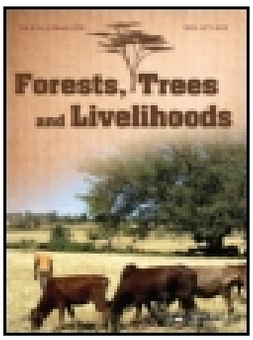

Forests, Trees and Livelihoods

ISSN: 1472-8028 (Print) 2164-3075 (Online) Journal homepage: http://www.tandfonline.com/loi/tftl20

Engaging local communities in social learning for inclusive management of native fruit trees in the Central Western Ghats, India

N. Hegde, M. Elias, H. A. H. Lamers & M. Hegde

To cite this article: N. Hegde, M. Elias, H. A. H. Lamers & M. Hegde (2016): Engaging local communities in social learning for inclusive management of native fruit trees in the Central Western Ghats, India, Forests, Trees and Livelihoods

To link to this article: http://dx.doi.org/10.1080/14728028.2016.1257398

Published online: 08 Dec 2016.

FORESTS, TREES AND LIVELIHOODS, 2016
http://dx.doi.org/10.1080/14728028.2016.1257398

Taylor & Francis
Taylor & Francis Group

Engaging local communities in social learning for inclusive management of native fruit trees in the Central Western Ghats, India

N. Hegde[a], M. Elias[b], H. A. H. Lamers[c] and M. Hegde[a]

[a]LIFE Trust, Sirsi, India; [b]Conservation and Management of Forest Genetic Resources, Bioversity International, Darul Ehsan, Malaysia; [c]Socio-economic & Marketing, Bioversity International, New Delhi, India

ABSTRACT

Participatory research and the social learning it supports are increasingly being used to improve forest management. Yet, the participation of women and other marginalized groups is often limited in these processes. This is a serious shortcoming, not only due to concerns for gender and social equity, but also because socially excluded, forest-dependent groups hold specific ecological knowledge, skills and interests that influence prospects for sustainable forest management. Carried out in India's Central Western Ghats, this study explores the potential participatory research holds for engaging communities in a socially inclusive learning process that can support forest management. Participatory tools – resource mapping, Four Cell Analysis, seasonal fruit calendar, and seasonal activity – were used to elicit information on native fruit tree diversity, phenology, agronomy, uses and marketing. We discuss the benefits of this research set-up which promoted interactions among individuals from different groups, who came to experience a common group identity. The notion of contact zones – where different cultures or groups meet and engage with each other in ways that can reduce conflicts or redress asymmetrical power relations – guides our analysis. We demonstrate that the contact zone created through research process facilitated multi-directional information sharing and supported collective actions for forest management.

KEYWORDS

Contact theory; gender; India; local ecological knowledge; livelihood; participatory research; social inclusion; social learning; Western Ghats

Introduction

Participatory methods have long been used in agricultural and natural resource management research for development. Participatory research has been described as a joint learning process that empowers and challenges both researchers and participants to extend their knowledge and action into new areas. This joint learning – or social learning – represents a change in understanding where people learn individually and as a group from each other in ways that can benefit wider social-ecological systems (Reed et al. 2010; Egunyu & Reed 2015).

CONTACT N. Hegde lifetrusts@gmail.com

Participatory research and the social learning it supports have been used to improve joint forest management or community-based forest management processes, whereby communities and the state share responsibilities to manage their forests within a government policy framework (McDougall et al. 2013; Egunyu & Reed 2015). In this context, participatory approaches have been shown to help overcome common problems in natural resource management, including over-harvesting, unsanctioned logging and forest encroachment (Blomley et al. 2008). Yet, patterns of exclusion within participatory research, social learning and joint forest management remain (Agarwal 2001). Egunyu and Reed (2015, p. 44) note that there is 'very little research that specifies who participates in activities that might encourage social learning and collective action' for natural resource management. It is known, however, that women – important collectors, users and managers of native fruit tree (NFT) resources in the tropics – are frequently excluded from forestry research for development initiatives (McDougall et al. 2013; Egunyu & Reed 2015). Similarly, in the South Asian context, marginalized groups such as migrants, landless agricultural labourers, underprivileged castes or indigenous subgroups that are most dependent on forest products are often left out of joint forest management and related research initiatives (Agarwal 2001; McDougall et al. 2013). These are serious shortcomings, not only due to concerns for social equity, but also because socially excluded, forest-dependent groups hold valuable and specific knowledge, skills and vested interests related to the forest that influence prospects for sustainable forest management (Agarwal 2001).

In light of these considerations, this study addresses the question: how can we engage communities in an inclusive social learning process that can support joint forest management? We specifically examine the value of an approach focused on multi-directional information sharing and learning around NFTs across groups differentiated on the basis of gender, age and ethnicity in India's Central Western Ghats, one of the world's biodiversity hotpots (Myers et al. 2000). To begin, we discuss the theory and method of contact zones that guide our study: spaces where different cultures or groups meet and engage with each other in ways that can reduce conflicts or redress asymmetrical power relations (Pratt 1992). Next, we describe the village contexts where our study is grounded, and the methods used for our interventions and analyses. We subsequently focus on the differentiated knowledge repertoires that present opportunities for social learning across different gender, age and ethnic groups. We then move to the research process, with a focus on local perceptions of the multi-directional information sharing and learning around NFT management, and the self-awareness, mutual appreciation and unity generated among participants during this process. Finally, we argue that social learning, which generates an improved understanding of complex local problems, fostered in a participatory research environment that creates a contact zone among differentiated local groups, can support socially inclusive collective actions for joint forest management.

Social learning and intra-actions in participatory research

Social learning has been defined as a 'process in which multiple stakeholders bring together their different knowledge, experiences, perspectives, values, and capacities for a process of communication and critical reflection as a means of jointly understanding and addressing shared issues, challenges, and potential options' (McDougall et al. 2008, p. 30). Knowledge sharing – an important dimension of social learning – is premised on the diversity and complementarities of the knowledge of different social groups hold and the value of this

diverse knowledge, when shared, for solving forest management and other problems (Maarleveld & Dangbégnon 1999). Social learning is considered essential if collaborative forest management arrangements are to provide socio-economic, environmental and cultural benefits to participant communities and the marginalized groups within them (Buck et al. 2001; McDougall et al. 2013).

McDougall et al. (2013) demonstrate how careful design of governance processes and arrangements can promote social inclusion, with elements such as social learning playing a central role in this inclusion.[1] The authors call attention to the importance of creating socially acceptable 'spaces' wherein marginalized groups can engage in governance (and underlying social learning) processes. Others demonstrate the importance of platforms – metaphorical or 'real' places where stakeholders meet and learn – for facilitating social learning (Röling & Jiggins 1998; Buck et al. 2001). These platforms can vary in form, from elected committees and formally appointed boards to one-time meetings. Key issues in relation to these platforms include who participates, who these participants represent, and how to facilitate discussion among different actors who may hold different or contradictory positions on the issues of concern (Röling & Jiggins 1998).

Studies of 'contact zones' yield insight into what such spaces or platforms can be and their prospects for fostering social inclusion. The notion of contact zones draws from 'contact theory' (Allport 1954, 1958), which stipulates that in situations of discrimination (or conflict) inter-group relations can be improved through increased inter-group contact under predefined conditions. These conditions include an equal group status within the contact situation, inter-group cooperation, a shared goal, the support of authorities, law or customary norms (Allport 1954), personal acquaintance among members, and inter-group friendships (Dovidio et al. 2003). Contact zones, then, have been conceptualized as social spaces where different groups come together and interact, mutually transforming each other through 'meaningful encounters' (Pratt 1992; Barad 2007). Lau and Scales (2016, p. 139) explain that 'boundaries between groups are often blurred and reproduced within the contact zone through an emphasis on certain collective aspects of identity.' Hence, the shift from inter-actions to intra-actions as a new collective identity emerges through common practices and shared experiences. In this regard, authors refer to contact zones not only as a theory, but also as a method to create spaces where differently positioned groups can work together despite their power inequities, and in so doing, create more equitable inter-group relations (Torre et al. 2008). It is from this perspective of contact zones as both method and theory that we situate this study.

Methodology

Study area and peoples

Our study was carried out in the villages of Salkani, Gonsar and Kalagadde-Kanchigadde in Uttara Kannada district of the state of Karnataka, in India's central Western Ghats (Figure 1). The region is characterized by rich forests and a high rate of endemism, making it one of the world's eight biodiversity 'global hottest hotspots' (Myers et al. 2000).

Local people strongly depend on the forest's rich resources, including both timber and non-timber forest products (NTFPs). NFTs of particular importance for direct consumption and sale include jackfruit *(Artocarpus heterophyllus)*, mango (*Mangifera indica*) and various *Garcinia* species. To mitigate their dependence on wild trees, local people (predominantly

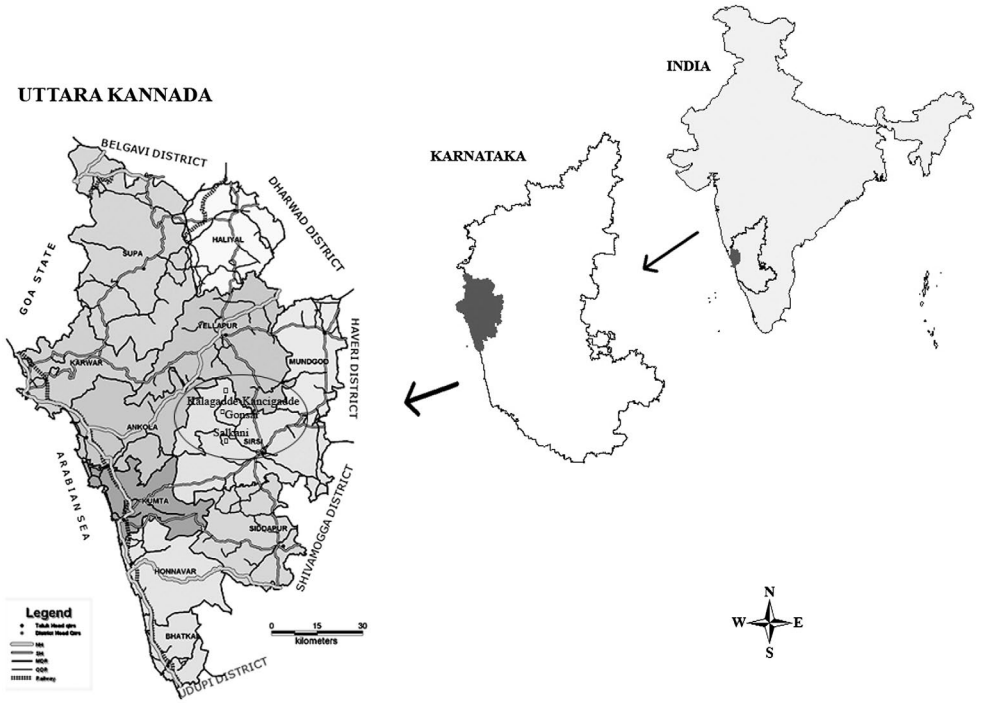

Figure 1. Study sites.

Havyak farmers – see below) have domesticated important forest species in their farms and orchards. Commonly cultivated species are jackfruit, mango, lakoocha *(*Artocarpus lakoocha*),* Indian gamboge (*Garcinia indica),* Malabar gamboge *(Garcinia gummi-gutta),* senna *(Cassia sophera),* common marsh bush wheat *(Polygonum chinense),* and spices such as wild nutmeg *(Myristica malabarica),* cinnamons (*Cinnamomum zeylanicum* and *Cinnamomum malabatrum)* and black pepper (*Piper nigrum).*

Forests are owned by the state Forest Department (FD) and can be classified as protected forest, reserve forest and minor forests. Degraded forests in reserve forest and minor forest zones are managed by Village Forest Committees: registered organizations that bring together the FD with local communities under India's Joint Forest Management program (referred to as the Joint Forest Planning and Management program in Karnataka).

The three villages, which are under high forest cover, were selected because of the wide variety of NFTs used by local communities, their large sociocultural and ethnic diversity, high local dependency on forest resources and villagers' willingness to participate in the research. Local residents belong to eight ethnic groups with distinct landholdings and access rights to NFTs. Different groups reside in the three villages. Havyaks, Poojars and Naiks reside in Salkani, whereas Havyaks, Khare Vokkaligas and Shettys live in Gonsar, and Havyaks, Marathis, Siddis, Poojars and Chaluvadi inhabit Kalagadde-Kanchigadde. The native Havyaks, who represent the large majority of residents in all three villages, belong to the upper caste Brahmin community (originally priests and teachers in ritual Hindu society; now experts in cultivation of spice gardens and areca (*Areca catechu*)) and generally have better living conditions than other ethnic groups. They wield most of the local political and economic power,

with larger landholdings and greater decision-making authority with respect to community affairs than other resident groups. The Khare Vokkaligas, Marathis, Naiks and Shettys are classified by the Karnataka state government as Other Backward Classes, whereas the Siddis and Chaluvadi who live in Kalagadde-Kanchigadde are Scheduled Tribes and Scheduled Castes, respectively.[2]

In the study sites, the Other Backward Classes, Scheduled Castes and Scheduled Tribes are landless or marginal landholders, socially and educationally the most disadvantaged, and most of them live below the poverty line (Government of India 2016). They work as waged labourers on the farms of Havyaks and rely heavily on forest resources to sustain their livelihoods. Yet, despite their forest-dependence, they hold less influence in Joint Forest Management and community decision-making processes than the Havyaks. Farmers with areca nut or spice gardens have exclusive private harvesting rights to collect green manure and NTFPs from so-called *soppinabetta* forests located near their farms as long forest cover is maintained. These privileges introduced by the British colonial administration in nineteenth century were granted to the (primarily Havyak) households that had areca nut orchards at the time.

In addition to ethnicity, local social dynamics are conditioned by gender norms and skewed power relations that attribute greater voice, value and decision-making authority to men than women (Cornwall 2003). This is manifest in women's lack of a role in public forums, their limited access to information about forest management, and in the heavy demands on their time within the household that limit their ability to actively participate in public life. Limited assets, formal education and confidence, which are also a product of social norms and power relations, further limit this participation (Agarwal 2001). Gender norms are expressed differently across social groups, with upper caste (Havyak) women being subject to more restrictive norms regarding mobility and participation in community affairs than other groups (Jewitt 2000; Agarwal 2001).

Participatory methods and data collection

Fieldwork was carried out between June 2013 and December 2014. Initial meetings were held in each village to explain the project's research for development objectives to the communities and seek informed consent (Table 1). Participants prioritized three species as the focus of research activities based on their concerns for resource availability, usage and potential for value addition and marketing: *M. indica, G. indica* and *G. gummi-gutta*. Subsequent participatory activities focused on these species.

Research activities were divided into two phases, each of which sought to promote social inclusiveness while advancing the project's other sustainability and livelihood goals. First, knowledge mapping exercises that are the focus of this paper were conducted. Then, capacity building exercises focused on improving the marketing of selected NFTs. The first phase explicitly sought to understand the amount and kind of knowledge held within the community to determine: (a) which knowledge was lacking or needed to be strengthened; (b) which particular groups possess or lack this knowledge; and (c) how to enhance collective knowledge exchange and facilitate inclusive participation in forest management. The knowledge mapping exercises relied on a combination of four participatory tools – resource mapping, four cell analysis (FCA), a seasonal fruit calendar and a seasonal activity calendar (Table 1). These tools were selected to elicit information on NFT species including phenology,

Table 1. Sequence of knowledge mapping activities conducted in the three study villages.

Activity	Goal of the activity	Participants and group design	Period
Prior informed consent and selection of target species	Informal meeting to explain proposed activities, obtain consent and decide which species the project should prioritize based on local interests	Male and female community representatives, collective discussion	June 2013
Resource mapping	Map the village and surrounding forests to understand the village setting in general and to identify and locate the NFTs, their availability, usage and management (knowledge of NFT spatiality)	Subset of local villagers segregated by gender and age	July 2013
Four cell analysis	Generate a list of NFT species and varieties found in the village and surrounding forests based on their perceived status (common, rare, threatened and endangered); to understand the degree of occurrence and distribution of NFT diversity based on local knowledge of NFT diversity	Subset of local villagers segregated by gender and age	July 2013
Seasonal activity calendar	Calendar of propagation, cultivation, harvesting, processing, home use, sales related to NFTs as well as who performs them to understand the division of tasks, knowledge and skills related to locally prioritized NFTs	Subset of local villagers segregated by gender and age	August 2013
Seasonal fruit calendar	Seasonally explicit description of the phenology (shape, size, colour and occurrence) of the selected NFT species' flowers and fruits to understand the complexity of local knowledge about selected NFT species phenology)	Subset of local villagers segregated by gender and age	October–November 2013

agronomy, uses and markets, required to enhance income and collective forest management. The four tools were adapted from Sthapit et al. (2006), De Boef and Thijssen (2007) and Chevalier and Buckles (2008).

Five men and one woman from a local NGO facilitated all activities in the local Kannada language. They carefully encouraged all group participants to speak up and to listen to each other, in spite of traditional customs that would endow members of elite groups to dominate

the discussion. Instead of carrying out gatherings in public spaces, such as community centres that imply a certain level of formality and dominance by more powerful groups (e.g. men from higher castes) (Mosse 1994), exercises took place in the outer recesses of the homes of community resource persons. These are places (outside the house) where social interactions across ethnic and caste groups are culturally accepted.

In each village, the participatory research design first involved bringing together participants of different ethnicities, genders and ages. After explaining the exercise to all participants, they were divided into four groups along age and gender lines; i.e. young (aged between 21 and 35) men, young women, older (above 35 years of age) men and older women. This segregation was intended to stimulate the participation of younger residents and women, who, because of social norms, might otherwise be hindered. Participants from different ethnic backgrounds were deliberately included in each group to stimulate interactions along the lines of gender and generational 'similarities' that could (formally, during the activities) supersede ethnic differences in the research setting. This represented a first contact zone among ethnically different participants. Each group included an average of eight participants. A total of 117 villagers across the three villages participated in the study. Groups worked simultaneously on the same activity, each of which lasted between 2 and 3 h.

The second part of the group activities involved one or two representatives from each group presenting the group's work in plenary to participants of all four groups. The presentations were followed by the larger group's reflections on the findings. Participants were asked to discuss inter-group knowledge differences and similarities regarding priorities and the type, breadth and detail of the knowledge presented and the reasons behind any observed differences. Discussions around problems and solutions with respect to sustainable NFT management and conservation ensued. The plenary represented a second contact zone among women and men of different ages and ethnicities.

Data analysis

The information gathered during the exercises and discussions were analysed across groups and villages to understand gender- and age-based differences and commonalities in knowledge in relation to six topics. First, knowledge of NFT diversity was assessed based on the number of distinct NFT species, varieties and types (NFT richness) a group could name during the FCA exercise (Sthapit et al. 2006). Then, knowledge of NFT spatiality was considered on the basis of the number of NFT source locations and the local names of these source areas, which were recorded in the resource maps. Third and fourth, knowledge of NFT phenology and agronomy was assessed based on seasonal fruit calendar data. Phenological knowledge was determined on the basis of the ability of participants to provide information on the size, shape and colour of leaves, fruits and flowers as well as life cycle events such as the timing of flowering and fruiting. Agronomical knowledge was assessed based on the ability of participants to describe harvesting methods, seed selection and treatment, identification of plus trees (those showing prized characteristics), nursery establishment, and grafting procedures. The size of the pit that should be dug to plant the seedlings and cultivation requirements such as manure application, weeding and irrigation were also considered as agronomical knowledge. Fifth, knowledge of NFT use was gauged based on the breadth and detail of descriptions of post-harvesting uses and practices, such as storage techniques,

Table 2. Knowledge scoring criteria.

Classification of rating	Qualitative description of rating	Score
Very limited knowledge	Very limited information or information that is inconsistent with reference material is provided	1
Limited knowledge	A small amount of superficial amount of information is provided that that is mainly consistent with reference material	2
Substantial knowledge	A substantial amount of information is provided with some detailed descriptions and examples that are consistent with reference material	3
Very high knowledge	The largest amount of information is provided with highly detailed descriptions and examples that are consistent with the reference material. No inconsistent information is provided	4

household usage, medicinal usage, nutritional values and related recipes elicited during the seasonal activity calendar activity. Finally, additional information from the fruit calendar and seasonal activity calendar shed light on knowledge of NFT marketing, which was assessed based on the ability to explain the value chains for the three target species and identify distinct market channels and price levels for selling value-added products.

To compare knowledge across groups in relation to the latter four topics, an approach adapted from Singh et al. (2013) was adopted in which a reference list with the sum of participants' knowledge was created and used as a point of comparison for each participant group. This was done for each knowledge-mapping activity by transferring the information participants had recorded on large sheets of paper during the activity into one Excel sheet per topic. This resulted in a list that spanned the breadth of responses provided by all the villages' participant groups per topic, which was then used as a reference for local knowledge at hand on a given topic.[3] This list was assessed with all participants during the plenary session and was cross-checked afterwards with local experts (botanists and ecologists) and reference materials (Agriculture University Dharwad, Agriculture University Bangalore, Horticulture Department Bangalore, Indian Institute of Horticulture Research 2014). In some instances, more than one response provided during the activities was considered accurate. For example, two different periods were named and considered correct for the flowering of *G. Gummi-gutta* due to climate changes over the last 5–10 years.

Subsequently, the results of each group were compared with this reference table. A score from one (lowest) to four (highest) was attributed to each group, for each topic, to indicate the density of knowledge held by the group in relation to the total knowledge included in the reference table. Knowledge was scored according to the criteria shown in Table 2. Scores were given for each of the three tree species separately and a mean was calculated by species by participant group for each of the four topics (phenology, agronomy, uses and marketing). The final scores were visually depicted as histograms and qualitatively compared across age and gender groups. The patterns observed regarding groups which held more knowledge on specific topical areas were also compared across villages.

To examine changes in the knowledge of individuals and of the larger group (i.e. to observe a social learning process) as well as degrees of social inclusion, we drew on our own observations of the research process and on perceptions shared by participants during and after the exercises. We used changes in behaviour – attitudes or collective actions (outcomes) – that emerged among participants over several months after the exercises as indications that social learning within the contact zones could lead to changes in forest management.

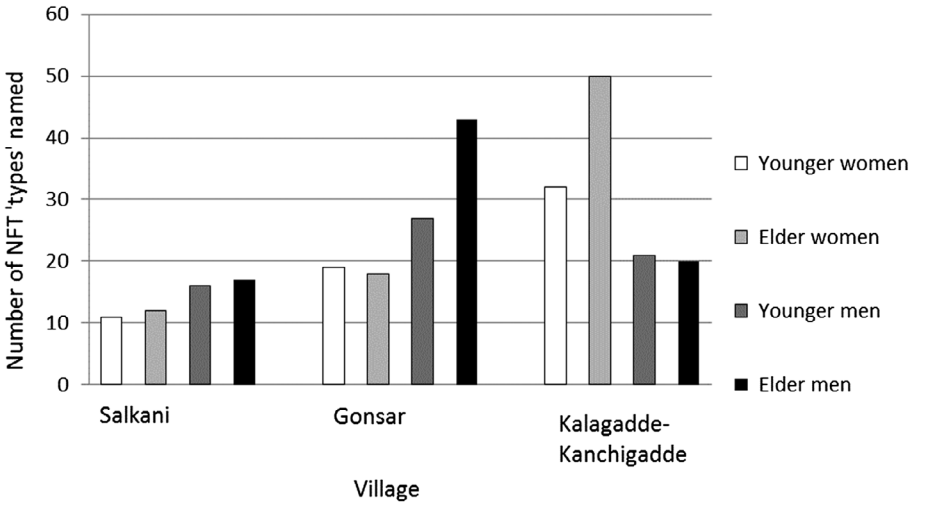

Figure 2. Number of NFT 'types' identified by different age and gender groups, all villages.

Results

Socially differentiated knowledge of NFTs

Knowledge of NFT species and their relative abundance across forests and farmlands varied between gender and age groups across villages. A total of 27 NFT species, varieties and farmer-recognized varieties (ethno-varieties) – referred to below as 'types' of NFTs indiscriminately – were listed by participant groups in Salkani, whereas 58 and 69 types of NFTs were listed in Gonsar and Kalagadde-Kanchigadde, respectively. Overall, a total of 81 NFT types were identified in the three sites. As shown in Figure 2, in Salkani and Gonsar the men's groups named more NFT types than the women's groups, irrespective of age. Kalagadde-Kanchigadde showed an opposite pattern as both the women's groups (young and old) could mention more NFT types than the men's groups. Elder women in this village, mostly from the Siddi and Khare Vokkaliga families, mentioned 49 types, which was the highest number identified by any group in the study villages. No major differences between younger or older participants of both genders could be observed in Salkani; a pattern that holds true for men in Kalagadde-Kanchigadde and for women in Gonsar.

Figure 3 shows that spatial knowledge of NFT source locations varied substantially across gender and age groups. In Gonsar and Salkani, the number of NFT source locations mentioned increased with age and was higher for men than for women. In contrast, in Kalagadde-Kanchigadde younger men identified more source locations (13) than older men (7) and almost three times as many as the young women, who – as in other villages – mentioned the fewest number of locations (Figure 3).

Results from the fruit calendar activity show a similar pattern for knowledge related to age and gender (Figure 4(a)). In all three villages, older men had more knowledge about NFT phenology than the other groups, followed by younger men, elder women and younger women, respectively. Similarly, older men, followed by younger men, were more knowledgeable about NFT agronomy (Figure 4(b)); with the exception of Kalagadde-Kanchigadde

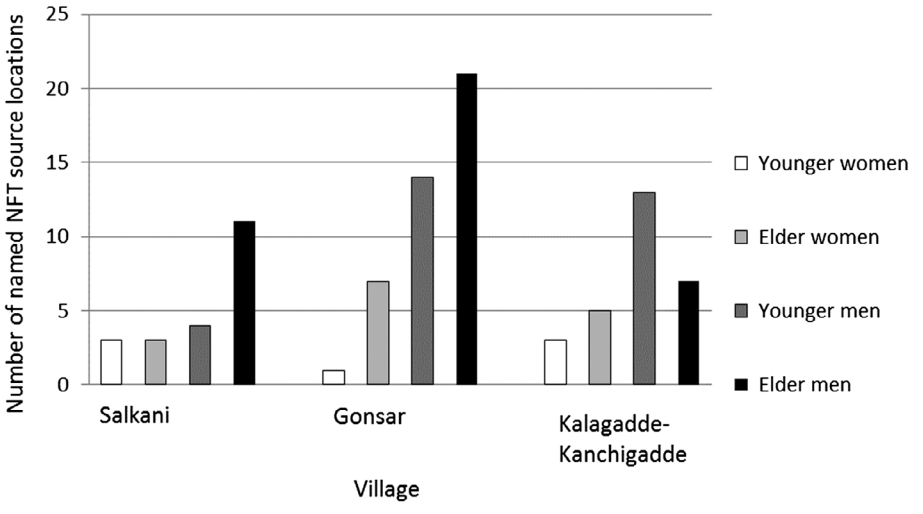

Figure 3. Number of locations identified for NFT by different age and gender groups, all villages.

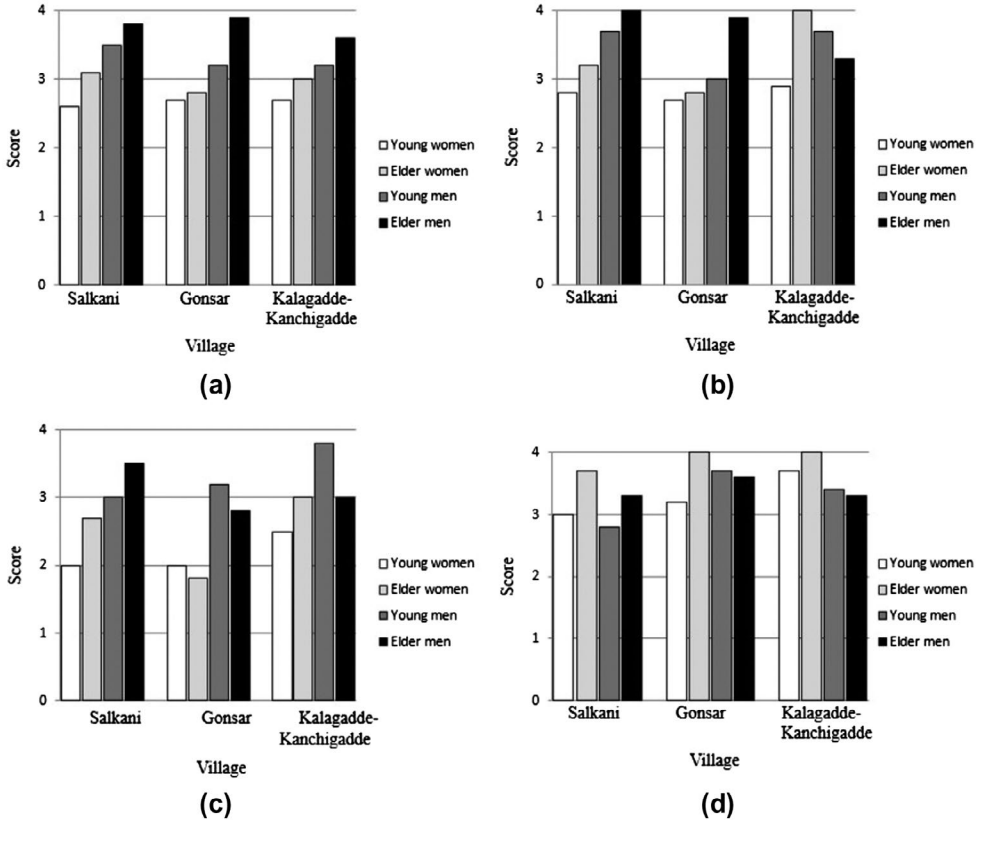

Figure 4. Clockwise from top left.

Notes: (a) Knowledge of NFT phenology for different gender and age groups, all villages; (b) knowledge of NFT agronomy for different gender and age groups, all villages; (c) knowledge of NFT uses for different gender and age groups, all study villages; (d) knowledge of NFT marketing for different gender and age groups, all villages.

village, where elder women showed a higher level of knowledge than their male counterparts.

Figure 4(c) describes knowledge of NFT uses. Elder women scored highest in the three villages, although the other three groups (elder men, and younger men and women) also showed substantial to very high knowledge of these uses. Finally, Figure 4(d) describes the gender differences that were observed regarding knowledge of NFT marketing. Men, especially of the younger generation, had the highest relative knowledge in this domain in all three villages, whereas younger and older women's knowledge about available markets and prices for NFT products was limited.

Experiencing the research process: individual and group learning among and across differences

Women and men participants from the three study villages actively engaged in the knowledge mapping activities. In Gonsar and Kalagadde-Kanchigadde, participants found the competitive angle of identifying which groups had most knowledge about the different topics particularly motivating. Participants were keen to complete the exercises even when these took over 2 h. Additionally, many participants from disadvantaged ethnic groups as well as illiterate and younger women explained that it was their first experience speaking in front of a mixed gender and multi-ethnic group in plenary. An elder woman from the Naik community in Salkani explained that, 'this is the first time that most of us, both men and women, spoke out in front of a group of people. Initially we were shy and hesitant, but after a while it brought out confidence within and among us.'

Careful facilitation and moral support were required to encourage participants to present their group's results in pairs in plenary. At times, encouragement was needed for the 'elder men' to listen to what the other groups presented. The women's groups expressed that the experience was new and positive as it gave different social groups the opportunity to learn from each other. A middle-aged Havyak woman from Salkani stated that the participatory research process 'provided an opportunity for us to learn more about [the stages of growth of] fruit trees in our village, from flowering, fruiting, cultivation, use and marketing. Now we have started looking at the fruit trees for the flowers and different stages of fruiting.' This sentiment was reiterated in other groups.

According to participants and facilitators, the sharing of knowledge between locally relatively disadvantaged (women and members of the Siddi and Khare Vokkaliga communities) and privileged groups was an exceptional occurrence. Participants realized that knowledge is differentiated across groups and that the knowledge sharing is beneficial for everyone. Members of Siddi and Marathi communities in Kalagadde-Kanchigadde stated that they learned about nutritional values, recipes, and marketing channels for value-added NFT products from the other groups, like the Havyaks. Even elder Havyak men acknowledged learning from other groups, as this quote by one man from Gonsar demonstrates:

> It is not that we, the older men, group had all the knowledge. We also learnt a lot from the other groups. We liked the activities and they were a real eye opener. No one in our group wants to miss any of these activities in our village.

Male and female participants in Gonsar also expressed that combining the experiential knowledge of elder participants with the popular scientific knowledge younger men

acquired through agriculture magazines and agricultural extension trainings enhanced the knowledge of all participants.

Plenary discussions first focused on knowledge differences but also raised awareness of threats to NFTs and the importance of sustainable harvesting practices. During the exercises and plenary meetings, younger and older women and men from all the three villages expressed that although they already knew about sustainable harvesting practices, they did not always use them. The activities and group discussions created awareness about knowledge differences and problems related to NFTs, and increased the sense of social responsibility among participants to conserve threatened and rare species and varieties. An elder Siddi woman from Kalagadde-Kanchigadde explained that, 'Now that we have learned about all the species that are under threat, it is our responsibility to conserve them by adopting sustainable harvest and use practices and by cultivating them.'

Coming together during the research activities led to inter-group interactions that broke down some of the barriers among and between the groups. Changes in inter-group relations were perceptible as women from different ethnic communities and/or caste groups interacted in closer physical proximity and with greater enthusiasm as the sequence of activities unfolded. A middle-aged Havyak woman from Kalagadde-Kanchigadde stated that, 'when all the villagers gathered, we built a good relationship among ourselves. Everybody understood about unity.' An elder woman from the Siddi community echoed this opinion: 'All men's and women's groups, younger and elder, discussed resource availability in the village. We created some unity among us.'

Five primary recommendations for improving the collective management and conservation of NFTs emerged during the plenary discussions, across the study villages and groups:

(1) Organize collective action in domesticating, cultivating and promoting sustainable harvesting practices for threatened NFTs, both in the wild and in agroforestry systems;
(2) Undertake awareness building to promote sustainable harvesting practices for species with a high market value, in particular wild nutmeg and Malabar gamboge;
(3) Initiate and promote new ways of processing, adding value and packaging mangoes, jackfruit, Indian gamboge and Malabar gamboge to improve the incomes of villagers;
(4) Acquire knowledge about different market possibilities, product options, production costs (and how to reduce them) and consumer preferences;
(5) Involve all local actors with a stake in the forest, including the FD, Village Forest Committees and conservation organizations, in the preservation of threatened NFT species.

Although detailing the outcomes of the participatory research process on forest management is beyond the scope of this paper, early indications are that some of the proposed actions were initiated within months of the knowledge mapping activities. For example, the leaders of women's groups in Salkani stated that: 'The activities have convinced us and given us the confidence to increase our production of mango pickle.' In Kalagadde-Kanchigadde, the Havyak leader of the women's group indicated that:

> For the first time in our village, women of different ethnic and caste groups decided to form a women's group called Matrabhoomi (Mothers' land) and started producing kokum [*G. indica*] juice concentrate. […] The group was formed when women from different backgrounds

> [ethnic communities] came together, learned through group discussions and got inputs from the facilitators.

An elder Siddi group member added that:

> In our village, people from different ages, genders, castes, rich and poor have gathered to discuss issues related to native fruit trees. We learned a lot. Now we have established a group and started to prepare a product. We [Siddi women] will supply the raw fruits to the new women's group as we know how to climb the tree and harvest its fruit, and other [Havyak] members will do the processing, packaging and marketing. We started to make kokum [Indian gamboge] juice and good things will come.

The knowledge-mapping process thus provided a launch pad for actions related to NFT-based livelihoods and management.

Discussion

Knowledge differences as opportunities for social learning

When participants were asked to reflect on the distribution of knowledge across groups, they were acutely aware of the knowledge differences, and recognized that different segments of their community brought distinct and specialized knowledge to the table. In Salkani and Gonsar, elder men's higher knowledge of NFT diversity and source locations were attributed to the fact that they generally collect NFTs from the forests, and in so doing, gain familiarity with NFT locations. In contrast, gender norms restricting women's mobility, particularly among the Havyaks, and prescribing heavy domestic and farm responsibilities limit women's exposure to more remote parts of the forest, where most of these NFTs are found. Moreover, the custom of patrilocality, whereby women move to their husband's village upon marriage, means that as newcomers to the villages, young (newly married) women participants have limited experience with the local landscape (cf. Jewitt 2000) – and lower relative knowledge of NFT source locations. With respect to phenology and agronomy, elder men were relatively most knowledgeable in Salkani and Gonsar, but younger men from Gonsar showed particular knowledge linked to the popular agronomic magazines they consult and to agricultural extension.

A different pattern was observed in Kalagadde-Kanchigadde, where women – especially elder women – were most knowledgeable about NFT diversity. This pattern can be attributed to the fact that women from the tribal Siddi and Poojar communities that inhabit the village are mostly landless wage labourers and thus more dependent on forest fruit collection than other participating communities. They are also less hindered by restrictive norms around mobility than their Havyak counterparts. Ethnicity also explains the higher knowledge of NFT diversity and spatiality in Gonsar, where the Khare Vokkaliga and the Shetty men who participated in the activities lead a lifestyle more thoroughly linked to the forest than groups that reside in Salkani. These differences draw attention to the intersection of gender, age and ethnicity in shaping knowledge of NFTs and to the importance of a multi-faceted approach for understanding local knowledge rather than an undifferentiated or separate focus on gender or ethnicity or caste (e.g. McDougall et al. 2013).

In all villages, elder women were most knowledgeable about NFT uses because of their roles in fruit processing and in household food preparation. In two of the three villages, younger men – who have access to motorbikes, visit markets and cities, and trade in NFTs – showed the highest relative knowledge of NFT marketing. A similar pattern has been

reported in the Eastern Himalayas (Singh et al. 2013). Participants from all groups recognized the limitations of their NFT marketing knowledge; which was indeed the least pronounced of all types of knowledge registered, especially among the women's groups. This is likely due to their home-bound domestic tasks, the remoteness of the villages from markets, and reliance on few traditional marketing channels such as farm gate sales to traders.

The fact that different groups showed high levels of knowledge for distinct activities, rather than one group dominating across all activities, helped to level the playing field and encouraged mutual appreciation among groups. This was evidenced in statements by participants, such as that of the elder Havyak man who stated that elder men also learned a lot from the other groups; confirming that social learning can foster perceptions of interdependence and appreciation among groups (Buck et al. 2001). Our results confirm that engaging with different gender, generational and ethnic groups can expand the breadth of information generated through participatory research activities (Faridah et al. 2017, this issue) and create opportunities for social learning. These may be even more significant, given knowledge differences across groups, than those produced when working within more socially homogeneous groups. As differences within ethnic groups for a given gender and age group were not thoroughly examined in this study, this issue remains to be examined in future studies.

The contact zones of participatory research

In fostering interactions among multiply positioned actors within specific contextual conditions, the participatory research process represented a contact zone that diluted and shifted certain inter-group boundaries. Grouping participants from different ethnicities according to common gender and age characteristics brought these axes of social similarity to the forefront and relegated ethnic differences to second stage. As participants entered their activity groups, the hierarchies between women or men of different ethnic groups and generations were thus attenuated – a pre-condition for social inclusion (Allport 1954) – since identity in the research context was externally defined (by researchers) along the lines of gender and age. The smaller gender- and age-specific groups helped put participants at ease; an observation also made by other researchers using participatory approaches to advance social inclusion (Faridah et al. 2017, this issue).

Nonetheless, social differences did not automatically disappear: Havyak women and men were often the ones that took up the task of drawing or writing their team's responses during the participatory exercises given their relatively higher level of comfort and skills doing so (cf. Mosse 1994) and the sense that they should be the team 'leaders'. They were also often nominated by the group to present their group's results in plenary, although facilitators encouraged Scheduled Tribe or Other Backward Class participants to co-present. Men from these groups and women from all groups showed signs of shyness at the beginning of the group activities that reflected a lack of experience participating in such activities and a discomfort with the shakeup of local social norms. Women and men from the more forest-dependent groups were also initially guarded in their responses perhaps because, despite the recognition they stood to gain by sharing their knowledge, once the knowledge was shared they would no longer remain its privileged holders (cf. Code 1991). Skilled facilitation by a research team that established good rapport with women and men from each of the different ethnic groups was key for putting participants at ease. Prior to the activity, facilitators had

also discussed with the Havyak community the importance of soliciting and listening to the perceptions of all participants. This facilitation by researchers, external to the communities, who sanctioned more equitable, collaborative relations to emerge, encouraged a relaxation of norms around social hierarchies and fostered inclusion in the 'neutral "'interstitial" space' (Lau & Scales 2016, p. 138) of the contact zone.

Adding a competitive slant during the activities further encouraged inter-mingling by challenging each group to demonstrate its knowledge of NFTs in relation to the other groups'. This fostered engagement and collaborative team work within the small groups; another pre-requisite for social integration in contact zones (Allport 1954). The strategy helped to create positive interdependence among members of the groups, confirming Allport's (1958, p. 454) hypothesis that: 'While it may help somewhat to place members of different ethnic groups side by side on a job, the gain is greater if these members regard themselves as part of a *team*.'

Framing the research activities in relation to joint forest management and sustainable forest-based livelihoods of significance for all participant groups meant that interactions grew out of common interests and 'real-life issues', encouraging inter-group cohesion (Askins & Pain 2011). While sustainable forest management is itself political, the entry point for the knowledge mapping activities was information that was considered non-threatening to reduce the risks more marginalized groups that depend on the forest may have perceived from their participation. Such risks to, and potential conflicts among participants must carefully be considered when planning interactions among differently positioned groups. In the present case, positive interactions were enhanced by emphasizing the fact that all groups had knowledge to contribute.

While contact theory (and research, more generally) has tended to adopt a binary view of 'groups', emphasizing a single aspect of social difference (Valentine 2007), our study shows the importance of considering the complex and multifaceted ways in which individuals are positioned within those groups. For instance, elder Siddi women could find some common grounds on the basis of age and gender with elder Havyak women despite ethnic differences (c.f. Agarwal 2015). This allowed them to form a women's producers group with a common goal, albeit with distinct roles played by members of different ethnicities. Our design for participatory group discussions, wherein groups were segregated according to at least two intersecting axes of social differentiation (in this case, age and gender) before coming together in joint reflection, helped to overcome such a one-dimensional perspective among both researchers and participants. Selecting appropriate dimensions of group segregation during research activities is crucial and requires insight into the community (Buck et al. 2001). In our research, we had considered grouping participants along both ethnic and gender lines but instead segregated groups according to age and gender to foster inclusion, particularly along ethnic lines. With this set-up, some axes of social difference were subdued, while others were accentuated to blur the boundaries of group identities. In the process, different ethnic groups began to 'intra-act' (Barad 2007) as group identities formed along gender and generational lines. These identities may be transient (see also Lau & Scales 2016), given the short duration of the project and the time required to engender self-sustaining intra-actions; but the women's groups alluded to above are still active in 2016. A parallel shift was initiated at the larger group level, where interactions across gender and age groups led to a sense of mutual appreciation and unity, anchored in both shared and distinct NFT experiences and knowledge.

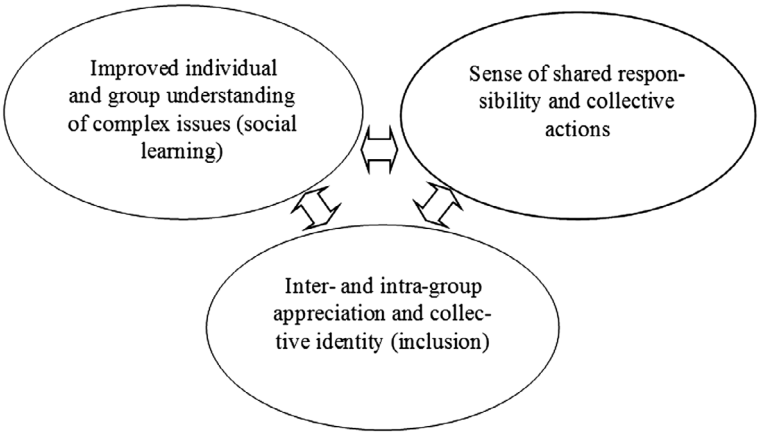

Figure 5. Mutually reinforcing processes driven by socially inclusive participatory research.

From social learning and 'intra-actions' to socially inclusive joint forest management

Buck et al. (2001, p. 12) have shown that 'Participatory research can stimulate social learning by bringing different groups together through a conscious and deliberate cycle of inquiring, observing, reflecting, planning and acting.' Our study demonstrates that participatory research can also be strengthened when complementing it with a contact zone approach (Askins & Pain 2011). Such an approach focuses on how differentiated groups can learn together and from each other about matters of 'real-life' relevance, and in so doing foster less discriminatory and more inclusive relations underpinned by a sense of unity. We suggest that in so doing, a socially inclusive, participatory research approach can contribute to (positive) changes in joint forest management through three processes interwoven through positive feedback loops (Figure 5).

This comes about firstly, through inter- and intra-group interactions that bring different bodies of knowledge to the fore, where participants can gain understanding about complex issues, such as those related to NFTs (Jones et al. 2014). Secondly, and related to the first, participants can develop an appreciation for the knowledge held by different social groups – and for those groups themselves (Faridah et al. 2017, this issue) by engaging in inter and intra-group interactions, identifying common concerns that foment community cohesion (Hellin et al. 2008). Thirdly, together these processes can inspire local change by motivating a shared sense of social responsibility and collective action (Jones et al. 2014). In our study, this sense of collective responsibility transgressed gender, age and ethnic divides and motivated self-directed reflection on activities to enhance forest-based livelihoods and conservation. Although we do not suggest that this process is necessarily rapid or linear (Askins & Pain 2011), learning, appreciation and a sense of collective responsibility were observed within a relatively short time frame, signalling positive prospects for more socially inclusive initiatives.[4]

Conclusion

The participatory research process initiated in three multi-ethnic villages was explicitly designed to support social inclusion in joint forest management. The research set-up brought villagers of different ethnic backgrounds together in gender- and age-segregated groups that then interacted to discuss the groups' specific and overlapping sets of knowledge of NFTs. Knowledge levels for NFT species diversity, spatiality, phenology, agronomy, use and marketing varied across groups, with each group having its own area of expertise. Participants expressed that bringing differentiated sets of knowledge together increased the knowledge held individually and collectively, ensured that different perspectives could be recognized and valued, and provided a more comprehensive picture of the breadth of local knowledge on NFTs.

In the contact zones of participatory research, socially differentiated groups were brought together in unconventional ways. Juxtaposing and iterating between segregated groups and collective work across multiple, intersecting axes of social difference blurred group boundaries and fostered inter-group cohesion. Finally, the participatory and socially inclusive research approach based on knowledge sharing across social differences initiated a sense of shared responsibility and collective actions that can lead to more sustainable collective forest management. Through the interrelated processes of social learning, inter-group appreciation, and collective awareness and action, more socially inclusive initiatives can emerge in the multiple contact zones of such a participatory research design.

Notes

1. Governance here refers to the formal and informal institutions including rules, norms, principles and decision-making procedures related to how forests should be used and managed, as well as their implementation.
2. Other Backward Classes, Scheduled Castes and Scheduled Tribes (in reference to indigenous peoples) are official designations in the Constitution of the Indian Republic for some of the country's most marginalized groups.
3. We do not suggest that this knowledge represents the sum of all knowledge in the villages since participants represent only a subset of village residents. However, we take the sum of the knowledge from these participant groups as the total amount of knowledge participants could draw from during the social learning moments created by the project.
4. Measham (2013) makes a distinction between the collective change in awareness and understanding that can occur through social learning processes, and the capacities to act upon the problem at hand (e.g. unsustainable forest management). The former can develop relatively quickly, whereas the latter may take more time.

Acknowledgements

We thank Laura Snook, Bhuwon Sthapit, Maninder Kaur, Vasudeva Ramesh and Choo Kwong Yan for their help at various stages of the research process. We gratefully acknowledge Maria Fernandez, Alessandra Grosse, Riina Jalonen and two anonymous reviewers for valuable inputs on the manuscript. Last but not least, we thank all the women and men from Kalagadde-Kanchigadde, Salkani and Gonsar villages who actively participated in the research process.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This study was made possible through a fellowship from Bioversity International's Gender Research Fellowship Programme. Funding was provided by the CGIAR Research Program on Forests, Trees and Agroforestry and the CGIAR Fund Donors. The study was part of the larger project "Conservation and Sustainable Use of Cultivated and Wild Tropical Fruit Diversity: Promoting Sustainable Livelihoods, Food Security and Ecosystem Services", which was funded by UNEP and GEF and regionally implemented by Bioversity International and the Indian Council of Agricultural Research in collaboration with local research partner, LIFE Sirsi.

References

Agarwal B. 2001. Participatory exclusions, community forestry, and gender: an analysis for south Asia and a conceptual framework. World Dev. 29:1623–1648.

Agarwal B. 2015. The power of numbers in gender dynamics: illustrations from community forestry groups. J Peas Stud. 42:1–20.

Agriculture University Dharwad, Agriculture University Bangalore, Horticulture Department Bangalore, Indian Institute of Horticulture Research. 2014. Totagarike belegala sudharita besaya kramagalu [Improved cultivation practices for horticulture crops]. Kasargod: Central Plantation Crops Research Institute.

Allport GW. 1954. The nature of prejudice. New York (NY): Perseus Books.

Allport GW. 1958. The Nature of prejudice (abridged). Garden City (NY): Doubleday.

Askins K, Pain R. 2011. Contact zones: participation, materiality, and the messiness of interaction. Env Plann D: Soc Space. 29:808–821.

Barad K. 2007. Meeting the Universe Halfway. London: Duke University Press.

Blomley T, Pfliegner K, Isango J, Zahabu E, Ahrends A, Burgess N. 2008. Seeing the wood for the trees: an assessment of the impact of participatory forest management on forest condition in Tanzania. Oryx. 42:380–391.

Buck LE, Wollenberg E, Edmunds D. 2001. Social learning in the collaborative management of community forests: lessons from the field. In: Wollenberg E, Edmunds D, Buck L, Fox J, Brodt S, editors. Social learning in community forests. CIFOR and East West Centre: Bogor; p. 1–20.

Chevalier JM, Buckles DJ. 2008. SAS2 social analysis systems: a guide to collaborative inquiry and social engagement. Ottawa: International Development Research Centre.

Code L. 1991. What can she know? Feminist theory and the construction knowledge. Ithaca (NY): Cornell University Press.

Cornwall A. 2003. Whose voices? Whose choices? Reflections on gender and participatory development. World Dev. 31:1325–1342.

De Boef WS, Thijssen MH. 2007. Participatory tools working with crops, varieties and seeds. A guide for professionals applying participatory approaches in agrobiodiversity management, crop improvement and seed sector development. Wageningen: Wageningen UR Centre for Development Innovation.

Dovidio JF, Gaertner SL, Kawakami K. 2003. Intergroup contact: the past, present, and the future. Group Processes Interg. 6:5–21.

Egunyu F, Reed MG. 2015. Social learning by whom? Assessing gendered opportunities for participation and social learning in collaborative forest governance. Ecol Soc. 20:44.

Faridah AM, Elias M, Lamers H, Shariah O, Brooke P, Mohd HH. 2017. Evaluating the usefulness and ease of use of participatory research tools for sustainable forest management and livelihoods in Sarawak, Malaysia. Forests, Trees and Livelihoods

Government of India. 2016. Ministry of Social Justice and Empowerment. Department of Social Justice and Empowerment. [cited Jul 20]. Available from: http://socialjustice.nic.in/Home
Hellin J, Bellon MR, Badstue L, Dixon J, La Rovere R. 2008. Increasing the impacts of participatory research. Exp Agric. 44:81–95.
Jewitt S. 2000. Unequal knowledges in Jharkhand, India: de-romanticizing women's agroecological expertise. Dev Change. 31:961–985.
Jones K, Glenna LL, Weltzien E. 2014. Assessing participatory process and out comes in agriculture research for development from participants perspectives. J Rural Stud. 35:91–100.
Lau JD, Scales IR. 2016. Identity, subjectivity and natural resource use: how ethnicity, gender and class intersect to influence mangrove oyster harvesting in The Gambia. Geoforum. 69:136–146.
Maarleveld M, Dangbégnon C. 1999. Managing natural resources: a social learning perspective. Agr Hum Values. 16:267–280.
McDougall C, Jiggins J, Pandit BH, Rana S, Leeuwis C. 2013. Does adaptive collaborative forest governance affect poverty? Participatory action research in Nepal's community forests. Soc Nat Res. 30:569–585.
McDougall C, Ojha H, Banjade M, Pandit BH, Bhattarai T, Maharjan M, Rana S. 2008. Forests of learning: experiences from research on an adaptive collaborative approach to community forestry in Nepal. Bogor, Indonesia: CIFOR.
Measham TG. 2013. How long does social learning take? Insights from a longitudinal case study. Soc Nat Res. 26:1468–1477.
Mosse D. 1994. Authority, gender and knowledge: theoretical reflections on the practice of participatory rural appraisal. Dev Change. 25:497–526.
Myers N, Mittermeier RA, Mittermeier CG, da Fonseca GA, Kent J. 2000. Biodiversity hotspots for conservation priorities. Nature. 403:853–858.
Pratt ML.1992. Imperial eyes: travel writing and transculturation. London: Routledge.
Reed MS, Evely AC, Cundill G, Fazey I, Glass J, Laing A, Newig J, Parrish B, Prell C, Raymond C, Stringer LC. 2010. What is social learning? Ecol Soc. 15:r1.
Röling NG, Jiggins J. 1998. The ecological knowledge system. In: Röling NG, Wagemakers MAE, editors. Facilitating sustainable agriculture. Cambridge: Cambridge University Press; p. 281–301.
Singh RK, Rallen O, Padung E. 2013. Elderly Adi women of Arunachal Pradesh: 'living encyclopedias' and cultural refugia in biodiverity conservation of the Eastern Himalaya. India Env Manage. 52:712–735.
Sthapit BR, Rana RB, Subedi A, Gyawali S, Bajracharya J, Chaudhary P, Joshi BK, Sthapit S, Joshi KD, Upadhyay MP. 2006. Participatory four cell analysis (FCA) for local crop diversity. In: Sthapit BR, Shestra PK, Upadhyay MP, editors. Good practices: on-farm management of agricultural biodiversity in Nepal. Nepal: NARC/Li-BIRD/IPGRI/IDRC.
Torre ME, Fine M, Alexander N, Billups AB, Blanding Y, Genao E, Marboe E, Salah T, Urdang K. 2008. Participatory action research in the contact zone. In: Cammarota J, Fine M, editors. Revolutionizing education youth participatory action research in motion. New York (NY): Routledge; p. 23–44.
Valentine G. 2007. Theorizing and researching intersectionality: a challenge for feminist geography. Prof Geogr. 59:10–21.