

# **Agricultural transformation and indigenous communities**

## **A case study of the Soliga Communities in the montane forests, Southern India**

Dissertation

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## **DECLARATION**

I declare that this dissertation is a presentation of my original research work and contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Wherever contributions of others are involved, every effort is made to indicate this clearly, with due reference to the literature.

The work was done under the guidance of Professor [Prof (emer.). Dr. Eckart Ehlers], at the University of Bonn, Germany.

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## **Abstract (in German)**

Die ländlichen, indigenen Gemeinschaften (Adivasi) gehören zu den am meisten benachteiligten und ärmsten Bevölkerungsgruppen in Indien. Ihr sozio-ökonomischer und kultureller Zustand unterliegt einem schnellen Wandel. Die Einführung der kommerziellen Landwirtschaft sowie die Ausweisung von Schutzgebieten (Protected Areas, PAs) in den Wäldern welche traditionell von indigenen Gemeinschaften genutzt werden, sind wichtige Triebkräfte der Veränderung. Die entwicklungsorientierte Arbeit von Nichtregierungsorganisationen (NGOs), die Einführung von Schulbildung und der Auf- und Ausbau der technischen Infrastruktur (zum Beispiel Straßen) sind ebensolche Faktoren.

Der landwirtschaftliche Wandel hat massiven Einfluss auf die sozio-ökonomische und kulturelle Situation von indigenen Gemeinschaften, vor allem in den bislang noch weitgehend autonom lebenden indigenen Gruppen in den Bergregenwäldern Süd-Indiens. In den meisten Fällen findet ein Wandel von extensiver Subsistenzwirtschaft und agroforstwirtschaftlichen Tätigkeiten hin zur kommerziellen Landwirtschaft statt. Der Wandel geht mit dem Verlust traditioneller Kenntnisse einher, welche durch „modernes“, wissenschaftlich fundiertes Wissen über landwirtschaftliche Praktiken ersetzt werden.

Die vorliegende Forschungsarbeit konzentriert sich auf die Frage wie sich der landwirtschaftliche Wandel und die Ausweisung von Naturschutzgebieten in den Bergregenwäldern Süd-Indiens auf die Landnutzung und den Lebensunterhalt der dort lebenden indigenen Soliga -Gemeinschaften auswirkt. Als Fallbeispiele dienen das Male Mahadeshwara-Wildschutzgebiet im Bundesstaat Karnataka und das Sathyamangalam-Wildschutzgebiet im Bundesstaat Tamil Nadu.

Hierbei wurde ein vielschichtiger methodischer Ansatz gewählt. In einer Vorstudie im Februar/März 2013 wurden die beiden Fallbeispiele ausgewählt und erste Informationen vor Ort gesammelt, um den Forschungsansatz einzugrenzen. Es wurden Menschen aus den Soliga- und Lingayat-Gemeinschaften, ihre Dorfältesten, Angestellte der staatlichen Forstbehörden und Vertreter von NGOs, die in den Gebieten aktiv sind, befragt. In der Hauptphase der Feldforschung (Juni 2013 bis Februar 2014) in Indien wurde ein dreistufiger Ansatz genutzt. Zuerst wurde eine Literaturanalyse durchgeführt, um daraus einen geschlechterspezifischen, geeigneten und angepassten analytischen Ansatz zu entwickeln, womit das lokale Wissen über die Bewirtschaftung der landwirtschaftlichen Flächen beurteilt werden konnte. Im nächsten Schritt wurde eine GIS-basierte Kartierung durchgeführt, um die Flächennutzung und Bodenbedeckung der letzten 10 Jahre in den Forschungsgebieten zu erfassen. Anschließend wurden qualitative, partizipative Bewertungsansätze wie teilstrukturierte Haushaltsbefragungen, mündliche Überlieferungen und teilnehmende Beobachtung genutzt, um detaillierte Primärdaten und Informationen zu vergangenen und derzeitigen Bedingungen, Aktivitäten und Maßnahmen zu erhalten.

Die Ergebnisse dieser Forschung wurden verwendet, um die Prozesse des landwirtschaftlichen Wandels und die Antriebskräfte der Landnutzungsänderungen der indigenen Gemeinschaften in diesem Teil Indiens zu verstehen und Empfehlungen für eine nachhaltige Flächennutzungspolitik

und deren Umsetzung zu geben, welche die Bedürfnisse und Anliegen der Gemeinschaften besser widerspiegeln. Die vergleichende Studie wurde angefertigt, um die positiven und negativen Folgen verschiedener politischer Regelungen in beiden Bundesstaaten in Bezug auf die Rechte indigener Völker zur Nutzung von Waldflächen für den Ackerbau aufzuzeigen. Die Wahrnehmung beider staatlicher, politischer Regelungen durch die Menschen vor Ort wurde dazu genutzt, die Vor- und Nachteile der Regelungen zu erfassen, sowie die Wirksamkeit von Wildschutzgebieten für den Natur- und Umweltschutz zu bewerten.

### **Abstract (in English)**

Rural indigenous communities (Adivasi) represent some of the most marginalized and poorest people in India. Their socio-economic and cultural livelihoods are subject to rapid change. Introduction of commercial agriculture and new cash crops as well as the establishment of Protected Areas (PAs) in the forests that are traditionally used by indigenous communities are important drivers for change. The development-oriented work of NGOs, the introduction of formal education and the establishment of new infrastructure (e.g. roads) are other factors in this regard.

Agricultural transformation impacts massively on the socio-economic as well as cultural conditions of the indigenous communities, especially on those living in remote montane forest areas. In most cases, the transition goes from low input low output subsistence farming and agro-forestry practices to commercial farming. The transformation goes together with a shift from, and loss of, traditional knowledge systems towards induced agricultural practices based on modern science-based knowledge.

The main objective of this study was to understand how agricultural transformation and designation of Protected Areas impact on the land uses and livelihoods of the Soliga communities living in and around the Male Mahadeshwara Wildlife Sanctuary, in the Karnataka State, and the Sathyamangalam Wildlife Sanctuary, in Tamil Nadu State.

This research applied a multi-faceted methodological approach. A pre-study has been conducted in February/March 2013 to select the case studies and to collect first hand local information that allowed the scholar to narrow down the research approach. The Soliga communities, their village heads, State Forest Department officials and NGO representatives in the areas have been interviewed. A three-tier methodology has been carried out during the main field research period in India (June 2013 until February 2014). Firstly, a literature review has been used for developing a suitable, place-case specific, and gender-sensitive analytical framework for assessing local knowledge of agricultural management. Secondly, GIS mapping has been resorted to map land use and land cover of the study areas for the past 10 years and finally qualitative participatory appraisals have been used to derive narratives of the past and existing situations using semi-structured interviews, oral histories and participant observations.

The outcome of the research helps to understand the underlying agricultural transformation processes and the drivers of land use changes of the indigenous communities in this part of India and to recommend for sustainable land use policies and its implementation that better reflects the needs and concerns of the indigenous communities. The comparative study was done to bring out the positive and negative practical outcomes of the various policies adopted by the two different states with regard to tribal rights of use of forest land for crop cultivation. The pros and cons of both the state policies have been recorded according to the local people's perceptions and used to evaluate the functioning of the Wildlife Sanctuaries with regard to environmental protection and conservation.



## Abbreviations and Acronyms

ATREE-	Ashoka Trust for Research in Ecology and the Environment
CF-	Community Forestry
CIA-	Central Intelligence Agency
CPR-	Common Property Resource
DAP-	Diammonium phosphate
DFID-	Department for International Development
FAO-	Food and Agriculture Organization of the United Nations
FGD-	Focus Group Discussion
GDP-	Gross Domestic Product
IDS-	Institute of Development Studies
IFAD-	International Fund for Agricultural Development
LAMP-	Large Area Multipurpose Cooperative Society
MFP-	Minor Forest Produce
M. M. Hills-	Male Mahadeshwara Hills
MYRADA-	Mysore Resettlement and Development Agency
NABARD-	National Bank for Agriculture and Rural Development
NGO-	Non-Governmental Organization
NTFP-	Non-Timber Forest Product
PA-	Protected Area
PHC-	Primary Health Centre
PWD-	Public Works Department
SAS-	Soliga Abhivruddhi Sangha
SHG-	Self Help Groups
SLA-	Sustainable Livelihood Approach
SLF-	Sustainable Livelihood Framework
STF-	Special Task Force
UK-	United Kingdom
UNDP-	United Nations Development Programme
UNESCO-	United Nations Educational, Scientific and Cultural Organization
VFC-	Village Forest Council

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## References

## **1. Introduction**

### **1.1 Background**

The livelihoods of 200 to 300 million people in South and South-East Asia directly depend on forests, often in hilly and remote rural areas. Many of these people belong to indigenous ethnical groups. Value-laden terms refer to them as 'hill tribes' in Thailand, 'minority nationalities' in PR China, 'cultural minorities' in the Philippines, 'isolated and alien people' in Indonesia, 'aboriginal tribes' in Taiwan, 'aborigines' of Peninsular Malaysia, adivasi or 'scheduled tribes' in India (Colchester, 1992 cited from Pimbert and Pretty, 1995).

In India the rural indigenous communities represent some of the most marginalized and poorest people in the country. However, their socio-economic and cultural livelihood conditions are subject to rapid change (Mukhija and Goyal, 2005). The introduction of commercial agriculture and new cash crops (such as coffee), as well as the establishment of Protected Areas (PAs) on lands that are traditionally used by indigenous communities are important drivers for change. The development-oriented work of NGO, the introduction of formal education and the establishment of new technical infrastructure (e.g. roads) are other factors in this regard (Mukhija and Goyal, 2005).

In the last decades, a large number of Protected Areas (PAs) were established throughout the world to promote the conservation of forest ecosystems and more sustainable use of forest resources. In India, the two main PA categories are National Parks and Wildlife Sanctuaries. The former primarily aim on ecosystem conservation while the latter aim more on sustainable use of its resources (Sawhney, 2003). The first National Park in India, Hailey National Park, was established in 1936. It is now known as Jim Corbett National Park in the state of Uttar Pradesh. As of April 2012, there were 104 National Parks in India encompassing a total area of 38024.11 square kilometers - which is 1.2% of the total land area of India. Concurrently in 2012, there are 514 Wildlife Sanctuaries out of which 40 are Tiger Reserves. The total area of Wildlife Sanctuaries is 155980.15 square kilometers. The Tiger Reserves have been established as part of the National Indian Project Tiger. Around 166 national parks have been authorized till date and the remaining parks are underway to be established soon (Data Portal India, 2012; Sawhney, 2003).

Around 23% of India's total land area is under forests (World Bank, 2015). The three main forest and wildlife related protection acts in India are the Indian Forest Act of 1927, the Wildlife Protection Act of 1972 and the Forest Conservation Act of 1980. Under the auspices of the Indian Forest Act, many forests in India were categorized as reserved or protected forests. In reserved forests all anthropogenic activities are formally permitted while in protected forests only sustainable use of forests resources by local communities can be allowed. In the year 1973, the 'Project Tiger' was established with the aim to protect the last tigers in India in their natural habitats. Ever since, Tiger Reserves were established within and around National Parks and Wildlife Sanctuaries. The core zones of the Tiger Reserves are completely restricted from human access and activities while the buffer regions are permitted to be sustainably used by local people unless forbidden to carry out activities like agriculture or livestock grazing (Gogi, 2000; Sawhney, 2003).

India's total population is 1.2 billion out of which around 360 million people live in and around forested areas. Out of this 360 million an estimated 84 million can be defined as indigenous

communities. The Indian government labels these communities as ethnically “scheduled tribes” (Mukhija and Goyal, 2005; Agrawal, 2009). Most indigenous communities living in remote forested areas are socio-economically, politically and culturally marginalized and subject to social injustice and exploitation (Agrawal, 2009). Their livelihoods are often characterized by poverty, illiteracy, lack of primary health care facilities, and malnutrition (Ministry of Home Affairs, 1991; Agrawal, 2009; Ministry of Tribal Affairs, 2012).

Agricultural transformation massively impacts on the socio-economic as well as cultural conditions of rural indigenous communities in India. In most cases the transition goes from low input-low output subsistence farming and agro forestry practices to higher input commercial farming. The transformation goes along with a shift from and loss of traditional knowledge systems towards introduced agricultural practices based on “modern” science-based knowledge (Gamborg et al, 2012).

The role of traditional knowledge in agriculture, forestry and related transformation processes is widely recognized by researchers nowadays. Traditional knowledge “*has the potential to improve conservation and development efforts [...]. The marriage of traditional and scientific knowledge is potentially the most potent combination for both environmental and human well-being.*” (Colfer et al. 2005, p. 180, cited from Gamborg et al, 2012). The integration of forest related traditional knowledge along with “modern” scientific knowledge is already often aimed at in so-called joint and participatory forest management systems. However, practice showed manifold constraints to this approach, such as problems to access forest-related traditional knowledge efficiently and effectively and insufficient communication between traditional knowledge holders and its potential future users (UNU-TKI, 2013).

## **1.2 Problem Statement and Objectives of the Study**

### **1.2.1 Problem Statement**

India only accounts for 2.4% of the world’s geographical area and 4% of the total water resources, however, it accounts for 17% of the world’s population and 15% of the world’s livestock (Department of Agriculture, 2013). Despite rapid urbanization in the last decades, out of India’s total population of 1210.2 million people, still 833.1 million are living in rural areas. Between 2001 and 2011, India’s rural population has increased by 90.47 million (Census of India, 2011). Agriculture and its allied sectors<sup>1</sup> is the major livelihood provider for people living in rural India (National Portal of India, 2014). About 50% of the Indian work-force are working in the agricultural sector (National Portal of India, 2014). However, agriculture contributes ‘only’ 17.4% to the countries’ GDP and ‘only’ 8% to its exports (Department of Agriculture, 2013; CIA World Fact Book, 2014). In 2011-12 the GDP growth rate was 3.6% while in 2012-13 the GDP growth rate was 1.8% (Department of Agriculture, 2013). Similar to other developing countries, the agricultural sector in India is in a state of transition from less intensive more subsistence based smallholder agriculture to a more intensive commercial larger scale practices, spurred by a large number of internal and external factors (Department of Agriculture, 2013).

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<sup>1</sup> Agriculture in this case is defined as “The science or practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool, and other products” (Crops Farming Review, 2014). In this study the allied sectors include horticulture and agro-forestry.

About 70% of the population in India depend on incomes from rural areas (Ministry of Home Affairs, 2011). However, millions of people in rural India are underemployed and unemployed, particularly the younger generation. Most agriculture in India is rain-fed. Unpredictability of rainfall, aggravated through climate change, perils yields and productivity and affects particularly the income of the smallholder, perpetuating poverty traps. Lack of access to bank loans is another structural problem that hinders socio-economic and technological change for the betterment of agricultural productivity and livelihoods in rural India (Department of Agriculture, 2013).

Most of the agricultural land holdings in India are small holdings. The average small and marginal land holding size in the country is less than two hectares according to the Agricultural Census 2011-2012. It accounts for 85% of the total operational land holdings and 44% of the total operated area (Department of Agriculture, 2013). The traditional inheritance law foresees the distribution of land holdings amongst all male and female children and hence further increases the fragmentation of land holding size. Most small holdings, however, are not cost-efficient and do not fall under the 'economy-of-scale' rule (Department of Agriculture, 2013).

India's population growth had a decadal growth rate of 17.64% in 2001-2011 (Census of India, 2011). In rural areas the growth rate was 12.18% and in urban areas it was 30.80% (Census of India, 2011). Growing population increases the pressure on land. Land is the main agricultural production factor. The lack of secure land ownership is a constant source of poverty and conflict.

As mentioned before 23% of India's total land area is under forests (World Bank, 2015). In India where there is a high concentration of forest areas there is also a high concentration of indigenous people. It is estimated that around 300 million people depend on forest resources for economic sustenance and social and cultural way of life. In many rural areas in India, people depend on forests and trees for alternative livelihood when there are inadequate returns from agriculture. The depletion and degradation of forest resources leads to poverty traps (Biswas, 2003). Traditional land use practices included agroforestry and slash and burn methods to clear forest land for temporary agricultural use (Walker, 2012). In combination with population growth and socio-economic and technological change this eventually lead to forest destruction and environmental degradation. At current, the forests in India are being destroyed at a rate of one million hectare per year since 1970s, mainly due to the expansion of agriculture (Biswas, 2003). Large scale agricultural investments augment the pressure on available land resources for other uses (Walker, 2012).

Protected Areas (PAs) are a land use planning instrument – or rather a bundle of instruments - used for the in-situ conservation of species and ecosystems on the basis of defined geographical spaces. PAs have been promoted and used as strategies to enable countries to protect species in situ in their representative ecosystems. PAs generally aim to change land use systems by re-negotiating and re-constructing man-nature interaction on a clearly defined area of land. Several studies conclude that PAs can be effective in preventing losses of species and ecosystems, predominantly those caused by expansion of agricultural expansion and overutilization of resources (Bruner et al., 2001; Brockington & Schmidt-Soltau, 2004; SCBD, 2010). However, PAs also often lead to conflicts that arise due to varying interests of different stakeholders, such as groups of indigenous communities, NGOs and governmental bodies (Sawhney, 2003).



Although there are many strategies of nature conservation, PAs constitute a chief strategic role for land use planning in many countries, also in India. The PA model is a very distinct form of conservation strategy which sets territorial boundaries on the areas to be protected and restricts human access and use (Persha et al, 2010). Conservationists across the globe appreciate PAs as a strict regime for the protection and conservation of biological and natural resources. In doing so they fail to see the potential of other institutional based resource governance which will channelize the human induced deforestation and human encroachment. It will also reduce the social costs generated due to these strict regimes and borne by the rural poor in those areas (Persha et al, 2010). PAs do stand isolated from the socio-ecological systems they govern. There are many forms of PAs. Integrated PA systems, such as UNESCO Biosphere Reserves, try to reconcile biological and cultural diversity and socio-economic development through participative concepts and people-nature partnerships.

Many forests areas in India are inhabited by indigenous communities. The government has introduced policies and programs to improve their situation, however, with limited success (Walker, 2012). Indigenous communities living in forested areas do not only use forests as a source for resources for their sustenance and livelihood. Forests are also the basis of their identity, culture, traditional knowledge systems and social organization. Indigenous communities apply a combination of multiple land-use systems such as agriculture, agro-forestry, forestry, and pasture. However, many indigenous communities are at the lower end of the social and economic order in India and do not have political decision-making power nor control over the land they use, particularly the forested areas. Most forests are under control of local governments and the lack of secure and proper land tenure rights makes it difficult for indigenous communities to adapt sustainable land management and livelihood systems (McLean, 2012).

The Indian forestry sector is mainly dominated by three actors groups, namely governmental forest agencies, forestry schools and forest industries. The governmental forest agencies play a key role in developing policies and rules and regulations for the use, management and conservation of forest land and forest resources. The forestry school has given a steady stream of forest professionals to the government agencies and forest industries. Forest industries generate income opportunities, capital and products in applied forestry and the timber logging and processing sector. NGOs and environmental groups are relative new players in the forestry sector. They are increasingly critical in the formulation of new policies and regulations while advocating societal needs. However, the relationships between NGOs, environmental groups, governmental forest agencies and forest industries are complicated based on different interests, needs and views involved (Korten, 1992).

Upon this backdrop, the present study attempts to explore the socio-economic agricultural transformation pattern and related land use changes in two rural indigenous communities, and to identify the underlying reasons behind. The study uses the example of the Soliga communities living in and around the M. M. Hills and Sathyamangalam protected forest areas in Karnataka and Tamil Nadu, South India.

### **1.2.2 Objectives**

The study examines the livelihood strategies of the Soliga people and the transformation in agricultural crops over the past years. The study also aims at identifying the impacts and underlying tensions among the indigenous communities living in newly established protected areas and the state authorities and NGOs. Given the above shown socio-economic and ecologic problem scenario, the objectives of this study are as follows.

- **Scientific Objectives**

To scientifically examine the impact of agricultural transition and PA approaches on land use and socio-economic dynamics of Soliga communities in selected case studies in Karnataka and Tamil Nadu. The study also identifies the

- **Societal Objectives**

To understand the livelihood strategies of the Soliga communities living in and around the protected areas in Karnataka and Tamil Nadu. To contribute to better livelihoods and income generation of the Soliga communities and a more sustainable use of forest resources.

- **Personal Objectives**

To enable me to better understand the socio-economic and cultural background of the Soligas and their livelihood dynamics.

Chapter two discusses the theoretical framework and research questions used as a basis for this research study.

## 2. Conceptual Framework

### 2.1 Sustainable Livelihood Framework

This study applies the Sustainable Livelihood Framework (SLF)<sup>2</sup> in order to analyze the interdependencies between land use change, agricultural transformation and livelihoods of Soliga communities in two selected areas in Southern India.

The concept of livelihoods is the central keystone of the SLF, and hence needs more detailed discussion here. Today, the concept of livelihoods is widely acknowledged and used across social sciences disciplines in general, and research on socio-economic development in the Global South in particular. In their Institute of Development Studies (IDS) discussion paper of 1992, Robert Chambers and Gordon Conway defined livelihoods in the way that “a livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term” (Chambers and Conway, 1992:7).

In 2001, Krantz defined livelihoods as follows: “A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base.” (Krantz, 2001:1). DFID adopted the definition of Chambers and Conway for the development of the SLF with minor changes (Krantz, 2001). Hence this study will be based on Chambers and Conway definition.

Livelihoods are shaped by a multitude of economic, political and social forces and factors. They vary between socio-economic necessities on the one hand and individual or collective choices on the other (Kabeer and Van Anh, 2000; Dolan, 2002). Livelihoods are dynamic; they are influenced by factors and forces which are constantly changing and shifting. The above definition by Krantz does not state that for a livelihood to be sustainable it has to contribute to the net benefits of other livelihoods. The SLF is not organized in a way that suggests that all livelihood analysis needs to begin with the vulnerability context which is at the starting of the SLF. The people-centered analysis of SLF simultaneously studies livelihood assets, livelihood objectives and livelihood strategies used to obtain these objectives (DFID 2000).

#### 2.1.1 Roots of the Sustainable Livelihood Framework

In the last two decades, the SLF concept has become increasingly important in the development and sustainability debate (Scoones, 1998; Scoones, 2009). Similar to other conceptual frameworks of this kind, the SLA was not framed and developed by one particular scholar or organization. It was developed, modified and adapted over time based on evolving theoretical concepts and changing work focus and practical needs of many stakeholders, as multilateral bodies, research institutes and non-governmental organizations (NGOs), most of whom were focusing on poverty mitigation measures (Solesbury, 2003).

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<sup>2</sup> The term Sustainable Livelihood Framework (SLF) and Sustainable Livelihood Approach (SLA) has been used interchangeably in this dissertation.

The basis for the SLA concept first appeared in literature in the late 1980s. The Brundtland World Commission on Environment and Development Report of 1987 put the concept of sustainable development in the agenda of political debate at global level and paved the way for what was later conceptualized as SLA (Krantz, 2001; Solesbury, 2003). The Brundtland report defined sustainability as: *“development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of ‘needs’, in particular the essential needs of the world’s poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment’s ability to meet present and future needs.”* (World Commission on Environment and Development, 1987: 43, cited from Solesbury, 2003). The Brundtland Commission Report (1987) and the Human Development Report of the United Nations Development Program (1990) focused on poor people and their needs, on the importance of citizen participation and self-reliance and the interrelated resource and ecological constraints which later characterized the SLA (Solesbury, 2003).

The SLF’s origin is widely attributed to a discussion paper by UK’s Department for International Development, University of Sussex, titled “Sustainable rural livelihoods: practical concepts for the 21st century” written by Robert Chambers and Gordon Conway in 1992 (Solesbury, 2003; Scoones, 2009). The Food Report 2000 developed for the Brundtland Commission by M. S. Swaminathan, Robert Chambers and others in 1986 in Geneva conceptualized the connection between the three terms ‘sustainable’, ‘rural’ and ‘livelihood’ by using rural poor’s realities in the Global South as a foci and by laying out a vision for more people-oriented development (Scoones, 2009).

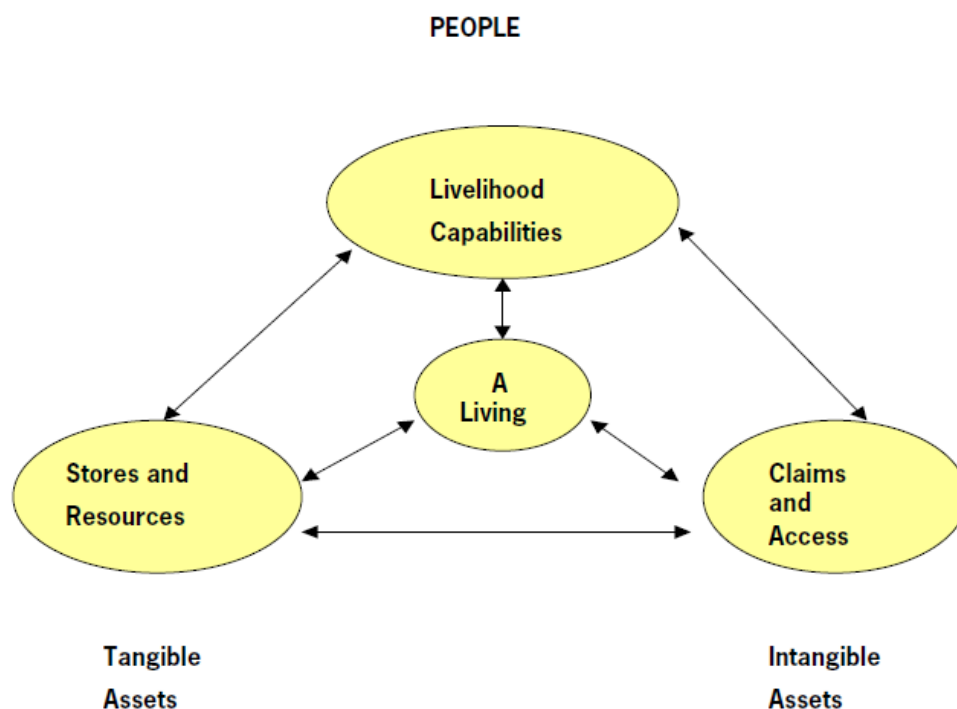


Figure 1: UNDP’s approach to promote sustainable livelihood development (Krantz, 2001:14)

In 1993, OXFAM first used the sustainable development approach to formulate its overall aims and strategies. In 1994, CARE International employed ‘household livelihood security’ shown in Figure 2 as a framework for its relief and development work. In 1995, UNDP followed it up by adopting the “Employment and Sustainable Livelihood” concept given in Figure 1 as one of the five mandates for human development developed after the World Summit for Social Development in Copenhagen in early 1995 to frame and conceptualize its programs for poverty reduction (Solesbury, 2003; Scoones, 2009). In parallel, since the 1990s UK’s Department of International Development (DFID) used SLA as a core principle for its pro-poor policy advice (Solesbury, 2003). Ever since, many research institutes and development oriented organizations around the world used the SLA as a core conceptual framework for their work on poverty mitigation concerned with human-nature interaction and socio-ecological systems (Solesbury, 2003; Scoones, 2009).

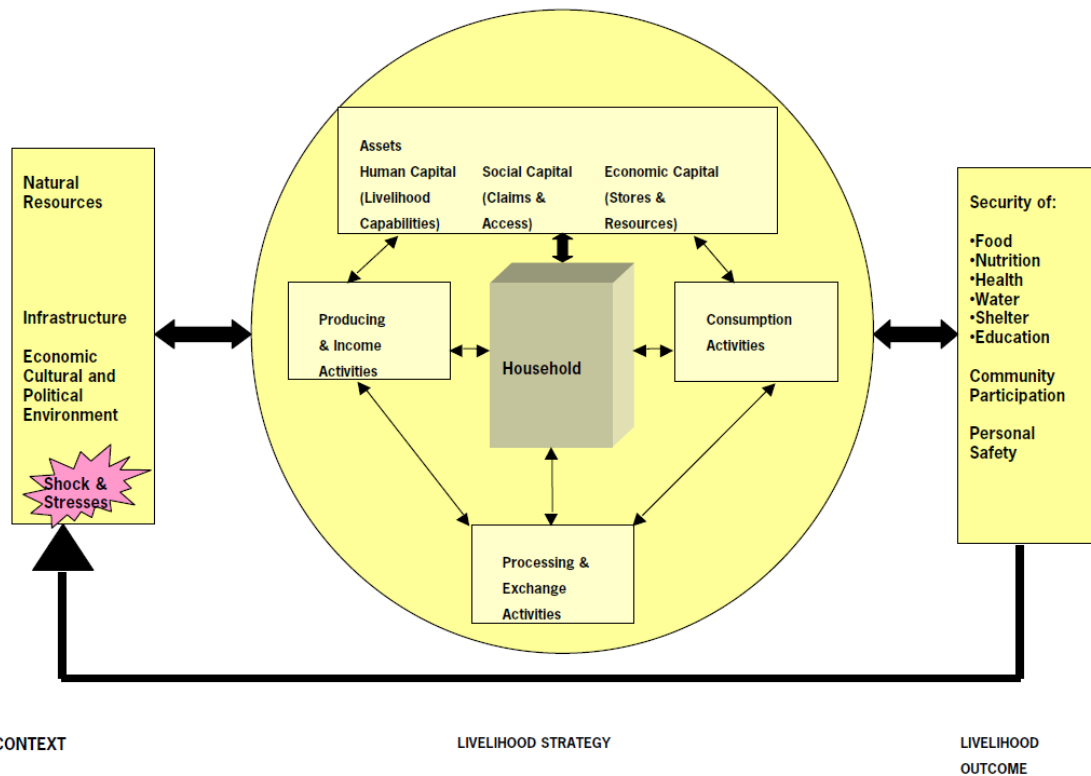


Figure 2: CARE’s Livelihood Model (Krantz, 2001:16)

### 2.1.2 Evolution of the Sustainable Livelihood Framework

In 1997, a key moment in the history of the SLA framework came with the election of a Labour Party government and the subsequent headship of Clare Short as a committed Secretary of State for International Development. Thereafter DFID developed a White Paper that introduced Sustainable Rural Livelihood as a central strategy in UK’s development policy making. The evolution of the paper was framed by several research projects in Bangladesh, Ethiopia and Mali coordinated by DFID.

Thereafter a comparative method using a diagrammatic checklist to analyse livelihood changes by integrating groups of different empirical data sets was developed by a multi-disciplinary team (Scoones, 2009). It was first introduced in 1998 as the Sustainable Rural Livelihood framework checklist (see Figure 3) in another DFID discussion paper (Scoones, 1998).

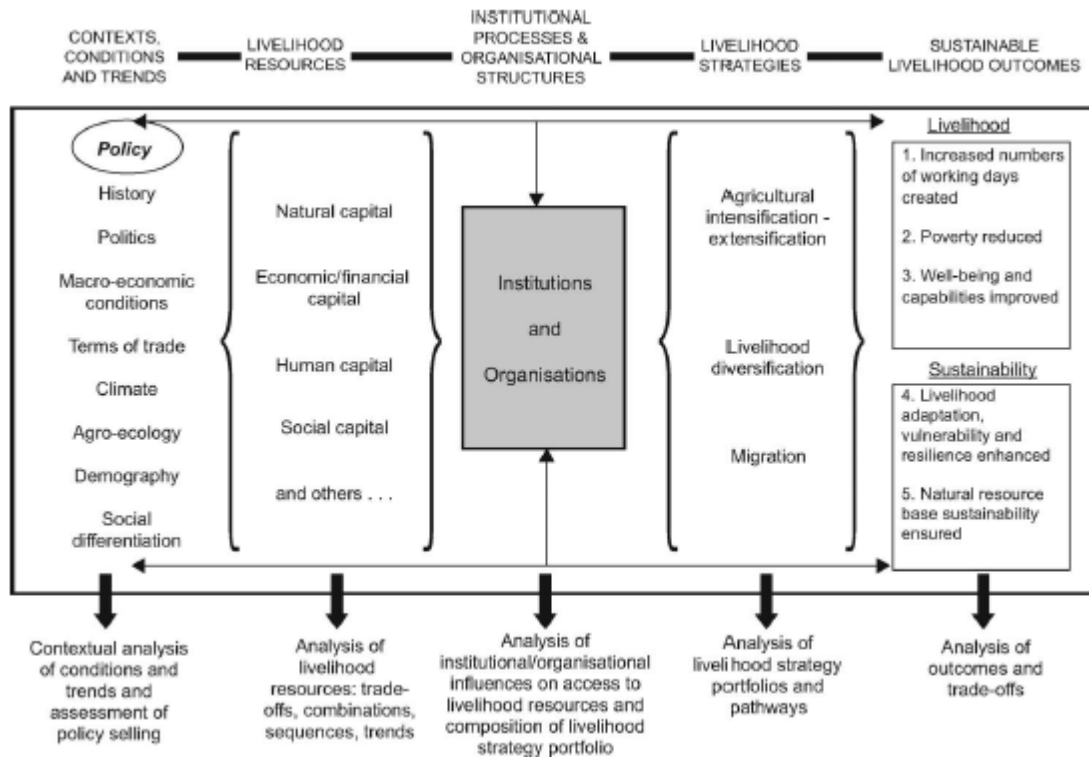


Figure 3: Sustainable Rural Livelihood framework checklist (Scoones, 1998: 4)

Figure 3 shows the Sustainable Rural Livelihood framework framed in 1998 and shows the links between the inputs, outputs and outcomes. Inputs include assets and capitals. Outputs include livelihood strategies which in turn are connected to the outcomes, namely poverty lines, employment levels, well-being and sustainability (Scoones, 2009).

The focus of the Sustainable Rural Livelihood framework checklist on capitals and assets pushed the discussion more into economic disciplines. It was important to understand how assets could be combined, substituted and switched over time for different groups of people in different settings with different portfolios. Another important step of the framework was to link the changes in the natural capital to changes in social and economic capital and to have a broader overview of the assets thus keeping the economic focus the priority in these researches. Thus the use of the 'asset pentagon' was in some cases an unfortunate diversion (Scoones, 2009).

The IDS studies focused on the institutions and organizations to arbitrate livelihood strategies and outcomes. These combine the socio-cultural and political processes which explain how and why diverse assets are linked to different strategies and outcomes. This can be used to analyse and explain the 'rules of the game', such as power relations, and to answer questions of rights, access and governance (Scoones, 2009).

The transition from a sustainable livelihood diagrammatic checklist to the SLF happened towards the end of 1998. DFID's old Department of Natural Resources was transformed into a Department of Livelihoods with its own Livelihood Support Office later. Under the leadership of Diana Carney from the Overseas Development Institute, London, UK, the Sustainable Rural Livelihoods Advisory Committee was set up, and with the involvement of other DFID experts, and staff from other international research organizations and NGOs, the Sustainable Rural Livelihood framework checklist was transformed into the SLF over a period of several months building on the earlier works of IDS amongst others (DFID, 1999a; Scoones, 2009). Figure 4 shows the SLF as framed by DFID in 1999a, which will be thereafter used to conceptualize this study.

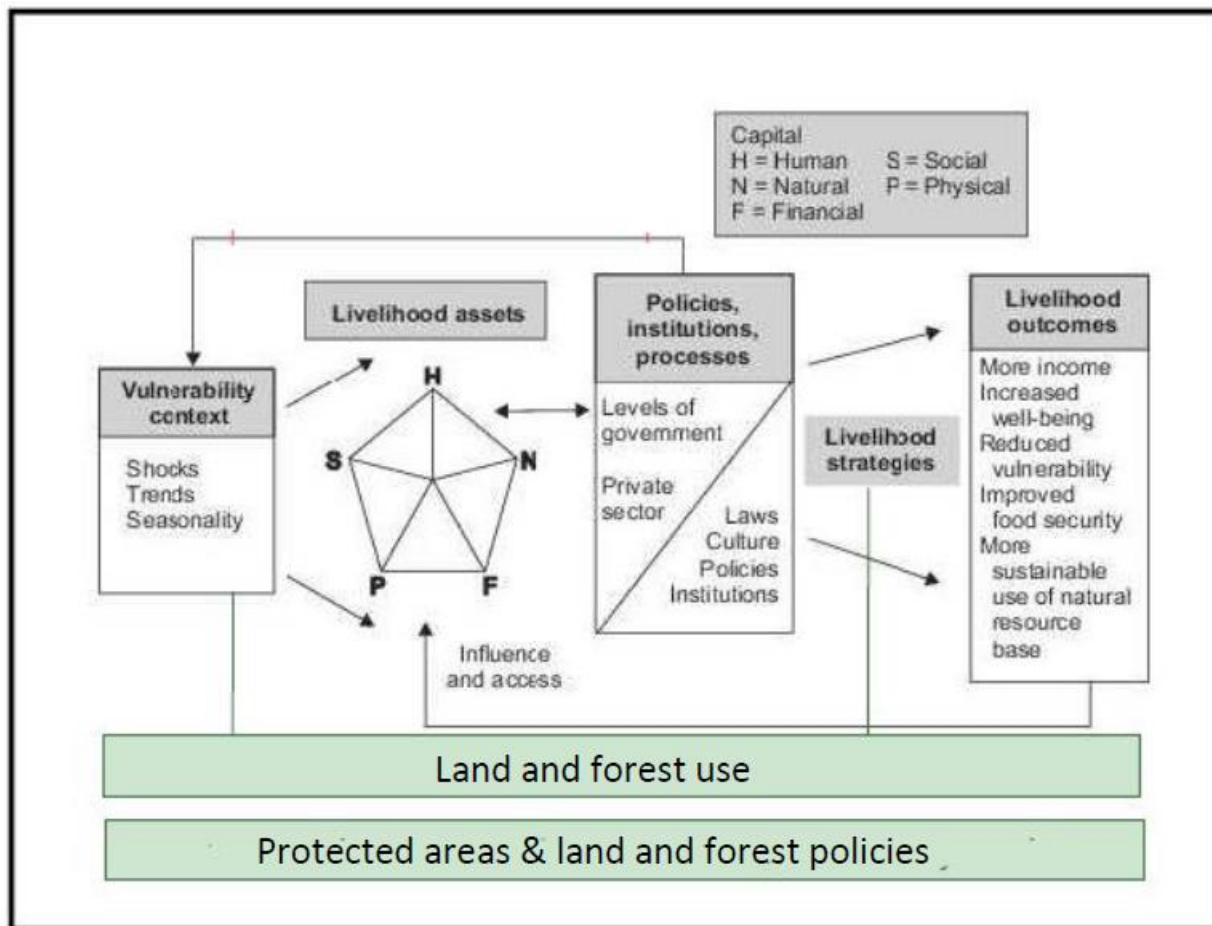


Figure 4: The Sustainable Livelihood Framework (Adopted from DFID 1999a)

### 2.1.3. The Analytical Components of the SLF

In the following, the different components of the SLF, as shown in Figure 4, will be explained in detail. These are 1) the Vulnerability Context, 2) the Five Livelihood Assets, 3) Policies, Institutions and Processes, 4) Livelihood strategies, and 5) Livelihood outcomes.

#### Vulnerability Context

The Vulnerability Context is the external environment in which people live. SLF sees people as an operating system within a vulnerability context based on their access to assets or factors leading

to poverty reduction. The existing social, institutional and organisational environment influence the livelihood strategies and livelihood outcomes of the people. The livelihoods and assets of people are affected by critical trends (population trends, resource trends including conflict, national and international economic trends, trends in governance including politics and technological trends), shocks (human health shocks, natural shocks like floods, droughts, cyclones; deaths in the family; violence or civil unrest; crop or livestock health shocks, economic shocks); and seasonality (of prices, of production, of health and of employment opportunities over which they have limited or no control over). The shocks, trends and seasonality are not susceptible to control by people in the short and medium term. The negative effects of Vulnerability Context have to be minimised by building greater resilience and providing better livelihood security options to the people as the poor people will not have saleable assets to respond to the shocks and seasonalities unlike their richer counterparts (DFID, 1999b).

The Vulnerability Context can be identified through two core considerations given by DFID 1999b, namely:

- the extent to which different groups are exposed to particular trends/shocks/seasonality; and
- the sensitivity of their livelihoods to these factors (this relates directly to resilience).

The above mentioned issues are best approached in a phased out way. First the different groups in a community prone to risk have to be identified and secondly the key problems, the nature and magnitude of expected changes, coping strategies and potential solutions have to be analysed (DFID, 1999).

### **The Five Livelihood Assets**

The SLF approach is people-centric. It aims to understand people's strengths, namely assets and endowments which people convert for getting a livelihood outcome that is perceived positive. The general belief is that no single asset is sufficient to achieve a positive livelihood outcome and hence a melange of all assets needs to be included in the analysis (DFID, 1999c). The possession of basic material and social, tangible and intangible assets determines the different livelihood strategies pursued by people. The livelihood resources form the base (in kind and/or in capital) for the construction of livelihoods from different productive streams (Scoones, 1998).

Livelihood assets differ for different households based on the accessibility to available resources. Livelihoods are affected by the diversity of assets, and the amount of assets and balance between them. Livelihood assets include human, financial, natural, physical and social capital, all conceptually illustrated in an 'asset pentagon'. The pentagon is embedded within the vulnerability context and shows the inter-relationships between the different assets. The shape of the pentagon shows the people's access to different assets diagrammatically. The mid-point of the pentagon has zero access to the assets and the outer perimeters have the maximum access to the assets available. It is important to realize that a single asset can have multiple functions. For example land which is a natural asset can also be a financial asset when apart from getting direct benefits in the form of farm produce it can also be used as a collateral to get loans (DFID, 1999c).

The pentagon can be used as a focal point to understand the trade-offs between different assets and also how they will serve the needs of different social groups. With constant change in asset



endowments the pentagon shape also keeps shifting. Two important relationships are necessary to identify the combination of different assets to generate positive livelihood outcomes and they are sequencing and substitution. According to DFID (1999c) they are defined as below:

- Sequencing: Do those who escape from poverty tend to start with a particular combination of assets? Is access to one type of asset (or a recognizable sub-set of assets) either necessary or sufficient for escape from poverty? If so, this may provide important guidance on where livelihood support should be focused, at least at the outset.
- Substitution: Can one type of capital be substituted for others? For example, can increased human capital compensate for a lack of financial capital in any given circumstance? If so, this may extend the options for support.

According to Scoones (1998) and DFID (1999c), the pentagon consists of five capitals as listed below:

- Human Capital: health, nutrition, education, knowledge and skills, capacity to work, capacity to adapt.
- Financial Capital: savings, credit or debt (formal, informal, NGOs), remittances, pensions, wages.
- Natural Capital: land and produce, water and aquatic resources, trees and forest products, wildlife, wild foods and fibres, biodiversity, environmental services.
- Physical Capital: infrastructure (transport (roads, vehicles, etc.), secure shelter and buildings, water supply and sanitation, energy, communications); tools and technology (tools and equipment for production, seed, fertiliser, pesticides, traditional technology)
- Social Capital: networks and connections (patronage, neighbourhoods, kinship), relations of trust and mutual support, formal and informal groups, common rules and sanctions, collective representation, mechanisms for participation in decision-making, leadership.

The five capitals are briefly described in the following:

Human capital is of intrinsic value. The skills, knowledge, ability to labour and good health which enables people to pursue different livelihood strategies falls under human capital. It is needed to make use of the other four assets but it is not stand alone to achieve positive livelihood outcomes. It is the knowledge and labour and the ability to command labour. At the household level human capital is based on the amount and quality of labour. This is dependent on many factors like household size, skill levels, leadership potential, health status, etc (DFID, 1999c). Financial capital comprises the financial resources required by people to obtain their livelihood objectives. It is dependent on the availability of stocks and regular flow of income (DFID, 1999c).

According to the SLF, land is the key natural asset. Land is used by individual or collective actors based on their socio-economic stand and their political and power influence in a society. Land tenureship is understood as the “*Land tenure is the relationship, whether legally or customarily*

*defined, among people, as individuals or groups, with respect to land*” (FAO 2002). Land tenure is defined by institutions, i.e., rules invented by societies to regulate behaviour. Rules of tenure determine how property rights to land are to be allocated within societies. They define how access is granted to rights to use, control, and transfer land, as well as associated responsibilities and restraints. In simple terms, land tenure systems determine who can use what resources for how long, and under what conditions. (FAO, 2002). Land is often the basis for sustained livelihoods, especially in rural societies based on agriculture and forestry (Adato and Meinzen-Dick, 2002; Morse et al, 2009).

Physical capital comprises the basic infrastructure and producer goods needed to support livelihoods. Infrastructure is usually a public good and is free to use except for shelter which is individually owned or in some cases fee-based like toll for usage of roads and energy supply. Producer goods maybe privately owned or rental based depending on the goods. Infrastructure is the physical environment which is conventional for the production of goods for a better livelihood and the producer goods are the tools and equipment used to produce those goods (DFID, 1999c).

Social capital facilitates collective action amongst individuals and households through institutions and networks. Social capital plays a vital role in the dissemination of resources based on the social networks and relationships existing within the society (Adato and Meinzen-Dick, 2002). Local development planning, improved social support structures and social cohesion are often labelled as social capital in livelihood context.

Upon this basis, the short paragraphs below define the other boxes of the SLF as shown in Figure 4.

### **Policies, Institutions and Processes**

Transforming structures and policies include policies of different levels of governments, of NGOs and of international bodies. Institutions include political, legislative and representative bodies; executive agencies; judicial bodies; civil society and membership organisations; NGOs; law, money; political parties; commercial enterprises and corporations. Processes include the “rules of the game”, decision-making processes, social norms and customs, gender, caste, class and language (DFID, 1999d).

The concept of institutions and institutional processes plays a particularly significant role in human livelihoods and in the management of natural resources and socio-ecological systems. It is therefore an integral part of SLF as shown by Scoones: “*Of particular interest in this [SLF] framework are the institutional processes (embedded in a matrix of formal and informal institutions and organisations) which mediate the ability to carry out [...] strategies and achieve (or not) [...] outcomes*” (Scoones, 1998:3). However, the SLF is a conceptual tool-kit that needs to be adapted to individual research priorities and – in case of empirical studies - local real-world circumstances (DFID, 1999d).

There are many ways to define institutions. In 1985, Nobel Prize Laureate Elinor Ostrom, by referring to the common pool resource debate (see below), defined institutional arrangements as “*the rules in use by a community to determine who has access to the commons, what use-units authorized participants can consume and at what times, and who will monitor and enforce these*

rules” (Ostrom, 1985). A most often cited definition of institutions came from another Nobel Prize Laureate Douglas North who wrote that institutions are “*humanly devised constraints that shape human interaction [and] structure incentives in human exchange, whether political, social, or economic [as well as] define and limit the set of choices of individuals.*” (North 1990: 3,4).

### **Livelihood Strategies**

As discussed above, the SLF is largely based on the concept of livelihoods. The livelihoods concept is a useful proxy of conceptualising people's activities and needs in a holistic and dynamic way. SLF promotes choice, opportunity and diversity for the treatment of its livelihood strategies as people make use of different range and combination of activities to achieve their livelihood goals (DFID, 1999e). People achieve their livelihood goals by combining activities and choices like productive activities, investment strategies and reproductive choices. It also includes the combination of the assets they can access, taking into account the vulnerability context which is supported or obstructed by policies, institutions and processes (DFID, 1999e).

IDS has developed a useful checklist of questions about livelihood strategies (based on Scoones, 1998 and DFID, 1999e).

- Sequencing: What is the starting point for successfully establishing a particular livelihood strategy? Is one type of resource essential?
- Clustering: Is there a clustering of particular livelihood assets associated with particular livelihood strategies?
- Trade-offs: In pursuing a particular portfolio of livelihood strategies, what are the trade-offs faced by different people with access to different assets?

### **Livelihood Outcomes**

Livelihood Outcomes are the outputs or achievements of livelihood strategies adopted by people. They can be understood based on the income levels, increased well-being, reduced vulnerability, increased food security and sustainable use of natural resources (DFID, 1999f).

#### **2.1.4 Why and How to Use the Sustainable Livelihood Framework?**

SLF deals with the objectives, scope and priorities for development (DFID, 1999a). Adato and Meinzen-Dick define SLF as a tool for “*analysing causes of poverty, peoples’ access to recourses and their diverse livelihoods activities, and relationship between relevant factors at micro, intermediate, and macro levels. It is also a framework for assessing and prioritizing interventions.*” (Adato and Meinzen-Dick, 2002:5). The DFID uses it as a tool to understand and improve the livelihoods of the rural poor. SLF has people as the central unit and hence increases the effectiveness of development assistance and efforts to reduce the poverty level of the poor (DFID, 1999a). The SLF is one way of understanding interrelated complexities and processes of livelihoods, natural resource use, policies and institutions. The framework helps in understanding the factors influencing livelihood dynamics in general and the role of land and resource use within those dynamics in particular (DFID, 2000).

SLF is one of the theoretical approaches that can be used by researchers to conceptually organize their work and help understanding complex and dynamic issues surrounding human livelihoods. It is often used in interdisciplinary social science research to analyze sustainable livelihoods and socio-ecological systems in which people directly depend on natural and biological resources. Scoones (1998) highlights that the SLF is particularly helpful to answer the following research question:

*“Given a particular context (of policy setting, politics, history, agroecology and socio-economic conditions), what combination of livelihood resources (different types of ‘capital’) result in the ability to follow what combination of livelihood strategies (agricultural intensification/extensification, livelihood diversification and migration) with what outcomes? (Scoones, 1998:3).*

DFID (1999c) identified six core objectives of the SLF with regard to poverty reduction and sustainable livelihoods. These are:

- improved access to high-quality education, information, technologies and training and better nutrition and health;
- a more supportive and cohesive social environment;
- more secure access to, and better management of, natural resources;
- better access to basic and facilitating infrastructure;
- more secure access to financial resources; and
- a policy and institutional environment that supports multiple livelihood strategies and promotes equitable access to competitive markets for all.

## **2.2 Common Property Resource Management**

The sustainable governance of natural resources is an ongoing struggle (Ostrom and Nagendra, 2006). Common property resource (CPR) management is garnering lot of attention for managing natural resources in the developing world (Campbell et al, 2001). CPR management is a feasible option to combine poverty reduction, enhancement of local level economic development and biodiversity conservation in rural areas of the developing world (Adhikari et al, 2003). Since the 1990s, the management of natural resources by local communities stands in the conceptual focus (Campbell et al, 2001).

CPR management links the social and ecological systems and focuses on understanding how institutions can be designed to improve sustainable resource governance, the relationship of resource users to each other, and institutional processes themselves (Agrawal et al, 2013). Environmental problems at both local and international levels pose structural dilemmas. As it is often not possible for an individual or a community or even a nation-state to bring about solutions, CPR problems largely require collective and co-operative actions to bring about a change for the better (McKean, 1992).

Common property is often misunderstood as unowned resources in which the resource does not belong to any individual or group. It is vulnerable to degradation has no one has recognized rights over the resources and hence the property belongs to no one. It is doomed to tragedy as no one can control the use or keep anyone out of the common resources. The term CPR is sometimes used to refer to public resources which are owned by the nation- state. It is held in trust for the use of the abstract entity “the public” for their well- being and policed by representatives namely the

government officials. The publicly owned resources are as vulnerable as the unowned resources due to lack of proper monitoring due to the distance from the resources and lack of personal stake and motivation to protect the resources by the officials (McKean, 1992).

### **2.2.1 The Tragedy of the Commons**

Hardin's article "The Tragedy of the Commons" (1968), one of the most influential and most often cited scientific articles in the last half century, triggered a major debate on the issue of the best property rights system for the control of commonly shared resources. With this article, Hardin popularized the theory that resources held as a common property are vulnerable to over-exploitation. He prophesied it as the 'tragedy of the commons' saying that the use of common resources does not have technical solutions. On this basis, he suggested that governments should impose public or private ownerships on common resources to control their management and restrict the "commons" from over-exploitation.

"Freedom is the recognition of necessity"- Hegel cited from Hardin, 1968. Hardin sees the commons infringement of freedom with the passing of new laws and regulations. His article speaks about common property management and about envisioning an open pasture and the benefits herder gain by adding additional animals for grazing to it and only suffers because of costs due to overgrazing. Each herder is mainly concerned about his/ her own benefit and loses only due to shared costs of over-grazing. Thereby the tragedy strikes where each herder increases his/ her benefit unlimitedly in a limited world. In CPR situations the beneficiary only sees the short-term gain and does not give much thought to the long-term sustainability of the resource and its management (Hardin 1968; Ostrom, 1990).

Hardin's article has often been challenged by consecutive research studies including his own work. Berkes et al (1989) argue that sustainable management of common resources need not necessarily be achieved through government control or privatization as proven in many case studies. They use ecological sustainability has a successful management index of resources without implying the need for ecological as well as economic optimum (Berkes et al, 1989). Many social scientists argue that Hardin's assumptions and conclusions pose serious problems and that he does not differentiate between open-access resources, closed access shared resources, and corporate resources (Ostrom and Nagendra, 2006). Many scholars have identified, explained and suggested possible cures for the tragedy of the commons. According to them if we understand why the tragedy of the commons occurs and how and when people avoid or recover from such tragedies then we can find solutions from existing situations for the future. These solutions can be applied in the context of developing and under-developed countries and for the management of local as well as global commons around the world (McKean, 1992).

McKean's study in 1984 of communal ownership of grazing, forest and waste lands in Japanese villages enabled peasants living in harsh environments to effectively regulate delicately balanced commons. There was tight regulation by village councils for the access to the commons by the villagers based on time and amount of use. If private ownership was used to regulate instead of communal ownership based on the given environment and economic activities there would not have been effective use of the land by the peasants nor would have central public regulation would have worked due to the lack of reflection of the knowledge by the villagers to control the commons.

Several centuries of successful regimes based on institutional arrangements establish stable communal ownership patterns (Ostrom, 1985).

### **2.2.2 Forest Resources and the Common-pool Resource Discourse**

In developing countries contexts, human-dominated landscapes provide a large number of ecosystem services on which livelihoods, particularly those of the rural poor, depend (Persha et al, 2011). Tropical forests are particularly important in this regard. Located mainly in rural, often remote, areas, they provide a vast array of ecosystem services of local, regional and global importance (Chhatre and Agrawal, 2009). The diverse socio-economic as well as ecological ecosystem services from forests encouraged many governments to introduce forest conservation and sustainable use policies with the aim to maintain key forest ecosystem services while simultaneously providing livelihood benefits to local users. The way and kind of policy interventions for the conservation and sustainable use of forest resources is, however, an ongoing debate with key issues being property and land tenure systems (Ostrom and Nagendra, 2006).

Forest commons – defined as “*forests used in common by a large number of heterogeneous user’s*” (Chhatre and Agrawal, 2008:1) - are particularly complex to be governed. However, Chhatre and Agrawal (2008:1) also write about best practices in which forest commons are “*forests for which the boundaries of the resource, the identity of the usergroup, and property rights to benefits from the resource are well defined. Users have a stake in good governance of forest commons and central governments formally or informally recognize local interests in and claims to the resource*”.

Over the last decades, a fast array of different forest conservation approaches, based on different paradigms, have been developed and implemented, out of which not all were successful. The current forest conservation debate, however, is very much dominated by the concepts of sustainability and participation of local forest user communities. The key mechanism for the sustainable conservation and use of forests by local communities is the introduction of local participation through decentralized management of resources. Many countries across the globe, also India, decentralised forest management policies in the last decades. Although these policies are aimed at the regeneration of degraded forests they can also be used to augment conservation along with protected area regimes (Chhatre and Agrawal, 2009; Persha et al, 2010). This also triggers questions about the effectiveness of these decentralized schemes, which can be hampered for example by the capture of resources by local elites and the lack of proper functional linkages between local decentralized institutions and macro-level government organizations (Persha et al, 2011).

The above review of the concepts are of importance for this study. This observation holds true for the general impacts of the five livelihood assets and of special importance are the role of the forests as well as the endeavors to create nature reserves, protected areas, state forests and/ wildlife and tiger reserves. As will be discussed in Chapter 5 and 6, these regulations and restrictions are of great importance for the indigenous people of Southern India, their traditional ways of life and their efforts to change them in favour of innovative agricultural transformations.

Upon this backdrop, this study deals with the research questions listed below in two case study sites (see Chapter 4 for details about the study areas).

## **2.3 Research Questions**

This research aims at answering the following research question and sub-questions:

### **Main Research Question**

- How does agricultural transformation and Protected Areas designation impact on land use and livelihoods of Soliga communities living and around the M. M. Hills Wildlife Sanctuary, Karnataka, and the Sathyamangalam Tiger Reserve, Tamil Nadu?

### **Sub-Research Questions**

1. What are the different trends in agricultural practices over the years within the Soliga communities? What are the underlying drivers for change?
2. How do the different land and forest policies in Karnataka and Tamil Nadu impact on land use and agricultural transformation in the case study areas? Who are the key actors?
3. How does the establishment of the M. M. Hills Wildlife Sanctuary and the Sathyamanagalam Tiger Reserve affected land use and agricultural transformation of the Soliga communities in the two case study areas?
4. What are the various contestations in relation to land use by various stakeholders?
5. What role does the traditional forest and agriculture-related knowledge play in agricultural transformation and land use change? How could traditional knowledge systems be used to promote more sustainable agriculture management and forest conservation?

The following chapter discusses in detail the methodologies adopted for this research. Both qualitative and quantitative techniques were employed for data collection during the field-work and for the data analysis respectively.

### **3. Methodological Approach**

This research applies a multi-faceted interdisciplinary methodological approach in which quantitative and qualitative research methods were used and combined. Two case study areas in Southern India, namely Male Mahadeshwara Hills and Sathyamangalam, have been chosen. Both study areas were chosen after a pre-study conducted in February-March 2013 (for a justification of the selection and detailed description of the study areas see Chapter 4).

The main empirical field research of this study was carried out in India between June 2013 and February 2014. In the main field research period a three-tier methodology was carried out as described below.

#### **3.1 Literature Review**

The scientific and grey literature on agricultural transformation, land-use change, and indigenous communities as well as on both study areas was reviewed and appraised and used to develop a suitable, place-case specific, and gender-sensitive field work concept. In Male Mahadeshwara Hills Wildlife Sanctuary and Sathyamangalam Tiger Reserve not much research has been carried out due to the remoteness of the area and also due to the fact many parts of the region were under the control of a local criminal and smuggler for many decades thus making the area less accessible to academics and researchers. In recent years after the death of the criminal (2004), the areas are being developed by the state authorities. Thus much of the literature for the area was got only from old government records (especially state forest departments). Also literature (journal articles, reviews, books) pertaining to similar settings were reviewed to better understand the dynamics involved in the study and to derive comparative narratives.

#### **3.2 Quantitative Methods**

Secondary data in the form of census reports, land use records and maps from various government offices (mainly Agricultural Departments, Block Development Offices, Village Panchayat Offices, Statistical Departments and Forest Departments) and NGO's have been gathered to generate a sound socio-economic, geographic and demographic background understanding of the study areas. These data have also been used for the production of Geographic Information System maps (see Chapters 4, 5 and 6). Policy reports and other documents were collected from different sources to understand the present land and forest policies with regard to the concrete study areas contexts.

Survey of India topo sheets from the 1970s with a scale of 1:50000 have been used as base maps for creating GIS maps of the study areas. Land use and Land cover maps from the National Remote Sensing Agency, Indian Space Research Organization were analysed to show land use change over time in the case study areas for the time period 2005-2006 and 2011-12. The use of GIS data provided a local and regional frame for the study and was also used to demarcate the actual areas under consideration. Agricultural lands, including the different crops, and forested land have been mapped using GIS techniques. The secondary data and GIS maps give the background information of the study area.



### 3.3 Qualitative methods

Besides the quantitative research methods shown above, a set of qualitative research methods has been used in this study. The empirical field- work was the basis for this specific research and approach. They will be briefly introduced in the following.

#### Questionnaire Survey and Expert Interviews

A questionnaire survey was conducted in all (6- Soliga villages and 6- Lingayat villages) case study villages in both case study areas in order to understand socio-economic background, land use practices and agricultural patterns in the villages in the past and in the present. A total of 278 interviews were conducted with Soliga villagers living in the two study sites. Out of this 278, 112 interviews were conducted in Male Mahadeshwara Hills and 166 in Sathyamangalam. 85 and 81 interviews were done in both Geddesal and Kanakkarai village respectively, 33 were conducted in Gorasane, 19 in Kombudikki<sup>3</sup>, 11 in Medhuganai, and 49 in Palar.

Additionally 140 interviews were conducted among another ethnicity living in the same region called the Lingayats to compare and contrast between the underlying similarities and differences between both the ethnicities living in the same area (see Chapter 4 for more details). In M. M. Hills the Lingayat villages chosen for study were Anaiwala, Kombudikki, Konganur and Kiranwala and 33, 22, 23 and 28 interviews were conducted respectively. Jaderudrasampuram and Jogigoundanur were the two Lingayat villages chosen for study in Sathyamangalam and 20 and 14 interviews were conducted in each village respectively. Due to time and resource constraints the main focus of the interviews with the Lingayats were mainly about their agriculture.

The interviews took between 40 minutes and two hours each. In some cases the interviewees had to be visited twice or thrice to complete the interview as all questions could not be answered in one sitting.

The participants were chosen randomly, however, particular weighting was given based on local contexts. Geddesal village, for instance, consists of two hamlets (one below the school premises and one above the school premises), hence participants were chosen from each hamlet. In Kanakkarai village, on the other hand, participants were chosen from two ethnic sub-groups, Malai Soliga and Urali Soliga, as well as from five smaller hamlets<sup>4</sup> (Eraiyan doddi, Kettiamma doddi, Kettayan doddi, Meesakonuran doddi and Jiyam doddi) a little away from the main village area. The core village consists of five streets, hence

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<sup>3</sup> Kombudikki village: This village is inhabited by both Lingayats and Soligas. Lingayat households live in the front areas of the village and the Soligas are located near the periphery of the village.

<sup>4</sup> The five hamlets which are part of the Kanakkarai village are located on the peripheries of the village and comprise five to seven households each. They have their own source of water from government overhead tank and a small stream flowing nearby. None of the houses have electricity in these hamlets nor proper roads. Due to the lack of infrastructure and rugged nature of the terrain ploughing is done using oxen. The core village households also borrow the cattle from the hamlets for ploughing their own lands. The hamlets are surrounded by estates (large acres of lands owned by people from the plains. These lands were purchased from the Soligas for a pittance many decades earlier when there was no regulation in place for the indigenous communities to not sell their lands to outsiders) hence it is a common practise for the Soliga households (land owning and landless households) to rent lands from the estate owners to practise agriculture.

participants were chosen from each of the five streets. One major limitation was that people from all villages seasonally migrate to neighbouring towns and cities for employment (usually between 6 and 12 months) and were hence not available for interviews during the field research phase.

Gender and age were taken into consideration in the selection of the participants. Around 50 percent of the interviewees were chosen below the age of 50 years and the rest above the age of 50 years. The reason for such a selection was to gather first-hand information about land use change and agricultural transformation from older people. Around 35 percent of the interviewees were female, which is, given the cultural context in rural India, high for such studies. The survey was held in Tamil, Kannada or Soliga language and later transcribed into English.

The interviews were conducted in various places and settings. Most interviews were conducted at the residence of the interviewee. However, if this was not possible, participants were interviewed in other locations such as around their fields (e.g. while participants were guarding their fields in the evenings), or at river banks where women are washing clothes.

Beyond the questionnaire survey, 12 expert interviews were conducted with key resource persons such as village elders, government officials and NGO workers to understand land use change, agricultural transformation processes as well as land and forest governance structures. The expert interviews lasted for about 20 to 35 minutes. They were conducted in different settings. The villager elders were mainly approached at their residences while the NGO workers and government officials were interviewed in their offices or during their visits to the villages. Overall expert interviews were undertaken in Sathyamangalam, Thalavady, Hasanur, Arepalayam, Germalam, Male Mahadeshwara Hills and Kollegal.

### **Narrative Analysis, Participation Observation and Field Diaries**

Narrative Analysis technique has been used to relate the present situation within the Soliga and Lingayat communities with regard to land use change and agricultural transformation. This thesis is based on this technique to explain the findings from the field- work and to elaborate on the results derived from analyzing the data.

Participant observation was employed for the whole field- work period in order to observe land-use and agricultural practices, as well as cultural and socio-economic coherences, views and behaviour of Soliga communities in the study area.

Field diaries and notes were used to record important events and activities and capture perceptions of people with regard to land-use change and agricultural transformation. The day to day life of the Soliga people was documented apart from noting down the daily interactions and incidents in the villages.

### Focus Group Discussions

Two Focus Group Discussions (FDGs) (see Figure 5) were held to understand the role in and perception of different groups of local people in land-use change and agricultural transformation and to gain insight into their traditional ecological knowledge and practices. One FGD was conducted in each study area. The participants of the FDGs were chosen based on gender (both men and women), as well as role/ position within the community (village heads, village forest council heads).



Figure 5: Focus Group Discussion in Sathyamangalam Tiger Reserve

The first FGD was conducted in the Cultural Centre (*Kalaikudam*) of Hasanur village Sathyamangalam Tiger Reserve, on 02.10.2013 with members of Geddesal and Kanakkarai village (see Figure 5). The quarterly Hasanur panchayat union meeting took place just before the FGD which led to a high attendance. One problem was to limit the number of participants. Around 25-30 people were invited as active participants but temporarily more than 80 took part, most as observers. Participants were from both Soliga (from Geddesal and Kanakkarai villages) and Lingayat communities (from Arepalayam, Banglapodu, Centre Thotti and Hasanur villages), Forest Department officials, agricultural officers, panchayat members and leaders, village leaders, village forest council members and leaders, village administrative officers, block development officers, fire department officials, and NGO workers. The FGD took more than three hours. The Cultural Centre is

an open shed like area where participants sat together in a semi-circle and interacted - relatively - freely. Both men and women shared their views but the participation of women was much less comparatively. Moderated by the researcher and research assistants, the FGD participants discussed topics pertaining to the establishment of the Sathyamangalam Tiger Reserve, land use change and tenure issues, and impacts for Soliga communities.

The second FGD was conducted in Anaiwala village in M. M. Hills on 09.01.2014 with 40 participants. Participants were Soliga community members (from Gorasane, Medhuganai, Kombudikki, Palar and Anaiwala village), village forest council members and leaders, village heads, Soliga Sangha<sup>5</sup> members and leaders, as well as NGO workers. The meeting was initially planned for the morning around 10 am but for nearly two hours no one showed up. It then started at 12 pm and took place for around two hours.

### **Oral Histories**

Oral Histories were conducted with village elders and community leaders to gather information about past land use and agricultural activities. Elderly persons from each case study village were asked to narrate land use and agricultural patterns and trends in the concerned areas in the past 30-40 years. Beyond oral histories, unstructured interviews with village elders were employed to gather historic information which was largely used for verification and triangulation. Both, oral histories and unstructured interviews were conducted in front of participants' houses or under trees in the villages.

### **Network Analysis**

Network analysis was undertaken to identify local key actors and to map roles and connections of individuals and organisations involved in land use, land use change and agricultural transformation patterns in the concerned study areas. This exercise was carried out on various levels. The participants involved included Soliga smallholders, NGO workers, forest department officials at the beat, range and taluk level,<sup>6</sup> school teachers, taluk agricultural officer, taluk horticultural officer, block development officers, village panchayat leaders, village forest council leaders, village administrative officers, fire department officials and Soliga Sangha members (see Figure 6). This exercise helped to identify the actual different roles of actors in land use and agricultural transformation processes.

Participants of the network analysis were asked to identify actors who were actively assisting village smallholder at present and the role these actors are likely to play in future. The word 'farmer' was given as the central unit. The participants were asked to identify the actors involved in the development activities in relation to the farmers. The network analysis was done at various levels. First it was conducted among farmers themselves from the respective Soliga case study villages in M. M. Hills and Sathyamangalam, it was also conducted amongst school teachers, forest department officials and NGOs. In the next level

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<sup>5</sup>The Sanghas are local level committees organized within indigenous communities with the assistance of forest departments.

<sup>6</sup>India is administratively divided into states. The states of Tamil Nadu and Karnataka are further divided into districts, taluks, blocks and village panchayats. The respective government forest departments in the two states are divided into district forest divisions, range divisions and beat divisions.

the different local actors who have a stake in agricultural transformation processes in the case study regions namely farmers, government bodies like the forest department, agriculture department, horticulture department, block development officers, village administration officers, village and panchayat union leaders, village forest council leaders and members, school teachers and NGOs, were brought together.

The activity was carried out in different settings. The farmers were approached in their respective villages and both male and female farmers were brought together and allowed to discuss and note down the different actors playing a role in shaping agriculture and agricultural transformation in the area. The gender dynamics were also made note of. In most cases women were noticed to be standing in the background and only spoke when spoken to. The participants discussed amongst themselves in small groups and selected key actors whose names they wrote on cards. Three different colour-coded cards were given to the participants. Yellow cards indicated the local level community organisations and entities such as the village (gram) panchayat, panchayat union, fair price shop, village forest council, LAMPS, Primary Health Centre (PHC) and community organisations (Soliga Sangha at the taluk and district level). The blue cards indicated NGOs (such as ATREE, MYRADA, Keystone), Self-help Groups (SHGs) and schools in the area, and finally the green cards indicated government bodies such as Forest Departments, agricultural officers, horticultural officers, taluk, district, state and central government authorities, as well as district and taluk level block development offices.

Among all identified organisations, the participants were asked to identify those whose role they consider most important, middle important and least important for agriculture development in the area. The actors considered most important were highlighted with white stickers, middle important ones with pink stickers and least important ones with yellow stickers. Finally the most important and least important actors in three above-mentioned categories were identified by placing an orange and green sticker respectively.

Once these actors were identified and their importance weighted, the participants were asked to draw linkages between the various actors. Black lines indicate direct connections and green lines indirect connections. Blue lines indicate information flow between the actors, red lines indicate financial flows while the orange lines indicate actors who were meant to have more or stronger linkages in the future. The arrows at the end of the different colour lines indicate the direction of flows. The green and pink stars drawn on the cards indicate the actors involved in environmental conservation and sustainable development respectively.



Figure 6: Network Analysis in Sathyamangalam Tiger Reserve

### **Mental Mapping**

Mental mapping exercises were conducted to record and illustrate the perceptions of Soliga people with regard to land use, land use change and agricultural transformation processes. For this exercise key information holders were asked to group together and asked to sketch maps of their villages based on their individual perceptions. Maps included information such as land use and settlement patterns and forest boundaries in and around these villages.

The following chapter elaborates on the chosen case study areas M. M. Hills and Sathyamangalam Tiger Reserve.

## **4. Study Areas: The Background**

### **4.1 Introduction of the Physical and Human environment of the Study Areas**

This study provides two empirical case studies of indigenous communities living in hilly forested areas in Southern India, one in Karnataka and one in Tamil Nadu state (see Figure 7). Both sites are located in protected areas, namely in Male Mahadeshwara Hills Wildlife Sanctuary and Sathyamangalam Tiger Reserve. The former site is a wildlife sanctuary established in 2013 while the latter site was established as a wildlife sanctuary in 2008 and has been declared as a Tiger Reserve in 2013. Tiger reserves are much more restrictive in the use of forest land and resources compared to wildlife sanctuaries.

Both areas are rich in biodiversity and home to larger wild animals like deers, elephants, bears, tigers, monkeys and snakes. It has a wide array of flora as well, such as Bamboo, Gooseberry, Tamarind, Soap nut, and Silver Oak (Working Plan Kollegal, 2012; Sathyamangalam Management Plan, 2012).

The reason for the selection of these two study sites are mainly due to the fact that although geographically and ecologically similar in nature they differ politically, administratively and socio-economically. Both sites are inhabited by Soliga (see section 4.2) communities who fall under the scheduled tribe category which is the lowest strata in the Indian caste system. The other ethnicity in the vicinity are the Lingayats (see section 4.3). Politically, the two sites fall under the administrative capacity of two different states namely Karnataka and Tamil Nadu. Both states have different law systems and land tenure rights. Administratively, they fall under two different protected areas, namely Male Mahadeshwara Hills Wildlife Sanctuary and Sathyamangalam Wildlife Sanctuary and Tiger Reserve. The rules and regulations for the use, management and conservation of resources in both protected areas differ widely. Beyond that, the presence, composition and impact of non-governmental organizations (NGOs) substantially differ in both study sites.

The empirical field work for this study was undertaken in both sites from June 2013 to February 2014.

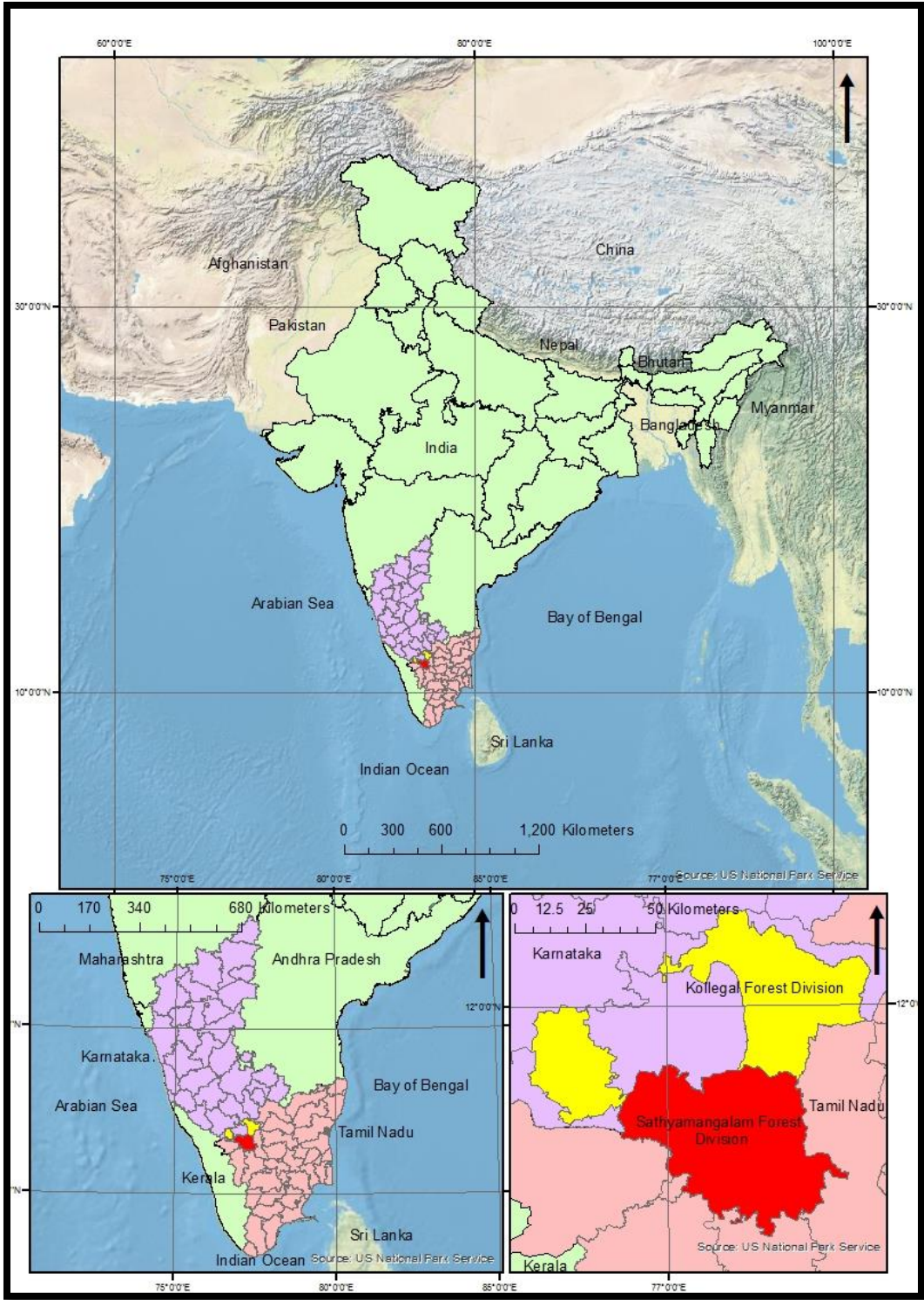


Figure 7: Location of Kollegal Forest Division (with Male Mahadeshwara Hills; case study area one) in Karnataka state and Sathyamangalam Forest Division (case study area two) in Tamil Nadu state

Source: Survey of India toposheets (1970-71)



#### **4.2 Indigenous Communities of the Soligas**

Indigenous Soliga communities traditionally live in the mountainous and forested areas of Karnataka and Tamil Nadu. They have been described by different authors in different spellings as Soliga, Soligaru, Soligars, Sholaga and Sholiga (Aiyappan, 1948; Nanjundayya and Iyer, 1935; Luiz, 1963; Thurston, 1909). Today officially, they are referred to as Soligas in Karnataka and Sholagas in Tamil Nadu. Historically the Soligas are hunters and gatherers who practiced shifting agriculture until the middle of the 20<sup>th</sup> century (Morab, 1977). They traditionally used a variety of forest products for their subsistence, such as roots, tubers and leaves namely *Noore genasu*, *Neve genasu*, *Bellaru genasu*, *Kanekke soppu*, *Gaddi soppu*, *Keerai soppu*, *Mushte soppu* (Primary data, 2013). Most Soliga communities live in small hamlets (*podus*) with five to 120 households. Soliga language bears a semblance to the Dravidian languages Tamil and Kannada which is widely spoken in Tamil Nadu and Karnataka states (Morab, 1977).

The earliest reference of the Soligas in literature is by Buchanan in 1807. He refers to them as “people living in poor conditions” (Buchanan, 1807). He further stated that Soligas spoke a ‘bad’ dialect of Kanarese and lived in huts made of bamboo and plantain leaves (Buchanan, 1807). Morab (1977) distinguishes Soligas into two ethnic sub-groups namely the Hindu or Malai Soligas and the Urali Soligas. The Uralis are believed to be originally belonging to the Irula community living in Sathyamangalam as well. According to Morab (1977) the Malai Soligas are divided into five sub-sects and the Urali Soligas into 12 clans.

Soliga communities are the pre-dominant inhabitants living in both Male Mahadeshwara and Sathyamangalam study areas, along with the ethnic group of the Lingayats, as well as indigenous Irulas in Sathyamangalam area. According to the traditional caste system, Lingayats are perceived higher ranked in the social order compared to the Soligas and Irulas.

Soliga communities are historically found living in tracts stretching from Dhimbam town in Tamil Nadu to Kollegal town in Karnataka (Thurston, 1909). According to an inhabitant of Geddesal village, located in the Sathyamangalam case study area, “the village of Geddesal existed before 200 years around 3 kilometers away from its present location near the Jadesamy temple in the Minchukuli Valley and the villagers practiced subsistence farming and grew *rugi* (finger millet) and *avarai* (broad beans) for their own consumption. They are living in the present location since the need for accessibility to basic amenities and have started growing commercial crops like vegetables (potatoes, beans, garlic) for sustenance purposes”. Traditionally, the collection of non-timber forest products, like bamboo, gooseberry, tamarind, soap nut, stone moss, and tree moss is very important for Soliga households for supplementing their livelihood. With the establishment of protected forest areas in recent years they have been increasingly been restricted to collect only certain non-timber forest products and in limited quantities.

#### **4.3 Indigenous Communities of the Lingayats**

The Lingayats are a Hindu religious community with various sub-castes based on their occupation. The Lingayats are devotees of Lord Shiva and are also known as Lingawants, Lingangis, Lingadhari, Sivabhaktas and Virasaivas. The name Lingayat is derived from the Sanskrit work “*linga*” and is symbolized by the silver dollar that both men and women belonging to this caste wear on their necks. The Lingayats from Mysore speak Kanarese (Nanjundayya and Iyer,

1935).The Lingayats are temple priests who came to the hills originally from Mysore. Lingayat families take turns to work in the temple once a year (Patil, 2007).

Lingayat communities living in Male Mahadeshwara Hills and Sathyamangalam rely on agriculture for their livelihood. They also rear cattle and poultry for additional income apart from gathering non-timber forest products from the forests.

#### **4.4 Study site one: Male Mahadeshwara Hills (M. M. Hills)**

##### **4.4.1 Introduction**

Male Mahadeshwara Hills Wildlife Sanctuary (in the following referred to M. M. Hills) is located in Kollegal taluk, Chamrajnagar district of Karnataka state. It is bound on the three sides by the Cauvery Wildlife Sanctuary, Biligirirangana Tiger Reserve and Sathyamangalam Wildlife Sanctuary in Tamil Nadu. It stretches from 11° 55' to 12° 15' north to 77° 45' to 77° 25' east. It has an area of 434.80 square kilometers (Working Plan Kollegal, 2012; Uma Shaankar et al, n.d.). Geographically it is part of the Nilgiri Western Ghats. The M. M. Hills is a series of irregular hills. Ponnachi Boli has the highest point in M. M. Hills with an elevation of 1514 m. The highest inhabited village is Kokkubarai at a height of 1430 m (Working Plan Kollegal, 2012). It is an extension of the Mysore plateau belonging to the Dharwar system. The rock type is gneissic in origin. The area around Kombudikki has granite, precious stones and semi-precious stones. They are not mined due to the Forest Conservation Act which came into existence in 1980 (Working Plan Kollegal, 2012). This area has a mild climate throughout the year. It receives most of its rainfall from the Northeast monsoons during the months of September and October. January to March is the driest season (Working Plan Kollegal, 2012; Uma Shaankar et al, n.d.). The forest types include scrub, moist and dry deciduous as well as evergreen forests. The forests are home to larger animals such as elephants, deers, snakes, and monkeys.

##### **4.4.2 The Case Study Villages in M.M. Hills**

Four villages in M. M. Hills have been chosen for case studies, namely Gorasane, Kombudikki, Medhugunai and Palar (see below Table 1 and Figure 8). The reasons for the selection of these villages are as follows. Gorasane, Kombudikki and Medhugunai are revenue villages while Palar is a forest settlement. The revenue villages are under the direct control of the village panchayat while Palar as a forest settlement is administered by the Kollegal Forest Department. The land in Gorasane, Kombudikki and Medhugunai can be sold or ownership can be transferred to others. In Palar land cannot be sold. Only land use rights can be bequeathed to family members.

<b>Name of Village</b>	<b>Number of households (1999)</b>	<b>Appr. inhabitants (1999)</b>	<b>Number of households (2013)</b>	<b>Total area (km<sup>2</sup>)</b>	<b>Type of village</b>	<b>Ethnic groups</b>
Gorasane	40	200	60	n.i.	Revenue	Soligas
Kombudikki	20 (Soligas), Lingayats (n.i.)	100	25 (Soligas), Lingayats (n.i.)	1.22	Revenue	Lingayats, Soligas
Medhugunai	n.i.	100	18	n.i.	Revenue	Soligas
Palar	46	200- 300	70	n.i.	Forest	Soligas

Table 1: Area and population size of the four case study villages in M. M. Hills  
Source: Primary data collection, Village Records, Uma Shaankar et al (n.d.)

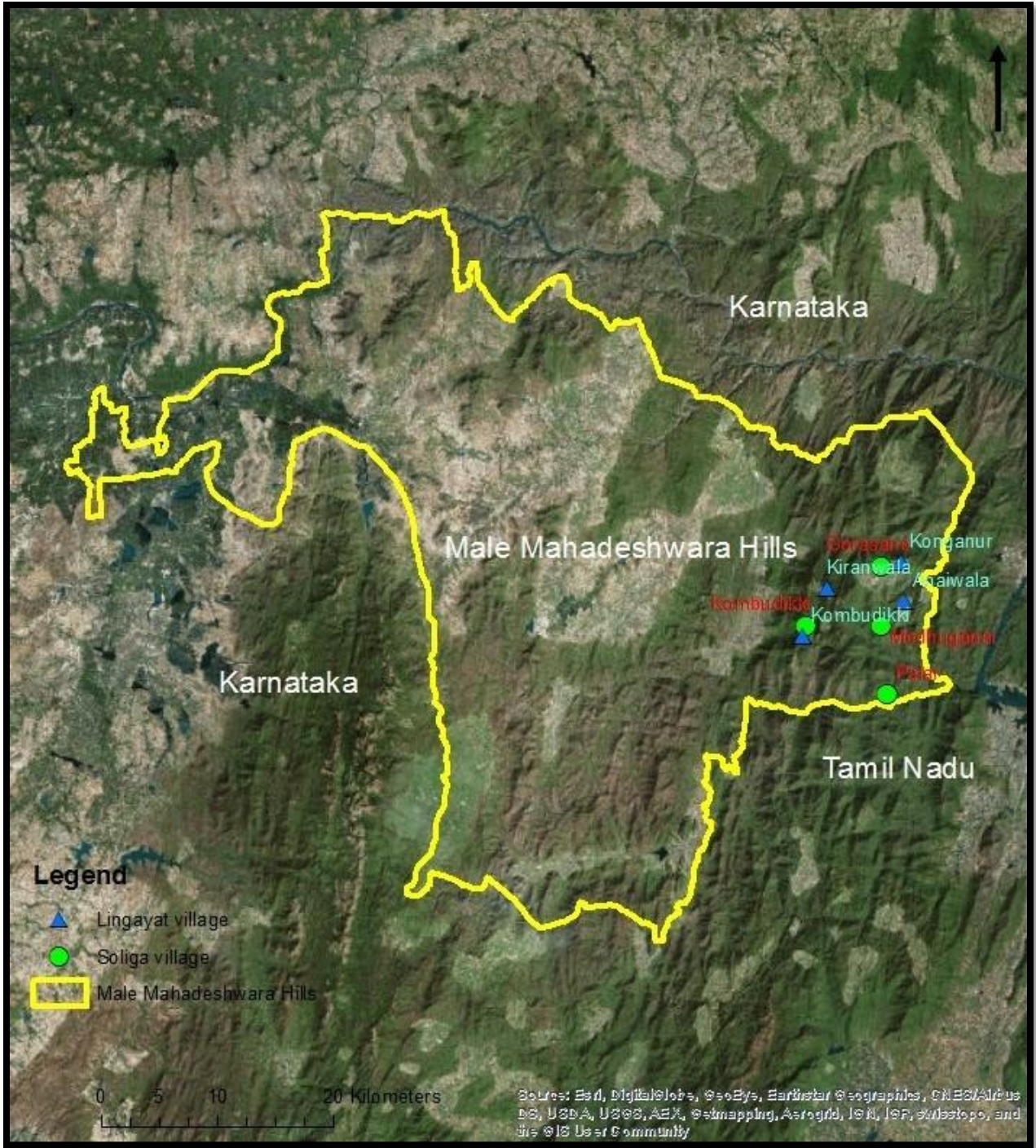


Figure 8: Location of the Soliga and Lingayat case study villages in M. M. Hills  
 Source: Karnataka Forest Department and author's own creation, 2013

## **Gorasane**

Gorasane was chosen as a case study village due to its location near a quarry site which is causing health hazards to the villagers apart from posing safety and security issues. It is the case village which is most closely located to Male Mahadeswara temple town in M. M. Hills (the M. M. Hills gets its name from the Male Mahadeshwara temple), and has comparatively the best accessibility to infrastructure and basic amenities. The name Gorasane was given to the village because of a stone which has hooves of a cow imprinted in it. In colloquial Kannada language, “Gora” means cow (as told by an interviewee, 2013). Gorasane village is also known as Haliyur. In 1999, it was inhabited by about 40 households with a population size of about 200 people. The number of households grew to around 60 in 2013. Gorasane village falls under the M. M. Hills panchayat, Kollegal taluk, Chamrajnagar district, Karnataka state jurisdiction. It is a revenue village with a primary school (1<sup>st</sup> to 5<sup>th</sup> grade) and a *palvadi* (Kindergarten for under 3-year-olds) school. A well and a bore pump caters to the needs of the villagers for drinking water and washing purposes. There are no public transportation facilities to this village. The villagers have to walk around 5 kilometers to reach the larger town of Male Mahadeshwara Bhetta.<sup>7</sup> The nearest public distribution shops, banks and hospitals are all located in Male Mahadeshwara Bhetta.

Livelihoods in Gorasane mainly depend on rain-fed agriculture. People grow *ragi* (finger millet, *Eleusine coracana*), *avarai* (broad beans, *Vicia faba L.*), *togari* (horse gram, *Macrotyloma uniflorum*), *uchillu* (oil seeds), *jola* (maize) and beans. According to the village elders the rainfall in recent years has lessened due to deforestation. The village elders largely attribute the decrease in the forest cover to the chopping down of trees for firewood production, either for home use or for selling it in Male Mahadeshwara Bhetta town. As the forests around Gorasane village are part of the protected area M. M. Hills Wildlife Sanctuary, it is illegal to cut trees there.

## **Kombudikki**

Kombudikki was chosen as a case study village because it is inhabited by both, Soliga and Lingayat communities. “The name was derived from the fact that two bulls locked their horns together in a fight and it was witnessed by the villagers” (as told a villager in 2013 during my field visit). Agriculture is the main source of livelihood, with crops like *ragi* and *avarai*. The Lingayat households also grow marigolds, coconuts, mangoes and tamarind. Apart from agriculture, people are involved in bamboo basket weaving for income.

Kombudikki village also falls under the M. M. Hills panchayat, Kollegal taluk, Chamrajnagar district, Karnataka state. It is a revenue village with an area of 1.22 square kilometers. The land around the village is mainly covered by moist and dry deciduous forest. In 1999 Kombudikki had about 20 households with a total population of about 100 people. In 2013 the number of households had grown to about 25. The houses are arranged in a step-like structure. Four to five houses are built in a row and the next set of houses is built behind it divided by cemented narrow paths. The agricultural fields are located behind the houses. The houses have been built by the government. Some households have also been provided with electricity. Kombudikki has one public distribution shop run by the state government. The shop aims to cater the needs of the villagers by providing either free or subsidized food items (such as rice, pulses, cooking oil, sugar, tea) and other basic products (such as kerosene for use in stoves instead of gas cylinders).

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<sup>7</sup>Male Mahadeshwara Bhetta is a popular Shaiva pilgrim town known for its ancient temple of Sri Male Mahadeshwara. “Bhetta” means hills.

There is a middle school in Kombudikki village for both Soliga and Lingayat children. There is also a well which provides water to the villagers. A water storage tank was built by the NGO MYRADA and is located in front of the houses which caters to the needs of the whole village. The people draw water from it for all purposes. Before the water tanks were constructed, villagers used to trek several kilometres into the forest to fetch water from natural ponds in the forest.

Kombudikki village was serviced by government run buses around five years back but due to poor patronage the buses were stopped later. Now the village is accessed by privately run jeeps which ply between Male Mahadeshwara Bhetta town which is located 15 kilometers away and the village.

### **Medhuganai**

Medhuganai village has been chosen as a case study village due to its relative inaccessibility. It is located on the top of a hill about 3 kilometers from Male Mahadeshwara Bhetta town. The village is rather inaccessible, particularly during rainy seasons. There are no roads leading to Medhuganai. The passage to the village is a muddy and rocky path through the forest which is occasionally frequented by elephants and king cobras.

Medhuganai village also falls under the jurisdiction of M. M. Hills panchayat in Kollegal taluk, Chamrajnagar district, Karnataka. “The name Medhuganai denotes the flat top of the hill” (as told by a villager, 2013). Medhuganai had 18 households in 2013. The agricultural land around the village is mostly owned by Lingayats living in Male Mahadeshwara Bhetta town. They have rented the land for cultivation to Soliga households living in Medhuganai village. The harvest is shared. The main crops grown include *ragi* (finger millet) and *avarai* (broad beans) (see Figure 9).



Figure 9: A Soliga lady is winnowing *ragi* in front of her house in Medhuganai

Being a revenue village Medhuganai is formally entitled to water and electricity facilities from the government. However, due to the rugged terrain and inaccessibility it still remains under-developed in terms of infrastructure compared to other revenue villages. Solar lamps have been installed by the government. Villagers fetch water from a government dug well around one kilometer away from the village during the rainy season. In the summer months they have to walk for around five-six kilometers to reach the river and carry back pots of drinking water. The NGO Good Shepherd runs a primary school (1<sup>st</sup> to 5<sup>th</sup> grade) in Medhuganai village.

## **Palar**

Palar village has been chosen as a case study village as it is formally administered as a forest settlement by the Karnataka forest department jurisdiction. It has been hypothesized in this study that the socio-economic conditions in Palar village are significantly lower compared to the other three case villages in M M. Hills.

Palar village is a forest settlement falling under the jurisdiction of the M. M. Hills panchayat, Kollegal taluk, Chamrajnagar district, Karnataka. It is located on the banks of the river Palar and hence the name. It was formed 30 years ago by the state forest department to relocate villagers from Devarahalli, Indiganattam and Kombudikki villages for forest plantation work. In the year 1999 Palar was inhabited by 46 households with a population of about 200-300 people. In 2013 the village has grown to about 70 households (out of which three households belonging to the scheduled caste).<sup>8</sup>

Rain-fed agriculture is the main source of livelihood in Palar village, with *ragi* (finger millet) and *avarai* (broad beans) as the main crops. Livestock keeping (particularly cattle and goats) plays a larger role in Palar than in the other case villages in M.M. Hills.

The Palar villagers fetch their water for drinking, washing and cooking from the nearby river Palar. They also get drinking water from potholes near the river beds which have been dug in such a way that the water gets appropriately filtered by the soil.

## **4.5 Study Site Two: Sathyamangalam Tiger Reserve**

### **4.5.1 Introduction**

The second field work site of this study is located in the Sathyamangalam Forest Division which is located in Erode district, Tamil Nadu state. The Forest Division covers 1455 square kilometres. Between the 1970s and 2004 the area was under the control of the local sandalwood brigand Veerappan<sup>9</sup>. In 2008 it was declared a wildlife sanctuary and in 2013 it has been declared a Tiger

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<sup>8</sup>There are no households from the scheduled caste in the other case study villages.

<sup>9</sup> Koose Muniswamy Veerappan (nickname: Jungle Cat) was the leader of a sandalwood and ivory smuggling gang hiding in the forested areas between Karnataka and Tamil Nadu state between the 1970s and 2004. His gang was thought to have killed as many as 150 people. Veerappan's smuggling career saw tons of sandalwood taken from the forests as well as thousands of elephants killed for their tusks. In Southern India, he attained an almost mythic status. Veerappan made global headlines in 2000 when his gang kidnapped the famous Bollywood movie star Rajkumar and

Reserve by the Government of India (Sathyamangalam Management Plan, 2012). In this study site, the field work was conducted in two villages namely, Geddesal and Kanakkarai.

The Sathyamangalam Wildlife Sanctuary is located in the Erode district, Tamil Nadu state. It extends between latitudes 11° 29' 15'' to 11° 48' 41'' and longitudes 76° 0' 50' to 77° 27' 22'. It is bound on its northern side by the Chamrajnagar Forest Division, on its western side by the Nilgiris North Division (which belongs to the Nilgiri Biosphere Reserve) and in the East and South by the Erode Forest Division. The Moyar river flows in the south of Sathyamangalam Wildlife Sanctuary. The sanctuary has an area of 524.34 square kilometers. It is inhabited by elephants that migrate from the Mudumalai Wildlife Sanctuary and National Park to the Sathyamangalam Wildlife Sanctuary in search of fodder and water (Sathyamangalam Management Plan, 2012).

The Moyar Valley is an undulating plain. Its altitude rises between 960 m to 1266 m in Sathyamangalam, Talavadi, Talamalai, Bhavani Sagar and Hassanur ranges. The plateau region experiences moderate climate while the slopes and plains have hot and dry climate. The temperatures vary between 21°Celsius to 27° C in the plateau area and between 26°C to 32°C in the plains. The area experiences heavy rainfall between the months of October to December from the north-east monsoons which account for almost 70% of the rainfall. During the south-west monsoons between June and September, the area is prone to heavy winds in south-westerly direction. Sathyamangalam Wildlife Sanctuary includes a wide range of forest types from tropical dry thorn forests, tropical dry mixed deciduous forests, sub-tropical hill forests, tropical semi-evergreen forests to riparian forests. The change in vegetation cover is gradual from the east towards the west, largely depending on the rainfall gradient. The east of the sanctuary is on the leeward side of the Western Ghat rains. The sanctuary is known for its rich wildlife, such as elephants, spotted deer, monkeys, black buck, vultures, snakes, leopards, wild boars and bears. Especially elephants, wild boars and bears frequently destroy agricultural crops causing severe man-animal conflicts (Sathyamangalam Management Plan, 2012).

The study in Sathyamangalam has been conducted in two villages. See Table 4 for the basic details:

#### 4.5.2 The Case Study Villages in Sathyamangalam

The two villages chosen for study in the Sathyamangalam Tiger Reserve are Geddesal and Kanakkarai. The demographic details and the location of the case villages are shown below in Table 2 and Figure 10.

Name of Village	Households (2013)	Approx. inhabitants (2013)	Total area (km <sup>2</sup> )	Type of village	Ethnic groups
Geddesal	125	650	n. i.	Forest	Soligas
Kanakkarai	135	700	n. i.	Revenue	Soligas

Table 2: Area and population size of the two case study villages in Sathyamangalam

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held him hostage for over 100 days. Veerappan was killed on 18 October 2004 by a Tamil Nadu Special Task Force (Oliver 2004).



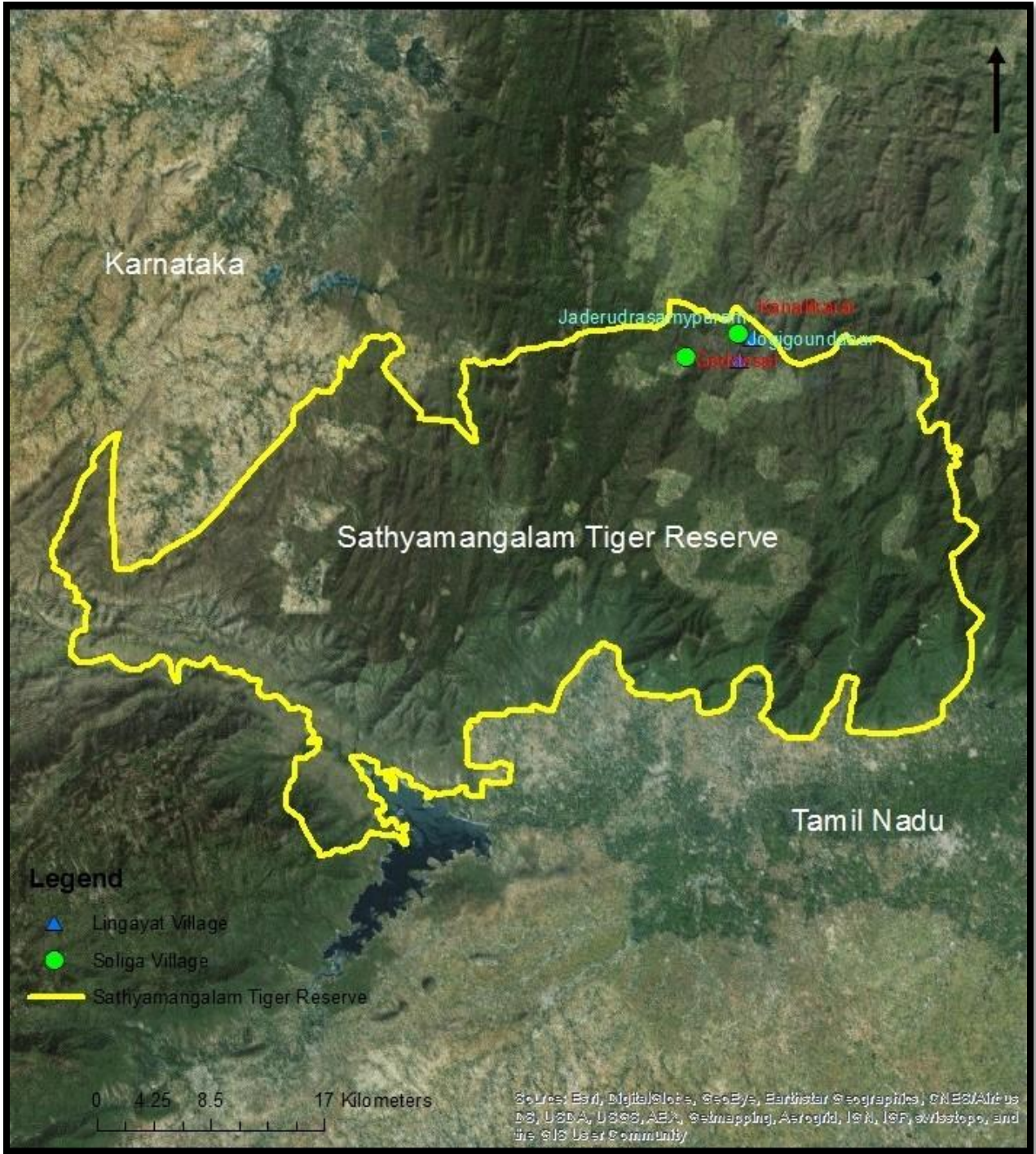


Figure 10: Location of the two case study villages in Sathyamangalam Tiger Reserve  
 Source: Sathyamangalam Forest Department and author's own creation, 2013

The reason for the selection of these two villages as case studies is two-fold. First, Geddesal is a forest settlement predominantly inhabited by ethnic Malai Soligas, while Kanakkarai is a revenue village predominantly inhabited by Urali Soligas. Second, Kanakkarai village is considered more ‘developed’ compared to Geddesal village, largely due to interventions by the local government and NGOs.

### **Geddesal**

Geddesal village is located in the Sathyamangalam Tiger Reserve around 45 kilometers from Sathyamangalam town and 15 kilometers from Hassanur town. It falls under the control of the Tamil Nadu Forest Department and the jurisdiction of the Hasanur panchayat in Thalavadi block, Sathyamangalam taluk, Erode district, Tamil Nadu state. The village is inhabited by around 125 households from the Malai Soliga community. Geddesal is highly inaccessible, especially during the rainy season. The only access is a two kilometer muddy path from the Arepalayam- Germalam main road through the forest to the village. During summer month, using this footpath can be dangerous because of elephants that drink at a nearby pond.

The Tamil Nadu Forest Department has built a *Samudaya Kudam* (community hall) and eight residential houses in the village. The rest of the houses were built by the villagers themselves (see Figure 11).



Figure 11: A Soliga house in Geddesal village

The Adi Dravidar and Tribal Welfare Department of Tamil Nadu state runs a residential high school (1<sup>st</sup> to 10<sup>th</sup> grade) in Geddesal village that caters to the needs of pupils from Geddesal and the surrounding villages. There is also a *palvadi* (kindergarten) in Geddesal. For higher secondary education students from Geddesal usually go to the residential school in Hassanur. The nearest primary health care centre is located in Germalam around 12 kilometres away. For major ailments Geddesal villagers have to visit the hospital in Sathyamangalam. The nearest post office and public

distribution shops are located in Arepalayam which is 10 kilometers away. The nearest bus stop is located on the Arepalayam- Germalam road around 1.5 kilometers from the village. The nearest temple (*Jadesamy*) in which the village priest performs public prayers each Monday is located about 3 kilometres away from the village.

The name Geddesal has evolved from the word “*gadde*”, which means ‘rice’ in colloquial Kannada language. Geddesal villagers tend to believe that a *Rakshasha* (a demon in Hindu mythology) named *Shavanan* once lived in the village. The villagers had to make sacrifices in form of rice grown and harvested on the same day on a daily basis. According to a village informant (Geddesal, October 2013), the ancestors of the Soligas living in Geddesal today came 100-200 years before from the Minchukuli valley which is around 3 kilometers away from Geddesal’s present-day location.

Geddesal village has five bore wells and four hand pumps for drinking water. There are also two overhead tanks used for water storage. There is no proper road facility in the village. During rainy season the mud path are slushy and the cow dung which is not cleared makes it very difficult to wade through to reach the main road.

The crops grown in Geddesal village include *ragi* (finger millet), *avarai* (broad beans), beans, potato, onions and garlic. *Ragi* (finger millet) and *avarai* (broad beans) are intercropped. Few farmers have also ventured into small scale cash crop coffee production. Other farmers said that they do not start producing coffee as it takes too long (up to 5 years) for newly planted coffee plants to bear yield. Villagers purchase fertilizers and seeds from Arepalayam and Udayarpalaiyam, about 25 kilometers away.

The crops grown around Geddesal are frequently destroyed by wild animals like elephants and wild boars. In the growing season, villagers hence often stay as watchmen during night in their respective fields where they light fires or torches to chase the animals away. In order to minimize human-wildlife conflicts, the Tamil Nadu Forest Department has also built electric solar fences on one side of the village.

### **Kanakkarai**

Kanakkarai village is located to the north-east of Geddesal (see Figure 10 above), around 51 kilometers away from Sathyamangalam town (Kanakkarai Village Forest Council Report, 2007). The village has around 135 households. Only a small proportion of the households (about six) hold full land tenure rights, while the large majority use land based on conditional land tenure. Kanakkarai village falls under the jurisdiction of Germalam panchayat in Thalavadi block, Sathyamangalam taluk, Erdode district, Tamil Nadu state. The village is home to both Malai and Urali Soligas. The socio-economic situation of Malai Soliga households is for the most part poorer compared to those of the Urali Soligas.

Kanakkarai village is placed at the Germalam- Kollegal high road and can be relatively easily accessed. A bus stop with public and private bus services can be found directly in front of the

village. More than 95% of the houses were built by the Panchayat Union.<sup>10</sup> The Tribal Welfare Department of the Government of Tamil Nadu runs a residential middle school (1<sup>st</sup> to 8<sup>th</sup> grade) in the village. There is also a *palvadi* (kindergarten) run by the State Education Department. The nearest primary health care centre is in Germalam village which is around 2 kilometers away. For other ailments the villagers frequent the hospitals in Udayarpalaiyam and Sathyamangalam. There is also an Anti-Natal care trained nurse in the village who teaches and takes care of maternal hygiene and needs. The nearest post office and public distribution shops are located in Arepalayam which is 20 kilometers away. There is a Jadesamy temple located within the village and a cemetery located near the boundary of the village. Kanakkarai village also includes five smaller hamlets nearby, namely Eraiyan doddi, Kettiyamma doddi, Kettaiyam doddi, Meesakonuran doddi and Jiyandoddi.



Figure 12: Women in Kanakkarai are harvesting potatoes from their fields

The name Kanakkarai evolved from the term “*Karai*” which means source of water or pond in Tamil language. A pond located few kilometers away from the present-day village once was the only source of water for the villagers. Some 30 years before, only five houses were located where the village is now placed. When the Tamil Nadu state authorities initiated a housing scheme for tribal communities, households from surrounding smaller hamlets were resettled to this spot (village informants, Kanakkarai, 2013).

Kanakkarai village has a handful of functional hand pumps and taps which provide drinking water. There is also one overhead tank which is used for water storage. The NGO “Mysore Resettlement and Development Agency” (MYRADA) (see page 92) is active in the village in several projects, such as the construction of pumps, cow sheds and toilets.

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<sup>10</sup>A Panchayat Union is the group of village panchayats. The union serves as the link between villages and district administrations. Panchayat Union form the local government at the Taluk level. As of 2016, Tamil Nadu has 385 panchayat unions (Government of Tamil Nadu 2016).

The most common crops grown in Kanakkarai are *ragi*, *avarai* and *cholam* (maize). There has also been an increasing diversity of vegetables grown in the village like beans, potatoes, carrots, beetroot and *noorkohl* (a kind of turnip) (see Figure 12). Few villagers also grow coffee in their gardens and generate additional income from it at small scale. Similar as in Geddesal village, the crops are often destroyed by wild animals, particularly elephants and wild boars. Some villagers have put up electric fences around their fields toward off larger wild animals. Bears also frequent this village. Several attacks on humans have been recorded.

Kanakkarai village is surrounded by several huge estates like King Farm and Taj Estate established by external investors and large scale farmers who grow maize, turmeric, citrus fruits and coffee. Kanakkarai villagers reported about ongoing land conflicts with investors and large scale farmers who obtained agricultural land for relatively cheap from the locals. Some villagers reported to still waging legal battles to claim back their land.

The following Chapters 5 and 6 discuss in detail the agricultural trends, demographics and land use patterns in both the case study sites, namely M. M. Hills Wildlife Sanctuary in Karnataka and Sathyamangalam Tiger Reserve in Tamil Nadu based on the empirical data collected during the field- work phase.

## **5. Agricultural transformation and Soliga indigenous communities in Male Mahadeshwara Hills**

### **5.1 Introduction**

**“What are the local agricultural livelihood dynamics within the Soliga communities? What are the trends and drivers for change?”**

This section aims to answer the above research question. This chapter shows empirical evidence gathered from the field studies conducted in Male Mahadeshwara Hills Wildlife Sanctuary (in the following M. M. Hills) and Sathyamangalam Tiger Reserve. Evidence is based on the questionnaire survey conducted at the household level, the maps produced using Survey of India topo sheets and the National Remote Sensing Agency data, and supplemented by information recorded through oral histories and focus group discussions.

The following section reflects on the first two sections of the conceptual framework, the “Sustainable Livelihood Framework” (SLF). Chapter 5 discusses the demographic details, conflicts in the use of available resources and livelihood variations based on agriculture and forestry. All this falls in the vulnerability context of the SLF. Secondly, this chapter shows the assets held by the Soliga people in the case study areas, forming the asset pentagon, namely the second part of the SLF. The human capital in this chapter denotes the ability and availability to do labour, which is largely agricultural in this context. Financial capital is composed of income mainly obtained from selling agricultural products on local markets, but also from loans and remittances from government agencies, NGOs and banks. Land forms both, a part of the natural capital and a part of the financial capital, and is the main production factor in the case study areas. Land and land tenure will hence be discussed in more detail in this chapter. Infrastructure (such as roads) and technological production assets (like bore wells and tractors) form an important part of the physical capital together with seeds and fertilizers. In both case study areas, infrastructure and technological production assets are poorly developed - also compared to general rural standards in India. Social capital is the value of social networks, reciprocity, trust, rules and regulations that facilitate individual or collective action, and can hence contribute to livelihood productivity of individuals and groups (Foley and Edwards 1997). In the case study areas, especially the informal dimensions of social capital tend to be strong.

### **5.2 Demographic and Ethnic Background of Interviewees in Male Mahadeshwara Hills Wildlife Sanctuary**

Male Mahadeshwara Hills Wildlife Sanctuary is inhabited by the Soliga and Lingayat ethnicity. They are settled in 48 villages, out of which 23 are inhabited by Soligas (MYRADA, 2013). Due to the caste hierarchy prevalent in the Indian society, Soliga and Lingayat communities live separated. The Lingayat ethnicity living in M. M. Hills belong to the upper strata in the caste system, whereas Soligas form a lower strata in the caste hierarchy and usually settle in the peripheries of the villages.

Livelihoods of the Soliga communities in M.M. Hills largely depend on agriculture and forestry. Before the early 20<sup>th</sup> century, Soliga communities practiced *podu*<sup>11</sup>, shifting cultivation, in an extensive subsistence production system (Shaanker et al, 2003).

In this study, a total number of 218 households (112 Soliga and 106 Lingayat) were interviewed in M. M. Hills in seven villages, namely Gorasane, Medhuganai, and Palar (all three inhabited solely by Soliga communities), Konganur, Anaiwala, and Kiranwala (all three inhabited by Lingayat communities) and Kombudikki (inhabited by both Soliga and Lingayat people),

### **5.2.1 Soliga Ethnic Group**

In this study, a total of 112 households from the Soliga ethnic groups were interviewed in M. M. Hills in the four villages Gorasane, Kombudikki, Medhuganai and Palar. The number of interviews conducted in each of the four villages was 33, 19, 11 and 49 respectively which represents 29 %, 17 %, 10 % and 44 % of all households in each village. All interviewees follow Hindu religion and belong to the Hindu/ Malai Soliga clan.

Special attention was given to the gender and age balance of the survey. Around 47 % of the respondents were female. Around 70 % of the respondents were between 18 and 60 years of age; 30 % were above 60 years. Approximately 85 % of the male interviewees were married, 8 % single, and 7 % widowed. Out of the female interviewees, 85 % were married, none was single, and 15 % widowed. In total, 85 % of the interviewees were married, 4 % single, and 11 % widowed.

### **5.2.2 Lingayat Ethnic Group**

Additionally the 112 households from the Soliga ethnicity, a total of 106 households were interviewed from the Lingayat ethnic community in M. M. Hills. The Lingayat interviewees live in four villages, namely Anaiwala, Kombudikki, Konganur and Kiranwala. The number of interviews conducted in each village was 33, 22, 23 and 28 respectively which constitutes 41 %, 15 %, 23 % and 33 % of all households in each village.

Female respondents constituted 48 % of all Lingayat people interviewed. Around 85% of the Lingayat interviewees were below the age of 60 years; almost 95% of the informants were married while 5% were widowed.

## **5.3 Agriculture and Forestry in Male Mahadeshwara Hills Wildlife Sanctuary**

Despite all external influences and land use changes, agriculture in M. M. Hills is still largely undertaken in traditional agricultural patterns and practices. Main staple crops are finger millet (*ragi/ kezhvaragu*) and broad beans (*avarai*), both crops are grown between August and November. Agriculture is largely rain-fed, however, irrigation from bore wells is increasingly practiced. The villagers are mostly smallholder farmers. Table 3 shows the land holding sizes of

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<sup>11</sup>For a background on *podu* in indigenous villages in India see Dash and Msira (2001).

the interviewed Soliga households in the four case study villages in M. M. Hills in comparison to each other.

<b>Village</b>	<b>No of households interviewed</b>	<b>No land (in %)</b>	<b>0-1 acre (in %)</b>	<b>1 acre (in%)</b>	<b>2 acres (in%)</b>	<b>3 acres (in %)</b>	<b>&gt;3acres (in %)</b>
Gorasane	33	4	4	7	21	32	32
Kombudikki	19	20	20	20	13	27	-
Medhuganai	11	14	-	-	43	29	14
Palar	49	15	7	18	29	22	9
Total	112	13	7	14	25	26	15

Table 3: Land holding size in M. M. Hills Soliga case study villages<sup>12</sup>

Table 3 shows the strong differences in land holdings size among the four case villages. The strongest differences can be seen between Gorasane and Kombudikki village, with the general land sizes been higher in the former. The percentage of landless households in Kombudikki is five times higher than in Gorasane; about one third of the interviewed households in Gorasane use more than 3 acres of land while none of the households in Kombudikki do so. Explanations might be that Soliga households in Kombudikki are perched on the very edge of the village as the other part of the village is inhabited by Lingayat households. Most Solinga are only able to cultivate small lands which are available near their settlement, while the larger agricultural plots of Kombudikki are used by people from the Lingayat ethnicity. Other factors might be that many Soliga households in Kombudikki do collective farming and a large number of household members work abroad (e.g. in stone quarries in far-away towns like Bangalore and Mysore).

In Gorasane only 14 households of the 33 interviewed households have legal land tenure documents for their land they use, which they can inherit to the next generation. Only five of the 11 interviewed Soliga households in Kombudikki hold legal land tenure documents. These five households were some of the early settlers in the village. All households who settled later in Kombudikki do not have legal land tenure rights and hence use the land informally.

Medhuganai is a village with only 18 households in total, and generally larger land holding sizes. The relative remoteness of Medhuganai due to its poor road accessibility apart from a lack of basic infrastructure like water and electricity does not encourage migrants to settle down in Medhuganai village. In Palar village, the household land size patterns are similar to the average of all four case study villages. According to informants from Palar, the size of land in Palar village largely depends on the amount of forest land each household was able to clear and secure when the now-villagers

<sup>12</sup>One acre is equivalent to 0.4 hectare.



were relocated here from Anaiwala village three years back (2010). The people who cleared more forest land in this time are still those who have larger land holding sizes today.

Thus on average, around 7 % of the Soliga households in M. M. Hills case study villages have agricultural land smaller than 1 acre, 14 % hold 1 acre, 25% hold 2 acres, 26 % 3 acres, and 15 % above 3 acres. 13 % of all interviewed households do not have agricultural land. 51 % of the Soliga households have a land holding size of 2 or 3 acre. This is considerably small given the fact that the average land plot holding size in Karnataka state is between 3 acres (NABARD, 2014).

The following two household case examples (the “large land holding household” and the “Female head household”) from Gorasane illustrate livelihood and household situations in the M. M. Hills case study villages.

#### **Case 1: “The large land holding household” in Gorasane**

The first household case example is a Soliga household from Gorasane with 7 members out of which four are male; and no children. The household head is not formally educated. The household has 6 acres of land on which they cultivate finger millets, broad beans, maize and beans. The land is inherited and the household obtains the full legal land tenure documents. The 7 persons live in a concrete house with an area of around 500 square feet. The sons of the household head work as quarry labourers in nearby towns.

The household has cattle and poultry, used for milk and eggs for household consumption. They have two oxen which are used for ploughing.

The household uses the nearby forest for Non- timber forest products (NTFP) collection. Firewood is used for household purposes while gooseberry, soap nut and broomstick grass are sold for additional income. The household head is also aware of medicinal plants which he collects in the forest and uses it for treatment of ailments in the village.

#### **Case 2: The “Female head” household in Gorasane**

The low income household case example is a household from Gorasane with 4 persons, out of which one is a child. The household head is an elderly widow. The house they live in is about 300 feet. Her son and daughter-in-law work in Kothagiri as labourers in tea and coffee estates. The child is studying in the middle school in Gorasane.

She relies on the support of her neighbours for her daily livelihood. She does odd jobs in the village to get free food and monetary support from the villagers. When her husband was alive they had 15- 20 cows and 4 goats and lead a relatively better life by selling the milk and cattle. She had to sell the cattle because no one was there to tend to it and she also needed the money for her livelihood. The household has no land hence is dependent on the subsidies from the government for survival. She gathers firewood from the nearby forest for household use.

Under the Forest Rights Act 2006, the Indian state issued temporary land use rights to Soliga households for the plots they tilled. Some were even given conditional land title deeds. The land title deed does not allow the selling of the land, however, it can be inherited (Forest Rights Act, 2006). Land use rights are owned by the father ancestrally and are not divided yet between the children. Children take care of the land and sow crops based on mutual agreements between themselves. In some households one member tends to the land while the others migrate to nearby villages and towns for labour work (see sub-section 5.7 for more information).

In Gorasane, for instance, the forest department allowed 30 Soliga households to clear the forest land near their village and to convert it into agricultural land. After the forest was cleared, however, the forest department denied the farmers the permission to use the land for agriculture.

Informants reported similar ‘oddities’ also from Palar village, a forest settlement established in 2010 (see details below in Chapter 5.7.).

Village	Number of households interviewed	Finger millet (in %)	Broad beans (in %)	Maize (in %)	Other crops (in %)
Gorasane	33	27	16	11	10
Kombudikki	19	8	8	1	29
Medhuganai	11	6	4	1	2
Palar	49	35	3	9	31
Total	112	76	31	22	72

Table 4: Agricultural crops per household in M. M. Hills Soliga case study villages, 2013-2014

Finger millet (*ragi/ kezavaragu*) is the main staple in all four villages. It is grown by almost all interviewed households. Apart from finger millet (*ragi*) (76), broad beans (*avarai*) (31) and maize (*jola/ cholam*) (22) are grown in all the four villages. 31 households in the four villages produce broad beans, which are intercropped with finger millet. Few villagers grow other crops apart from finger millet, broad beans and maize. Pigeon peas (*togari/ tuvarai*) is only grown in Gorasane (4) and Palar (4). Oilseeds are only cultivated in Gorasane village (2), pearl millet (*kambu*) only in Kombudikki (1), cowpeas (*thatta payiru*) (4), green gram (4), horse gram (2), red gram (1) and black gram (1) only in Palar.

Maize, finger millet, and broad beans are the main cash crops. Maize is exclusively grown as a cash crop, while finger millet is used as both a cash and food crop. Maize yields are between 500 and 700 kilograms per acre. Maize prices on the local markets are Rs.1200 per 100 kilograms. The yield of finger millet per acre is between 500 and 1000 kilograms. Soliga households sell finger millet for Rs. 2000 per 100 kilogram if in need of additional income. The broad beans yields are

50 to 60 kilograms per acre. The other millets like pigeon peas, cow peas, oil seed, green gram and black gram give an output between 10 to 30 kilograms per acre and are cultivated in the available space between the fields and not on entire acres of land.

Except for finger millet, broad beans, and maize the other crops are grown in horticultural systems for home consumption. Beans are grown only by very few of the sample households (only two each in Kombudikki and Medhuganai, four in Gorasane and three in Palar). Prices for vegetables on local markets are high. The price of tomatoes is about Rs. 60 per kg and for onions about Rs. 20 per kg. Few households sell their vegetable produce for additional income within their village or on neighbouring markets in M. M. Hills.

The highest variety of crops is grown in Kombudikki village. Beside the grains and pulses, interviewees reported to grow pumpkin (*poosani*) (6)<sup>13</sup>, bitter guard (5), tomato (2), chilli (5), onion (1), pomegranate (1), jack fruit (2) and coconut (2). There might be two predominant reasons for it. One is the higher water availability in Kombudikki compared to the other case villages, due to bore wells and a water storage tank built by the NGO MYRADA. The second one is the influence from the Lingayat community living in Kombudikki. Around 150 Lingayat households live in Kombudikki village. Interviews were conducted with representatives of 22 of these Lingayat households. Finger millet (*ragi/kezhvaragu*), broad beans (*avarai*), maize (*jola/cholam*), beans, tomato, chilli, onion, guava, jackfruit, coconut, papaya, mango, tamarind and sunflower are grown by these villagers for commercial purposes except finger millet (*ragi/kezhvaragu*) and broad beans (*avarai*) which is for household use only.

97 % of the 112 households interviewed in the four Soliga villages in M. M. Hills work as family farmers, without hiring external labour force. The remaining 3 % hire day labourer during sowing and harvesting periods. Hand digging, cow ploughs and tractors are used in the fields. Hand digging and cow ploughs are being used when there is lack of monetary resources or if the fields are sloppy or rugged. Some family farms rent cows or tractors. Costs for a cow plough are Rs.300 for a whole day, and Rs.600 per hour for a tractor. In Medhuganai village only hand digging and cow ploughs are being used since there is no road leading to the village so it does not facilitate the use of tractors.

Almost every farm household uses dung from cows or goats as fertilizers. Only 2 % of all interviewed Soliga households use Urea as a chemical fertilizer. Urea is purchased from Hanur and Ramapura towns about 30 to 40 kilometers away from the case villages. In some cases chemical fertilizers are used in lieu of organic fertilizers because of the absence or lack of availability of organic fertilizers. Most households, however, are unable to bear the expenses to purchase chemical fertilizers.

#### **5.4 Non-timber Forest Products**

Most Soliga households in M. M. Hills strongly depend on Non-timber Forest Products (NTFPs) for their livelihoods. The main NTFPs are fuelwood, bamboo, honey, goose berries, soap nut

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13. No. of households growing the crops in each village are given in the brackets

berries, and *seemar pullu* (broomstick grass). Firewood is largely collected by women. Fuelwood is either consumed in the own homestead or sold in the nearby villages. Prices for one bundle of fuelwood are around Rs. 100. Household labour availability allows to collect a bundle every day, thus making a maximum income of 100 rupees a day. Other NTFPs are sold to the “Large Area Multipurpose Cooperative Society” (LAMP). LAMP is a state association which aims to support the development of “Scheduled Tribe” people in India Soligas can sell NTFPs (except fuelwood) that they gather from the forests to LAMP. To prevent local people from gathering fuelwood in the forests, the state “Scheduled Tribe Development Programmes” supplies gas cylinder free of cost (and with a 50% subsidy after a few months of use) to most indigenous households in revenue villages in M. M. Hills. Although most Soliga households have been supplied with gas – in Gorasane, for example, almost 90 % of all households use gas cylinders - people continue to collect fuelwood from the forests.

## 5.5 Livestock

Many Soliga households in M. M. Hills use livestock as an additional source for subsistence and income. On an average 40% of the Soliga households in M. M. Hills have livestock. Cattle and poultry are raised in all four Soliga case study villages. The number of cattle ranges from 2 to 15 per household depending on their social status in the village. The livestock holding patterns in the four case study villages is shown in Table 5.

<b>Village</b>	<b>Number of households interviewed</b>	<b>Cows (in %)</b>	<b>Oxen (in %)</b>	<b>Goats (in %)</b>	<b>Sheep (in %)</b>
Gorasane	33	39	3	24	15
Kombudikki	19	16	n.i.	5	n.i.
Medhuganai	11	55	9	64	18
Palar	49	33	6	45	24

Table 5: Distribution pattern of livestock per household in the M. M. Hills Soliga case study villages, 2013- 2014

Livestock is fed by fresh and dry grass and finger millet stock. Cattle, goats and sheep also graze in the forest. In Gorasane and Palar village, MYRADA gives loans to Soliga households through the National Bank for Agriculture and Rural Development (NABARD) to purchase cattle, goats and sheep. Participating villagers pay half the amount on their own while the other half is paid by MYRADA. The loan amounts vary depending on the kind and number of livestock bought. In Gorasane, MYRADA paid Rs.12,000 as a loan while village households invested an additional Rs.10,000 for either 10 goats or 2 cows respectively. In Palar village MYRADA gave Rs.6,000 and villagers invested Rs.4,500 additionally for 5 goats. For the first two years the project participants are not allowed to sell the calves.

Goats and cows are a source of income, especially in time of need. Households sell their goats and cows directly to traders coming to their villages. The prices range between Rs.2,000 to Rs.3,500 for goats, and between Rs.6,000 to Rs.8,000 for cows. Cattle are used for ploughing the agricultural lands and milk for home use. In Palar village dairy products are sold to traders coming to the village or on the market in Govindapadi village (which is less than one kilometer from Palar on the Tamil Nadu side). Some Soliga households from Govindapadi village share their goats with households in Palar. While Govindapadi households purchase the goats, the daily feeding and care is provided by Palar villagers, who get money or half of the new born calves in return for their own.

## 5.6 Comparison to Lingayat households

Table 6 gives us the statistics pertaining to land holding size of the interviewed Lingayat households in the 4 case study villages to provide a contrast to the Soliga case study in M. M. Hills. The villages were chosen based on the proximity to the chosen Soliga case study villages.

Village	No of households interviewed	No land (in %)	0-1 acre (in %)	1 acre (in %)	2 acres (in %)	3 acres (in %)	>3 acres (in %)
Anaiwala	33	6	-	22	33	11	28
Kombudikki	22	-	41	29	24	6	-
Konganur	23	5	38	14	38	5	-
Kiranwala	28	-	8	31	15	31	15
Total	99	11	87	96	110	53	43

Table 6: Land holding size in M. M. Hills Lingayat case study villages

Table 6 displays that the Lingayat households have relatively larger land holdings in comparison to the Soliga households. This is shown, for example, in Kombudikki village, in which 20 % of the Soliga households are landless (see Table 3) while none of the Lingayat households. The Lingayat households also more often hold legal land tenure rights for the lands owned by them since they live predominantly in revenue villages.

<b>Village</b>	<b>Number of households interviewed</b>	<b>Finger Millet (in %)</b>	<b>Broad beans (in %)</b>	<b>Maize (in %)</b>	<b>Other crops (in %)</b>
Anaiwala	33	22	20	16	10
Kombudikki	22	15	13	5	11
Konganur	23	15	10	6	10
Kiranwala	28	11	8	9	21
<b>Total</b>	<b>106</b>	<b>63</b>	<b>51</b>	<b>36</b>	<b>52</b>

Table 7: Agricultural crops per household in M. M. Hills Lingayat case study villages, 2013-2014

All interviewed households in the four Lingayat villages grow finger millet, broad beans and maize.

Sunflower is grown in Anaiwala (5) and Kombudikki (1), cow peas in Anaiwala (1), pigeons peas by one household each in Konganur and Kiranwala, onions in Kiranwala (1), beans by two households each in Kombudikki and Konganur, bottle gourd, carrot and radish in one household each and tamarind and marigold in two households each in Konganur, bitter gourd in Kiranwala (2), sweet potato one each in Anaiwala and Kiranwala, Spinach in Kiranwala (1), tomato in Anaiwala (1) and Kiranwala (2), chilli in Anaiwala (2) and Kiranwala (1), cucumber in Kiranwala (1), coconut and mango by one each in Kombudikki, castor plant, ridge gourd, banana, custard apple and orange in one household each in Kiranwala, and mango in one household in Kombudikki.

Table 7 shows the crops grown by the Lingayat communities in case study villages in M. M. Hills. In comparison to the interviewed Soliga households in M. M. Hills, the Lingayat people grow a wider variety of crops. On average each Lingayat household produces 500 to 1000 kilograms of finger millet and 50 to 100 kilograms of broad beans for household use. Sometimes finger millet is sold in M. M. Hills for Rs. 200 for 10 kilogram. Maize is grown only for commercial purpose. It is not consumed by the Soligas nor the Lingayats. Approximately 5 kilograms of Maize seeds are sown and between 1000 to 2000 kilograms are harvested per acre by both the Soliga and Lingayat community. Maize yields are sold to traders for Rs. 1250 to Rs.1300 per 100 kilogram. Three households of the interviewed households in Anaiwala installed bore wells on their own costs (about 3 lakh rupees). They sell the water to their neighbours, making it a good source of income. Vegetables are mainly grown for household use but are also sold on neighbouring village markets for additional income. Marigold is mainly grown as an offering for the temple. It is also sold to people who come for prayers in the temple. In 2012, few Lingayat households in Anaiwala and Kombudikki started growing sun flower. Their harvest gave good returns, however, sun flower can only be grown by households with enough water resources. The sun flower seeds are purchased from Hanur town (around 30 kilometers away on the foot hills of M. M. Hills) for Rs. 400 per kilogram. Sweet potato gives the Lingayats an annual profit of Rs. 10, 000 per household. Beans and radish are sold within the villages for Rs. 10 to 20 per kilogram.

Konganur village is inhabited by 100 Lingayat households (out of which 23 were interviewed as part of this study) and is located adjacent to Gorasane village which is solely inhabited by Soliga people. The crops being grown in both villages are very similar. Finger millet, broad beans, maize, pigeon beans, beans, carrots, radish, and pumpkin in Konganur compared to finger millet, broad beans, maize, pigeon beans, beans, chilly and oilseed in Gorasane (see Table 2 and 5 above). Also the ecological and geographical conditions, including water availability, are similar in both villages. However, the agricultural patterns and related socio-economic conditions in Konganur and Gorasane are quite different. People in Konganur village belong to a 'higher' strata in the caste division than the Soligas living in Gorasane. Konganur villagers are on average better formally educated, are more exposed to the 'outside' world (including opportunities for trade and off-farm income) and are more able to benefit from agricultural transformation processes than households in the Soliga community in Gorasane. Lingayats are not directly benefitting from government agricultural programs. In contrast Soligas receive free seeds and subsidies to purchase fertilizers through governmental programs, as showed above in detail.

### **5.7 Land use and land cover change in Male Mahadeshwara Hills Wildlife Sanctuary**

This sub-chapter shows the land utilization and land cover changes in case study one, the Male Mahadeshwara Hills, Chamrajnagar District, Karnataka State. The findings are based on Survey of India toposheets, and land use and land cover maps obtained from the National Remote Sensing Agency, India, during the empirical field study period in 2013-14.

Male Mahadeshwara Hills (M. M. Hills) Wildlife Sanctuary falls under the jurisdiction of the Kollegal Forest Division which is under the control of the Karnataka Forest Division. The River Palar flows through the M. M. Hills Wildlife Sanctuary and also forms the border between Karnataka and Tamil Nadu State. The location of the M. M. Hills Wildlife Sanctuary can be seen in Figure 13.

The land use and land cover of the region has seen changes in the recent years. The main reasons include expansion of residential spaces as well as clearance of forest land for the purpose of agriculture for livelihood purposes.

In Figure 14, land use and land cover maps for the years 2005-06 and 2011-12 for the M. M. Hills Wildlife Sanctuary are compared. In the year 2005-06 it can be seen that the agricultural fallow otherwise known as the cultivable wastelands are of a higher percentage compared to the year 2011-12. The reduction of fallow lands can be attributed to the growing population and resettlement of people in this area from neighboring regions.

In 2009-10 the Soliga inhabitants from Anaiwala village, for instance, were relocated by the forest department to a forest area then named Palar in the pretext of providing them with own agricultural land. An underlying reason for the resettlement to Palar was to work on the nearby plantations. The Soligas were also allowed to clear forest land to cultivate crops for their subsistence near their houses. The larger the forest area cleared the larger the area of land under ones ownership. It was, however, only a temporary arrangement. Once the plantation work was over the resettlers were

asked to leave which entailed in a conflict between the forest department and the villagers. The villagers submitted a petition against the forest department claiming the right to use the land that they cleared for agriculture. Around 30 people were arrested by the police department but later released. After further fighting for their rights some Soliga have obtained conditional land tenure documents for their agricultural lands. These conditional land tenure rights allow them to inherit the land, however, not to sell it. Once young Soligas get married they live in nuclear families and hence each family needs a new piece of forest land for their sustenance. Hence more and more forested land has to be cleared.

During this period also many other households from Tamil Nadu, the neighbouring state migrated to this forest area and cleared land for agriculture. Land tenure papers were, however, only allotted to 'Schedule Tribe' people, so households belonging to the 'Scheduled Caste' did not receive any legal land tenure papers (Source: Oral histories conducted in Palar in 2013-2014).

Surprisingly, and in stark contrast to the above shown deforestation argument, the changes in the area of forest land are comparably low in M.M. Hills between 2005-06 and 2010-12. Also area under grass is getting reduced due to over grazing of the cattle especially in Palar village. The villagers reported that the cattle are untied and led into the forest to graze on their own. The cattle eventually return in the evenings to their owners mainly due to the need for water and protection from large predators. .



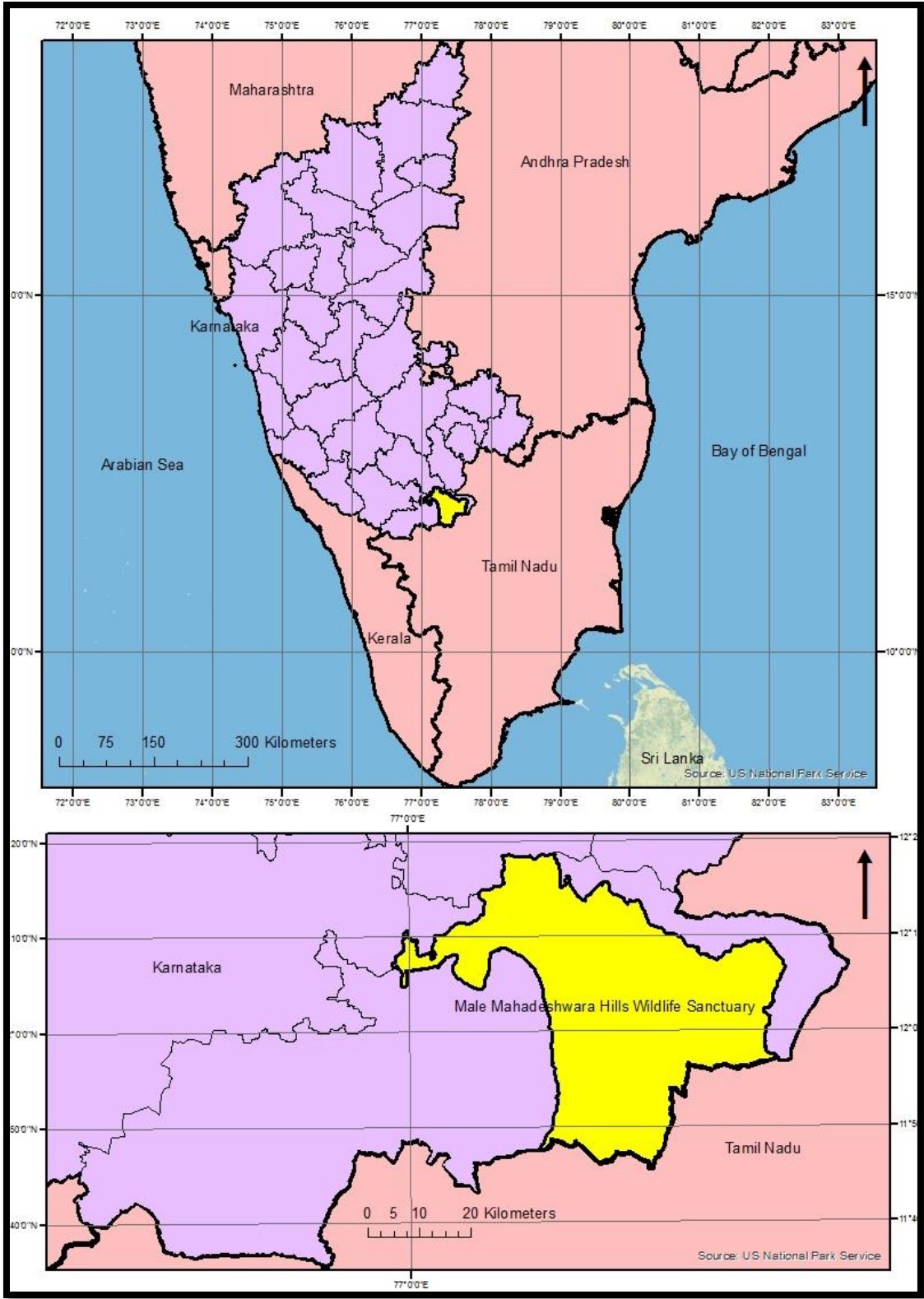


Figure 13: Location of Male Mahadeshwara Hills Wildlife Sanctuary in Karnataka State  
 Source: Survey of India toposheets (1970-71)

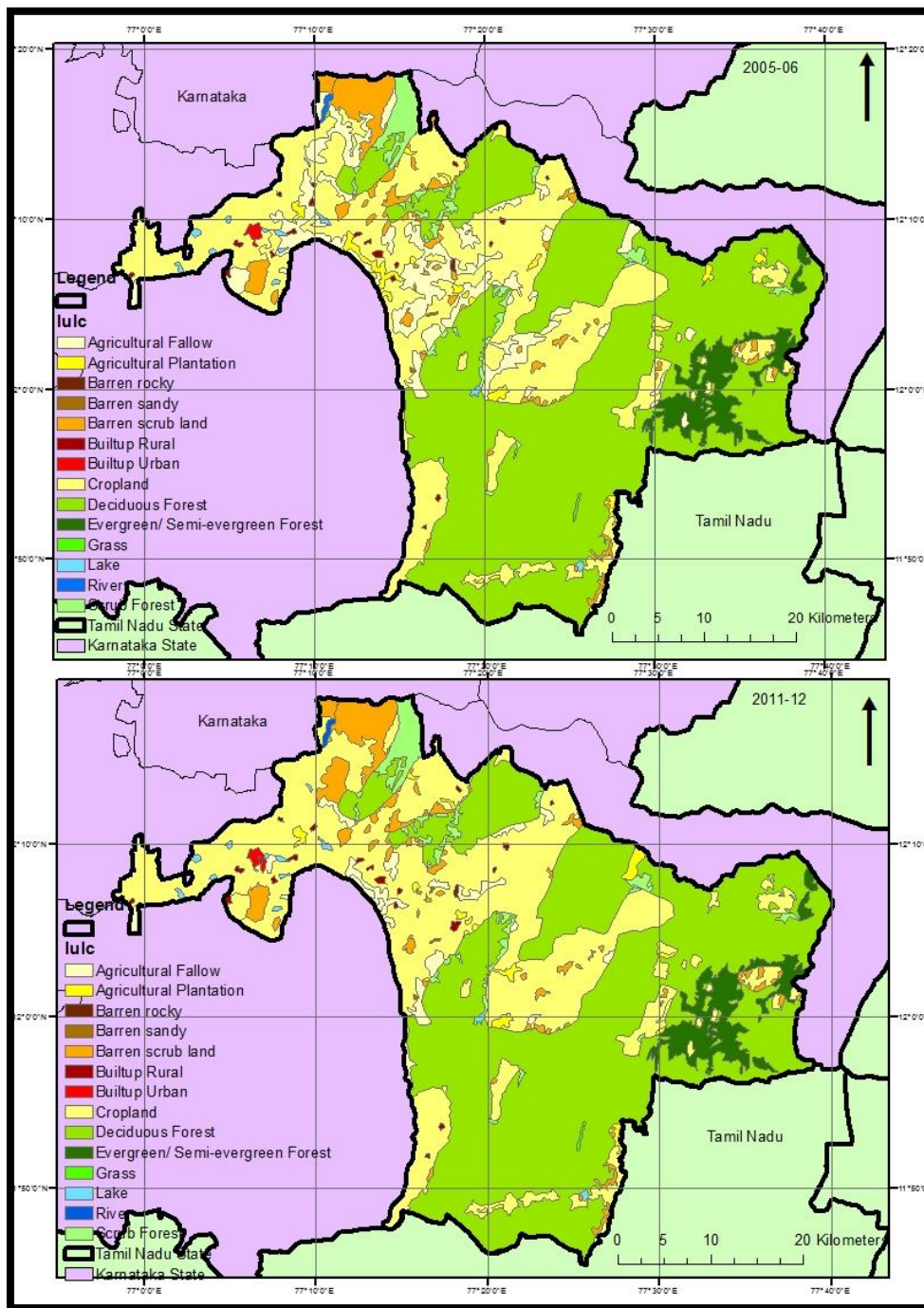


Figure 14: Land use and land cover in Male Mahadeshwara Hills Wildlife Sanctuary, 2005-06 and 2011-12

Source: Land use/ Land cover maps, National Remote Sensing Agency, Indian Space Research Organization

### 5.8. Off- farm income in M. M. Hills

Agriculture is still the dominant source of livelihood in M.M. Hills. However, Soliga people living in M. M. Hills increasingly work as off-farm day labourers in in their own villages or in surrounding villages. Seasonal and permanent migration also plays a role. Soliga from M.M. Hills migrated for off-farm income to urban areas in Karnataka, Tamil Nadu and Andhra Pradesh (large cities such as Bangalore, Karnataka, and Madurai, Tamil Nadu in particular) where they work for example in spinning mills. Another off-farm income is the collection of NTFPs in nearby forests. The NTFP collected include gooseberry, soap nut, swallow root (*Decalepis hamiltonii*, *Magaliberu* in Kannada language) and broom grass. Some people weave bamboo baskets and sell them to generate alternative off-farm income (Figure 15). The prices range from Rs. 25 to 100 based on the size and sturdiness of the basket. There are also generational differences between the “younger” and “older” generations. The younger generation, e.g., is much less involved in bamboo basket making.



Figure 15: Village elders in Medhuganai village are making bamboo baskets

The numerous NGOs that are active in M.M. Hills also provide alternative income sources for Soliga households. The NGO “Good Shepherd” for example provides training in carpet weaving for Soliga women in Medhuganai village (Figure 16). The materials and tools are provided by the NGO themselves and they also support the women in selling the carpets. For each carpet sold a woman gets Rs.150.



Figure 16: The wife of the village head in Medhuganai is weaving a carpet

The Lantana Craft Centre (eight kilometers from Gorasane, near the village Anaiwala) plays an important role for off-farm income of Soliga households in M. M. Hills. Supported by the NGO “Ashoka Trust for Research in Ecology and the Environment” (ATREE), in this center Soliga men and women are involved in designing and making furniture from Lantana roots and shoots (Figure 17). Many Soliga from villages like Medhuganai, Palar and Anaiwala have participated in the program and have been trained in the last years on how to make lantana furniture. The basic raw material is available for free in the nearby forests, and the participants make a handsome income from selling the furniture. A self-made Lantana sofa set, for example, can be sold for Rs.10, 000, which is a significant additional income for most Soligas. The NGO ATREE helps the producers in the sale of their products. One expert of the Public Works Department of the M. M. Hills explained that the Soliga villagers are permitted to collect Lantana roots in the forests around their villages and that “the Forest Department does not have any right to stop them”. The Forest Department sees Lantana as an invasive species and a menace to the spread and growth of other forest species.



Figure 17: People at work in the Lantana Craft Centre near Anaiwala

Villagers interested in Lantana craft making are provided with one and half months of training by the NGO ATREE. Thereafter the trainees start to work on their own, becoming more skilled as their experience grows.

### **5.9. The Role of MYRADA and the NABARD Program in M. M. Hills**

The NGO “Mysore Resettlement and Development Agency” (MYRADA) is the most active NGO in M.M. Hills. MYRADA is engaged in soil conservation, ecology, protection, planting materials and subsidies facilitation. MYRADA is also concerned with the provision of all requirements of agriculture hereabouts, particularly the distribution of seeds. MYRADA organizes Self-Help Groups (SHGs) through which loans are granted for agricultural production and transformation. MYADA also helps Soliga households with brick buildings for housing, even levelling the lands, building check dams and small farm ponds. The “National Bank for Agriculture and Rural Development” (NABARD) runs a development program in areas with indigenous people and in M. M. Hills this program is implemented by MYRADA.

MYRADA initially had to cajole and convince indigenous people to participate in the NABARD funded program. Some contradictions between agricultural development and forest protection became evident as part of the program. Under the Livestock Development Program, for example, NABARD is yet giving sheep, goats, and cattle to indigenous communities in M. M. Hills to promote agricultural change and to contribute to their livelihoods. The initiative of giving goats and sheep for free to Soliga communities, however, has been objected by the Forest Department because goats and sheep tend to graze in the forests around the villages where they substantially reduced plant (re-)growth and depleted forest diversity. Hence, the program shifted towards

promoting cows and buffaloes – milk cattle – rather than goats and sheep, although the latter can multiply faster and sooner contribute to additional income.

Under the Livestock Development Program Soliga households in M. M. Hills in villages like Palar and Konekere have received livestock in the last years. Besides it NABARD gives a 75% grant, with 25% from the beneficiaries, for bunding of fields, water storage tanks, and individual toilets. SHGs have been organized by MYRADA to facilitate livestock development programs. The programs and SHGs are only targeting indigenous ‘scheduled tribes’ households.

Of the reportedly 686 Soliga households in the M. M. Hills, 516 households have been covered by the NABARD, with full grants as well as some with some proportion of grant. Of the 516 households to be covered under the scheme, 441 households are land owning (with formal land tenure documents) and 75 are landless. During the time of this study in 2013, however, so far only 213 households have been covered under the scheme. However, the program is expected to continue until 2017, with the years 2016 and 2017 for monitoring and evaluating the progress and impact on the Soliga households.

## **6. Agricultural Transformation and Soliga Indigenous Communities in Sathyamangalam Tiger Reserve**

This chapter provides a detailed description and analysis of the agricultural transformation and livelihood situation of Soliga communities in the chosen case studies in Sathyamangalam Tiger Reserve.

### **6.1. Introduction**

The Sathyamangalam Forest Division covers 1455 square kilometers, both in Sathyamangalam and Gobichettipalayam taluk. Sathyamangalam Tiger Reserve is a smaller area of 800 square kilometers demarcated within the Sathyamangalam Forest Division. The broader land use in this area can best be shown at the geographic unit of the district level. Thereafter, this chapter geographically zooms in by showing the situation on the taluk (sub-district) level. This is followed by a detailed portrayal of land use and land use change on the protected area level, namely in the Sathyamangalam Tiger Reserve.

Tamil Nadu state has 32 districts. Erode District is located in the north-west of the state. It was formed in 1979 under the name Periyar District after the bifurcation from Coimbatore District, and renamed in 1996 as Erode. Erode District is administratively sub-divided into five taluks of which Sathyamangalam is one. Figure 15 shows the location of Sathyamangalam taluk in Erode district in Tamil Nadu state.

Sathyamangalam Tiger Reserve is located in the Sathyamangalam Forest Division in Sathyamangalam Taluk, Erode District, Tamil Nadu State (Figure 18). Established in 2013 as a part of the Project Tiger<sup>14</sup>, Sathyamangalam Tiger Reserve is the largest wildlife sanctuary in Tamil Nadu. Administratively, the Sathyamangalam Tiger Reserve falls under the jurisdiction of the Sathyamangalam Forest Division at the taluk level and the Erode District forest division at the district level. Geographically, the reserve is located in the meeting point of two distinct biogeographic landscapes of Southern India, namely the Eastern and Western Ghats. Sathyamangalam Tiger Reserve plays hence an important role as a biogeographic link between the ecosystems in the Eastern and Western Ghats, enabling exchange of species and genes between the two large habitats. The vegetation types within the reserve are very diverse, ranging from dry thorn shrub in the lower regions to patches of semi evergreen forests in the upper regions. The reserve is home to several endemic flora and fauna. The Sathyamangalam Forest Division is drained by two rivers namely R. Bhavani and R. Moyar. Both rivers originate in the western parts of the Nilgiri Biosphere and flow through there and finally drain into the Bhavanisagar Reservoir (Sathyamangalam Management Plan, 2012).

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<sup>14</sup> The Project Tiger is a scheme of the Indian Federal Ministry of Environment, Forests and Climate Change launched in 1973 providing central assistance for tiger conservation in designated tiger reserves throughout India (see [www.projecttiger.nic.in](http://www.projecttiger.nic.in)).

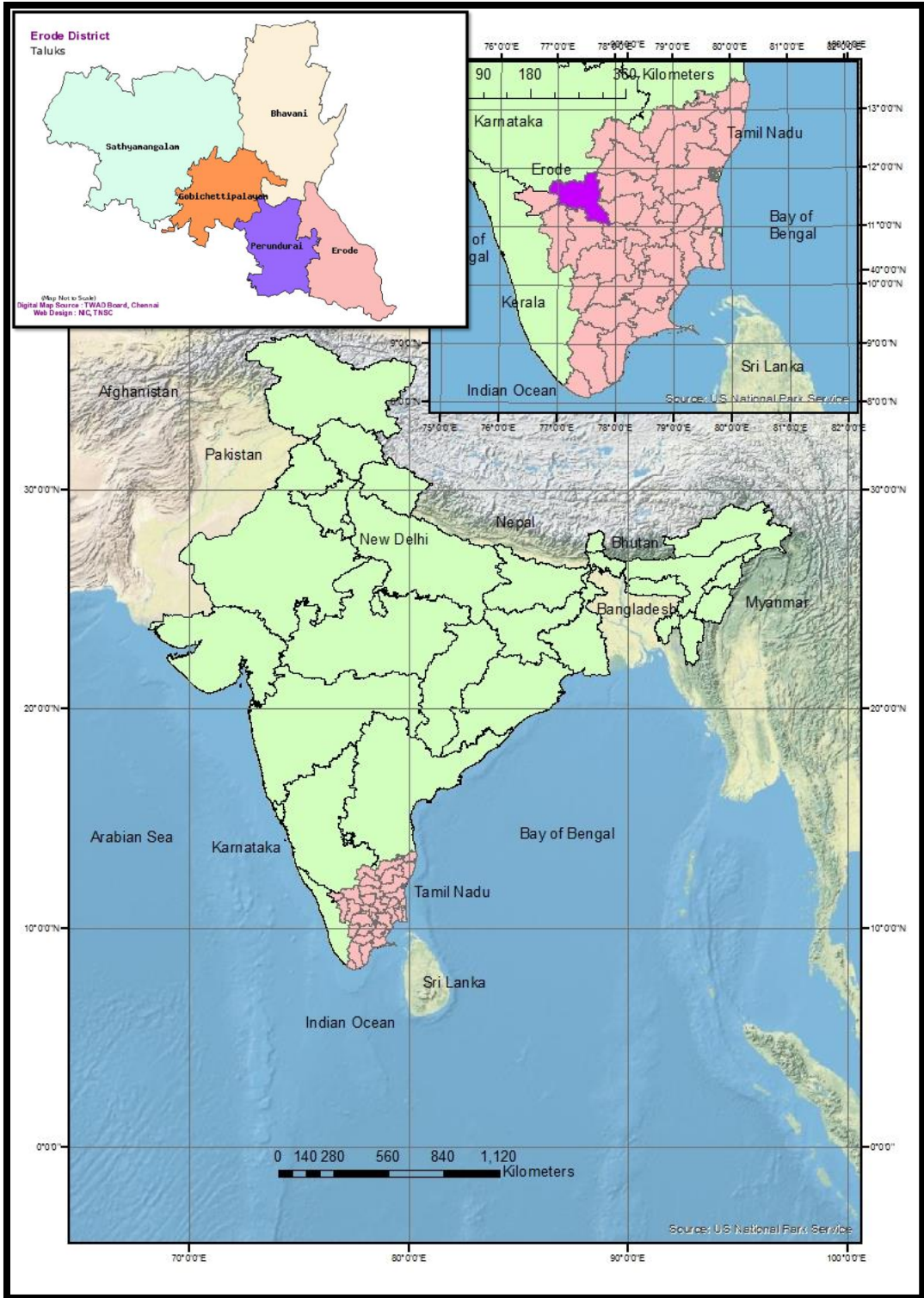


Figure 18: Location of Sathyamangalam taluk in Erode district in Tamil Nadu state

Source: Designed by the author, using Survey of India topo sheets and TWAD Board, Chennai



## **6.2 Demographic and Ethnic Background of Interviewees in Sathyamangalam Tiger Reserve**

In this second case area of the study, Sathyamangalam Tiger Reserve in Tamil Nadu, a total number of 199 households were conducted in four villages. These are two villages inhabited by the Soliga ethnicity (Geddesal and Kanakkarai) and two villages inhabited by the Lingayat ethnicity (Jogigoundanur and Jaderudrasampuram).

164 household interviews were conducted in the two villages Geddesal and Kanakkarai. A total of 85 interviews were conducted in Geddesal, which constitutes 52 % of all village households. A total of 79 interviews were carried out in Kanakkarai village, representing 48 % of all village households.

All people living in Geddesal and Kanakkarai villages are of Soliga ethnicity. Surrounding villages in the vicinity are, however, inhabited by Lingayats. Geddesal is a forest settlement while Kanakkarai is a revenue village. Both villages are located within a radius of 15 kilometres in the Sathyamangalam Tiger Reserve.

A focus of the survey was put on the gender balance of the sample. Geddesal village had 52 % male and 48 % female respondents while Kanakkarai had 47 % male and 53 % female respondents. In total, the number of male respondents was 49 % and the number of female respondents was 51 % in the two case study villages.

Amongst the male interviewees in Geddesal and Kanakkarai 84 % were married, 10 % were single, 4 % were widowed and 2 % were separated or divorced. The marital status of the female respondents in both the villages were 69 %, 28 % and 3 % married, widowed and separated respectively. In total in both the villages the number of single, married, widowed or separated/divorced rate amongst the respondents were 5 %, 76 %, 16 % and 3 % each. 75 % of all respondents were between 18 and 60 years of age, while 25 % were above 60 years.

In order to provide a local comparison to the Soliga communities, additionally 35 households from the Lingayat ethnicity were interviewed living in two villages adjacent to Kanakkarai village. The names of the Lingayat villages are Jogigoundanur and Jaderudrasampuram, . The household sample comprised 43% of all households in Jogigoundanur and 80% of all households in Jaderudrasampuram. The total number of female respondents in the two villages were 35%.

80% of the respondents in Jogigoundanur village, and 75% of those in Jaderudrasampuram village were between 18 and 59 years; 20% and 25% respectively of the respondents were older than 59 years. In Jogigoundanur 67% of the respondents were remarried, 13% single and 20% widowed in Jaderudrasampuram 75% were married 15% single and 10% widowed.

### 6.3 Agriculture and Forestry in Soliga Case Study villages in Sathyamangalam Tiger Reserve

Similar to the Soliga communities in the M. M. Hills, Soligas in Sathyamangalam Tiger Reserve were traditionally hunters and gatherers. The communities gradually shifted to agriculture in the course of the 20<sup>th</sup> century and started cultivating crops like finger millet (*ragi/ kezhvaragu*) and broad beans (*avarai*). Both crops are until the present day the basis for the local staple food. Households largely depend on small-scale subsistence farming, however, in the last five to ten years, many Soliga households in the Sathyamangalam Tiger Reserve have ventured into commercial cropping of cash crops like vegetables. Table 8 shows the land holding sizes of the 164 interviewed Soliga households in the two case study villages in the Sathyamangalam Tiger Reserve in comparison to each other.

Village names	No land (in %)	Rented land (in %)	< 1 acre (in %)	1 acre (in %)	2 acres (in %)	3 acres (in %)	3-6 acres (in %)
Geddesal	0	5	15	22	43	11	4
Kanakkarai	6	13	19	22	20	10	10
Total	9	3	17	21	32	11	7

Table 8: Land holding size in Soliga case study villages in Sathyamangalam Tiger Reserve, 2013-2014

According to NABARD (2014), the average land holding size in the state of Tamil Nadu between <1 acre. These generally very small land holding sizes are also being reflected in the two case study villages in Sathyamangalam. From Table 8 it can be seen that land holding sizes of most of the farmers in both villages are two acres and below. About 70 percent of the households fall under this category.

Table 8 also shows that Kanakkarai households rent more agricultural land compared to Geddesal households. The reason behind it is that there are huge farms owned by external farmers surrounding the Kanakkarai village. Farming households in Kanakkarai, mainly the Soliga households located in the peripheries of the village, rent the land to sow crops and pay annual rents to these external farmers. In Geddesal, all interviewees answered that they have their own agricultural land. This is due to the fact that Geddesal it is a forest settlement in which the villagers encroached the forest and reclaimed land to cultivate crops - although there are stringent measures to curb these activities. Also there are no large scale farms owned by external farmers surrounding Geddesal village. All land in this area belongs to the forest department; Geddesal villagers have land use rights, but are not allowed to sell the land.

Agriculture in Sathyamangalam Tiger Reserve is mainly rain-fed, only few households use bore wells. The informants in both villages told us that the land lies fallow between February to April which is the dry season in this part of Southern India. Land is under tillage after the dry season,

normally in May. Both men and women work on the fields. However, only men plough the land while women mostly weed the land. The women use hand sickles to clear the land of grass and weeds (Figure 19).



Figure 19: Women weeding the land in preparation for sowing in Geddesal village

On plain fields, rented tractors are being used for ploughing, based on the affordability of the farmer. The charges for a tractor are Rs.500 to 600per hour. In the case of Geddesal village, tractors can be rented from large scale farmers in surrounding villages like Arepalayam and Hasanur; in the case of Kanakkarai tractors can be rented from farmers in Germalam and Jogigoundanur village or from the Taj Estate. The tractors are brought to Geddesal and Kanakkarai village for a day or two where households then share the costs and use time amongst each other. Only about 4% of the households in the case study villages have their own oxen to plough their fields. In some cases oxen-driven ploughs are rented from farmers in neighboring villages. The charges are around Rs.300-400 per hour. Few farmers also do hand digging using hand ploughs to plough the land. This method was traditionally used around 30-40 years ago to prepare land before oxen-driven ploughs came into reach. In the first decade of the 2000s, households in Geddesal and Kanakkarai started renting tractors. Hand digging and cow-plough are, though, still employed for rugged and sloppy land (Figure 20).



Figure 20: A farmer ploughing his land in Geddesal village

The main food staples finger millet and broad beans are being sowed in or around September, after the monsoon rains in July-August. Both crops are intercropped. They are four months crops normally being harvested by January. The yield for finger millet is normally around four to five bags (100 kilograms each) per acre. Yields for broad beans is about one bag (of 50 kilograms) per acre. Farmers with very small land holding sizes, such as below one acre, usually only grow finger millet and intercrop broad beans with it. Farmers with around two acres of land tend to grow finger millets in one half and beans in the other half.

Households in Geddesal and Kanakkarai village usually do not sell either finger millet or broad beans, and entirely use it for own consumption. A 100 kilogram bag of finger millet can be sold for Rs.1000-1500 to vendors who come to the villages, however, prices highly fluctuate over the year.

Farmers with access to water resources to irrigate their fields can produce up to two harvests of beans per year, with a first season between May-June (sowing) and July (harvesting), and a second- and main - season from September/ October (sowing) to November/ December (harvesting). The prices for beans on the markets in Mettupalayam, Sathyamangalam or Udayarpalayam - where producers from Geddesal and Kanakkarai villages can sell their beans produce -are between Rs.15 to 30per kilogram for the first harvest and Rs.7 to 10 for the second one. To reduce the costs of bringing the harvest to the markets in other villages, villagers share the costs for trucks. Some vendors also buy the produce directly at the farm gate.

Potatoes sold on the Mettupalayam market fetch prices between Rs.500 to 800 per bag (of 50-60 kilograms). Apart from these crops some farmers also grow maize extensively. A bag of maize (of around 50 to 60 kilograms) is sold on local markets for Rs. 800 to 1000. Few farmers also grow

carrot, beetroot, garlic and onion depending on availability of and access to water . The latter two crops are mostly for home use. Coffee has not reached the importance as a cash crop that it gained in other mountainous parts of Southern India. Only three farmers in Geddesal and one farmer in Kanakkarai grow coffee on small portions of their land. During interviews the farmers highlighted that the crop takes five years to mature and bear fruit.

To comparatively exemplify different livelihood and household situations in Sathyamangalam Tiger Reserve, the following two household case examples (“land owning” household and the “landless” household) from Kanakkarai village are given below.

#### **Case 1: “Land owning” household in Kanakkarai**

An example a land owning household in Kanakkarai with one and a half acres of land and a house of approximately 300 square feet which was obtained from his wife’s uncle who also lives in Kanakkarai. They rent the house for NGO purposes and to people who visit the village. The household head obtained the land by clearing forest area recently. He has, however, no formal land registration documents for this land.

The household receives water from a bore well installed on its relatives land by the NGO MYRADA. It was setup for use by the whole village seems to be solely used by the owner of the land where it is installed and his family. They cultivate only potato on the one and half acres of land that they own for marketable purposes at Udayarpalayam. The lady of the house possessed 15 goats but sold most of it for income due to crop failure. The animal dung is used as a fertilizer for the crops in his fields. The goats graze in the nearby forest, herded mostly by the wife.

His wife is also one of the two trained anti-natal care nurses in the village. She works in Orati, a village three kilometers away from Kanakkarai. During the time of this field work, she was preparing herself to participate in the upcoming panchayat board elections to contest the post of the panchayat head. Both, husband and wife collect broom stick grass and gooseberry apart from firewood from the forest.

The villagers are afraid to go against the lady of the house because of the superstition that she has powers to curse them for life. They also have television, electricity and mobile phones.

### Case 2: The “landless” household in Kanakkarai

The other example chosen is a household in Kanakkarai with no land. The family consists of three people. The household members live in a thatched house with an area of approximately 200 square feet. They only have basic amenities for survival purposes like food, clothes and shelter. The father and the son go for wage labour in surrounding towns like Kothagiri to work on tea and coffee plantations. The mother works as a day wage labour in surrounding villages of Jogigoundanur and Germalam. They do not cultivate crops as they are landless.

The family also collects NTFPs like firewood, soap nut, broom stick grass, *kadukkai* as well as stone and tree moss in the surrounding forests. The collection of stone and tree moss is illegal in Sathyamangalam forests. If they are caught they can be heavily fined by the forest department. But the local market price of about Rs.150 for one kilogram of moss seems to outweigh the risk.

The following table shows the agricultural crop production in the two case study villages in Sathyamangalam. Finger millet, beans, maize and potatoes, broad beans, carrot and beetroot are cultivated in both villages. German turnip, cabbage, chilli, tomatoes, onion, garlic, eggplant and sweet potato are only grown in Geddesal village while horse gram and Italian millet are grown in Kanakkarai village only.

Village names	Number of households	Percentage of households that grow the following crops					
		Finger millet (in %)	Broad beans (in %)	Maize (in %)	Beans (in %)	Potato (in %)	Others (in %)
Geddesal	85	66	32	15	50	43	67
Kanakkarai	81	56	14	38	32	35	97

Table 9: Agricultural crops grown per household in Soliga case study villages in Sathyamangalam Tiger Reserve, 2013-2014

The following other crops are grown in Geddesal village: beetroot (by 10 households), carrot (8), german turnip (8), field beans (5), cabbage (4), coffee (3), jackfruit (2), chilli (1), tomato (1), onion (1), garlic (1), eggplant (1), , sweet potato (1), coconut (1), , papaya (1), mandarin (1), tapioca (1), plantain (1), and tamarind (15). In Kanakkarai village “other crops” include mango (24 households), lime (24), gooseberry (17), tamarind (15), beetroot (2), mustard (2), orange (2), silver oak (2), carrot (1), field beans (1), horse gram (1), pearl millet (1), jackfruit (1), papaya (1), plantain (1), betel (1), spinach (1), coffee (1), turmeric (1), teak (1), and banyan (1).The figures show that households in Kanakkarai cultivate far more tree crops than households in Geddesal.

Cow and goat dung is the pre-dominantly used manure for crops. Chemical fertilizers like diammonium phosphate (DAP) and urea are also used. The villagers buy them in surrounding villages like Arepalayam and Udayarpalayam for prices between Rs.1000 to 1300 for a container of five kilograms. These prices are, however, subsidized by the government. Interestingly the interviewees reported that they only use organic fertilizers for the crops they consume themselves and chemical fertilizers for the crops they sell. They say that they know the consequences of consuming too much chemically grown crops and hence avoid it for their own consumption. Their reasons for using chemical fertilizers for their cash crops are better yield and hence more income generation.

Many fields in Geddesal village are secured with electric fences to prevent the intrusion and destruction of crops by wild pigs and elephants. Solar fencing has been provided by the forest department on one side of the village-forest boundary. Before and during the harvest periods, villagers also pitch temporary look-out huts in the fields and stay guard for whole nights. They shout, throw stones and use torch light to scare the wild animals from eating and destroying their crops.

Iron barrels are mostly used to store the finger millet yield. Until 20-25 years ago, however, households in Geddesal and Kanakkarai village used only bamboo-made storage container (*thombai*) to store their yields (see Figure 18). One *thombai* can hold between 300 to 400 kilograms (3 to 4 bags) of finger millet (the unit traditionally used to measure the millet yield quantities *kollaga*). *Thombai* are cylindrical and taper upwards. Below there is a lid with a key. When needed, one has to open the key, take the required finger millet and winnow (*nembi*) it and grind it to make porridge (*kali*), the local staple food. The finger millet stalks (*thinai*) are hit and the waste (*pottu*) is taken out. *Thombai* are closed with a layer of *ragi pottu* (finger millet waste) and another layer of pat cow dung on the top of the *ragi pottu* to restrict rodents from entering it. One reason why *thombai* are not used any longer might be a lack of bamboo because according to the forest protection regulations households are not allowed to cut down bamboo trees in the forests any more.



Figure 21: Iron barrels and bamboo *thombai* used for finger millet storage in a house in Anakarai village

Another way of storing finger millet yields which was used approximately until five years ago were finger millet pits (*ragikuzhi*) (see Figure 22 below) and sacks. During the time of the field study, there were still two *ragikuzhi*'s in Kanakkarai. One is in the Kanakkarai village head's house (his kitchen was used as *ragikuzhi* storage), the other is the in the village head's father's house in Erayandoddi, a hamlet in the outskirts of Kanakkarai village.

However, interviewees reported that the post-harvest losses were high, e.g. in the *ragikuzhi* they used to lose two or three bags per season due to termites (*karaiyan*) infestation. Especially in tiled house/ thatched houses the problem of post-harvest losses due to rats is still immense. Households have to have one or two cats to control rat infestation. Rats were also known to make holes in the bamboo *thombai*'s. In order to reduce post-harvest losses, most households in Geddesal and Kanakkarai village now use iron barrels (see Figure 21) to store their finger millet yield. Maize yields is not stored in iron barrels but in sacks as traders buy the yield directly after harvest.





Figure 22: An old finger millet pit used for storage of finger millet grains

#### **6.4. Non-timber forest product**

The Soligas in Sathyamangalam gather Non-timber forest products (NTFP) for additional income during the agricultural season and the main source of income during the dry season (January-March). The Soligas collect gooseberry, broom stick grass and honey and sell it through the Village Forest Council (VFC) for fixed prices. The VFC is regulated by the Sathyamangalam Forest Department and has members of the concerned village and officials from the government forest department. The price of the NTFP are fixed every year after a meeting among the members of the council.

The villagers in Kanakkarai also gather bamboo shoots from the forests which are predominantly used for own food consumption. The cutting down of the bamboo shoots reduces the regeneration rates of the bamboo tree and thus brings about a change in the existing ecosystem. The bamboo flowers once in 60 years before it dies and the new shoots have to be protected for the cycle to continue. Due to forest regulations it is illegal to cut down these shoots but the villagers continue to do so in stealth. Cutting down the bamboo shoots in the forest also contributes to the reduction of food for wild elephants, who also feed on bamboo. This eventually forces the beasts to enter the fields in search of food, thereby causing total crop failures.

#### **6.5 Livestock**

Livestock plays a crucial role for the livelihood of some of the households in Geddesal and Kanakkarai village. The most common farm animals are cows, buffaloes, oxen, goats and sheep. The distribution of livestock in Geddesal and Kanakkarai village in 2013-2014 is shown below in Table 10.

Village	Number of households	Percentage of households with the following livestock				
		Cows (in %)	Buffaloes (in %)	Oxen (in %)	Goats (in %)	Sheep (in %)
Geddesal	85	9	6	7	14	4
Kanakkarai	81	16	2	12	11	1

Table 10: Distribution of livestock per household in Soliga case study villages in Sathyamangalam Tiger Reserve, 2013-2014

Table 10 shows that, although livestock is important e.g. to till the fields or for milk production, only relatively few households hold livestock. Households in Kanakkarai tend to hold more cattle than those in Geddesal.

State and NGO agencies support the use of livestock in both case villages. The state government of Tamil Nadu provided 20 households in Geddesal and Kanakkarai with five goats each for free. The NGO MYRADA supported the construction of cow sheds in Kanakkarai village. MYRADA does not work in Geddesal because it is a forest settlement. Except the forest department no other external agency is allowed to work in these forest settlements.

Cattle normally graze on their own in the nearby forest areas and return to the village in the evenings. The goats and sheep are shepherded by the villagers in the forests. In some cases villagers also herd the cattle. Hens are given 21 days hatching period; their eggs are sold or used at home. Milk from the cows is an important diary product for households. Oxen are central to plough the fields. In times of need goats or sheep are sold for about Rs.5,000 to Rs.6,000, a single cow for the price of Rs.9000 to Rs.10,000 and a pair of cows for Rs.15,000 to Rs.20,000 to traders who come from towns in Tamil Nadu and Kerala state.

## 6.6 Comparison to Lingayat households

In order to provide a comparison to the Soliga households in Geddesal and Kanakkarai village, the following two tables show the land holding sizes and crops grown by households of the Lingayat ethnicity in Jogigoundanur and Jaderudrasampuram village. Both villages are adjacent to Kanakkarai. The Lingayats predominantly have land holding size larger than one acre. Jaderudrasampuram is located near a larger village called Germalam. The villagers of Germalam have vast expanse of land that they rent out to villagers in Jaderudrasampuram.

<b>Village Names</b>	<b>No land (in %)</b>	<b>Rented land (in %)</b>	<b>&lt; 1acre (in %)</b>	<b>1 acre (in %)</b>	<b>2 acres (in %)</b>	<b>3 acres (in %)</b>	<b>3-6 acres (in %)</b>
Jogigoundanur	7	20	-	13	40	13	7
Jaderudrasampuram	-	-	-	50	30	-	-
Total	7	20	-	63	70	13	7

Table 11: Land holding size in Lingayat case study villages in Sathyamangalam Tiger Reserve, 2013-2014

Table 11 clearly shows that the land holding sizes of Lingayat households in Jogigoundanur and Jaderudrasampuram village are much larger than those of the Soliga households in Geddesal and Kanakkarai (see Table 8 above). This is the case although the natural and agro-ecological conditions are very similar in all four villages. The different agricultural patterns can also be seen in the crops grown. Table 12 shows the agricultural crops grown in the Lingayat case study villages.

<b>Village</b>	<b>Number of households</b>	<b>Finger Millet (%)</b>	<b>Broad beans (%)</b>	<b>Maize (%)</b>	<b>Potato (%)</b>	<b>Others (%)</b>
Jogigoundanur	14	8	3	8	7	21
Jaderudrasampuram	20	15	8	15	10	21
Total	33	23	11	23	17	42

Table 12: Agricultural crops grown per household in Lingayat case study villages in Sathyamangalam Tiger Reserve, 2013-2014

Others crops comprise beans (grown by 4 households), beetroot (3), carrot (2), garlic (2) german turnip (2) and cabbage (1) in Jogigoundanur village and beans (5), carrot (5), garlic (2) and beetroot (1) in Jaderudrasampuram village.

## **6.7 Land Use and Land Cover Change in Sathyamangalam Tiger Reserve**

This sub-chapter shows the land utilization and land cover change in the second case study area, in the Sathyamangalam Tiger Reserve, Erode District, Tamil Nadu State (Figure 23). The section is based on primary and secondary data taken from satellite imageries and Survey of India topo sheets, as well as on supplementary GIS collected during the empirical field study in 2013-14. By additionally using historical data, the chapter also shows and analyses the changes in land use and land cover in the case study area over a period of twenty years.

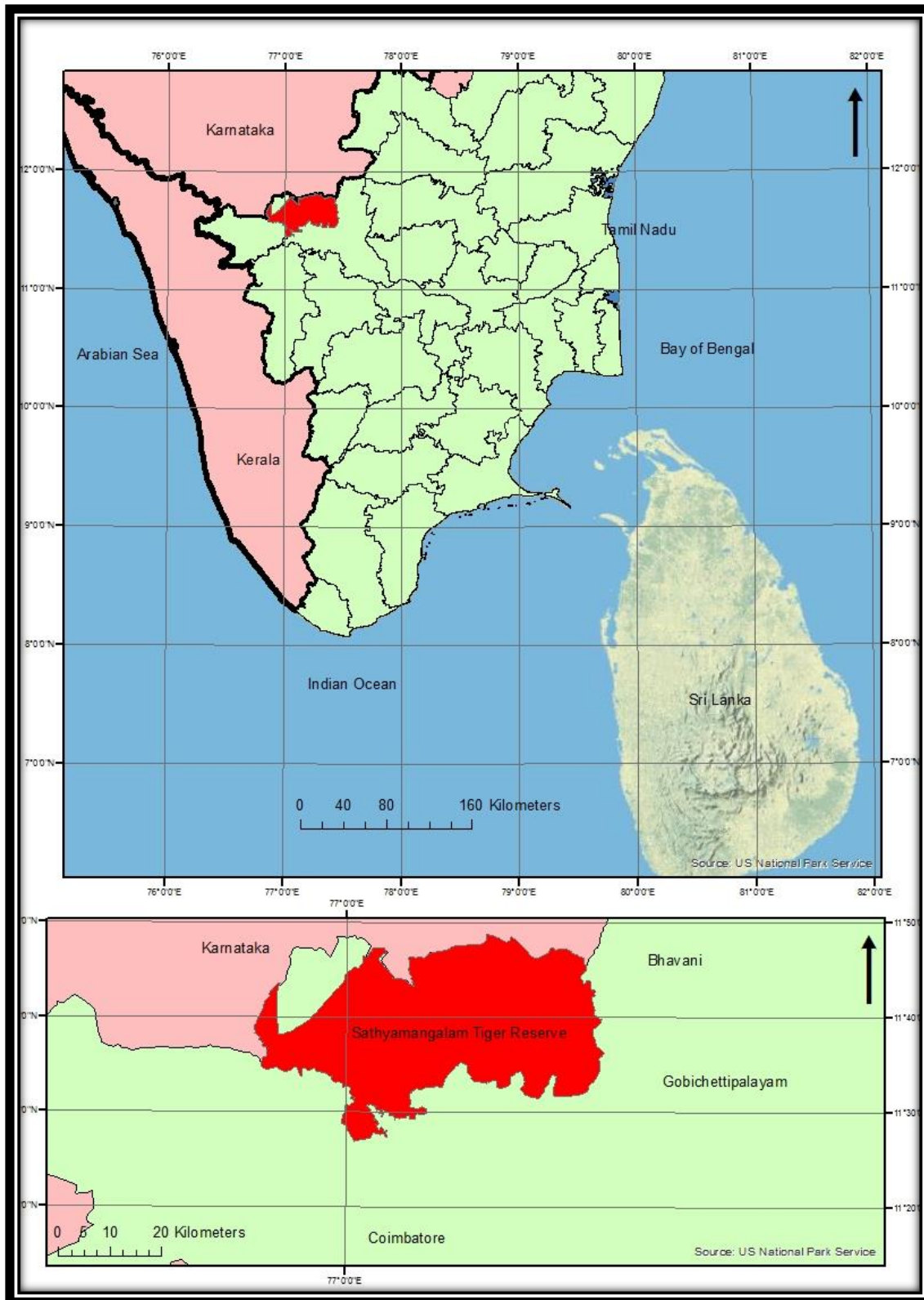


Figure 23: Location of Sathyamangalam Tiger Reserve

Source: Survey of India topo sheets (1970-71)

The agricultural systems and patterns shown above are not static but are currently undergoing various transformations and changes, driven by internal and external, economic and ecological factors. It is hypothesized that the transformations and changes are mirrored in gradual processes of land use and land cover change. Figure 21 shows the land use and land cover change for Sathyamangalam Tiger Reserve between 2005-2006 and 2011-2012.

The maps in Figure 24 were produced using a base data from the Indian Space Research Organization (ISRO) which uses the land use and land cover classification scheme of the Indian National Remote Sensing Agency (NRSC). ResourceSAT LISS III data were used to map the case study areas in two time periods (2005-2006 and 2011-2012). Data from three seasons was used to produce the maps. The three season data was gathered in the months of *Kharif* (October/November), *Rabi* (January/February) and *Zaid* (April/May). In this part of Southern India, the *Kharif* season is the monsoon period while *Rabi* and *Zaid* are the post and pre monsoon periods respectively. The maps were produced at a 1:50,000 scale under the National Natural Resource Management System in 2014. To verify and triangulate the data, excessive ground truthing was done throughout the case study area.

The study villages Geddesal and Kanakkarai are located in the north-east of the Sathyamangalam Tiger Reserve. The area is dominated by deciduous and evergreen/semi-green forests with patches of cropland in between. However, no major shift in land use land cover patterns can be seen in this area when comparing the two maps in Figure 24. There is a slight increase in scrub growth in 2011-12 compared to 2005-2006.

There has been an increase in the settlement areas due to the clearing of land to build houses for the growing population in 2011-2012 as compared to 2005-2006. Also the agricultural fallow areas have been converted to crop growing areas as can be seen in the maps below. In Kanakkarai forest land near the village has been cleared to build residential units and was approved by the Tamil Nadu State Forest Department in the year 2013-2014. Around 60 families received land units to build houses. Interviews also provided information that villagers in Geddesal moved the reserved forest boundary stones and encroached the surrounding forest land near the village to cultivate crops.

Many land use and land cover changes, however, are not visible in Figure 24. Although forest records from the government forest department show that there was encroachment of forest land around the case study villages for the cultivation of crops.

In many parts of the forest, invasive species like *Lantana camara* (also known as wild-sage) changed the land cover pattern. *Lantana camara* was brought by the British as a decorative plant in the 18<sup>th</sup> century and now extensively grows as a under growth that prevents the growth of many indigenous tubers and roots, traditionally consumed by the Soligas and Lingayats. Some parts of the forest have increasingly been covered by thick bushes, reducing the cross pollination by birds as the bushes prevent seeds to reach the ground.

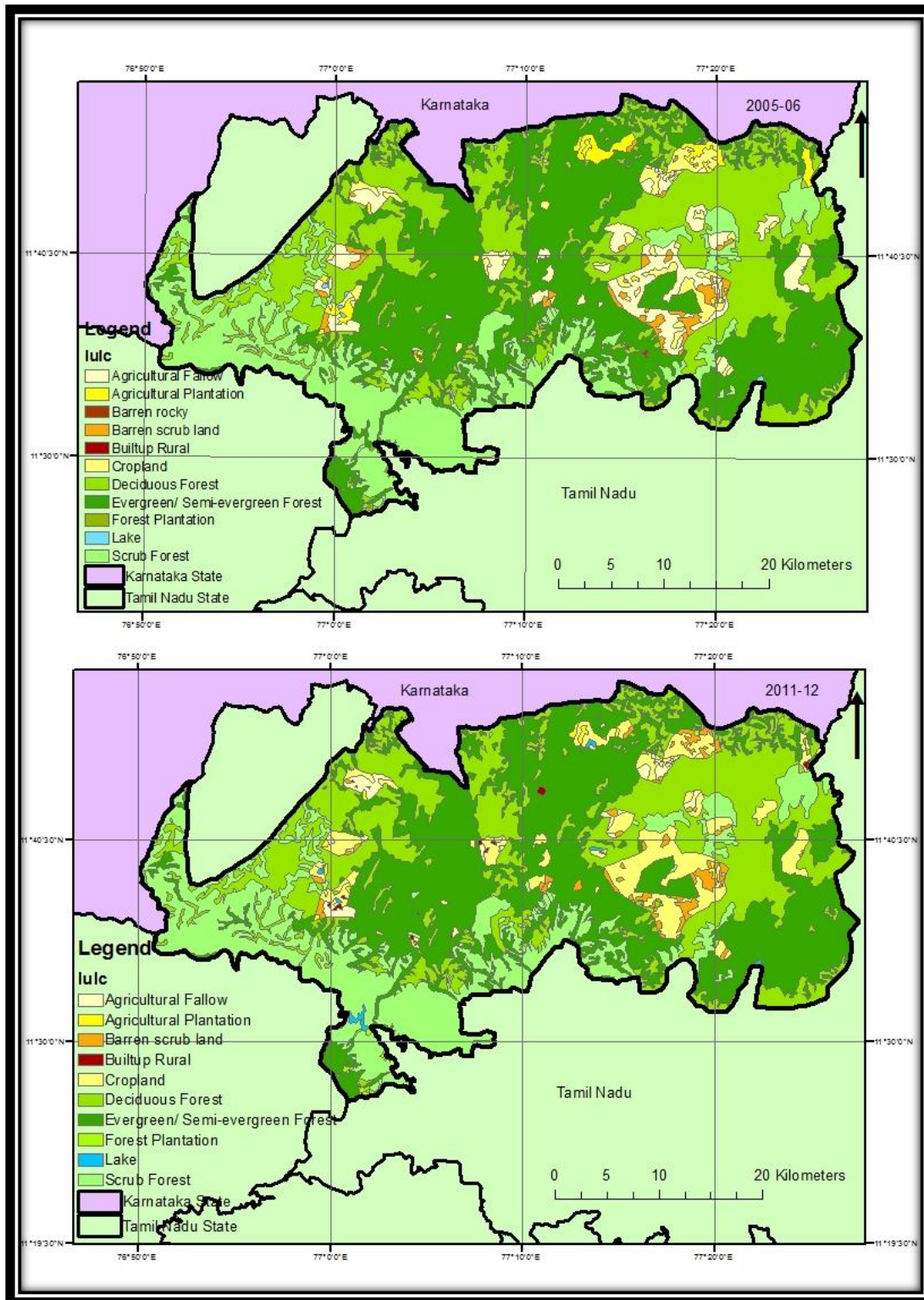


Figure 24: Land use and land cover map for Sathyamangalam Tiger Reserve, 2005-2006 and 2011-2012

Source: Land use and Land cover maps, National Remote Sensing Agency, India (2005-2006, 2011-2012)

## 6.8. Off-farm income in Sathyamangalam Tiger Reserve

The off-farm income situation of Soliga households in the Sathyamangalam Tiger Reserve case study differs significantly from the one in M.M. Hills case study. Many Soliga household members are employed in plantation activities by the forest department. Around 40 hectares of land near Geddesal village is under eucalyptus cultivation. Soliga villagers are also employed as fire watchers for the prevention of forest fire in the surrounding forest areas. Another off-farm employment opportunity is a 30 hectare silk farm within the limits of Kanakkarai village which is owned by the State Sericulture Department.

During the dry season some Soliga people in Sathyamangalam work as day labourers in the tea or coffee estates in the plains. Some Soliga men and women temporarily migrate to work in the Kothagiri coffee estates in Tamil Nadu for several months during off-season. They usually return to the village for the start of the agricultural season in July. Men are roughly paid Rs.200 and women Rs.100 per day for agricultural labour as remuneration apart from food and transportation charges. Many Soliga from Sathyamangalam also seasonally migrate for work in quarries in large cities like Bangalore and Madurai.

Some Soliga people are engaged in broomstick making from grass available from the nearby forests. They sell it for about Rs. 10 per broomstick on markets in the surrounding towns (Figure 25).



Figure 25: A Soliga man is making grass broomsticks (*Seemar pullu*) in Kanakkarai

## 7. Conclusions

### 7.1 Land Management Practices in M.M. Hills Wildlife Sanctuary and Sathyamangalam Tiger Reserve

This study shows and analyses the livelihood conditions and the agricultural transformation among indigenous communities (in India officially referred to as scheduled tribes<sup>15</sup>) of the Soliga ethnicity living in protected forest areas in Southern India. Based on empirical local field research conducted in 2013-14 the research compares and contrasts between livelihood conditions of two ethnic groups namely the Soliga communities and Lingayat communities as well as land use rules and regulations in two case study areas in two Indian states, namely Karnataka and Tamil Nadu. The case study areas are: a wildlife sanctuary in Male Mahadeshwara Hills (M. M. Hills), Karnataka, and a tiger reserve located in Sathyamangalam, Tamil Nadu. Both case study areas are located on the Southern Deccan plateau approximately 150 km south of Bangalore, in the same bio-physical environment with similar socio-economic, cultural and historical conditions. However, the both case study areas are part of different Indian states, and are differently influenced by activities, decisions and rules made by state authorities, largely forest governing bodies, and non-governmental organizations. This allows for a good comparison of the agricultural transformation processes and livelihoods of Soliga communities. In order to be able to provide a local comparative perspective, also interviews with farmers from the indigenous ethnic group of the Lingayat, living in or adjacent to Soliga villages, were conducted.

The Sustainable Livelihood Framework (SLF) was adapted as the conceptual framework for this study. In the context of this empirical study, the SLF allows to understand the different capitals needed for the livelihood conditions of the Soliga communities living in the two case study areas. The SLF was used to understand the correlation between agricultural transformation, land use changes and livelihoods of the Soliga communities. It is worth noting that otherwise than initially expected, Ostrom's 'tragedy of the commons' theorem was found to be no significant issue in the study area. It was found that the villages chosen for this study comprised only small holder farmers dependent on the land resources for their livelihood apart from the forest resources. Under this backdrop the study answers the main research question:

- **How does agricultural transformation and Protected Areas designation impact on land use and livelihoods of Soliga communities living and around the M. M. Hills Wildlife Sanctuary, Karnataka, and the Sathyamangalam Tiger Reserve, Tamil Nadu?**

The research illustrates how land management practices in both case study areas are dominated by small scale farming. However, promoted by socio-economic, cultural and institutional transformations in rural Southern India in the last decades, the agricultural sector and the livelihood of the Soliga smallholders underwent fundamental changes. Land management practices became more diverse, more market-based and more stimulated by and dependent on 'outside' drivers and interests. Land is increasingly being contested in both study areas.

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<sup>15</sup> Scheduled tribes (ST) is a term coined in the Indian constitution for different groups of historically disadvantaged native people in the country.



Different interest groups follow different, often contradicting, agendas and priorities such as agricultural intensification, forest and wildlife protection, or economic development of indigenous groups. Livelihoods and agricultural activities of Soliga communities in the case study areas are increasingly affected by land use intensification and extensification at the same time. This is promoted by ‘modern’ agricultural practices and market drivers on the one hand and the establishment and enforcement of protected areas on the other.

In this line, the study shows underlying tensions and conflicts associated with the newly established protected areas in the study sites due to the intervention of state authorities in the land management practices of the indigenous groups. Access to and tenure of land is the primary source of concern for Soliga farmers in both the study areas. Many Soliga farming households have either no land tenure rights at all or only conditional land tenure rights (they can inherit the land from their ancestors but cannot sell it to a third party). The lack of formal land tenure documents has many implications, such as that the farmers cannot obtain loans from banks to invest, e.g. in the betterment of their crops or yield. With the establishment of protected areas in the form of wildlife sanctuaries and tiger reserves indigenous farmers can no longer extend their land into forest areas. Before the establishment of the protected areas it was relatively easy for Soliga communities to clear forest land for agricultural purposes and building houses.

The establishment of protected areas also raised concerns among the Soliga communities about a contradiction between wildlife conservation and agricultural production. In the past, Soliga people generally protected millet, their main food crop, from wild animals by joining together at main times of animal intrusion and destruction. However, agricultural transformation and land use change brought new challenges. In Sathyamangalam Tiger Reserve, Tamil Nadu state, bamboo trees have been cut down in the last decades for building houses and the number of bamboo shoots declined as they were overconsumed by Soliga communities living in and around it. Wild elephants living in the tiger reserve feed on bamboo, and the increasingly lack of bamboo in the forest forced them to forage into the nearby villages for food. Elephants as well as other wild animals like wild boars destroy the maize crops in the night. In Kanakkarai, a case study village in Sathyamangalam Tiger Reserve, villagers have set up electric fencing and a night watch to chase wild animals by shouting aloud or frightening them with fire. In Geddesal village in the same study area, the NGO MYRADA introduced collective maize farming for Soliga communities around ten years ago. However, the crops were completely destroyed by wild elephants and hence the project was finally completely dropped.

- **What are the different trends in agricultural practices over the years within the Soliga communities? What are the underlying drivers for change?**

Many drivers promote and influence a transition of agriculture from traditional, largely subsistence-based farming systems to ‘modern’, more cash crop oriented systems. In the last few decades, traditional agricultural practices by the Soliga communities have been drastically converted by a series of outside influences (also see Sundaram et al 2012 and their work in Soliga communities in the Biligiri Rangaswamy Temple Wildlife Sanctuary, Karnataka state). In this research, three main groups of outside influences have been identified, namely state activities, NGO activities, and activities of neighboring communities.

Traditionally the people in the case study villages grew both finger millet (*ragi/ kezhvaragu*) and broad beans (*avarai*) for their household needs and gathered wild tubers like *noore*, *neve* and *belare kizhangu* (tubers) along with other fruits from the forest to supplement their food needs. The growth of broad beans (*avarai*) has gone down in the late 2000s due to the need for more space to cultivate finger millet (*ragi/ kezhvaragu*) to fulfill the needs of the growing family sizes and a lack of availability of seeds (traditionally seeds were stored from the previous year's crops).

In the last years, agricultural transformation, especially the change in use of crops, is also promoted by activities of the NGO "Mysore Resettlement and Development Agency" (MYRADA). MYRADA offers trainings for Soliga farmers in the use of commercial crops and supplies them with seeds.

MYRADA has organized Self Help Groups (SHGs) in the Soliga villages (and also other non-Soliga villages) in the M. M. Hills area through which the trainings and seed distribution activities are being organized and spread. As of 2013/14, there are about 50 SHGs under MYRADA's umbrella in the whole M. M. Hills area.

As part of the Central-National Seed Project Program and the "National Bank for Agriculture and Rural Development" (NABARD), MYRADA distributes seeds free of costs each year at the MYRADA office in Male Mahadeshwara town in M. M. Hills. On June 19, 2013, the author participated in the distribution ceremony at which large numbers of farmers (around 4000 people, more women than men), gathered at the MYRADA office for collecting seeds. At this occasion, the author talked to farmers, MYRADA employees and extension officers. At the ceremony, officers from the Agricultural Extension Department were there to directly distribute seeds to the farmers. There were also scientists and experts from the University of Agriculture, Bangalore, present during the seed distribution.

The crop varieties are all highly disease resistant and suitable for both dry and rain fed conditions. Beans take about 6 months and maize about 4 months to grow and produce yield. There are, however, also reports about failures to introduce maize. The seed distribution program falls under the National Seed Project, which has two wings, namely, the Breeder Seed Project and the Seed Technology Research Wing. The objective of the National Seed Project, central government sponsored, is to strengthen the Research and Development Farms, especially the seed farms. The government provides a number of services to the farmers at marginal prices. The services include certification, seed testing, seed physiology, seed distribution, hybrid varieties, directly supply and sales points to farmers. Under the "Tribal Sub-Plan" introduced during the fifth five year plan (1974-79) by the Government of India seeds are given to "Scheduled Tribe" people apart from promoting seed replacements with new varieties. Seeds are distributed according to the agro-climatic zones to test the ultimate user performance and free of cost. All crops, horticultural and crafted materials are given to indigenous "Scheduled Tribe" communities. The farmers are also trained on local best practices in production, crop diseases and farm pest control methods as well as on the reduction of post-harvest losses. The overall aim is to increase agricultural productivity, knowledge and awareness of indigenous farming communities. (Source: Interview with a member of the Department of Seed Science and Technology of the University of Agricultural Sciences, Bangalore).

However, the Tamil Nadu state forest department restricted activities of NGOs in forest settlements like Geddesal village to reduce the interference from external sources. Soliga informants from Geddesal village reported that they started collective farming to grow maize in their fields in the second half of the 2000s after getting seeds and training from MYRADA, but that they gave up soon due to the destruction of their maize fields by wild elephants in the vicinity.

Another important driver for agricultural transformation in the Soliga communities that is particularly evident in the Sathyamangalam case study is the influence from neighbouring communities. Most notably these are influences on 'modern' agricultural practices coming from communities who belong to the ethnic group of Lingayats. Around 66% and 56% respectively of the Soliga households in the villages of Geddesal and Kanakkarai were found to grow finger millets and 32% and 14% grow broad beans for subsistence. Around 50% and 30% grow beans and 43% and 45% grow potatoes as other major crops for commercial purposes. Lingayat households in Sathyamangalam have diversified into vegetable cultivation like carrot, beans, potatoes and german turnip, much more than Soliga households in the same area. Agricultural transformation also promoted an increased integration of people from Soliga communities into local and regional labor markets and market connections to neighboring villages and towns. According to Soliga informants from Sathyamangalam, for example, some Soliga smallholders started to adopt the techniques of coffee production during their time spent as wage laborers on coffee plantations in towns in the plains, such as Kothagiri in Nilgiris district, Tamil Nadu. Coffee production, however, is still being applied by only few Soliga smallholders, largely due to the fact that it is a long term perennial while most Soliga smallholders need immediate returns for sustenance from their small plots of land.

Soliga farmers in M. M. Hills have not diversified much into commercial cropping. Around 68% of the interviewed Soliga households grow finger millet for own consumption. In contrast, Lingayat smallholders in M. M. Hills tend to grow a wider variety of crops, including sun flower, and more often use irrigation own private irrigation bore wells on their lands than Soliga smallholders. In contrast to the Soliga communities living in M. M. Hills the Soliga communities living in the adjacent Biligiriranga Hills Tiger Reserve (BRT) claim to have drifted from the predominant use traditional crops to commercial crops like coffee and pepper. One driver that promotes the conversion from traditional food crops to commercial cash crops is the fact that the latter is less affected by infestation of wild animal from the nearby forests.

In the last decade, many Soliga smallholders gradually started cultivating cash crops which they sell to private merchants. Coffee production was introduced amidst the villagers by people who went to other areas for work and brought the innovation and technology of cultivation back with them. This was coupled with a decline in the cultivation of millets over time. With regard to wild animal infestation, this led to difficulties for the Soliga smallholders who are still cultivating millets. Cash crops like coffee are rarely eaten and/or destroyed by most wild animals. That is, with the numbers of households cultivating millets declining, there were relatively more attacks by wild animals on the remaining millet fields and less people willing to protect them. So much so, the change from food crop to cash crop land management practices has brought in a transition not only in terms of changes in cropping patterns and market integration but in terms of human-wild animal conflicts.

Local state authorities support the agricultural transformation and the changes of land management practices in many ways. In the case study in Sathyamangalam Tiger Reserve, for example, the use of fruit trees is supported. The agriculture and horticulture officer in Talavady block (Geddesal and Kanakkarai village fall under Talavady block jurisdiction) encourages farmers to start or increase the use of fruits like mango, orange, guava and chickoo that tend to produce yield relatively fast after a couple of years. These fruit trees are frugal and can generate good and long term income. The NGO MYRADA provided seedlings like mango, orange, coffee and silver oak to the plantation farmers in Kanakkarai village. Huge areas in in Sathyamangalam Tiger Reserve have come under plantations in these forest areas and give profitable returns.

Agricultural change and innovation is also visible in the large farming estates in the study areas. Drip irrigation, for example, has been introduced in some of the large farming estates to grow citrus fruits like orange.<sup>16</sup> A precondition to get support with irrigation facilities by local state authorities is, however, to have formal land tenure titles. As shown in Chapter 5 and Chapter 6, this is not the case for most of the Soliga farmers. Only if farmers have the documents they can take the initiative to approach the local state authorities.

Although 99% of the Soliga households are involved in farming activities not necessarily farming is the sole income generating occupation practiced by the households. In M. M. Hills Soliga households mostly use the farm produce for own consumption and largely rely on non-farm and off-farm activities, such as wage labour, NTFP collection, furniture and carpet making, for income generation. In contrast to M. M. Hills, Soliga farmers in Sathyamangalam Tiger Reserve rather rely on farm produce for income generation and are more involved in NTFP collection – which is however difficult for them as the forest protection rules in the area are increasingly monitored by the state forest authorities.

- **What role does the traditional forest and agriculture-related knowledge play in agricultural transformation and land use change? How could traditional knowledge systems be used to promote more sustainable agriculture management and forest conservation?**

In the past, Soliga communities tend to gather firewood and other NTFPs such as fruits for their household from faraway distances in the surrounding forests. Walks of eight to twelve kilometers per day were not uncommon. . The radius to gather firewood and other NTFPs decreased in the last decades, both due to less supply and less demand. Soliga elders expressed that the present generation does not have the strength for such kind of hard labour and it is mainly attributed to the eating habits and nutrition deficiency (Village Elders, Fieldwork, 2013-14). In the past Soligas consumed more finger millets grown using traditional seeds which contained higher nutrition levels supplemented by tubers and fruits from the forests. In recent times, the use of traditional seeds has considerably gone down due to lack of storage and increase in commercial farming for income returns, and the use of tubers and fruits from the forests decreased due to the over growth of weeds and invasive species.

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<sup>16</sup>According to informants, the land for the estates was often purchased from Soliga farmers many years before “by people from the plains”.

The traditional storage pits and baskets have vanished from the villages due to lack of massive food crop production output (see Chapter 6). The field plots are rather divided for both subsistence and commercial cropping. As most of the crops are rain-fed, the yields are highly fluctuating.

In the past Soliga farmers only used natural fertilizers (cow and goat dung) on their fields. Since about 2010, there has been a transition to use chemical fertilizers by Soliga farmers. This is largely due to subsidized products available from the state government. Natural fertilizers are, however, still used. In Kanakkarai village, for instance the Soliga farmers continued to only use natural fertilizers for their food crops on their fields as they are aware of the health implications from chemical fertilizers.

Lantana (*Lantana camara*) is a weed plant. It was brought as an ornamental plant by the British to India around 150 years ago and it is known as an invasive species that undermines forest ecosystems in the M. M. Hills and Sathyamangalam ever since. In M. M. Hills the Soligas use lantana barks to make furniture instead of cutting down bamboo (see Section 8.2). In Sathyamangalam the plant still poses a threat and the state forest department has started taking measures to control the spreading of Lantana in the forest areas as it absorbs more water from the soil and leads to the death of local plant species. Lantana has also affects the growth of roots and tubers consumed by Soligas in the forest areas. It has impacts upon the pollination of seeds carried by birds because the seeds do not reach the soil due to the dense nature of the Lantana plant and hence there is a break in the ecological cycle. Thus it also affects the food availability for the wildlife in the case study region. An old villager from Anaiwala said that Lantana has been around in the M. M. Hills for well over 50 years. In M. M. Hills, Lantana is used as a substitute for bamboo to make furniture.

In the past, Soliga communities used to cause forest fires on purpose once in few months to eliminate the 'unwanted' flora and fauna in the forests and to revitalize the soil for better plant growth. With the establishment of protected areas, there has been stricter measures in place which restrict the Soliga communities from practicing these traditional practices.

## **7.2. Final recommendations**

### **Environment**

The Soliga households, as many other indigenous communities in rural India, must be involved more in the planning, establishment and implementation of protected areas that directly affect their agricultural activities and their livelihoods. This holds especially true for more exclusionist protected areas such as tiger reserves. Instead of trying to evacuate indigenous communities from their traditional homesteads it would be better to use their traditional ecological knowledge for the betterment of the environment. Active participation by the local indigenous communities would facilitate problem solving related to both socio-economic as well as environmental concerns in the areas. Environmental protection and socio-economic development have to better integrate. Soliga people in the case study areas can be for example employed by the state forest authorities to plant trees in the forests or to create forest fire lines and even to safe guard the environmental resources and wildlife from poachers, thus generating locally integrated livelihood opportunities for the Soligas. For instance in Sathyamangalam Soligas traditionally set up forest fires on purpose once in a few years to eradicate weeds and invasive species in the forest and to allow the local species to flourish. This system has been

completely banished by the state forest authorities due to environmental conservation concerns. Thus formal institutions and regulations voluntarily or involuntarily are affecting the natural habitat conservation carried out by the indigenous communities and it has had a massive impact in the region. One prominent example is the dispersion of the invasive lantana plant species.

Firewood collected in the nearby forests is the most commonly used fuel by the Soliga households. In order to reduce the illegal cutting down of trees in the protected forests, the state government authorities can provide Soliga households with alternative fuel arrangements as gas cylinders. Lack of electricity is also a prime concern as well as proper infrastructure like roads. It is dangerous and unsafe for the Soligas to move about in the dark due to animal activities. It has to be made sure that the development of infrastructure does not inflict major harm on the environment and does not go against the protected area regulations in these regions.

Water is also another source of problem as most of the agriculture depends on seasonal rains. The installation of bore wells would help the Soliga farmers in the case study areas to increase their agricultural productivity and to diversify their crops. Drip irrigation could also be introduced to promote citrus varieties in the region.

Traditional seeds have to be preserved. Most of the Soliga households are unable to conserve their traditional seeds. Also due to external influence of traders and NGOs high-yield variety seeds are being introduced in the region and are slowly replacing the traditional seed varieties.

Stine quarrying is carried out in M. M. Hills from people from the plains without legal permit. Illegal quarry activities in the neighborhood must either be terminated or legal permit issued so as to generate local employment opportunities and also to safe guard the locals from undue accidents and mishaps.

### **Economic**

The Soliga communities are the weakest 'players' on the local and regional markets. Their commodities must be sold through regulated markets for the indigenous farmers to get good market returns. In both study sites the agricultural goods produced by the Soliga farmers are either sold directly after harvest at the farm gate to traders (middle men) or on the nearby town markets, in both cases without much profit. In Kanakkarai traders in some cases give the maize seeds to the Soliga farmers for cultivation and half the produce is taken by the traders. If there are yield losses e.g. due to lack of rainfall or crop damage due to wildlife intrusion the farmers have to face the brunt of it. Smallholder farmer cooperatives could channelize and fix the price for the commodities for the farmers to receive profit from their produce.

Also the collection and use of certain NTFPs by Soliga communities can be regulated and organized in a better way. Some NTFP are legal to collect in Karnataka whereas in Tamil Nadu it is illegal to collect the same (e.g. tree moss). Uniform rules and regulations must be implemented in the protected areas that allow for a sustainable use of NTFPs by indigenous communities that enables them to benefit from alternative livelihood incomes. In this regard, also trainings for the safe and environmentally friendly collection of NTFPs can be given to the indigenous communities.

### **Social**

Interestingly, many of the educated youth in the case study villages returned to their parents' farms to practice agriculture and try to procure off-farm jobs (like school teacher) to

supplement their income. The youth must be encouraged in this endeavor and employment schemes must be set up to tap their knowledge. It should be used for the betterment of the livelihoods of the indigenous communities as well as the prevention of massive rural-urban migration.

A crucial issue is land tenure. In the present scenario there is no fixed regulation for all the Soliga case study villages in M. M. Hills Wildlife Sanctuary as well as Sathyamangalam Tiger Reserve to receive formal land tenure documents from the state government authorities. Secured and formal land tenure is the basis for agricultural change and rural development. The documentation reforms must be implemented at the earliest for the Soligas to benefit from state, NGO and private sector programs and activities, such as receiving loans from banks.

The state authorities must provide protection against wildlife intrusion from the protected areas to the agricultural fields and homesteads of the Soliga farmers. Electric and/or solar fencing must be introduced in the fields to ward off the animal intrusion. Trenches can be dug around the circumference of the village to prevent elephants from entering the villages. Crop damage due to animal intrusion must be appropriately addressed and compensated to reduce the poverty cycle among the Soligas and to provide them with better livelihoods.

Lastly, actions are required to implement the policies in place. Many existing policies and programs that aim to improve the livelihoods of indigenous communities and at the conservation of the nature in India are not properly implemented and enforced. Together the nature can be conserved with the state authorities and NGOs providing the scientific and technical support while the indigenous farmers provide the traditional ecological knowledge.

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