus. He adopted good nursery practices from the UNEP GEF TFT Project training and produces saplings for his own farm and to serve his fellow farmers. His efforts have created higher awareness regarding good planting material of citrus for longer orchard life and higher productivity. Mr. Wankhade rightly thinks that other farmers should also be encouraged to grow a few mother trees in their gardens like he did so that they can produce their own planting material. If this good practice is adopted on a larger scale, environmental, social and economic benefits will accrue to the farmers. He also opines that if more mother plants of Rangpur lime could be planted and maintained in this area, the farmers will have access to and will be able produce genuine rootstock through commercial nurseries in the area.

Continuation and Support

Mr. Wankhade is interested in obtaining and using the new and improved rootstock material Alemow that was identified by NRCC. His son is interested in continuing this work. Other farmers of the areas are also becoming interested in maintaining and using the citrus rootstock. Under UNEP GEF TFT Project, NRCC has distributed 3000 seedlings of Rangpur lime and rough lemon rootstock to all the three communities. Training on the identification of superior rootstock material has helped Mr. Wankhade with the successful establishment of his nursery. His major need for the present is to create a shade net structure for the primary and secondary nurseries.

Passport Data

Name of the custodian farmer	Contact address Coordinate (GPS)	Production system and area (Ha)	Species & intra-specific diversity measured by richness & evenness	Describe unique /rare/ special variety conserved
Vasant Mahadev Rao Wankhade	Village: Bargaon, Warud, Amravati Maharashtra GPS : Elevation 418 m N 21° 26' 17.6" E 078° 08' 02.1"	Land Holding = 4acre. Nagpur mandarin (450), Kagzi lime(2), Rangpur lime rootstock(40), Mango (2)	4	Unique Rangpur lime rootstock and Best nursery on genuine rootstock

Contributed by:
IP Singh, National Research Centre for Citrus, Nagpur
and Bhac Reddy, National Project Coordinator

Outcomes of the Workshop on Custodian Farmers of Agricultural Biodiversity: Policy Support for their Roles in Use and Conservation

(New Delhi, 11-12 February 2013)

Bhuzwon Sthapit, Hugo Lamers, Ramanatha Rao, Ronnie Vernooy, Vasudeva Ramesh, BMC Reddy, Shailendra Rajan, Pichit Sripinta, Idha Widi Arsanti, Aditya Kiloos, Salma Idris, Shafie Md Sah, EDI Oliver King, Sajal Sthapit, MP Vasimalai, Gennifer Meldrum, GV Ramanjaneyulu, Camila Zanzanaini, R.C. Agrawal, KC Bansal, NK Kishan Kumar and Prem Mathur

Characterization of the Custodian Farmers

In total, 20 farmers from five countries (India, Indonesia, Malaysia, Nepal and Thailand) participated in the workshop. Farmers from India came from eight different states, including a woman farmer from the Indian State of Tamil Nadu. All farmers introduced themselves to the group and explained the diversity they hold, which unique material they have, their sources of motivation, and what kind of support they need to be able to continue their conservation, dissemination, or adaptation efforts. The group included a farmer who maintains 135 rare farmer varieties of mango within his orchard, a farmer who has gathered over 80 varieties of rice, and a farmer who experiments with and cultivates a wide range of tuber crops and vegetables at his home in Nepal. Many farmers in the group have domesticated wild tree species (*Garcinia* and *Mangifera*), including some farmers who have developed varieties that grow in sandy soils.

It was clear from the farmers' presentations that motivations to maintain a wide range of crop species and landraces differ among farmers according to factors such as the type of crops maintained, socio-cultural background, and geographical and climatic context. The only woman farmer participating in the workshop expressed motivation by an appreciation of the high nutritional quality of native millet varieties and their high adaptability to diverse local land conditions in the Kolli hills. On the other hand, several mango growers were motivated by the pride and honor of having a century-old orchard containing many rare varieties. Some farmers were inspired by the desire to have a diverse portfolio of crops and varieties. The motivations of the 20 farmers are thus diverse, responding to the personal, socio-cultural, economic and environmental needs of each farmer. A larger sample of custodian farmers, including more women farmers, would enable analysis of the relative importance of different motivations as they relate to the farming system and socio-cultural and environmental context.

Defining Custodian Farmers

The workshop assisted in redefining the working definition of "custodian farmer" proposed by the workshop organizers. The working definition at the start of the workshop was as follows:

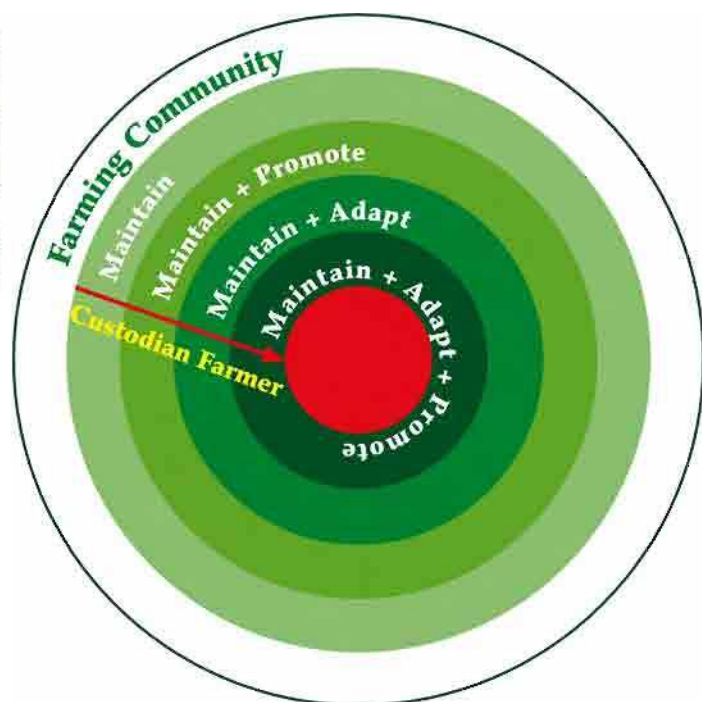
Custodian farmers are those conserver farmers who actively maintain, adapt and disseminate agricultural biodiversity over time and space, including the culture and institutions in which it is embedded, and the knowledge needed for its use and cultivation.

The definition¹ was refined during the workshop as follows:

Custodian farmers are those farmers (men and women) who actively maintain, adapt and promote agricultural biodiversity and related knowledge over time and space, at farm and community levels, and are recognized by community members for doing this. Often, custodian farmers are actively supported in their efforts by family or household members.

Based on the refined definition and the 20 custodian farmers present at the workshop, an initial typology of four types of custodian farmers was identified (see the figure below). Within farming communities one can find a) farmers who maintain a rich and unique portfolio of species and varieties, b) farmers who maintain and promote a portfolio of species and varieties, c) farmers who maintain and adapt a portfolio of species and varieties, and d) farmers who actively maintain, adapt and promote their set of species and varieties.

Typology of Custodian Farmers (Sthapit, 2013)



¹ Although the term custodian farmer is becoming more recognized in the Anglophone world, it is not yet known how the concept "translates" to other languages and accepted term. This will require more research and reflection.

Discussions and case studies suggest that boundaries between the types of custodian farmer might be blurred depending on the local context, including the crop type, local culture, exposure to new knowledge and locations, and environmental conditions. What is important to note is that custodian farmers are very often central actors in institutions for community-based management of diversity, such as community seed banks or community forests, in which they play nodal roles driven by their own set of motivations. Custodian farmers' roles can also change over time due to exposure to new knowledge and information or interventions by external agencies. The purpose of the typology therefore is to highlight the diversity of custodian farmers one might expect to find in the field.

Exploring Policy Support

The workshop was instrumental in developing a "responsibilities and rights" framework for the identification of policy support to custodian farmers. This framework is based on the principle that farmers are *de facto* the primary actors in on-farm/*in situ* conservation for which they deserve full recognition and appreciation from the global community.

The deliberations also resulted in some clarity about the sustainability of conservation efforts by the custodian farmers. Although in some farmer families the custodianship will be passed on to the next generation, there are numerous occasions where this is not guaranteed. A proposed mechanism to maintain custodianship is through the establishment of a network of custodian farmers in which the 'tenure' of one custodian farmer can be taken over or shared by one or more farmers in the network when they are no longer capable of continuing their efforts. Custodian farmers at the workshop liked the idea of establishing this type of network, which could be organized based on geography, type of crop/species (perennial, annual etc.) and other key issues.

Function of Custodian Farmers: Roles, Responsibilities and Rights

Role	Responsibilities (assumed/realised)	Rights (conferred)
Maintain	<ul style="list-style-type: none"> ● Save seed/planting materials of richness of species/variety/ trait diversity conserved at Household (HH) level and document associated Traditional Knowledge (TK) ● Take care of at least one unique/rare/special/difficult-to-propagate variety 	<ul style="list-style-type: none"> ● Formal and informal recognition ● Protection of TK (individual or collective) ● Ensure through current or new/adjusted legal framework of Farmers' Rights
Adapt/innovate	<ul style="list-style-type: none"> ● Identify, domesticate, select or improve traits of interest ● Blend and use ecological indigenous knowledge of diversity, heritability and selection with scientific knowledge 	<ul style="list-style-type: none"> ● To save and/or sell seeds/materials ● Access to information and materials ● Participation in research and development activities ● Recognition (internal or external) for innovation ● Protection of farmers' knowledge in a secured way that leads to community benefits ● Farmer plant breeders' rights
Promote	<ul style="list-style-type: none"> ● Share materials and knowledge with other farmers ● High frequency of exchange of seed and associated knowledge 	<ul style="list-style-type: none"> ● Right to participate in decision making & benefit-sharing through community-based approaches: i) capacity building, ii) seed selection and CBSP, iii) collective benefits-CBR, CSB, PPB, FFS, iv) community development, v) CBM fund
Continuity	<ul style="list-style-type: none"> ● Make sure family continue to harbor portfolio of species and varieties ● Transfer of knowledge and practice to younger generation ● Sets of traits maintained when old varieties are replaced ● Ensure alternative options for crops/varieties under threat 	<ul style="list-style-type: none"> ● Benefit sharing ● Empowerment of network of custodian farmers ● Institutional support (local level –CSB and national gene bank) ● Recognition of shared custodianship within households and whole communities ● Access to new materials. ● Direct household-level benefits

Recommendations

The workshop confirmed that custodian farmers exist and play a distinct and important role in agriculture. They maintain and conserve a wide range of crop species and varieties based on their own interest. They are often a nodal point for the informal exchange of seed and plant material among farmers. They are key providers of seed and plant material and related knowledge to breeders and seed improvement or adaptation programs. Custodian farmers provide key functions that link the traditional and modern seed systems and their efforts contribute to the evolutionary process of crop adaptation in a changing context.

Considering their key roles in on-farm conservation of agricultural biodiversity, the workshop recommendations are as follows:

1. Advocate for the formal recognition of (the concept of) custodian farmers, similar to the special recognition of concepts such as outstanding, progressive farmers or gene bank curator as steward of the world's food and nutritional security. (*Action: Local and national government agencies*)
2. Create and raise awareness of the roles, responsibilities and rights of custodian farmers at different levels, including staff and managers of genebanks, agricultural departments and extension services, seed companies, development NGOs, agricultural research institutes and farmer or community organizations. (*Action: State and National Agricultural Research and Development agencies; Conservation NGOs*).
3. Support the identification and documentation of at least 1000 case studies of custodian farmers in the next two years for various neglected and under-utilized crops, fruit trees, spices and vegetables. (*Action: State and National Agricultural Research and Development agencies; Conservation NGOs*)
4. Assess the importance of custodian farmers for on-farm/*in situ* conservation of local crop diversity. (*Action: State and National Agricultural Research and Development agencies; Conservation NGOs*)
5. Accept farmers' elite/unique materials for registration in the name of the custodian farmer or the community, according to appropriate standards. (*Action: National PGR System/Protection of Plant Varieties and Farmers' Rights Authority*)
6. Establish and recognize networks of custodian farmers to empower them to share knowledge, skills, seed or planting material, and potentially engage in research and development interventions. In order to gain experience and institutional innovation, pilot 10-20 networks of custodian farmers to consolidate their roles as conservers, innovators and promoters of agricultural biodiversity, and strengthen a framework that can lead to policy formulation. At international level, Bioversity International can play research and advocacy role and promote enabling policies (*Action: National PGR System/Protection of Plant Varieties and Farmers' Rights Authority, Bioversity International*)
7. Further develop the framework of responsibilities and rights of custodian farmers in those countries where a relevant policy is not in place. This includes the right to participate in national decision making processes and benefit-sharing policies as well as international agreements such the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and the Convention on Biological Diversity (*Action: State and National Agricultural Research and Development agencies; Conservation NGOs*).
8. Use a community-based approach to build capacities of custodian farmers on: i) protection of traditional knowledge of PGRFA, through documentation, use and conservation of traditional knowledge (e.g. community fruit catalogue, community biodiversity register, community seed banks etc.), ii) the right to save, use, exchange and self-farm saved seed/ planting material, (e.g. community seed banks, community based seed production (CBSP) and participatory crop improvement (grassroots breeding, participatory variety selection, participatory plant breeding, farmer field schools, etc.), iii) the right to participate in making decisions at the national level on the matter of conservation and use of PGRFA and overall community development, (e.g. community biodiversity management, institutional strengthening and governance, establishing CBM fund, etc.), iv) the right to equitably participate in sharing benefits arising from the utilization of PGRFA by creating economic and nutritional benefits (e.g. product development, marketing and home processing) (*Action: State and National Agricultural Research and Development agencies; Conservation NGOs*).
9. Formulate a national on-farm/*in situ* conservation strategy with participation of custodian farmers and other key stakeholders through which their voices are heard and their specific needs are addressed. Custodian farmers' networks could be an integral part of the national and international conservation strategies and linked directly to agricultural biodiversity conservation institutions, such as genebanks to document diversity and involve custodian farmers in research on seed regeneration, improvement or adaptation programs (*Action: national PGR system/protection of plant variety and farmers' rights authority*). Connect custodian farmers to agricultural extension services (e.g. KVK in India and similar agencies in other countries), NGO sectors and the formal and commercial seed system. (*Action: State and National Agricultural Research and Development agencies; Conservation NGOs*)
10. Mobilize social capital to create locally-driven financial assets to establish community biodiversity management funds that can directly support custodian farmers and their communities at the local level. (*Action: State and National Agricultural Research and Development agencies; Conservation NGOs*)
11. Support custodian farmers and their communities with product development, market linkages and home processing activities to utilize the special nutritional and commercial traits of a wide range of neglected landraces and crops. (*Action: State and National Agricultural Research and Development agencies; Conservation NGOs*)



Workshop on Custodian Farmers of Agricultural Biodiversity: Policy support for their roles in use and conservation

New Delhi, 11-12 February 2013

Rationale

It has been estimated that nearly one and half a billion people are poor, about one billion people are hungry and 1.02 billion are undernourished worldwide (FAO 2009). A large number of these poor and low income people are smallholder farmers. Thus, without tackling food insecurity problems of such deprived people, the world cannot be freed from hunger.

Food crop diversity is key to sustainability. This diversity is one of the most important resources that smallholder farmers have easy access to contributing to improve food security, alleviate poverty, improve nutrition, raise income, and sustain critical and fragile ecosystems. Agriculture is the largest global user of biodiversity (Wood and Lenne, 1999). In the context of climate change, over-reliance on a handful of crops puts global food security at greater risk. Agricultural biodiversity, which has been used by generations of farmers, contributes to reducing malnutrition, alleviating poverty and combating climate change challenges. This diversity is now in danger of disappearing and global commitments to support conservation effort are limited.

Despite this global scenario of biodiversity loss, there are still few farmers who actively maintain, adapt and disseminate agricultural biodiversity, and who possess the knowledge needed for its use and cultivation. We define them as the 'custodian farmers' who maintain portfolios of diverse species and varietal diversity of agricultural biodiversity, who select varieties adapted to local conditions and who promote to the use and conservation of local diversity among their friends and neighbours even in the absence of any tangible incentives. Many people have reported the existence of such farmers and their significant contribution to conservation and use of genetic diversity on-farm/*in situ*. However, our desk research revealed that there is lack of methodology that guides frontline researchers to identify such custodian farmers and understand their characteristics. Their sources of motivation are poorly understood and documented. Their unique characteristics, roles that they play in the conservation and use of agricultural biodiversity and how they differ from the average farmers are still not well understood. As far as we know, no systematic research has been done about these custodian farmers. It is feared that their number is dwindling given that, around the world, the young generation of rural dwellers is not very keen to continue farming.

The proposed workshop about custodian farmers aims to find answer to the following key questions: - How could the roles of custodian farmers in conservation, innovation and promotion be consolidated? Could the establishment of a network or networks of such custodian farmers equipped with an effective information sharing system be considered as a viable on-farm conservation strategy? Which kind of low cost policy recommendations could support their contribution to society? Could custodian farmers play a role in a national system of genebanks and contribute to a national conservation strategy? How could custodian farmers be linked to the public sector genebank system?

The promotion of custodian farmers in conservation and use is important because:

1. Low cost approach – their efforts are complementary to an *ex-situ* approach in the sense of serving as a genebank *in situ*.
2. Key knowledge sources at local level: for other farmers and for scientists (social network).
3. Direct knowledge exchange between researchers and key farmers.
4. Could function as nodal point for the regeneration, dissemination or field testing of released material/promising genebank material.
5. Continuous innovation and adaptation of knowledge and material (germplasm, climate change).
6. A concrete manifestation of farmers' rights and a form of sustainable agriculture (empowerment).
7. A linkage between *ex situ* and *in situ* conservation (community or forest genebank).
8. Best option for the conservation of rare types that are important, but fall outside of priority list of national and international genebanks.

The key issue is how policy can support custodian farmers as conservers, innovators and promoters and integrate them within NBPGR system.

Purpose

The purposes of the workshop are: 1) to develop deeper understanding of the roles of custodian farmers in conservation, use and dissemination of agricultural biodiversity; 2) to highlight their contribution to the national plant genetic resources system and overall sustainable agriculture development; and 3) to raise their visibility and recognition in the genetic resource management field.

The workshop aims to bringing together custodians from across India and other South and South East Asian countries to share experiences, develop a methodology to identify custodian farmers, debate challenges faced by such farmers and discuss ways to strengthen and/or support their invaluable contributions to society. The event will explore options for creating networking activities and a possible information platform meant to support the exchange of knowledge for achieving more resilient agricultural production systems. The meeting will also contribute to raise visibility of custodian farmers at national and international levels, and produce options/recommendations to policy makers for developing a more enabling environment for on-farm conservation efforts.

Objectives

1. Create better understanding of the roles of custodian farmer in conservation, use and dissemination of agricultural biodiversity and related knowledge.
2. Discuss and refine the concept and methodology to identify custodian farmers.
3. Enable the sharing of experiences, ideas and opinions of custodian farmers, scientists and ex situ sector managers to develop a strategy for on-farm conservation through custodian farmers.
4. Consolidate the role of custodian farmer for conservation and availability of/access to agricultural biodiversity through recognition, visibility and creating linkages (policy support).
5. Formulate an action plan to support custodian farmers and recognize their contributions to the society.

Methodology

A dynamic mix of short talks on a conceptual framework for custodian farmers, country case studies, and experiences from custodian farmers, expert opinions, round-table discussions and interactive focus group workshops will be used to produce a synthesis of scientific knowledge on custodian farmers of agricultural biodiversity. A short pre-workshop survey will be conducted with a group of custodian farmers and policy makers and researchers to identify key issues for discussion and follow up action. Special attention will be paid to better understand the motivations of custodian farmers whether it be personal, socio-cultural and economic, how such behaviour can be fostered through policy support, and how their roles could be included in a strategy for on-farm management of agricultural biodiversity.

The event will present documented case studies of custodian farmers of tropical fruit tree diversity from India, Indonesia, Malaysia and Thailand and share experiences and learning from other countries –including Nepal.

Outcomes of the Workshop

The workshop will result in better understanding of the concept of custodian farmers and facilitate a community-of-practice to consolidate their roles in the context of on-farm conservation of agricultural biodiversity:

- Clarity on the definition of 'custodian farmers' and a related typology
- Refined characteristics/indicators to assess the efforts of different types of custodian farmers
- Roles of custodian farmers identified
- Deeper understanding of key drivers of custodian farmers (nature and degrees of motivations and trade-offs)
- Better understanding and insight on how to support and strengthen the roles of custodian farmers

Participants: 65

Custodian farmers	<ul style="list-style-type: none"> ● GEF UNEP Bioversity Project, "Conservation and Sustainable use of Cultivated and Wild Tropical Fruit Tree Diversity: Promoting Food Security, Sustainable Livelihoods and Ecosystem Services" from India (9), Indonesia (2), Malaysia (2) and Thailand (2) ● IFAD NUS/ Bioversity/MSSRF/ LI-BIRD/ PROINPA, "Reinforcing the resilience of poor rural communities in the face of food insecurity, poverty and climate change through on-farm conservation of local agrobiodiversity" from LI-BIRD, Nepal (1), and MSSRF, India (1) ● Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA): Gene Fund Awardee (2) ● Non-project Indian partners (NGO) : 4
National partners	<ul style="list-style-type: none"> ● GEF UNEP TFTGR Project researchers : Indonesia, Malaysia and Thailand countries (4) ● GEF UNEP TFTGR researchers (India) : 8 ● IFAD NUS Project : 2 countries from India (1) and Nepal (1)
Indian Council of Agricultural Research (ICAR)	<ul style="list-style-type: none"> ● Secretary DARE and DG, ICAR(1) ● DDG (Horticulture)(1) ● NBPGR, ICAR (4)
Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA): 2	
NGOs	<ul style="list-style-type: none"> ● Dhan Foundation (3) ● Society for Sustainable Agriculture (2)
Bioversity : 15	

Tentative Inaugural Programme (11 February 2013)

NAAS Auditorium, NASC Complex

Chief Guest	: Dr S. Ayyappan, Secretary, DARE and Director General, ICAR, India
Guest of honour	: Dr Emile Frison, Director General, Bioversity International, Rome
Custodian farmer	: Mr Dattatreya Hedge, Sirsi
Convenor	: Ms Maninder Kaur

Registration: 08:30-9:00 am

Time	Programme	Speaker
09:00 - 09:05	Welcome Address	Dr Prem Mathur, South Asia Coordinator, Bioversity International
09:05 - 09:10	Opening ceremony by lighting the lamp	Dr S Ayyappan together with Dr Emile Frison and custodian farmer
09:10 - 09:20	Objective of the meeting and workshop framework	Dr Bhuwon Sthapit, Regional Project Coordinator, Bioversity International
09:20 - 09:40	Experience of custodian farmer: key drivers	Mr Dattatreya Hedge assisted by Dr Vasu Deva Ramesh
09:40 - 09:45	Remarks	Dr R C Agrawal, Registrar General, PPV&FRA
09:45 - 09:50	Remarks	Dr K. C. Bansal, Director, NBPGR
09:50 - 10:00	Address by Guest of Honour	Dr Emile Frison
10:00 - 10.15	Address by Chief Guest	Dr S Ayyappan
10:15 - 10:20	Vote of Thanks	Dr BMC Reddy, National Project Coordinator
Before tea	Group photograph	Mr Madan Kantharaj

Tea/Coffee break: 10.20-11:00 am

Technical Programme

Venue : NAAS Auditorium, NASC Complex New Delhi

Date & Time	Programs	Presenter
	11 February 2013	
09:00 - 11:00	Inaugural Session	<i>Please refer a separate programme</i>
	<i>Chairperson: Dr N.K. Krishna Kumar, DDG (Horticulture), ICAR/Chair, NPSC</i>	
11:00 - 11:30	<i>Co-Chair : V. Ramanatha Rao, Technical Advisor Objective of the meeting, and workshop framework: On-farm Conservation theory into practice: what we can learn from custodian farmers?</i>	Dr Bhuwon Sthapit Regional Project Coordinator, Bioversity
11:30 - 01:00	A brief self introduction of all custodian farmers present (about 20 probably, which will take max 90 min) selected custodian farmers from India, Indonesia, Malaysia and Thailand	Custodian Farmers supported by researchers
01:00 - 02:00	Lunch Break	
02:00 - 02:15	TFT Country case study-India	Dr S Rajan
02:15 - 02:30	TFT Country case study-Indonesia	Dr Idha Widi Arsant
02:30 - 02:45	TFT Country case study-Malaysia	Mr Shafie Mad Sah
02:45 - 03:00	TFT Country case study-Thailand	Mr Pichit Sripinta
03:00 - 03:15	Tea Break	
03:15 - 03:30	IFAD NUS country case studies-Nepal	Mr Sajal Sthapit
03:30 - 03:45	IFAD NUS country case studies-India	Dr E Oliver King
03:45 - 04:00	PPVFRA country case studies - India	Dr Tejbir Singh
04:00 - 04:15	Roles, needs and challenges of custodian farmers: a perspective from the Andean region	Ms Gennifer Meldrum
04:15 - 05:15	Interactive Group Discussions suggested discussion points: 1. <i>drivers/motivations of custodian farmers</i> 2. <i>roles and functions in managing agricultural biodiversity to create deeper understanding why custodian farmers maintain, adapt and promote diversity</i> 3. <i>roles and functions they may provide to their family, community, the wider eco-system or potentially government system</i> All groups try to formulate a list of major drivers/motivations and roles/functions of custodian farmers based on experiences/stories of farmers.	Mr Hugo Lamers + 3 group facilitators <i>[These discussions are held in 2-3 groups of 10 participants with a good mix of custodian farmers and researchers.]</i>
05:15-05:45	Plenary reporting of group discussions. (5 min each group and discussions)	Group facilitators
05:45-06:00	Reflection	Dr MP Vasimalai Dr G V Ramanjaneyulu Chair/Co-chair
07:00 - 10:00	Social dinner	

Venue: NAAS Committee Room # , NASC Complex, Delhi

Date & Time	Programs	Presenter
12 February 2013		
09:30 - 11:30	<i>Participation at the inaugural session of the International Conference on Biodiversity</i>	<i>All participants</i>
11:30 - 12:00	Policy options to support custodian farmers for continued maintenance of agricultural biodiversity	Dr Ronnie Vernooy
12:00 - 01:00	<p>Round-table discussions (mixed groups) Key question: What support is required to ensure custodian farmers continue to maintain, adapt and disseminate agricultural biodiversity?</p> <ul style="list-style-type: none"> ● Network/linkages: Is their interest to exchange knowledge and/or material among farmers locally, nationally, internationally? Interest to learn and meet other custodian farmers of own crops or also other crops? ● Improving knowledge: Is there is a need for training for farmers on how to monitor, propagate, maintain and document diversity? ● Recognition: Is there a need for recognition for the role custodian farmer's play in conservation, adaptation or promotion? Will there be interest in receiving certificate and if yes then from which institution? Will official (online) registry of field collections of custodian farmers be interesting? ● How can the custodian farmers be integrated into nations PGRFA system? Include custodian farmers' field collections in reportage by genebanks? Assistance in plant varieties registration in farmer's name? ● Compensation: Is their need to compensate custodian farmers for their conservation efforts? What type of compensation is most appropriate? Should it be cash or in kind and how? Who will pay, government, multilateral institutions, genebank & research system? 	Dr Ronnie Vernooy and Mr Hugo Lamers + 3 group facilitators
01:00 - 02:00	<i>Lunch Break</i>	
02:00 - 02:30	Round-table discussion contd..	
02:30 - 03:00	Plenary reporting of group discussions. (5 min each group and discussions)	
03:00 -03:30	<i>Tea Break</i>	
03.30-05:00	Preparation time for recommendations and action plans	Organizing committee
05:00 - 06:00	<i>Closing ceremony</i>	
	Chairpersons:	Dr S. Ayyappan, DG ICAR, India Dr Emile Frison, DG, Bioversity International, Rome
	Presentation of the recommendations and action plans:	Dr Bhuwon Sthapit and Mr Hugo Lamers
	Vote of thanks:	Mr Hugo Lamers
	Closing remarks:	Dr. Emile Frison, Custodian farmer Dr S Ayyappan

A joint activity with ICAR under the UNEP/GEF project: 'Conservation and Sustainable Use of Cultivated and Wild Tropical Fruit Diversity: Promoting Sustainable Livelihoods, Food Security and Ecosystem Services'

Workshop on Custodian farmers of Agricultural Biodiversity: policy support for their roles in use and conservation

11-12 February, 2013
NASC campus, New Delhi, INDIA

S.N.	Organization	Country	Name	Designation	Address
1	Indian Council of Agricultural research	INDIA	Dr N K Krishna Kumar	Deputy Director General (Hort)	Indian Council of Agricultural Research (ICAR), Krishi Anusandhan Bhawan II Pusa Campus, New Delhi, 110012 INDIA Email. ddghort@gmail.com Tel. +91 11 25842068
2	Indian Institute of Horticultural Research	INDIA	Dr A S Sidhu	National Project Director	Indian Institute of Horticultural Research, Haessaraghatta Lake Post, Bangalore-560089, INDIA Email. director@iihr.ernet.in Tel. +91 080 28466353, 28466471
3	Indian Institute of Horticultural Research	INDIA	Dr BMC Reddy	National Project Coordinator	Indian Institute of Horticultural Research, Haessaraghatta Lake Post, Bangalore-560089, INDIA Email. bmcreddy@gmail.com Tel. +91 9448069568, +91 9845566446
4	Central Institute for Subtropical Horticulture	INDIA	Dr Rajan	Head, Division of Crop Improvement and Biotechnology	Central Institute for Subtropical Horticulture, PO Kakori, Rehmankhera, Lucknow-227107, INDIA Email. srajanlko@gmail.com Tel. +91 9415794997
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6	Farmer	INDIA	Mr Nawab Hasan	Farmer	Kasmandi Kala , Malihabad , Lucknow, India Tel. +91 9415549704
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8	Farmer	INDIA	Mr Vijay Kumar	Farmer	Sarsanda , P.O Kakori , Lucknow, India Tel. +91 9161584040
9	Farmer	INDIA	Mr Ram Kishore	Site Officer	Mohammad Nagar Taluckdari, PO Kasmandi Kalan, Lucknow, India Tel. +91 9198583393
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23	Farmer	MALAYSIA	Mr Razali Bin Yahya	Farmer	Jbs 27a, Kg. Changkat Ibol, 34850, Changkat Jering, Taiping, Perak Malaysia
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Photographs of Custodian Farmers



**Dattatreya Hedge,
India**



**Vishweshwar Ganapati Hedge
"Eshanna", India**



**K Ravindranath,
India**



**P. Lakshminarayana Reddy,
India**



**M. Gunashekar Reddy,
India**



**Chhote Lal Kashyap,
India**



**Nawab Hasan,
India**



**Kailash Prasad Rai,
India**



**Maiku Lal,
India**



**Sadhu Oyal,
India**



**Vasant Mahadev Rao Wankhade,
India**



**Vinod Rai,
India**

Photographs of Custodian Farmers



**Kodukka Malliga Seerangan,
India**



**Raja Ram,
India**



**Babulal Dahiya,
India**



**Sundaram Verma,
India**



**Ahmad Kusasi,
Indonesia**



**Sudarman,
Indonesia**



**Palin Along,
Malaysia**



**Razali Yahya,
Malaysia**



**Khem B. Chand,
Nepal**



**Suradech Tapuan,
Thailand**



**Liam Linlatai,
Thailand**



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